GRTC TRANSIT SYSTEM

RICHMOND REGION MICRO-TRANSIT STUDY

Final Report

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1. OVERVIEW

This report contains the findings of the Richmond Region Micro-Transit Study (planning phase). It covers the existing conditions analysis that was done to identify potential locations in the region where micro-transit would be a suitable and feasible transit service. It then summarizes the findings from a best practices literature review. The third chapter describes the findings from an exploration of potential operational challenges and opportunities from peer agency interviews and discussions with the region's current demand response operators. Finally, it concludes with recommendations for future micro-transit service in the region, which were informed in large part through engagement with the region's jurisdictions and planning agencies.

2. EXISTING CONDITIONS

2.1 Introduction

The Greater Richmond Transit Company (GRTC) provides public transportation services to Virginia's Richmond region. The region encompasses nine jurisdictions: Charles City County, Chesterfield County, Goochland County, Hanover County, Henrico County, New Kent County, Powhatan County, the City of Richmond, and the Town of Ashland. GRTC currently provides fixed-route and paratransit services, and primarily serves the City of Richmond and small portions of the adjacent counties of Henrico, Hanover, and Chesterfield. The recent formation of the Central Virginia Transit Authority (CVTA), with its charge to provide regional transit funding, provides an opportunity to study new types of transit service within the Richmond region that might be suitable outside the urban core.

Understanding the potential markets for different types of transit service is a fundamental element of identifying where and what types of transit will best serve the community. Transit level of service must be well matched to market demands to be most effective. While fixed-route services are suitable for the urban/more dense suburban areas of the region, micro-transit is a versatile service type that typically involves app-based booking and dynamic routing, which makes it a good option for areas where fixed-route transit is underperforming or not currently offered (a more detailed discussion of the definition of micro-transit is included in **Section 3.1.1**). This section establishes an understanding of existing conditions, which will inform the micro-transit service planning process.

The section begins with a market transit propensity analysis to identify where micro-transit could potentially be implemented successfully throughout the region. Two propensity indices were used to identify areas with characteristics consistent with successful micro- transit services; these propensity indices were a Transit Potential index and a Transit Need index. Transit Potential is a measure of population and employment density in an area. Micro-transit services are typically more suitable for lower to medium density areas where smaller vehicles can accommodate the lower demand. Transit Need is a measure of socioeconomic characteristics that are indicative of a higher tendency to use transit (such as on-demand services). Transit Need seeks to identify on transit-oriented populations and activity-oriented jobs (retail, medical, recreation, education, and government) that foster trips more throughout the day rather than just during typical commuter peak hours.

These two analyses will feed into the Micro-transit Suitability Analysis, which will highlight areas that might be better served with micro-transit, and the Service Gaps Analysis, which will be used to identify gaps by comparing where fixed-route and micro-transit services are already provided and locations of high transit need to identify the types of micro-transit needed.

2.2 Transit Propensity

The transit propensity analysis uses both a transit potential and transit need assessment to combine demographic and socioeconomic data. This enables identification of the places in the Richmond region where various types and levels of transit service could be most successful. It highlights not only areas that could support transit based on population or employment density, but also uses an equitable approach to highlight areas where residents may be more likely to use transit rather than other modes.

While areas identified as high in both transit potential and transit need are typically strong candidates for fixed-route transit services, micro-transit can provide an ideal solution for areas with moderate-to-high levels of transit need but that lack the overall density (transit potential) to support robust fixed-route transit. The project team took the following steps to assess the feasibility of micro-transit throughout the Richmond region, favorably scoring areas that are higher in transit need and lower in transit potential in the final micro-transit suitability analysis.

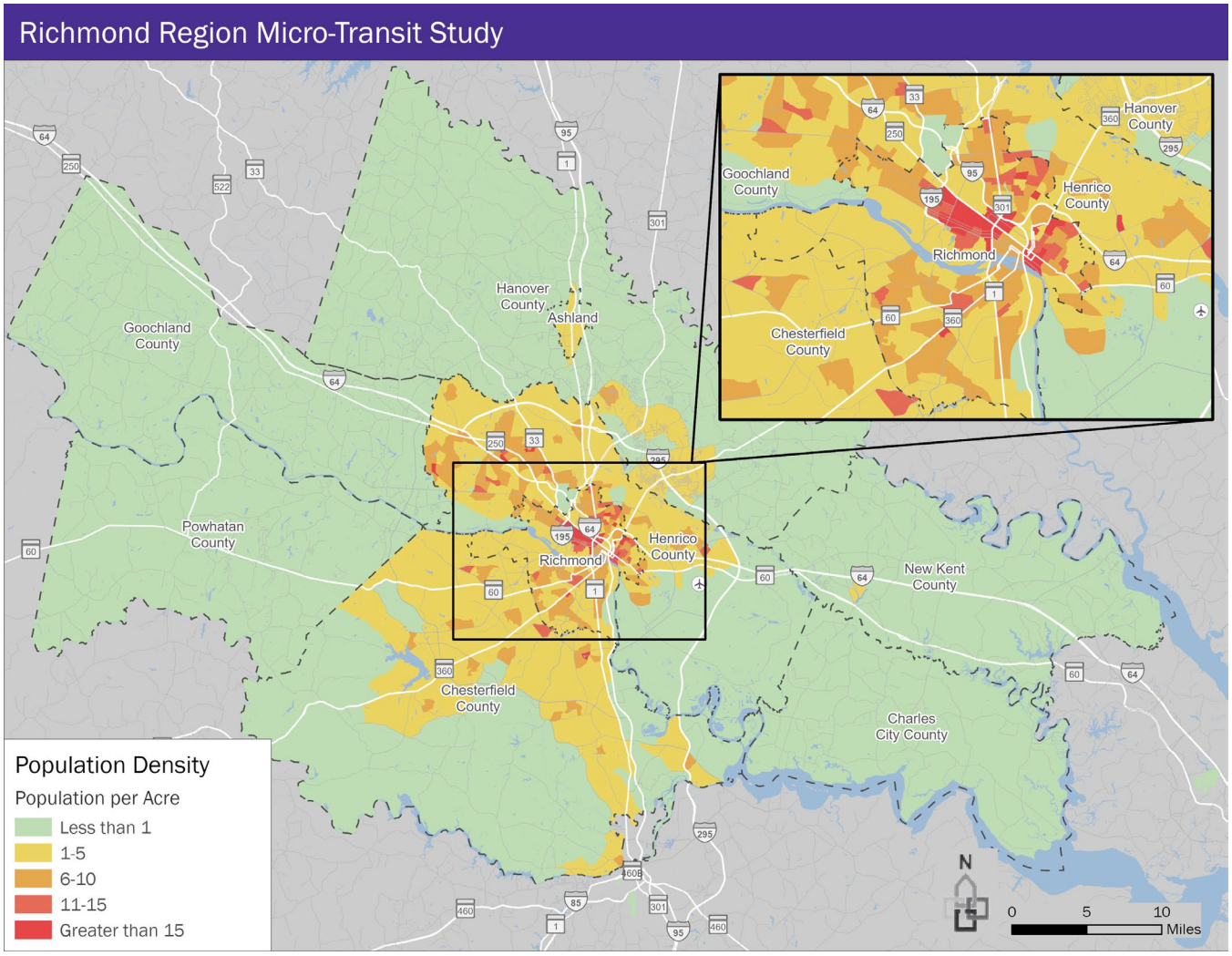
2.2.1 TRANSIT POTENTIAL

In general, higher concentrations of residents or jobs are correlated with higher transit ridership. In other words, transit ridership is higher where there is a larger total number of people and jobs per acre. This transit potential analysis first assesses population and employment density at the Census block group level throughout the Richmond region. The analysis then combines those two measures to produce an overall measure of transit potential.

Population Density

The Transit Cooperative Research Program (TCRP)'s *Transit Capacity and Quality of Service Manual, 2nd Edition* provides population and job densities that are considered supportive of transit. Densities of at least three households per acre (about six people per acre) are considered supportive of hourly fixed-route transit service. Micro-transit services are better suited in places with lower densities, where fixed-route services might not be appropriate. **Figure 1** visualizes population density by block group in the Richmond region. Most block groups meeting the fixed-route threshold, of more than six people per acre, are in Richmond, suburban Henrico County, and in Chesterfield County. Throughout outer Richmond, northern Chesterfield, eastern Henrico, Ashland, and portions of Hanover County, there are suburban densities of closer to one to five people per acre, which could potentially benefit from micro-transit services.

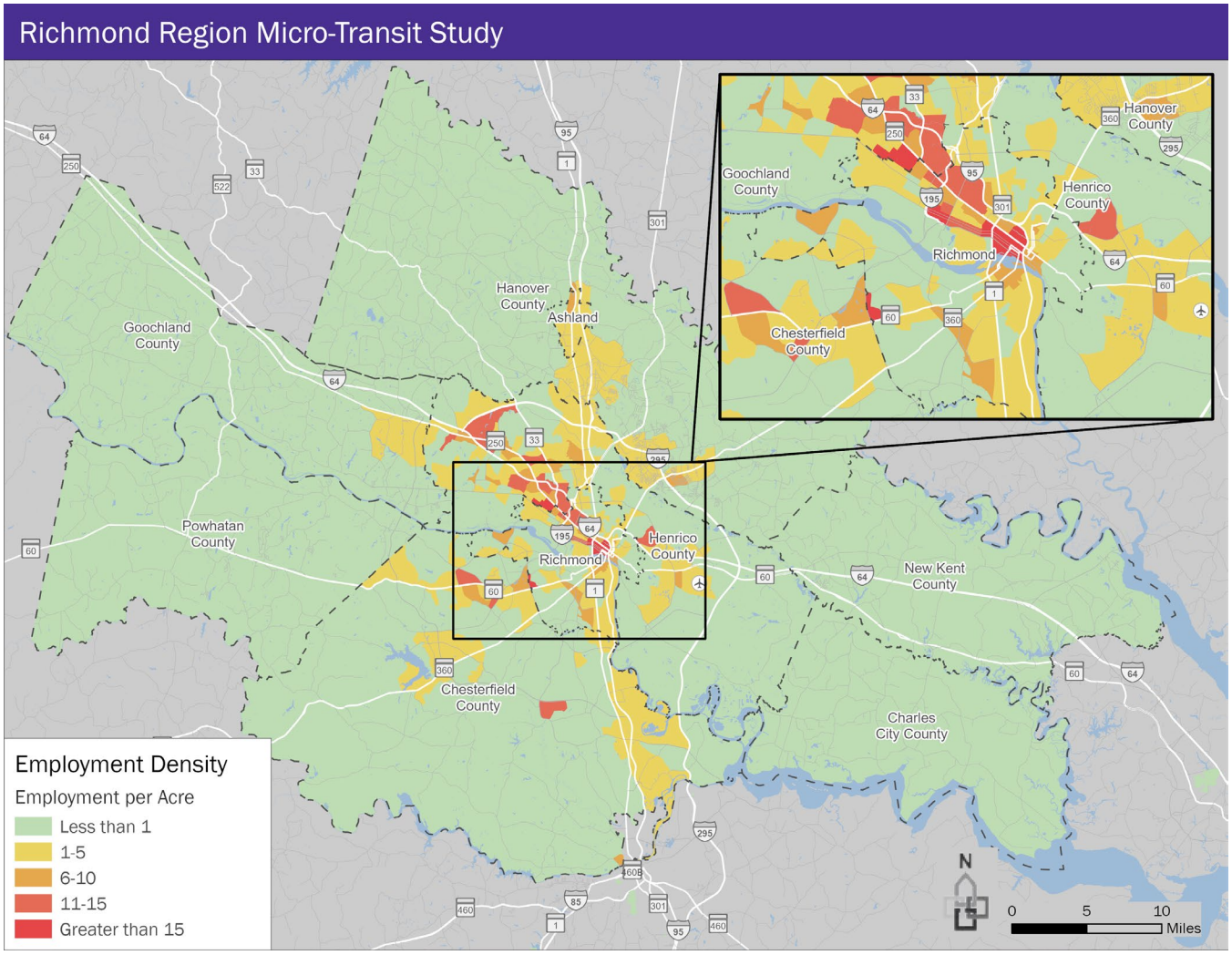
FIGURE 1: RICHMOND REGION POPULATION DENSITY



Employment Density

Employment density is the other component of transit potential, and densities of at least four jobs per acre are considered supportive of hourly fixed-route service. Again, medium densities, between one to five jobs per acre, may be most appropriate for micro-transit services. **Figure 2** visualizes employment density in the Richmond region. The distribution of job density is similar to the distribution of population density, with many block groups located in Richmond and Henrico County meeting the fixed-route transit supportive threshold. Some block groups with particularly high job densities do not also have high population densities, including several along I-64 northwest of Richmond. Medium employment density areas are found in eastern Goochland County, southern Hanover County, Ashland, various portions of Henrico and Chesterfield counties.

FIGURE 2: RICHMOND REGION EMPLOYMENT DENSITY

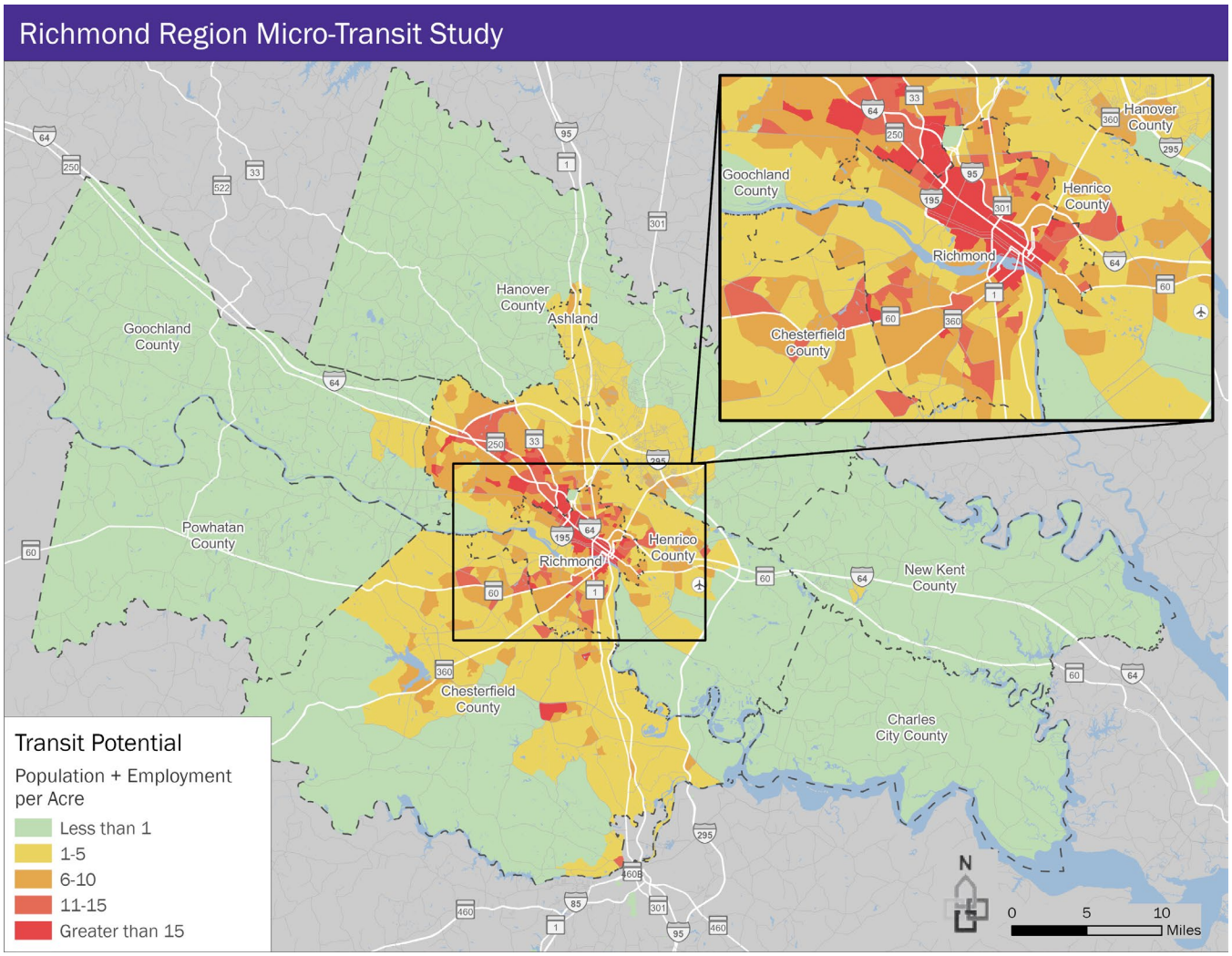


Transit Potential

Transit potential is the sum of population density and employment density. Densities of at least five people and jobs per acre support a base level of fixed-route service, and slightly lower densities of between one to five people and jobs per acre could possibly be better served with a nimbler micro-transit service. **Figure 3** provides a regional view of transit potential, with block groups shaded orange and red meeting the minimum threshold for fixed-route transit-supportive density, and yellow block groups representing lower densities that could be more suited to micro-transit service. Block groups meeting that threshold cover most of Richmond and western and central Henrico County, particularly along I-64 northwest of Richmond. Several clusters of population- and job-

dense block groups meeting the minimum threshold for fixed-route service are also apparent in Chesterfield County along US 60. Micro-transit has the potential to fill in gaps where there may be insufficient density for fixed-route service but where there still is demand for transit service. These areas likely include large portions of Chesterfield County, eastern Henrico County, and Hanover County.

FIGURE 3: TRANSIT POTENTIAL IN THE RICHMOND REGION



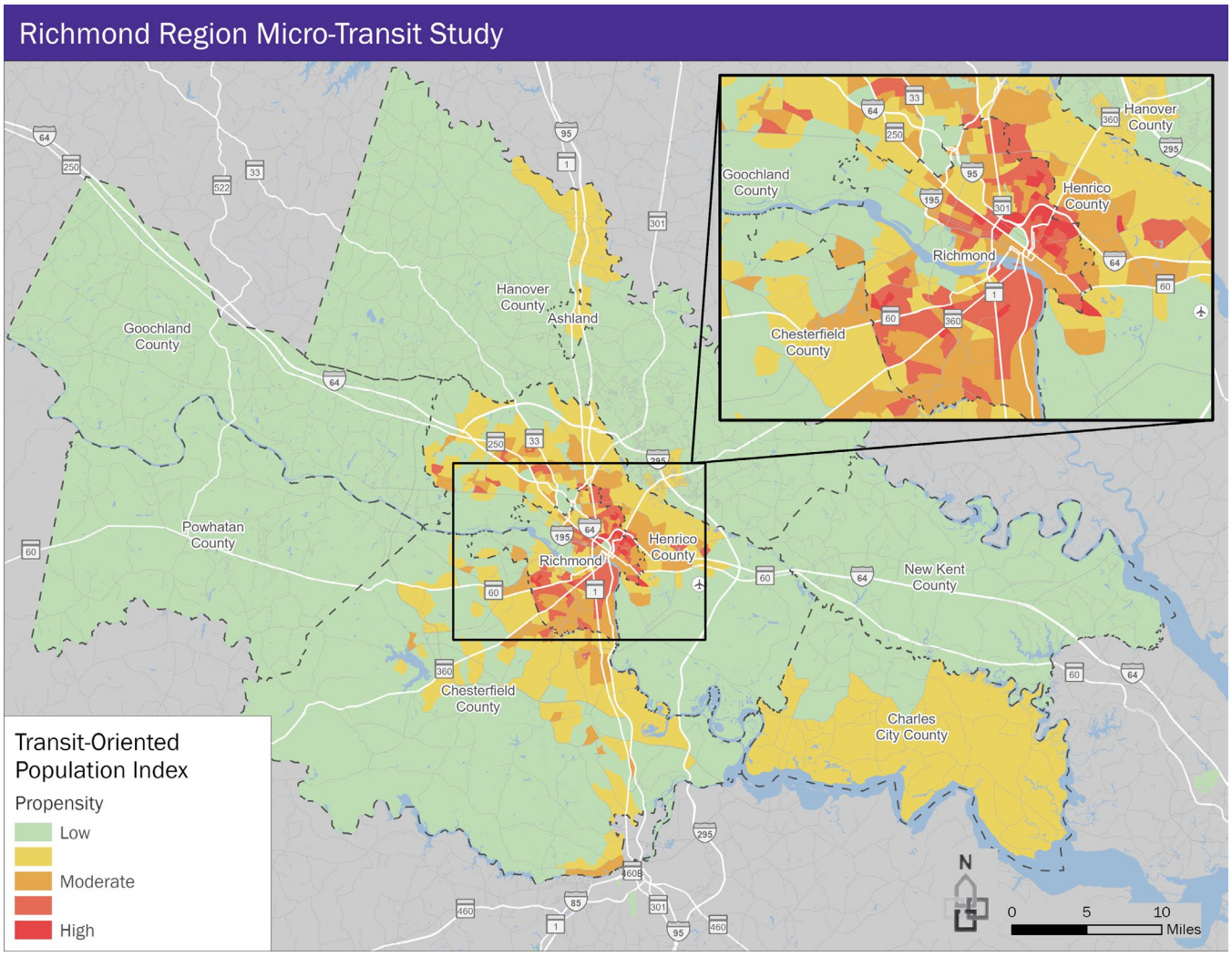
2.2.2 TRANSIT NEED

While population and employment density can highlight places where transit might be most productive, those places may be different from places where residents have the highest need for transit service. Areas with higher need for transit service could include those with higher total population densities or household densities, as well as those with higher concentrations of seniors, youth, minority populations, people living in poverty, households with limited vehicle access, and people with a disability. These characteristics can be combined into a transit-oriented population index, which is higher in places where people are more likely to use transit throughout the day to complete trips that may or may not be work-related.

Transit-Oriented Population Index

Figure 4 shows the transit-oriented population index in the Richmond region. Block groups immediately to the northeast and northwest of downtown Richmond have the highest index values, and many other Richmond block groups have moderate-high values. A number of block groups have high values on both the transit-oriented population index and the transit potential index visualized in **Figure 3**, particularly near downtown Richmond. The northern part of Hanover County, a large portion of Charles City County, and parts of Chesterfield County have a moderate transit-oriented population index, indicating potential areas that could be served by micro-transit.

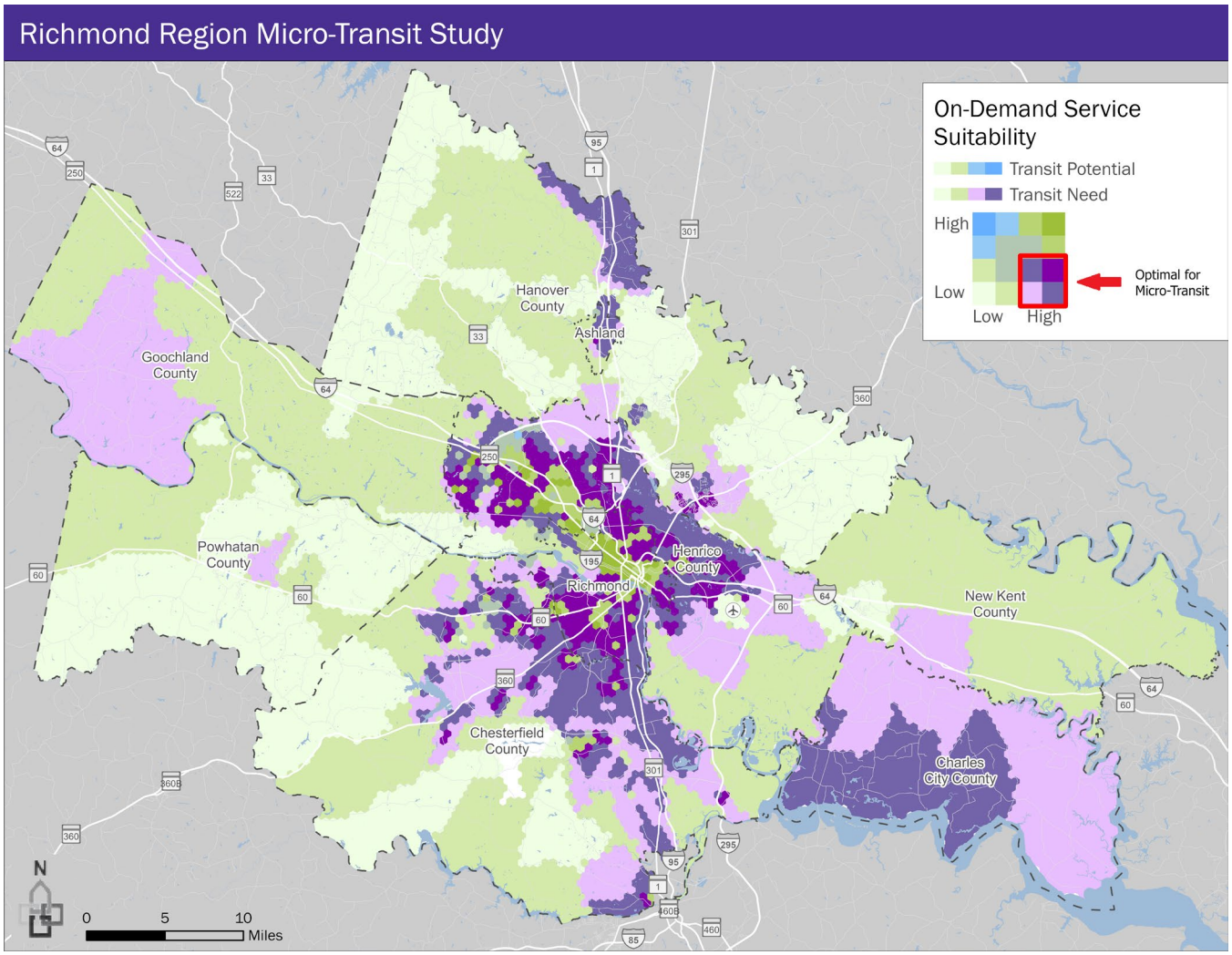
FIGURE 4: TRANSIT-ORIENTED POPULATION INDEX FOR THE RICHMOND REGION



2.3 Micro-transit Suitability Analysis

Micro-transit services provide the opportunity to re-envision how a community is being served by transit. To identify areas that would benefit the most from micro-transit service, a bivariate analysis combines the transit need and transit potential datasets and maps the results across the study area. The bivariate analysis visualizes areas higher in transit need and lower in transit potential. **Figure 5** illustrates the results of overlapping transit potential with transit need. Purple areas are the most suitable for micro-transit. There is strong potential for micro-transit service in Chesterfield, especially to the southwest of Richmond, as well as in Henrico County to the north and east of Richmond. Charles City County, especially the southwest portion, Ashland, the northern portion of Hanover County, the western portion of Goochland County, and central Powhatan County also have potential for micro-transit services.

FIGURE 5: MICRO-TRANSIT SERVICE SUITABILITY ANALYSIS FOR THE RICHMOND REGION



2.4 Service Gaps Analysis

This analysis compares fixed-route services to areas with high micro-transit suitable to ensure that there are no duplicate services recommended. GRTC is the main service provider in the region with 42 routes and 1,600 stops in the Richmond region. Bay Transit also provides seven fixed route services and three on-demand zones, all of which lie to the east of GRTC's service area. RideFinders also operates in the area, helping people connect with carpooling or vanpooling options.

Figure 6 depicts weekday peak headway for fixed-route services in the Richmond area. The darkest purple represents the areas with the most frequent service. The most frequent service is concentrated in downtown Richmond, south of Richmond near Belt Center, in North Side, and northwest of Richmond in Monument Avenue Park. There is also relatively frequent service along Richmond Highway (US 301) and Cary Street Road (State Road 147).

FIGURE 6: FIXED-ROUTE WEEKDAY PEAK HEADWAYS IN THE RICHMOND REGION

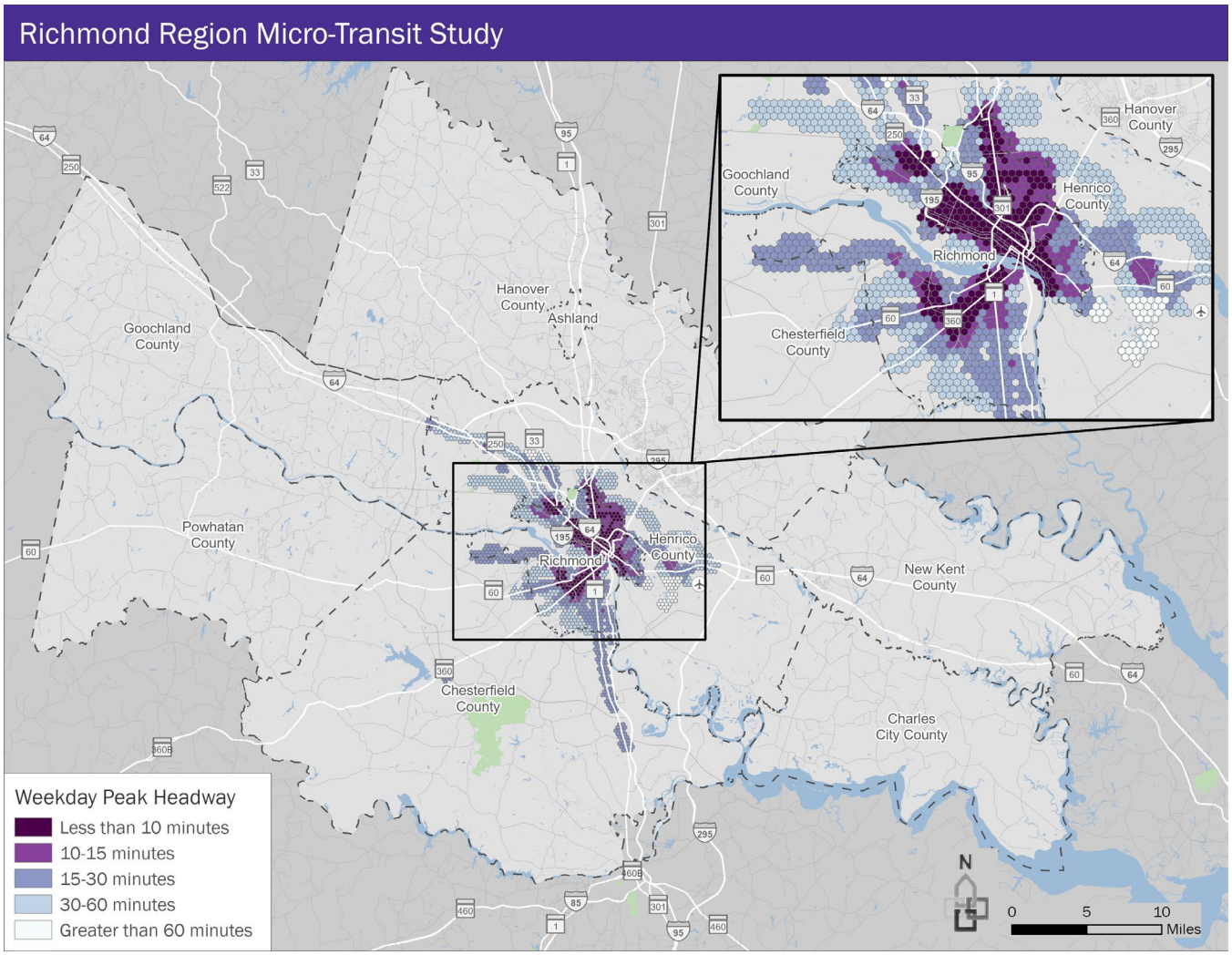
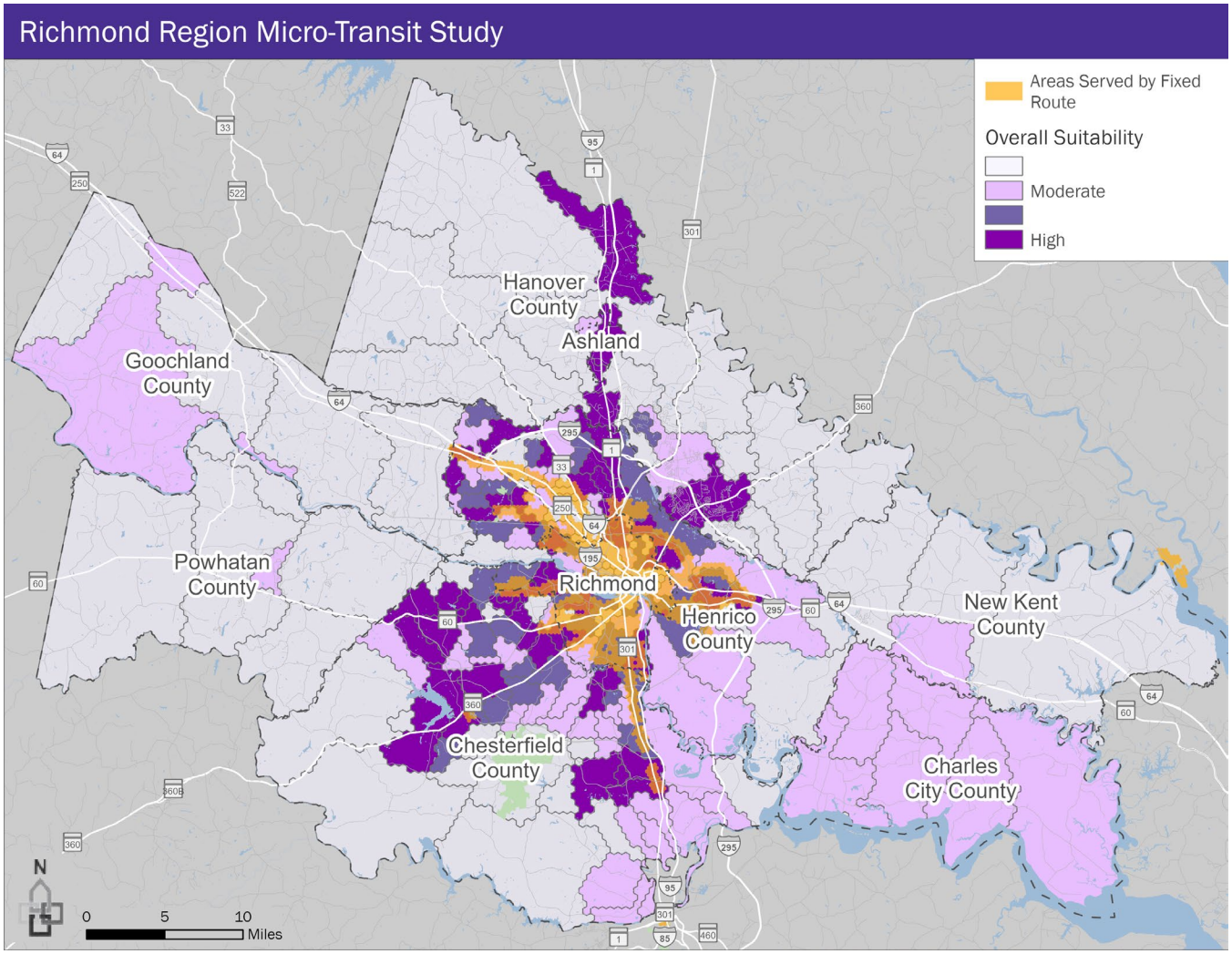


Figure 7 shows the micro-transit suitability scores (simplified from **Figure 5**) overlaid with the areas that are already served by fixed-route transit. Areas that are already served by fixed route are unlikely to be candidates for micro-transit service unless those services are low in productivity. In addition, micro-transit service can provide additional access to fixed-route services. For example, darker purple areas along US 301 could be a candidate for a micro-transit zone that connects riders to the fixed-route service that runs on US 301. There are many opportunities for this type of micro-transit zone around the edges of the fixed-route service area. However, micro-transit services do not need to connect to fixed-route services and could instead provide intra-zone travel. As one example, the darker purple areas in Charles City County could be a micro-transit zone that does not connect with the fixed-route services in and around Richmond.

FIGURE 7: MICRO-TRANSIT SERVICE SUITABILITY AND FIXED-ROUTE SERVICE AREAS



3. STATE OF THE PRACTICE REVIEW

3.1 Context

Microtransit in the United States has seen extraordinary growth in recent years as improvements to ride-matching and dynamic routing algorithms have improved to match riders and drivers with increased efficiency. The flexible nature of micro-transit services, when compared to traditional fixed-route transit services, has attracted the interest of public transit providers who are looking for ways to improve access to transportation services in communities where traditional fixed-route transit has underperformed, or where land uses have prevented otherwise transit-dependent communities from being considered for fixed-route bus service.

This section provides case examples of existing micro-transit services details how micro-transit services are designed to match the needs of the customer and the agency and outlines different technologies available for micro-transit providers. It also explores the equitable distribution of micro-transit services, common challenges, and a summary of key takeaways about the state of the practice in micro-transit, with case examples used to illustrate the findings. Key information from the case examples are also summarized in **Appendix A**.

3.1.1 WHAT IS MICRO-TRANSIT?

Multiple definitions of micro-transit have emerged in recent years. SAE International's[1] definition is "A privately or publicly operated, *technology-enabled* transit service that typically uses *multi-passenger*/pooled shuttles or vans to provide on-demand or fixed-schedules services with either dynamic or fixed routing."[2] A key distinguishing feature of micro-transit from other demand response services is that it is technology-enabled. While forms of demand response services, such as a Dial-A-Ride or paratransit have been used for decades to provide access to transportation, in particular for specific groups of riders such as those with disabilities, these services have traditionally required advanced scheduling ranging from 24-hours to a week out from the anticipated trip, and sometimes have eligibility requirements. While SAE International's definition mentions both dynamic and fixed routing, micro-transit is assumed to be a service that has the capability of offering dynamic routing to accommodate new trip requests. Micro-transit operations also typically utilize minibuses or vans because of these vehicles' efficiency compared to larger (e.g., 35+-foot) buses, as well as their flexibility operating on smaller streets or residential neighborhoods.

3.1.2 CURRENT STATE OF THE PRACTICE

Micro-transit services are operated all around the country, in rural, urban, and suburban areas, and by agencies of different sizes. Over 50 services are currently operating; the American Public Transportation Association's (APTA) 2021 review of mobility innovation highlighted 36 programs in 18 states, which make up only a portion of all micro-transit services.[3] This memo focuses on a selection of services, but the number and geographic range of micro-transit services continues to grow.

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[1] SAE International, formerly named the Society of Automotive Engineers, is a U.S.-based professional association that develops standards for engineering professionals in various industries.

[2] By comparison, "paratransit" refers specifically to "comparable transit service required by the Americans with Disabilities Act (ADA) for individuals with disabilities who are unable to use fixed route transportation systems."

[3] American Public Transportation Association, Mobility Innovation: The Case for Federal Investment and Support, https://www.apta.com/news-publications/press-releases/releases/american-public-transportation-association-releases-new-mobility-innovation-report/.

3.1.3 BENEFITS OF MICRO-TRANSIT

Micro-transit services rolled out throughout the U.S. have varied significantly in their performance and reception, as well as how well they achieved the benefits they were intended to provide. Six key benefits of micro-transit study have been detailed below:

Improved Customer Experience

Fixed-route bus service requires riders to navigate from their starting location to the nearest bus stop, which may not have or be served by amenities such as sidewalks, lighting, or benches, while being unsure of when the bus will arrive. Some micro-transit programs provide curb-to-curb or corner-to-corner service, which increases passenger comfort by not requiring riders to walk as far to access transit and taking them to their destination in a one-seat ride. Additionally, micro-transit's use of technology allows riders more access to information regarding their trip, such as pick-up and drop-off times.

Several agencies have said micro-transit has improved the customer experience, even with the added hurdle of incorporating apps as a booking and payment method. For example, Hall Area Transit in Gainesville, Georgia learned that **WeGo** riders enjoy using an app that is "easy and intuitive." The agency also found that, over time, most people who previously called in began using the app. Baldwin County, Alabama's **BRATS On-Demand** found that a majority of riders greatly appreciate the new service due to its flexibility compared to the service it replaced, which offered less flexibility and had strict scheduling requirements.

Increased Ridership on and Connections to Higher Capacity Network

In some cases, there is a nearby fixed-route bus or rail network whose ridership could increase if potential riders had a more convenient or affordable way to access it. Micro-transit can help solve the first/last mile problem by increasing the ways in which potential riders can reach high-capacity transit, leading to enhanced ridership on a nearby system.

It is difficult to separate all the factors that influence ridership across services and how micro-transit may lead to increased fixed-route ridership. A University of Washington report analyzing the use and performance of the **Via to Transit** pilot project in the Puget Sound Region found that, despite some anomalies related to changes in nearby transit

Case Study: RideKC Micro Transit

Kansas City, Kansas

Began as **a pilot in 2016** to provide **curb-to-curb service in low-density communities**. Launched as a full program in 2019 as **partnership between KCATA and TransLoc**.

Program **improved wait times** compared to fixed-route (now 15-minute wait), **reduced travel times**, and is **more affordable** than other ride-hailing options ($1.50 per one-way trip).

Case studies note **the importance of federal funding** in program's success.

services at the time the Via to Transit service was implemented, the Via to Transit service likely caused more Link ridership.[4] Another consideration is how micro-transit riders are using the service (e.g., door-to-door from their origin to destination, or as a connection to fixed-route services), and the potential of the latter to increase fixed-route ridership. For example, about 70 percent of trips on **RTA Connect** in Dayton, Ohio, which replaced some under-performing fixed routes, are first/last-mile connections.[5] Feeder services like these connect riders directly to fixed-route transit, different from circulator-type services that facilitate short-distance trips within a zone. Micro-transit service that functions more like feeder service (and less like a circulator) has higher ridership per hour because of increased spontaneous boarding at stops that attract higher numbers of riders, such as employment or transit centers.[6]

Increased Productivity and/or Cost Savings

It is often the case that the transition to micro-transit is done with the idea of improving productivity, particularly when micro-transit is replacing fixed route service. Those improvements are usually operational (e.g., passengers per revenue hour), financial (e.g., cost per passenger trip), or through overall cost savings (i.e., serving the same or a larger population at a lower total cost by using a smaller vehicle and non-CDL driver). **BRATS On-Demand** noted more productive service (in terms of passengers per hour) with micro-transit compared to its previous demand response service. **SacRT** in Sacramento observed that productivity of service increased *as the supply of micro-transit service increased*, going from 2.5 passengers per revenue hour to 3.6 once service was expanded.[7]

In some instances, micro-transit also had a positive financial impact. RTC's **FlexRide** in Sparks, Nevada saved approximately $10,200 per month in operations spending by converting underperforming fixed-route to micro-transit service. RTA Dayton cited the low operating cost of **Connect On-Demand** micro-transit service (relative to the cost of the fixed routes it replaced) as helping to balance the overall agency budget and enabling it to redirect $380,000 in annual operating funds to create a downtown circulator route, which now ranks in the top five in its system in terms of ridership.[8] Hall Area Transit's **WeGo** service noted the micro-transit service costs only half as much per

Case Study: RTA Connect

Dayton, Ohio

Began as a pilot in June 2017 with six zones **designed to serve areas with limited or no fixed-route service**.

Through 2019**, 70 percent of trips were first-last-mile connections, complementing fixed-route ridership.**

Redirected $380,000 in annual operating funds service to launch a free-to-use downtown circulator route.

Trips can be provided by TNCs, taxi, and ADA paratransit vehicles through one app or by phone.

rta connect on-demand

[4] Washington State Transportation Center (TRAC), Evaluation of the Use and Performance of Via to Transit in the Puget Sound Region, https://depts.washington.edu/trac/research-news/evaluation-of-the-use-and-performance-of-via-to-transit-in-the-puget-sound-region/. ("ORCA card data suggested that the Via service either increased the number of transit customers or at least converted cash paying customers into ORCA card users. By combining multiple ridership measurements, the evaluation team concluded that the Via service did have a positive effect on Link ridership.")

[5] American Public Transportation Association, Mobility Innovation: The Case for Federal Investment and Support, https://www.apta.com/news-publications/press-releases/releases/american-public-transportation-association-releases-new-mobility-innovation-report/, p. 7.

[6] TCRP Synthesis 141: Microtransit or General Public Demand Response Transit Service: State of the Practice (2019), p. 37, http://www.trb.org/Main/Blurbs/178931.aspx.

[7] TCRP Synthesis 141: Microtransit or General Public Demand Response Transit Service: State of the Practice (2019), http://www.trb.org/Main/Blurbs/178931.aspx.

[8] American Public Transportation Association, Mobility Innovation: The Case for Federal Investment and Support, https://www.apta.com/news-publications/press-releases/releases/american-public-transportation-association-releases-new-mobility-innovation-report/, p. 7.

passenger trip as its previous demand response service, and the operating cost per passenger trip (around $8) is close to the cost of the fixed-route service it replaced.

Increased Coverage

Micro-transit often expands the coverage of existing transit networks by serving areas outside of fixed-route networks or areas that have never had any type of transit service. A recent report from the Mineta Transportation Institute explores how to expand transit coverage for mobility disadvantaged citizens and concluded that pilot projects replacing fixed-route bus service with micro-transit are showing positive initial results.[9] Micro-transit can expand network coverage, potentially more cost-effectively. For example, RTC's **FlexRide** began as a replacement service for two underperforming fixed routes in Sparks. It has since expanded to provide service to a larger area at lower cost.

Improved Agency Experience

Agencies upgrade technology systems to facilitate micro-transit because these systems will provide them with better information and enable easier performance monitoring and analytics capabilities, which can support required performance reporting. TaaS and SaaS micro-transit services present the opportunity to design, operate, and monitor service through a single platform. Hall Area Transit's **WeGo**, for example, has found Via's SaaS interface easy to use for these purposes. Since the literature has not extensively documented agencies' experiences with micro-transit platforms, this topic was explored further during agency interviews documented in **Section 4**.

Enhanced Safety

Many riders do not feel safe accessing or riding a fixed-route bus at certain times of day or in certain locations – for example, some riders may not feel comfortable walking between their home and a bus stop in the dark. Micro-transit can provide a needed service in a situation where a fixed route is not viable for a rider due to safety concerns. However, the research and case studies reviewed by the project team provide little evidence about micro-transit safety benefits relative to fixed-route transit. This topic was explored further during the agency interviews discussed in **Section 4**.

3.1.4 MOST COMMON CHALLENGES

Although every micro-transit service is different, some challenges were common to several of the case examples. These include low micro-transit ridership and lower-than-expected productivity, slow adoption of new technology, accessibility and equity concerns, high wait times, and balancing convenience and productivity.

Low Ridership and Lower-than-Expected Productivity

Although some agencies experience rapid uptake of ridership on a new micro-transit service, others have seen lower ridership than expected. Houston METRO's **DRT Flex**, for example, saw disappointing numbers of passenger trips per revenue hour of between 2.2 and 2.5.[10] METRO's original plan to replace low-ridership fixed-route service with Flex service met political resistance, and Flex launched as a duplication of the existing fixed-route service. The result was two inefficiently provided, low-ridership services, rather than a service change that took advantage of micro-transit's potential to provide flexible service in places where fixed-route service performs poorly.

The Kansas City Area Transportation Authority (KCATA)'s partnership with **Bridj** also experienced lower than expected ridership, though for different reasons. Projected to have a daily ridership of roughly 200 riders, the service instead provided less than 600 total rides over its first six months.[11] The pilot faced multiple challenges, including limited marketing within the service area, initial difficulties training fixed-route vehicle operators to serve

[9] Mineta Transportation Institute, Steps to Supplement Park-and-Ride Public Transit Access with Ride-and-Ride Shuttles, https://transweb.sjsu.edu/research/1950-Park-and-Ride-Transit-Access.
[10] TCRP Synthesis 141: Microtransit or General Public Demand Response Transit Service: State of the Practice (2019), p. 55. http://www.trb.org/Main/Blurbs/178931.aspx.
[11] Eno Center for Transportation, UpRouted: Exploring Microtransit in the United States, https://www.eno-trans.org/wp-content/uploads/2018/01/UpRouted-18.pdf?x43122.

as micro-transit drivers, and a routing algorithm and service design that prioritized peak period, commuter trips. Overall, riders had difficulty learning about the service and found its service area and span did not suit their needs.

The experiences of Houston METRO and KCATA show there is a risk of disappointing micro-transit ridership. If a service directly competes with existing fixed route service, if a service is not effectively marketed to riders, and if a service is designed so that it meets the needs of only a small number of riders, then the service may have low ridership.

There is the risk, as highlighted in the Houston METRO example, of micro-transit and fixed-route service competing, resulting in lower ridership on both services. A rider survey from King County Metro's **Via to Transit** program showed a quarter of riders used the program as a replacement for fixed-route buses they had previously used to access Link light rail stations.[12] Jersey City's partnership with Via (**Via Jersey City**) produced a similar rider survey, which showed not quite half of riders used the program as a replacement for rail or fixed-route bus service (**Figure 8**).

FIGURE 8: MODE SHIFT SURVEY RESULTS FROM VIA JERSEY CITY

Depending on agency priorities and rider needs, a shift from fixed-route service may be an acceptable tradeoff. A significant portion of **Via to Transit** riders used the service as a substitute for fixed-route bus service, but that may be acceptable if the agency's main goal is to provide more direct connections to Link light rail. However, agencies should be aware of the potential for micro-transit to compete with fixed-route service, especially where fixed-route service is long-established and not underperforming.

As illustrated by the Houston METRO **DRT Flex** and **RideKC Micro Transit / Bridj** examples, micro-transit services can also fail to improve the efficiency or productivity of service delivery. In addition to the low operational productivity, METRO's **Flex** service demonstrated a higher than desired cost per passenger trip of $20 to $30. Even in cases in which productivity improves in terms of passenger trips per revenue hour, efficiency benefits in terms of cost per passenger trip or cost per revenue hour may be harder to realize. One example is Baldwin County, Alabama's **BRATS On-Demand,** which has experienced ridership growth but only modest increases in operational productivity.

[12] Stephen Fesler, Metro's Via To Transit Service Expanding to More Hubs, Adding Renton and Skyway, https://www.theurbanist.org/2021/08/10/metros-via-to-transit-service-expanding-to-more-hubs-adding-renton-and-skyway/.

Agencies have several options to improve the efficiency of a micro-transit service. If the service uses a TaaS or SaaS model, agencies can work with their contractor to improve trip pooling and increase the number of riders per vehicle. The structure of service zones also affects efficiency—areas that are especially difficult to serve can be classified as their own zone, making trip pooling more likely for rides to or from that zone.

Slow Technology Adoption

To deliver service most efficiently, many micro-transit services rely on the ability of most riders to use smartphone apps for booking rides. Cases like Kansas City's **Bridj** pilot show that ineffective marketing can limit rider awareness of the new booking method. When an agency pursues micro-transit to supplement or replace existing dial-a-ride demand response service, some riders may have difficulty transitioning to app-based booking. Cases like these include Hall Area Transit's **WeGo** and Baldwin County's **BRATS On-Demand**. These cases are discussed in more detail in the equity section of this memo, and strategies for addressing slow technology adoption are addressed in both the equity and marketing sections (**Sections 3.3.5** and **3.3.7**).

Accessibility and Equity Concerns

Providing service equitably is important to the success of a micro-transit service, and agencies may encounter several challenges in trying to do so. To ensure that wheelchair users have equal use of a micro-transit service, agencies need adequate numbers of WAVs, and those vehicles need adequate space at stops (a stable surface of around five by eight feet, at a minimum) to deploy the ramp or lift that allows wheelchair users to board. Vehicle operators also need to be properly trained in operating boarding equipment. These requirements present challenges for some agencies. As mentioned above, Hall Area Transit's **WeGo** revised its initial plan for its vehicle fleet and kept several cutaway vans to serve riders who use larger wheelchairs, as this was found to be more efficient and safer. Boarding times for wheelchair users may also be longer than boarding times for ambulatory riders. Agencies can work with their contractors to minimize wait times for riders who use wheelchairs while also providing adequate boarding time.

Agencies may also find that micro-transit riders do not reflect the demographic makeup of the micro-transit service area. King County Metro's **Via to Transit** rider survey suggested the proportion of White riders ranged between 47 percent and 58 percent of riders, compared to a service area proportion for all residents of 32 percent.[13] Ridership by low-income individuals also did not increase, despite measures to increase access for riders with low incomes. Agencies can conduct rider surveys to determine whether they are facing challenges like these, which may suggest improvements to make the micro-transit service more attractive and accessible for all riders. For example, agencies should consider whether fares are appropriately priced for low-income riders and whether additional outreach to people of color is necessary to support proportionate ridership.

Case Study: RTC FlexRide

Washoe County, Nevada

Launched in early 2019 as a six-month pilot with the goal to **replace two underperforming fixed bus routes** in Sparks, NV that had **consistently low ridership**.

Initially started as **one service area with several microtransit pickup/drop-off locations** in it, and later expanded to cover several more areas.

The service has eliminated approximately 12,200 fixed-route service hours (saving ~$10,200 per month on operations).

High Wait Times

Relatively low wait times is a common goal of new micro-transit services but achieving that goal can be a challenge and come with its own trade-offs. Sacramento's SacRT, for example, measured wait times of roughly 15 minutes on its **SmaRT**

[13] Stephen Fesler, Metro's Via To Transit Service Expanding to More Hubs, Adding Renton and Skyway, https://www.theurbanist.org/2021/08/10/metros-via-to-transit-service-expanding-to-more-hubs-adding-renton-and-skyway/.

Ride micro-transit service due to high peak period demand.[14] This was higher than desired, so the agency started advising riders to book during off-peak hours or to book peak period trips an hour in advance. Some services have seen increased wait times as demand increases, especially when agencies have difficulty meeting additional demand with their available drivers and vehicles. As the service has grown in popularity, Hall Area Transit's **WeGo** has seen average wait times increase to between 20 and 30 minutes.

It may be worth considering whether high wait times reflect a service's attractiveness, and this is an acceptable outcome in exchange for serving more riders. Whether a particular average wait time is too high will depend on agency goals and the characteristics of a service. A short wait time for micro-transit that replaced rural dial-a-ride service may be a long wait time for micro-transit that provides first-mile/last-mile connections in urban or suburban areas. Agencies can adopt a wait time goal to inform their approach to managing wait times.

Balancing Convenience and Productivity

Micro-transit service can be very convenient for riders. A service might be offered that allows riders to book rides to and from anywhere in a one very large zone. However, this can require a productivity tradeoff, since a small number of very long-distance trips can impact service quality on more frequent, shorter-distance trips.

There are many ways to strike this balance. Baldwin County, Alabama's **BRATS On-Demand** is considering introducing additional zones covering particularly remote areas, which would increase trip pooling and allow more productive service. This can also facilitate different booking requirements. For example, an agency might require trips to or from areas outside a zone to be scheduled days in advance, while allowing within-zone trips to be scheduled hours in advance or at will. This allows more efficient routing of trips that are harder to serve efficiently. Operators contracted under the **Transportation as a Service (TaaS)** or **Software as a Service (SaaS)** arrangements can also adjust routing algorithms to pool trips more aggressively.

3.2 Use Cases of Micro-transit

3.2.1 POTENTIAL MICRO-TRANSIT BENEFITS

Agencies across the U.S. have considered implementing micro-transit to address weaknesses or gaps in their system that are not logically served with another type of service such as fixed-route bus. In deciding to pilot or implement micro-transit, agencies typically are seeking to achieve one or more of the following potential benefits of micro-transit, as described in detail above in **Section 3.1.3**:

- Improved customer experience
- Increase ridership on or connection to a higher capacity network
- Increased productivity and/or cost savings
- Increased coverage
- Improved agency experience
- Enhanced safety

3.2.2 USE CASES

A feature of micro-transit services is that they can be designed for a variety of use cases, including integration into existing transit systems. Case studies throughout this report show examples of micro-transit programs planned and operated to replace underperforming fixed-route transit lines, provide important first-mile/last-mile connections, and/or help bring new transportation options to geographies previously lacking transit service. Each of these common use cases are described in this section. However, there are some cases in which services may have characteristics of multiple use cases.

[14] TCRP Synthesis 141: Microtransit or General Public Demand Response Transit Service: State of the Practice (2019), p. 55. http://www.trb.org/Main/Blurbs/178931.aspx.

Underperforming Fixed-Route Replacement

In this use case, a micro-transit zone is created in a location where fixed-route transit already exists but is typically underperforming and the area may have high micro-transit suitability. The concept of micro-transit suitability refers to the identification of locations where there are relatively high levels of transit service need, but relatively lower levels of other characteristics such as density and walkability that would make fixed-route service more viable. In this use case, micro-transit can either replace the route/service entirely or replace just a portion of it (e.g., an unproductive segment or time period such as only during late night hours).

Case Examples:

- *RTC FlexRide (Sparks, NV)*
- *TD Late Shift (FL) – Late Night Replacement*
- *DART Connect (DE)*
- *RTA Connect (OH)*

First-/Last-Mile Connections

Traditional fixed-route transit is highly efficient at moving passengers along arterials and other primary roads, but often requires residents to walk a distance to reach their destination. In places with low intersection density or poor sidewalk conditions, the lack of a first/last mile transit connection can place a significant burden on vulnerable populations and even act as a barrier to transit use entirely. A first/last mile-oriented micro-transit service is deployed to reduce barriers to transit use and to serve as a complement to existing transit services, especially high-frequency bus or rail. This service type would typically gather riders in residential parts of the zone, and shuttle them to nearby hubs for transit services.

Case Examples:

- *Greater Daytona RTA (FL)*
- *Via to Transit (WA)*
- *Pickup (TX)*
- *Ride On Flex (MD)*

New Service Area

Micro-transit can serve as a transportation solution for areas currently lacking transit service. In this use case, micro-transit creates new access opportunities. In some cases, it can be implemented as an extension of an existing service area, geographically or temporally, serving places where transit currently does not operate, or does not operate at all times needed throughout the day. New service area characteristics can vary significantly from one use case to the next – some micro-transit services cover entire counties while others, often much smaller in size, offer local circulation opportunities.

In addition to these common use cases, agencies sometimes implement micro-transit to "replace" or supplement traditional demand response (e.g., dial-a-ride) service; in these cases, the primary change is not related to the type of service being offered (still demand response), but to the implementation of new technological capabilities that enable riders to book and pay via a mobile app, and have access to more real-time information about when their vehicle will pick them up and their estimated arrival time at their destination. In more rural areas, to ensure a higher level of productivity (i.e., serving multiple passengers simultaneously – resulting in a higher number of passengers per hour), it helps to have some kind of advance booking requirement for micro-transit (e.g., riders select a 2-hour window for their pick-up or must book at least 3 hours in advance). Baldwin County, Alabama's **BRATS On-Demand** is an example of micro-transit replacing demand response service.

Case Examples:

- *DART Connect (DE)*
- *RideKC*
- *RTA Connect (OH)*
- *Lone Tree Link On-Demand (CO)*
- *CDTA Flex (NY)*
- *SmaRT Ride (CA)*
- *Ride Wilson (NC)*

Table 1 shows micro-transit use cases and identifies the potential benefits associated with each. Benefits are classified as "primary" or "secondary"; primary benefits are those that represent the most common and generally strongest benefits an agency is pursuing in implementing the use case, while secondary benefits are those that may be achieved but are less likely to be driving influencing factors in the decision to implement micro-transit.

TABLE 1: INTENDED PRIMARY AND SECONDARY BENEFITS OF MICRO-TRANSIT USE CASES

	Underperforming Fixed-Route Replacement	First/Last Mile Connections	New Service Area
Improved customer experience	✓	✓	✓
Increase ridership on or connection to higher capacity network	✓	✓	✓ (if providing connection)
Increase productivity and/or cost savings	✓	✓	
Increased coverage	✓	✓	✓
Improved agency experience	✓	✓	✓
Enhanced safety	✓ (esp. late night)	✓	✓

✓ – Primary intended benefit; ✓ – Secondary benefit (most commonly)

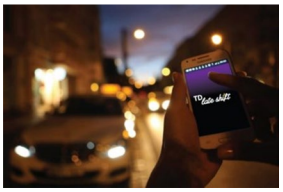
3.3 Developing a Micro-transit Service: Components and Considerations

3.3.1 UNDERSTANDING NEED

Micro-transit can serve different types of transportation needs. Some needs such as serving people in need of public transportation from locations that have underperforming fixed-route service, may already be well known to an agency. Other needs, however, may emerge through ongoing conversations with communities throughout the transit agency's service area. Identifying the need a service is intended to address has both quantitative aspects, involving the use of data to assess suitability, and qualitative aspects, which involve gathering information through public and stakeholder engagement. Assessing community needs through engagement can highlight issues which can be otherwise overlooked, such as unfulfilled late night service needs. Pinellas Suncoast Transit Authority in Florida, for example, designed its **TD Late Shift** service to supplement its daytime fixed-route service with late night micro-transit service in response to feedback from the community about people's need for service beyond the end of the fixed-route service span. Transit agencies can seek to better understand these needs through focus groups, public hearings, and workshops with the public and stakeholders such as non-profit organizations, major employers, schools, and other major trip generators. This engagement can also lead to the emergence of new partnerships with the transit agency, as was the case in Flint, Michigan with Flint MTA's **Rides2Wellness** program, discussed later in the memo.

Case Study: TD Late Shift

Pinellas County, Florida



Launched as a pilot **in August 2016** to provide low-cost transportation to low-income commuters **during times of day when fixed-route transit is unavailable**. The program partners with local taxi, local ADA transportation, and rideshare companies and receives ~$500,000/year from statewide grants. Users receive 25 free trips per month (>$300 in savings).

3.3.2 SERVICE AREA IDENTIFICATION

Micro-transit can be customized in its design in a variety of ways to meet the needs of a community and the resources available. Transit agencies, through their planning (including both data analysis and public and stakeholder engagement) and performance monitoring processes, tend to have a strong understanding of where gaps in their service areas exist in terms of times, places, and populations. This helps them identify potential micro-transit use cases that could be considered for addressing gaps. Ultimately, service design is an iterative process, bringing together data on service gaps, market analyses, and public and stakeholder feedback – as well as, subsequently, data on existing transit service performance to inform potential adjustments. Agencies can design and adjust their service according to a variety of components or aspects, including the following:

- **Geography served** – Agencies' planning processes, including micro-transit suitability analyses, enable identification of the locations where micro-transit is most needed and/or most likely to be successful. Micro-transit may make sense in the following situations:
    - In low-density neighborhoods, providing either general circulation or only providing trips to or from transit access points.
    - Between two key towns or hubs of activity (e.g., DART Connect in Delaware).
    - Customized zones with exceptions for key out-of-zone destinations such as a school or an airport (e.g., CDTA's Flex in Albany, New York).
    - Zones that serve a geography or population associated with a specific funding partner (e.g., universities, hospitals, etc.).
    - After an initial review of geographies in need of service and/or reviewing an entire service area to identify potential micro-transit zones, agencies may find an overabundance of potential zones. To prioritize areas for micro-transit service, agencies can look at additional characteristics to assess suitability and identify geographies to serve or even prioritize:
        - **Intersection Density and Roadway Network**: Lower intersection densities (intersections per square mile) are often indicative of longer roads with fewer pick-up points, and fewer direct paths between points for fixed-route transit to serve. Less direct routing can lead to longer travel times and less efficient fixed-route operations. In these physical environments, pedestrian infrastructure may not be as abundant either, meaning residents may not have safe or accessible ways to access other types of transit. Micro-transit can be a more suitable transit solution in areas with lower intersection density due to their smaller vehicles and ability to pick-up/drop-off riders closer to their actual origins and destinations.
        - **Land Use** – Areas that have higher ratios of residential uses to other land uses tend to generate ridership in micro-transit zones, while areas with higher job densities are often key attractors. Albany CDTA's **Flex**, service has zones designed to serve areas with high proportions of residential land uses, offering drop-off and pick-up points exclusively at key attractors outside of the zones.

Case Study: DART Connect

Sussex County, Delaware

Launched in April 2021 as a pilot microtransit program providing DART transit to **improve rural transit service** between the towns of Georgetown and Millsboro.

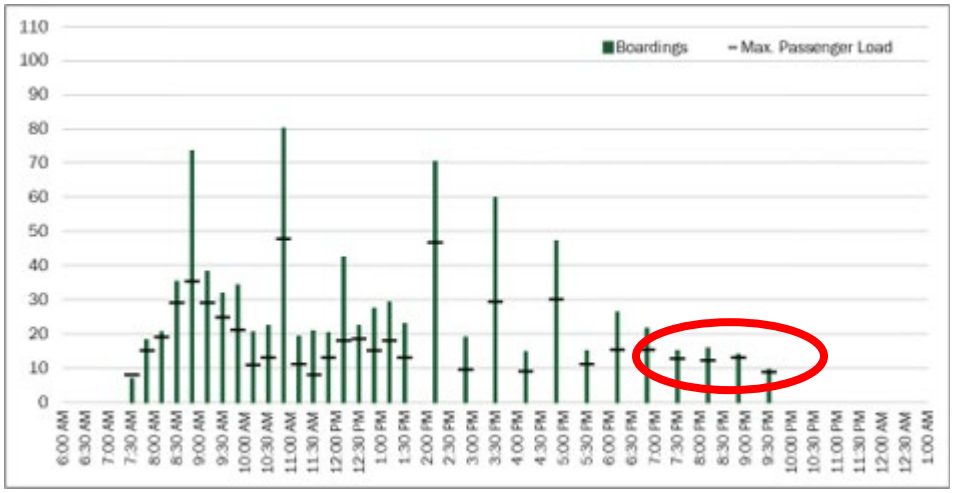
DART Connect **replaced two low-performing deviated fixed-routes** and saw modest ridership growth within one month.

DART Connect is **funded** in part by a one-time FTA Accelerating Mobility grant ($317,692).

- **Activity Generators** – Typical activity generators include grocery stores, retail shops, offices, and larger housing complexes. It is important to consider how people plan to use the service and whether it will enable them to access key activity generators. A zone intended to be used for circulation purposes should include key generators like grocery stores to enable people to use transit to meet their basic needs.
- **Service Area Demographics** – As lower-income and minority residents typically have a higher propensity to use traditional transit services and given that serving them well is particularly important from an equity standpoint, services should be deigned to capture these populations at rates at least comparable to the overall service area demographics. Other demographic-related factors that can be considered in evaluating locations for micro-transit suitability include employment and commuting patterns and times in a particular area.

- **Time of day or specific days** – Micro-transit can be provided as an all-day transit solution to replace fixed route, perhaps operating during the same span of service as other services already provided by an agency. Alternatively, micro-transit can be offered at specific times of day when there are known public transportation needs that do not make sense to serve with fixed-route buses. Late nights and early mornings are times when people who work second and third shifts are likely to need service but when the total level of demand does not warrant fixed-route service (**Figure 9**). Similarly, micro-transit can also be used to provide mid-day or weekend service to replace fixed-routes (e.g., local bus or commuter bus) that only operate in peaks or see low-ridership during these times. Agencies with large geographies to cover but relatively few resources can also consider offering micro-transit services in different areas on **different** days of the week to cater to populations such as seniors who need to make weekly errand or shopping trips.

FIGURE 9: EXAMPLE ANALYSIS SHOWING EVENING BOARDING DECLINE



- **Population served** – While micro-transit is commonly available to the public, it can be offered only to specific individuals as well (with such decisions sometimes influenced by the entities providing funding for the service). In some cases, micro-transit can exclusively serve particular groups of people such as people with disabilities, people with healthcare-, social services-, or job training-related transportation needs, students, or seniors.

3.3.3 SERVICE MODELS

There are two common service delivery models for micro-transit services. The **Transportation as a Service (TaaS)** model, also known as the "turn-key model," involves the acquisition, through an operational services contract, of a micro-transit platform, including the technology in the form of ride-matching software, and vehicles and personnel needed to operate the service (including maintenance staff, for example) – in some cases, TaaS could involve a contractor using their own facilities as well. The **Software as a Service (SaaS)** model involves the acquisition of ride-matching technology (and potentially customer support functions) but does not involve using a contractor's own vehicles or contracting of operating personnel through the operator. In reality, there may be

variations in the specifics of these two models, with the specific functions/personnel, facilities, etc. contracted out versus being "in-house" varying. In some cases, transit agencies or contracted operators can serve as "brokers" and allocate trip requests between multiple providers. TCRP Synthesis 135: ADA Paratransit Service Models describes and provides examples of a variety of service models for demand response service.

The case for adopting one service model over the other depends on the needs of an agency. If the agency does not have adequate facilities, staff for maintenance, or appropriately sized vehicles available for use, a TaaS model may be faster to implement and/or more cost-effective to operate. The TaaS model may offer additional flexibility as well, such as the ability to add vehicles to be in service for relatively short (e.g., two- or three-hour) shifts to adjust service to accommodate peak demand. Likewise, if space and vehicle availability are not issues for the agency, a SaaS model may be preferrable. Several agencies who have implemented the SaaS model note that it gives them more oversight of driver qualifications, experience, training, and adherence to performance standards. Because labor is the largest cost associated with operating transit service, pay rates for operators and other staff, which depend on a variety of factors including level of experience, training requirements, and presence or absence of collective bargaining agreements, have the largest impact on the overall operating cost for providing service. At present, in most cases, vendors who offer the TaaS service model can offer their service at an hourly rate that is below that of a public agency.

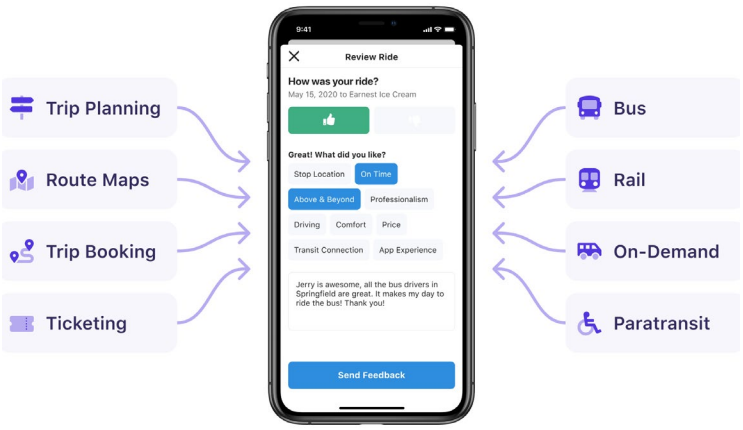
3.3.4 TECHNOLOGY USED

A key factor distinguishing micro-transit from any type of demand-response service is that it is a "technology-enabled" service, with the most innovative platforms utilizing the latest innovations in app-based mobility technology. Demand-response services historically used pen-and-paper scheduling systems or legacy software platforms that did not offer as wide a range of capabilities as some of the platforms available today. Advancements in smartphone technology, mobile GPS, real-time mapping, and ride-matching and routing algorithms have enabled modern micro-transit to operate as a more dynamic service, with the advantage being that travelers have more flexibility to schedule rides as their needs change.

More recently developed micro-transit platforms have features to improve the experiences of customers and agencies using the platform alike. The software platform is built around familiar mobile-device applications that automate the processes of receiving and processing customer orders and dispatching vehicles. Typically, a micro-transit platform hosts one mobile device application for the driver to receive orders, and one application for customers to place orders, each with additional advanced features.

Modern micro-transit applications provide many of the following features:

FIGURE 10: SPARE LABS MOBILE APPLICATION DIAGRAM



- **App-based booking** – Riders can download an app to their smartphones and create a profile, then enter trip details and request trip through the app; this process can be done without any person-to-person-based interaction.
- **Electronic fare payment** – The app enables in-app fare payments for micro-transit rides; integrated systems may offer purchase of transit passes as well.
- **Vehicle location tracking** – Riders can track the location of their driver on a real-time map.
- **Dynamic estimated arrival times** – The app provides constantly-updating arrival time estimates based on time of day, traffic levels, and roadway accessibility.
- **Automated customer notification** – The app issues trip and service updates as push notifications.

- **Integrated trip planning across modes** – An emerging feature of integrated apps are that they can provide information on other nearby multimodal transportation services.

While micro-transit platforms require high-speed data connections on mobile phones to access the applications, the services also provide an option to book rides by phone for customers without smartphones. One case study agency, Hall Area Transit, reported that this method of scheduling is not ideal for the ride-matching algorithm (i.e., manually booked trips were not as seamlessly matched with trips already in progress or those booked by app).

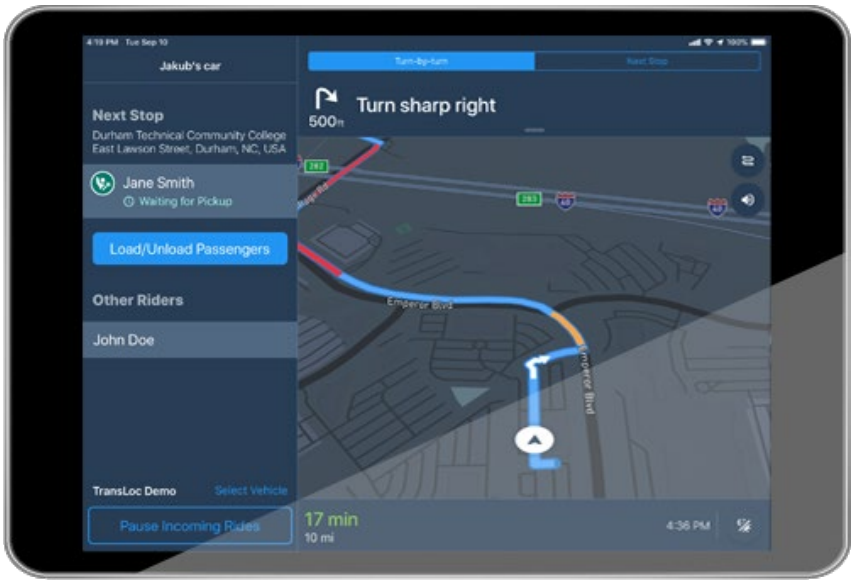
A separate set of features exist for driver applications, including:

- **Dynamic routing** – Provides GPS-enabled turn-by-turn directions that constantly update based on traffic levels and/or road closures.
- **Voice-response capabilities** – A safety feature for hands-free handling of reservations and cancelations.
- **Rider profile information** – Drivers are able to see relevant information about the rider they are picking up, such as whether the individual is using a wheelchair or has a disability such as hearing impairment.
- **Safety Features** – Limiting the ability of drivers to interact with features outside of the application while the vehicle is in motion.

From the driver perspective, use of the app offers benefits such as precluding the need to engage in fare collection for riders who pay electronically via the app.

Micro-transit software platforms offer capabilities to the transit agency that enables them to customize and manage their service in a more automated fashion, such as:

FIGURE 11: TRANSLOC DRIVER APPLICATION INTERFACE



- **Automated scheduling** – This eliminates need for a staff person to receive trip requests and schedule drivers by letting the software platform handle scheduling for trips booked through the app.
- **Automated customer notification channels** – Agencies can push notifications out to riders and drivers, such as with service information or marketing updates.
- **Automated data collection and analytics** – Easier visualization of rider origins and destinations and constantly updated analytics related to indicators such as average trip length, wait time, etc.
- **Real-time vehicle tracking** – Allows the agency to check in on the location of their drivers and vehicles in real-time.
- **Geofencing** – Ability to customize service parameters by specifying locations from which trips can originate and conclude.
- **Simulations and resource estimates** – Before launching a pilot zone or new program, many micro-transit software providers offer simulations to estimate average operating costs, vehicles needed, and average wait time per zone.

- **Customized fares** – Micro-transit platforms can simplify the process of offering reduced fares to specific populations such as seniors or low-income riders by assigning fares based on the information in a rider's profile.

Micro-transit technology platforms continue to evolve, with more sophisticated capabilities such as integration between services continuing to be rolled out. For example, platforms can now preclude provision of trips that could be made on a fixed-route system. In that case, the app would redirect riders who attempt to book a trip that could be served by a fixed-route system to another website or app with information about the fixed-route service.

3.3.5 EQUITY IN MICRO-TRANSIT SERVICE PROVISION AND ACCESS

Equity is a critical component of any transit service, including micro-transit. Equity can be particularly important to consider for micro-transit, given the service's reliance on smartphones, access to data service, and electronic payment. There are many ways that equity can be considered in the process of designing and operating micro-transit, including: the provision of service in terms of where it operates and who it serves; providing service to unbanked populations; serving people without smartphones; and setting fare levels with affordability in mind. Each of these components is discussed in more detail below.

Service Provision: Where Micro-transit Operates and Who Micro-transit Serves

By providing a flexible transit option in areas with infrequent or nonexistent fixed-route service, micro-transit increases mobility options. In fixed-route replacement case, service areas should be designed so that transit-dependent and disadvantaged populations receive a level of service that is similar to or greater than the service they previously received, in terms of frequency and service quality. In providing new service, it is important to identify service zones based on consistent criteria that can be applied across geographies, and the criteria should include measures of transit need in addition to measures like employment or population density. As discussed above, in evaluating micro-transit suitability, agencies should (and in some cases, must) consider the presence of low-income and non-white residents and how the quality of the service they receive will change or improve.

In some cases, micro-transit services are designed to serve specific populations such people with disabilities or seniors. In these cases, equity and need for transit have typically been heavily considered in designing the service.

Case Study: Rides to Wellness (R2W)

Genesee County, Michigan

R2W was launched in 2016 as a program **providing non-emergency medical transportation** to seniors, people with disabilities, and transportation-disadvantaged populations for grocery, pharmacy, and medical trips.

Trips are free for eligible customers through partnerships with state and local agencies including:

1. County Department of Veteran Services
2. State Department of Health and Human Services
3. Residents on County Public Health Plan

In Michigan, the Flint MTA received federal and state funding to start a **Rides 2 Wellness (R2W)** service, which initially provided rides to and from medical services that were free for qualifying Flint residents (with fares in some

cases charged to a public agency or healthcare provider).[15] The MTA has expanded access to the service over time, so that seniors, veterans, clients of partner social service agencies, and the general public can also use **R2W** to access medical services (in some cases, it functions as a premium service with a cost of $10-15 per trip for self-paying passengers[16]). Pinellas Suncoast Transit Authority's **TD Late Shift** program has focused on providing work trips for transportation disadvantaged riders.[17]

In all cases, micro-transit services must be equally accessible to ambulatory and non-ambulatory riders. Wheelchair users or other riders with limited mobility require Wheelchair Accessible Vehicles (WAVs), and fleets and booking systems must be able to accommodate their need for those vehicles. Many agencies, such as **BRATS On-Demand**, report that wheelchair users make up a significant portion of their riders, so ensuring a service will be easily accessible to wheelchair users is important. Hall Area Transit reported that it began using older cutaway vehicles for its **WeGo** micro-transit service once it became clear that this resulted in a quicker and less laborious boarding process, benefitting not only the driver and wheelchair-using rider, but also the other riders who are sharing the vehicle.

Serving Unbanked Populations

Electronic fare payment brings several benefits to agencies and riders, including reduced delay due to fare collection and reduces chances for conflict between riders and vehicle operators. However, electronic fare payment is easiest for those with a debit card and/or credit card, which not all riders have. Micro-transit services should be designed so that these riders can still access the service.

Agencies have adopted different strategies to ensure that access is maintained for unbanked riders. Baldwin County's **BRATS On-Demand** encourages riders to use prepaid debit cards available from retail stores to pay for rides. Other options include allowing riders to mail in cash to be added to their accounts, purchase vouchers in cash in person at an agency office or pay their fares in exact cash upon pick-up. About 20 percent of riders take advantage of the option to purchase vouchers in person, using cash, to ride Hall Area Transit's **WeGo** micro-transit service. In addition to making electronic payment as easy as possible, offering and communicating alternative payment methods is an important step in making micro-transit service equitable.

Making Service Accessible to People without Smartphones

A large majority of American adults now own a smartphone. As of 2021, more than three quarters of adults in households earning less than $30,000 own smartphones, and 97 percent of those adults own either a cell phone or smartphone.[18] However, not all smartphone owners may be able to afford to consistently maintain the data services needed to use micro-transit apps. These people, as well as the 25 percent of lower-income adults who do not own a smartphone, need equal access to micro-transit services. In addition, many people, particularly the elderly, are not familiar with using smartphones and may not have the capacity to book their own trips via app.

One way to provide this access is to maintain the option to schedule a micro-transit trip by calling in. When this option is provided, the prevalence of app-based booking varies by program, from as little as a third of trips to more than 80 percent of trips. **BRATS On-Demand** micro-transit service, for example, has seen as few as 35 percent of trips booked by app, while Hall Area Transit's **WeGo** has seen more than 80 percent of trips booked by app. Both services allow riders to schedule trips by phone. Hall Area Transit is currently seeking to work with a vendor to provide smartphones to riders who might be willing and able to book by app but lack a smartphone. Agencies have a variety of options to make the transition to app-based booking easy for as many riders as possible, while still accommodating riders for whom call-in booking is necessary. Training in how to book by app,

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[15] American Public Transportation Association, Mobility Innovation: The Case for Federal Investment and Support, https://www.apta.com/news-publications/press-releases/releases/american-public-transportation-association-releases-new-mobility-innovation-report/, p. 3.
[16] NADTC, MTA Flint Rides to Wellness Presentation, http://www.nadtc.org/wp-content/uploads/MTAFlint-RidesToWellness-Module-3.pdf.
[17] American Public Transportation Association, Mobility Innovation: The Case for Federal Investment and Support, https://www.apta.com/news-publications/press-releases/releases/american-public-transportation-association-releases-new-mobility-innovation-report/, p. 5.
[18] Pew Research Center, Mobile Fact Sheet, https://www.pewresearch.org/internet/fact-sheet/mobile/.

particularly if paired with an incentive such as reduced fares for participating, can help to facilitate more app usage in cases when ability to use technology is a greater barrier than smartphone access.

Setting Fares

Affordability of micro-transit service is another important equity issue. Many, if not most, public transit riders are price-sensitive and may respond to fare increases by reducing or ending their use of a micro-transit service, even when fares are lower than the price of comparable transportation options. A report on Kansas City's unsuccessful **Bridj** micro-transit pilot found that almost 25 percent of riders stated they would not ride the service if fares increased by $1, from $2 to $3.[19] Fares generally make up a small portion of operating revenues for public micro-transit service, so decreasing fares can have a significant benefit for riders without dramatically changing total revenues.

In the case of fixed-route replacement micro-transit service, for riders who are losing access to fixed-route service they had previously, it may make sense to charge an equivalent fare. Similarly, if a micro-transit service is intended to connect people to a nearby fixed-route network, it may make sense to price the transfer in fare the same way a connecting bus trip would be.

Like with fixed-route service, agencies can charge different fares to different passengers based on need or trip characteristics. For example, discounted senior fares are common, and trips to or from medical services or grocery stores may have discounted or free fares. In some cases, these are facilitated by partnerships, as with Flint's **R2W** program in Michigan. Partnerships with several state agencies allowed trips to medical services to be free for those agencies' clients, making the program simpler and more attractive for many riders. **R2W** also shows how fare levels can be adjusted as a micro-transit service evolves—as the service has become more popular, **R2W** now offers rides to the general public at a fare of $15.[20] Fares for trips between partner medical offices and Flint's downtown transfer center are cheaper, at $0.85 per person.[21]

A review of 27 existing micro-transit services showed that micro-transit services charge flat fares of between $1.50 and $3 per trip on average. However, there is significant variation by payment method, time of day, and whether a rider connects to fixed-route transit. Especially when implementing new service, agencies have flexibility in deciding fare levels and structure. During that process, agencies can decide on measures to increase access to the service among riders who may be especially burdened by fares.

3.3.6 FUNDING

Agencies have used several discretionary federal funding programs to fund micro-transit services in recent years, and pandemic-related funding sources have also emerged. As with other types of transit, agencies must supplement federal funds with funding from state, local, or other sources. Sources of funding for micro-transit could also include competitive grants.

FTA Formula Funding Sources

Federal formula funds are a familiar source of funds for transit agencies and can be used to fund micro-transit service in similar ways as demand response and fixed-route service. These include grants for urbanized and rural areas (Section 5307 and Section 5311), grants for services that benefit seniors and people with disabilities (Section 5310), and "New Freedom" grants for services developed as part of a human services transportation plan (Section 5317). Agencies, both on their own and in partnership with human services organizations, have used funds from all of these programs to support micro-transit services. Examples include Central Florida's **ACCESS LYNX**, which received 5310 and 5317 funding for its micro-transit program serving people with disabilities, and California's San Joaquin RTD's **Van Go!**, which received 5311 funding for its program serving a

[19] TCRP Synthesis 141: Microtransit or General Public Demand Response Transit Service: State of the Practice (2019, p. 12. http://www.trb.org/Main/Blurbs/178931.aspx.
[20] NADTC, MTA Flint Rides to Wellness Presentation, http://www.nadtc.org/wp-content/uploads/MTAFlint-RidesToWellness-Module-3.pdf.
[21] MTA Flint, Rides to Wellness, https://www.mtaflint.org/rides-to-wellness/.

large, rural area.[22] FTA's Capital Cost of Contracting policy allows federal funds to pay for a large portion of contracts with micro-transit service providers who are responsible for providing capital assets (as in the TaaS model); in some cases, agencies could qualify for an 80 percent FTA match.[23]

Other Federal Funding Sources

Other federal programs are also potential sources for micro-transit services. The federal Congestion Mitigation and Air Quality (CMAQ) grant program has been used to fund at least one pilot program in Lynnwood, Washington.[24] FHWA's Advanced Transportation and Congestion Management Technologies Deployment (ATCMTD) program represents another potential source. It is not clear whether ATCMTD has been successfully used to fund any micro-transit services, but the cities of Bellevue and Kirkland, Washington provide one example of an attempt to do so.[25]

Other federal agencies have also set aside funding that could be used for micro-transit services. The Department of Energy, for example, accepted applications in 2021 for up to $17.5 million to be used for new mobility systems.[26] The Chattanooga Area Regional Transportation Authority (CARTA) benefited from a similar DOE grant program, which provided $1.7 million for a project to improve CARTA's micro-transit routing and scheduling platform.[27]

Since the passage of the CARES Act in 2020 and subsequent federal pandemic relief acts, multiple agencies and municipalities have used CARES funding to create or expand micro-transit services. RTC in southern Nevada,[28] Prescott Valley in Arizona,[29] Hall Area Transit,[30] and Citibus in Lubbock, Texas[31] have all

Case Study: WeGo

Hall County, Georgia

Launched a microtransit service in December 2020. Eventually **replaced fixed-route service** when microtransit service area expanded to the entire county.

Contracted with Via using Software-as-a-Service model using app-based reservations and distance-based fares.

Agency saw increased ridership, reduction in wait times, and cost-per-trip savings.

[22] TCRP Synthesis 141: Microtransit or General Public Demand Resp
(2019, p. 38. http://www.trb.org/Main/Blurbs/178931.aspx.
[23] FTA, Capital Cost of Contracting, https://www.transit.dot.gov/funding/procurement/third-party-procurement/capital-cost-contracting.
[24] Stephen Fesler, Lynnwood Prepares Microtransit Pilot Program, https://www.theurbanist.org/2021/06/04/lynnwood-microtransit/.
[25] Dan Ryan, Bellevue prepares for autonomous vehicle transit, https://seattletransitblog.com/2018/06/27/bellevue-commutepool/.
[26] DOE Office of Energy and & Renewable Energy, DOE Announces $60 Million to Accelerate Advanced Vehicle Technologies Research, https://www.energy.gov/eere/articles/doe-announces-60-million-accelerate-advanced-vehicle-technologies-research#:~:text=Today%2C%20the%20U.S.%20Department%20of,efficient%2C%20and%20secure%20transportation%20energy.
[27] DOE Office of Energy Efficiency & Renewable Energy, The Departments of Energy and Transportation Collaborate to Improve Public Transportation Efficiency and Effectiveness Using Data and Technology, https://www.energy.gov/eere/articles/departments-energy-and-transportation-collaborate-improve-public-transportation.
[28] April Corbin Girnus, RTC expands service area, launches microtransit program for locals, https://www.nevadacurrent.com/blog/rtc-expands-service-area-launches-microtransit-program-for-locals/.
[29] Signals AZ, Startup Transit System Approved by PV Town Council Approves Implementation Using CARES Funds, https://www.signalsaz.com/articles/pv-town-council-approves-implementation-of-startup-transit-system-with-cares-funds/.
[30] Matt Eggers, Gainesville to use federal funding to usher in change to public transit, https://accesswdun.com/article/2020/7/921061/gainesville-to-use-federal-funding-to-usher-in-change-to-public-transit-service.
[31] Matt Dotray, Citibus launching microtransit service on Wednesday, https://www.lubbockonline.com/news/20200518/citibus-launching-microtransit-service-on-wednesday.

created or expanded micro-transit services using federal recovery funds.

Competitive Federal and State Grants

Competitive, innovation-oriented grants are another common source of funding for micro-transit services. The FTA has overseen several rounds of funding under Section 5312. In 2019, the FTA awarded Integrated Mobility Innovation (IMI) grants to a number of agencies for expanding or creating micro-transit services. Several agencies funded micro-transit services using 2020's Accelerating Innovative Mobility (AIM) grants. These include the Pinellas Suncoast Transit Authority's **Direct Connect** program, the Delaware Transit Corporation's SaaS contract with Via, and Wilson, North Carolina's fixed route replacement micro-transit service.[32]

Like the Virginia Department of Rail and Public Transportation (DRPT), whose MERIT Demonstration Project Assistance grants[33] can fund a variety of new projects including new micro-transit service, other states including California, Massachusetts, and Florida also operate competitive grant programs to support new micro-transit services. Massachusetts, for example, awarded roughly $500,000 to support the Worcester Regional Transit Authority's SaaS micro-transit service, and Florida's Service Development Program helped launch pilot programs developed by the Hillsborough Area Regional Transit Authority (HART) and the Central Florida Regional Transportation Authority (LYNX).[34]

Agency and Private Sector Partnerships

Partnerships between transit agencies, state and local governments, and private sector organizations have also provided funding for micro-transit services. Municipalities have generated funding through transit-related ballot initiatives like Austin, Texas' Proposition A and Sacramento County's Measure A. Austin Capital Metro's **Pickup** service will receive several million dollars in support from the multi-billion-dollar initiative,[35] and Sacramento's **SmaRT Ride** service was created with a $12 million grant of Measure A funds.[36] Colorado's **Lone Tree Link On-Demand** was launched as a partnership between several medical centers and local business districts. Similarly, Flint's **R2W** program originated as a service to connect medical service providers with transportation-disadvantaged riders in Flint with funding from those providers.

Micro-transit services have a wide variety of potential funding sources, and the same program may draw on different sources and partners over time. The **R2W** program, for example, has expanded to serve veterans and their families by partnering with human services agencies in the region. Sources like innovation grants may provide funding for only a few years, eventually requiring an agency to seek longer-term formula funding or state grants. Creative use of different funding sources can maximize the impact of a new or growing micro-transit service.

3.3.7 MARKETING / PUBLIC EDUCATION

Successfully launching a new micro-transit service can be challenging if riders are unaware that the service exists, or if they are reluctant to adopt a new and potentially confusing technology. Some aspects of successful micro-transit adoption are attributed to thoughtful service design (i.e., placing micro-transit operations in high-need communities, charging the correct price for the market, or providing the necessary accessibility features) but it is also important that the public is well-informed and comfortable using the service, including adopting the new technology. One of the leading micro-transit transportation network companies, Via, cites some of the following as key practices for a successful micro-transit marketing campaign:[37]

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[32] FTA, FY20 Accelerating Innovative Mobility (AIM) Project Selections, https://www.transit.dot.gov/research-innovation/fy20-accelerating-innovative-mobility-aim-project-selections.
[33] DRPT, MERIT – Statewide Transit Grants Program, http://www.drpt.virginia.gov/transit/merit/special-projects/.
[34] Cyrus Moulton, WRTA to receive grant toward shuttle service in Westborough, https://westborough.wicked-local.com/news/20200104/wrta-to-receive-grant-toward-shuttle-service-in-westborough.
[35] Capital Metro, Initial Investment, https://www.capmetro.org/project-connect/initial-investment.
[36] Sacramento Regional Transit District, SacRT SmaRT Ride – Shuttle Service that Comes to You, https://www.sacrt.com/apps/smart-ride/.
[37] Via, How to Successfully Launch and Grow an On-Demand Transportation Service, https://ridewithvia.com/resources/articles/how-to-successfully-launch-and-grow-an-on-demand-transportation-service/.

- **Lifecycle-based marketing:** Understanding that different marketing techniques and approaches will be more or less effective at different stages of platform deployment.
- **Customer segmentation**: Identifying core use cases for the service, as well as commuter behaviors, then tailoring the marketing approach to be visible and attractive to these customers.
- **Multichannel presence**: Use a multitude of marketing approaches, including digital advertising, signage, informational flyers, and paid/earned media, to reinforce key messaging while driving conversion.
- **Real-time data**: Understanding who the early adopters of micro-transit are, who is not adopting the service as may have been expected or hoped, and also adjusting marketing strategies to continue encouraging new ridership.
- **Virality**: Make use of referral programs and incentive structures that allow the community to become ambassadors of the new service.

Marketing

A number of approaches can be undertaken to market a new micro-transit program or service area. Building awareness of a new service can be challenging, especially for micro-transit service because micro-transit vehicles are often more discreet in their appearance than traditional fixed-route bus vehicles. A multi-channel approach to enhancing visibility and awareness is recommended for attracting new riders. Such channels include:

- **Placing collateral** including signs and flyers in micro-transit service areas and around existing transit stops.
- **Utilizing digital channels** such as social media and paid advertisements to raise awareness of a new service (**Figure 12**).
- **Branding vehicles** used for micro-transit operations to create more visibility of the micro-transit service in operation (**Figure 13**).
- **Holding pop-up events** with branded merchandise and informational material, providing opportunities to discuss the new service with prospective riders (as well as serving an education function).

FIGURE 12: FACEBOOK POST ON LAUNCH OF NEW METRO MICRO SERVICE

FIGURE 13: KING COUNTY METRO MICROTRANSIT VEHICLE BRANDED WITH SEATTLE SKYLINE

Engagement with community-based organizations and local politicians can help raise awareness of marketing events. When developing a plan for marketing its new micro-transit service, Denver Regional Transportation District (RTD) identified people most likely to use the service (workplace commuters and students) and focused its marketing efforts on these groups. Ultimately, RTD found that marketing micro-transit service was more difficult than marketing more-familiar fixed-route services, noting that the marketing effort required substantial coordination with communities, considerable outreach, and direct promotions.[38]

[38] TCRP Synthesis 141: Microtransit or General Public Demand Response Transit Service: State of the Practice (2019, p. 47. http://www.trb.org/Main/Blurbs/178931.aspx.

Public Education

As using micro-transit can be complex for those unfamiliar with modern ride-hailing services and other mobile apps, it is important to offer opportunities to educate the public and answer questions they may have about the new service. Some questions can be answered with short, highly visual documents that explain how to find, install, and set up micro-transit apps, such as the instructions for SacRT's **SmaRT Ride** in Sacramento, California (**Figure 14**).[39]

Aside from the technology aspect of using a new service, current riders of demand response transit as well as prospective riders may have questions about where they can be picked-up and dropped off, and when, how fares are collected, vehicle accessibility, wait times to plan for, and the available alternatives to using an app.

Setting up public education events offers opportunities for prospective riders to ask questions and learn more about the service, while also helping the agency to understand what concerns riders may have with adopting micro-transit. Partnering with economic development agencies, Business Improvement Districts (BIDs), community-based organizations (CBOs), and major employers can create opportunities for travel trainings, in which a transit agency representative can train people on how to use the service and even help them take their first ride. Aside from in-person education events, some transit agencies have developed videos to quickly introduce riders to micro-transit. **Ride On**, in Montgomery County, Maryland, features a how-to video for its Flex on demand service,[40] and a post on Los Angeles Metro's Facebook page shared a similar, instructional video and its Metro Micro micro-transit service.[41] Using micro-transit can involve several steps riders may be unfamiliar with, from using an app to book their trip to connecting to fixed-route transit in a shared vehicle (**Figure 15**). In-person and online rider education can help make those steps more understandable.

FIGURE 14: SMART RIDE INSTRUCTION FLYER

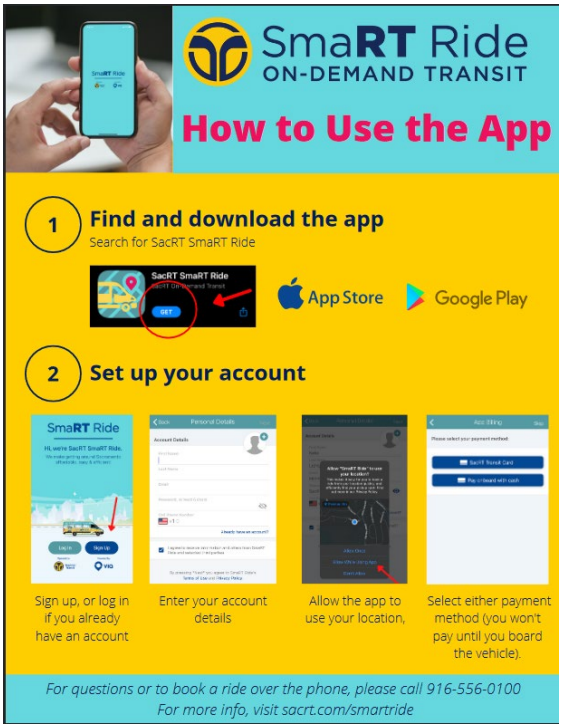
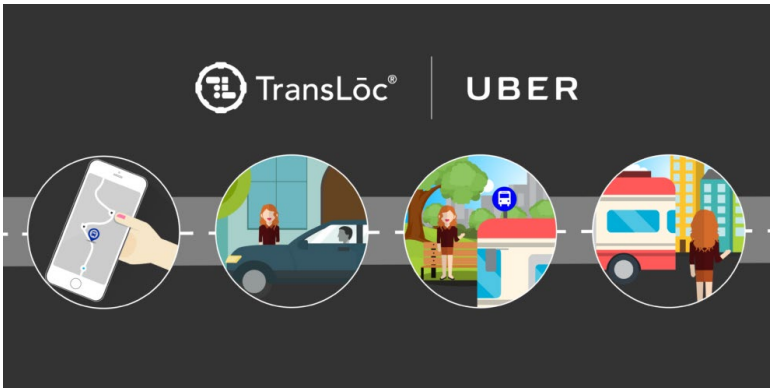


FIGURE 15: STEPS IN A MICROTRANSIT BOOKING



[39] Sacramento Regional Transit District, How to Use the App, https://www.sacrt.com/apps/wp-content/uploads/How-to-Use-the-SmaRT-Ride-App-Flyer.pdf.
[40] Montgomery County Department of Transportation, Ride On Flex, https://www.montgomerycountymd.gov/dot-transit/flex/.
[41] Los Angeles Metro, Facebook post, https://www.facebook.com/watch/?v=344278797088539.

3.4 Lessons Learned and Key Take-Aways

Across the various case examples reviewed for development of this memo, a few lessons learned for successfully deploying micro-transit service emerged. Many of the findings described in this section come from TCRP Synthesis 141.

Plan, Plan, Plan – and Monitor

Agencies such as RTD in Denver said that thoughtful and effective planning and implementation of the service was extremely important. Specific elements of effective planning that staff from RTD, LYNX, Houston METRO, and other agencies cited include:

- Establishing clear and measurable goals and service standards.
- Ensuring the service is oriented to the market it is serving (i.e., people – demographic and socioeconomic characteristics, travel patterns, etc.) and the benefits it is intended to provide.
- Preparing and implementing a marketing and public education plan to ensure a diverse array of potential riders know about the service and understand how to use it, as it can be more difficult to enhance public awareness of a micro-transit service compared to fixed-route bus service.
- Considering in advance how the agency will adapt if the service over- or under-performs.

Other considerations micro-transit service should anticipate and consider in advance include relevant provisions of applicable collective bargaining agreements; ensuring the right contract management and performance assessment mechanisms are in place to ensure the service meets agency standards (particularly under a TaaS model); and conducting an assessment of the technology to ensure all of the capabilities are functioning properly. Once the service has been implemented, monitoring its performance actively and regularly can lead to quick identification of whether the service is meeting the previously established goals and standards. By identifying these issues quickly, an agency is better prepared to adjust the service design and parameters, or take other actions such as additional marketing, to ensure that it does meet the standards that have been set.

Be Flexible and Consider Starting with a Pilot

Implementing micro-transit service always comes with a variety of unknowns. Even the most data-driven and thoughtful planning processes do not anticipate all of the potential patterns that may emerge in micro-transit usage. For example, it is very hard to project ridership for a micro-transit service before it goes into service; this is particularly true for a service covering a large geographic area. By branding a new micro-transit service as a "pilot," agencies allow themselves some flexibility to make changes on a rolling basis as they become needed. Houston METRO, for example, found that piloting its service initially was very valuable, as it provided an opportunity for potential skeptics and critics to examine micro-transit in the field. Many other agencies profiled in this memo rolled out their service initially as a pilot, and then adapted or expanded the service based on their experience as well as lessons learned.

4. OPERATIONAL OPPORTUNITIES AND CHALLENGES

4.1 About this Section

This section summarizes the findings from interviews conducted with six operators of on-demand micro-transit services from around the country as well as discussions held with four public providers of demand response services within the region. Drawing on these findings, this memo identifies potential opportunities and challenges for micro-transit service in the Richmond region.

4.2 Methodology

4.2.1 PEER AGENCY INTERVIEWS

Based on the findings from the Best Practices Review, the study team identified ten agencies from around the U.S. to consider for potential interviews. The team prioritized six peer agencies based on GRTC feedback, demographic factors, and their representation of a diversity of micro-transit use cases. The team's intention was to select a diverse sampling of agencies whose experiences and service types collectively would be relevant to multiple contexts (urban, suburban, and rural) within the Richmond region.

All six peers (**Table 2**) contacted agreed to be interviewed. Interviews were 45 minutes long, and interview questions (**Appendix B**) included both a set of general questions for all agencies and agency-specific questions tailored based on research in Task 3 into the specifics of each agency's service.

TABLE 2: INTERVIEWED PEER AGENCIES

Agency (Service)	Jurisdiction	Population	Households
CVTA	Richmond, VA region	1,083,625	412,351
Capital Metro (Pickup)	Austin, TX	2,114,441	764,989
CDTA (CDTA Flex)	Albany, NY	880,736	352,713
Dayton RTA (RTA Connect On-Demand)	Dayton, OH	803,543	330,975
DART (DART Connect)	Sussex County, DE	224,384	91,697
MATS (Go2)	Muskegon, MI	173,297	65,939
rabbittransit (Stop Hopper)	York, PA	445,565	172,421

4.2.2 OPERATOR MEETINGS

Four operators of demand response transit services were identified in the Richmond region (**Table 3**), and the study team held meetings with each of them. As summarized below under Operator Meetings, the four operators offer a variety of services with varying eligibility criteria. Operator interviews provided additional detail about each operator's service model and goals, as well as operators' future plans for their services and opinions about potential micro-transit services in the Richmond region. Interviews were one hour long, with both general and operator-specific questions (**Appendix C**).

TABLE 3: RICHMOND REGION DEMAND RESPONSE TRANSIT OPERATORS

Operator (Service)	Service Area within CVTA Region
Chesterfield County (Access Chesterfield)	Chesterfield County, with some trips allowed to Henrico County, Richmond, Colonial Heights, Hopewell, Fort Lee, and Petersburg
Bay Aging (Bay Transit)	Charles City County and New Kent County
GRTC (CARE and CARE On-Demand)	Richmond and Henrico County
Hanover County (Hanover DASH)	Hanover County

4.3 Peer Agency Interview Findings

4.3.1 FINDINGS SUMMARIES

The following pages contain summaries of the key take-aways from each of the peer agency interviews. The table in **Appendix D** contains information related to specific performance standards and metrics achieved by the peer agencies.

4.3.2 CAPITAL METRO PICKUP (AUSTIN, TX)

TABLE 4: CAPITAL METRO INTERVIEW SUMMARY TABLE

About the Service	Opportunities and Successes, Challenges, and Lessons Learned
• **Use case:** First/last mile, replace underperforming fixed route • **History/context:** Service implemented as a replacement of an unproductive route in 2017. The agency partnered with Via for a pilot program, with Pickup service launched in June 2019. The availability of the app led to an increase in popularity, and the agency has since added multiple zones. • **About the service area:** Service is provided in eleven zones, with four urban zones of less than three square miles in area and seven suburban zones larger than three square miles. Fares are set equal to MetroBus fares, at $1.25 per ride. • **Service model:** Via platform used; Capital Metro operators and vehicles provide trips.	**Opportunities and Successes**: • **Sharing vehicles across zones helps meet additional demand.** This is possible with Via's ability to mix vehicles between nearby zones and with the agency's own paratransit fleet. The agency has found micro-transit peak periods to be more similar to fixed-route peaks than paratransit peaks. • **Some route replacement zones have been their best-performing.** In one of the earliest zones, Pickup replaced a poor-performing fixed route and is now one of the highest-ridership zones. **Challenges**: • **Micro-transit can require more agency attention to manage demand** than other service types. Capital Metro observes demand spikes that require a response to keep high levels of performance. • **Standard performance reports generated by the Via platform have not been very useful.** Capital Metro calculates its own performance statistics. **Lessons Learned**: • **Establish service standards**. Service standards enable defensible choices about new zones, zone boundaries, and level of service. They also allow education of policymakers and the public. (See **Appendix E** for details.) • **Educating policymakers and the public helps make the service as effective as possible.** Outreach ensures stakeholders understand the goals and use cases, while also soliciting input on the service standards. During outreach to senior living complexes, the agency designates resident "superusers" who are especially familiar with the app and can assist other residents with booking. • **Keep zone sizes manageable.** There is often pressure to increase zone sizes, but doing so increases wait times and reduces the usefulness of the service. • **Assess performance by zone.** The service performs differently in different zones. E.g., shared rides are more common in urban zones than suburban zones. Do not aggregate performance data. • **Use of in-house drivers accustomed to assisting paratransit riders helped immensely with service quality**. Early on, Capital Metro provided Pickup trips using Transportation Network Company (TNC) drivers, who were not well-trained to assist riders with mobility needs. Capital Metro now provides trips with its own drivers.

4.3.3 CDTA FLEX (ALBANY, NY)

TABLE 5: CDTA INTERVIEW SUMMARY TABLE

About the Service	Opportunities and Successes, Challenges, and Lessons Learned
• **Use case:** First/last mile (original zone), new service area (newer zone). • **History/context:** Started as one of TransLoc's first implementations in the U.S. CDTA got a good deal on the software in exchange for piloting its use. The pilot was launched in January 2020. • **About the service and service area:** Two zones; one is 17 square miles and has been in operation since 2020. It provides connections to multiple fixed routes and BRT service as well as the airport and other out-of-zone destinations. It replaced underperforming fixed routes. The newer zone (<2 months in operation) connects a rural town to an activity center about 10 miles away (for doctor appointments, shopping, jobs, etc.). Fare is $3.00 but agency plans to reduce to be the same as regular bus fare. • **Service model:** TransLoc platform used; CDTA operators and vehicles provide trips. • **Other notes:** Allows walk-up trips. About 50 percent of trips are shared. No pre-scheduling.	**Opportunities and Successes**: • **Expanded access to destinations and other transit services** to people previously not within walking distance of a fixed route. • **The app's user interface is intuitive.** Riders who use the service via the app find it easy to use and enjoy using it. • **The TransLoc platform is very flexible** in some aspects, enabling real-time parameter changes. CDTA has found it easy to change service hours, zone boundaries, and other service characteristics as needed. **Challenges**: • **High wait times due to the large size of the initial zone and insufficient number of vehicles at launch.** Number of planned vehicles (two) relative to original zone's size (17 square miles) was inadequate, resulting in excessive wait times. CDTA had to add more vehicles, and then increase vehicles further during peak periods (6:00 to 10:00 a.m. and 2:00 to 6:00 p.m.), resulting than higher-than-expected costs to achieve desired service quality. • **The TransLoc platform does not meet some of CDTA's needs.** The process of extracting and visualizing performance data—including origin-destination data, hotspots, and the prevalence of ride sharing—from TransLoc's platform is laborious. The platform also does not enable CDTA to incorporate its own branding. **Lessons Learned**: • **Keep zone sizes manageable.** Be cautious rather than ambitious in zone sizes. • **Not everyone will book their trips by app.** Elderly populations in particular continued to book their trips by calling in. • **Marketing and terminology are important.** CDTA prefers referring to it as "on-demand" service. CDTA has found it important to ensure people understand it is not a private service, so that riders understand trips are shared and that wait times and trip times vary depending on demand.

4.3.4 DART CONNECT (GEORGETOWN, DE)

TABLE 6: DART INTERVIEW SUMMARY TABLE

About the Service	Opportunities and Successes, Challenges, and Lessons Learned
• **Use case:** Replace underperforming fixed route. • **History/context:** Service launched in April 2021 to replace routes 901 and 902, which were underperforming flex routes serving small towns in rural areas. Funded by an Accelerating Innovative Mobility (AIM) FTA grant. Pilot program extended through January 2023 with additional state funds. • **About the service area:** 10 square mile service area. Fares are set at the same level as a one-zone bus fare ($2 per ride). • **Service model:** Service is provided by First Transit via contract, with trip booking and routing services provided by Via (SaaS model). Agency operates a call center that uses Via's Operations Center product to handle phone bookings – about 50 percent of rides are booked via app and 50 percent by phone. The agency continues to operate statewide paratransit service, including in the DART Connect zone.	**Opportunities and Successes** • **Currently pursuing more involvement of public carriers**, who DART has an active relationship with as the designated state regulator of public carriers.[42] May allow as much as 50 percent savings compared to the existing First Transit contract. • DART saw a fairly **smooth roll-out process** when it introduced the service, indicating it could be feasible and relatively uncomplicated to implement in other locations too. • **DART Connect has received positive media coverage and rider feedback.** • **The booking platform allows integration with other transit service.** If a trip can be made by connecting fixed route service, that will be suggested. **Challenges** • **Difficulty attracting public carrier participation in the program**. Carriers have been reluctant to exclusively provide DART Connect rides. • **Challenging to integrate paratransit vehicles** into micro-transit booking. • **Interactions with Uber and Lyft have been unproductive**, and there is little TNC driver availability in the rural areas currently served by DART Connect. **Lessons Learned** • **Fixed-route service has to be performing poorly to be a good candidate for substitution with micro-transit.** DART Connect has a significantly higher cost per trip compared to fixed-route service. • **Have a plan for system outages.** Where possible, have backup booking options in case app-based booking systems go down due to issues such as cyberattacks. • **Plan for training needs.** For example, call center representatives required new training, and First Transit held multiple driver trainings.

[42] Public carriers are private firms (e.g., taxi companies, shuttle companies) that provide transportation services to the general public for a fee. Companies must meet standards set by regulatory agencies related to insurance, driver training and background checks, etc. to become certified as public carriers.

4.3.5 MATS GO2 (MUSKEGON, MI)

TABLE 7: MATS INTERVIEW SUMMARY TABLE

About the Service	Opportunities and Successes, Challenges, and Lessons Learned
• **Use case:** Replace underperforming fixed route, new service area • **History/context:** Service implemented in June 2020 following implementation of a redesigned and less expansive fixed-route network to address funding shortfalls. Followed elimination of a poorly performing countywide paratransit service, which was replaced with an ADA-required (only) paratransit service. • **About the service area:** Service provided in a 50 square mile area with pricing varying by jurisdiction. Agency included a few additional destinations to enable regular-fare travel to key destinations in a non-partner jurisdiction. • **Service model:** Turnkey (TaaS) operation, provided by Via (which procured vehicles through a subcontract with a rental car company). Agency staff continued to operate fixed route and ADA complementary paratransit. • **Other notes:** MATS sells Go2 trips to unbanked riders by accepting cash in person (at its transit center) in exchange for promo codes that are used as payment for trips. (Agency found that some unbanked riders have smartphones.)	**Opportunities and Successes**: • **Service maintains access** in locations losing fixed-route service and **covers new service areas** beyond previous and current fixed-route network. It is a **more convenient service** for some users. **Challenges**: • **Many customers are reluctant to use the app** and struggled adapting to the service. "Our results have been influenced by the willingness of riders to adopt the technology." • **Ridership has not met expectations** (although potentially related to the pandemic). • **Serving unbanked customers was a struggle at first.** The app was not initially set up to enable unbanked customers to use it (required entering credit card number). • **Challenging to handle customer complaints via outsourced customer call center.** Complaints are handled by overseas workers with no knowledge of the area, resulting in difficulties resolving issues and in communication due to language capabilities. • **Setting up an agency portal for healthcare providers and social services organizations was challenging.** MATS intended these organizations to book on behalf of clients but setting up a portal was difficult, and the organizations are not using it yet. • **Technical issues with vehicles.** For example, vehicle security systems would drain batteries, preventing vehicles from starting and causing delays. **Lessons Learned**: • **Ensure many if not all vehicles are wheelchair-accessible vehicles (WAVs).** Via underestimated the number of WAVs they would need. • **Local and consistent presence by TaaS contractor would have been very beneficial.** Via manages Go2 remotely. A local presence would have helped quickly resolve technical issues and issues with customer service staff not knowing the area. • **Think "outside the box" when it comes to planning metrics and know the audience.** To evaluate likely adoption of the app (and plan accordingly), consider unconventional metrics such as percentage of local population using delivery apps (for example).

4.3.6 RABBITTRANSIT STOPHOPPER (YORK, PA)

TABLE 8: RABBITTRANSIT INTERVIEW SUMMARY TABLE

About the Service	Opportunities and Successes, Challenges, and Lessons Learned
• **Use cases:** First/last mile and local circulation (East York zone); Local circulation and first/last mile for commuter route to York (Dallastown/Red Lion); Local circulation intended to gauge demand for fixed route and increase interested in fixed routes (Selinsgrove/ Sunbury). • **History/context:** Agency conducted analysis to identify needs. Significant political support to connect people to jobs. Agency sees service as an antidote to the equity implications of TNC services not being accessible to everyone. Service launched in August 2018. • **About the service area:** Service provided in 4 zones between 5 and 10 square miles in area, plus a small area halfway between two zones where there is an apartment complex. Trips between two zones can be made by transferring there. Fare $2 per trip, with free trips for people 65 and older. • **Service model:** SaaS; Via provides software (branded with company's logo); other components are agency-provided.	**Opportunities and Successes**: • **Rider satisfaction with Via is very high, and on all KPIs the service has met or exceeded goals.** Cost per revenue hour falls in the same range as fixed-route service (between $56 and $100 per revenue hour), passengers per revenue hour is above the goal of two, ride aggregation is above the goal of 25 percent, and the average customer rating for trips is 4.9 out of 5. • **Micro-transit was the only one of the agency's modes to increase in ridership during the pandemic.** The agency is looking more into the service model, which may have performed well due to its flexibility. • **A small area serving between zones has given people the ability to transfer between zones.** The zone's main purpose was to extend service to an apartment complex, but the agency realized it could facilitate a transfer between two zones, which is now does successfully (although these make up a small portion of all trips). **Challenges**: • **Vendor outages have caused occasional service disruptions.** Outages have occurred three times since rabbittransit's transition from TransLoc to Via, which has been affected by recent Amazon Web Services server outages. **Lessons Learned**: • **Consider a "soft launch" period** to get drivers and passengers up to speed and work out any technical issues. • **Maintaining agency branding is an important consideration in choosing a vendor.** Compared to TransLoc, Via allowed more freedom in branding the service, which the agency values for building rider awareness of the service. • **Marketing is key**, explaining the new service to riders and familiarizes them with it. • **Find an internal champion.** Supporters at the top of the agency can promote the service and develop buy-in.

4.3.7 RTA CONNECT ON-DEMAND (DAYTON, OH)

TABLE 9: RTA CONNECT INTERVIEW SUMMARY TABLE

About the Service	Opportunities and Successes, Challenges, and Lessons Learned
• **Use case:** First/last mile, replaced fixed-route service following funding loss. Expanded service in areas previously without it. • **History/context:** State-level sales tax changes in 2017 led to a reduction of $4 million in RTA's budget. RTA Connect On-Demand was launched to maintain some service where fixed-route reductions were needed. The service launched in June 2017 with Lyft as a partner, then added Uber and other partners after one and a half years. • **About the service area:** Service provided in 6 zones between 5 square miles and 26 square miles in size. All trips are free. All zones have a fixed-route bus stop in them to which riders can connect. • **Service model:** Service provided through a combination of in-house drivers and vehicles, as well as contracts with non-dedicated service providers (NDSPs) – Uber, Lyft, and a local taxi company. Riders directly select which provider they want to use and book directly with provider. TNC apps are programmed to automatically make fares free if a trip is within the zone.	**Opportunities and Successes**: • **A majority (70 percent) of Connect On-Demand trips connect to RTA fixed route service.** The remaining 30 percent of trips are within each zone. • **Initial success has led to expansion opportunities.** RTA has added Connect On-Demand service to replace fixed route deviations and is considering service to job centers with complicated shift schedules. • **Micro-transit freed up resources to fund other services**, such as a very successful local circulator route. **Challenges**: • **Driver availability was a minor issue.** At the start of the program, Uber provided an incentive for drivers to take Connect On-Demand trips, since some drivers were reluctant to accept the trips due to a lack of tips. • **Getting the initial agreement approved took time.** RTA used Pinellas Suncoast Transit Authority's agreement with Uber as a template, but legal review to finalize and implement the agreement was time-consuming. **Lessons Learned**: • **Reach out in advance** to customers and jurisdictions that may be affected by new or replaced service. This ensured customers knew what to expect and jurisdictions understood service was not being removed. • **Know the goal of the service before launch.** Micro-transit is a new mode, so an agency should have a clear idea of a service's purpose and how micro-transit achieves it.

4.3.8 PEER AGENCY CASE EXAMPLE IMPLICATIONS AND TAKE-AWAYS

The interviews summarized above provide insight into the specifics of each service, which have different goals and service models. Despite the services' differences, multiple opportunities and successes, as well as challenges and lessons learned were noted across agencies.

Common Opportunities and Successes

The interviewed agencies had generally positive experiences with their micro-transit services, and all plan to either maintain or expand their micro-transit service in the near term. Common opportunities and successes are summarized below.

- **Micro-transit is effective at maintaining or increasing access in areas that cannot or should not be served by fixed-route buses**. All of the agencies interviewed acknowledged that there are riders who enjoy the access micro-transit provides, as well as the on-demand nature of the service.
- **Micro-transit can support and increase fixed-route ridership**. Dayton's **RTA**, whose micro-transit service is designed to include at least one terminus of a fixed route in each zone, has found that more than 70 percent of its Connect On-Demand trips involved a transfer to fixed-route bus service.
- **App booking is very convenient for riders who do use it.** Agencies have found that riders who book by app find the process convenient, especially compared to demand response services that require booking a day or more in advance. Agencies have also found that efforts to encourage switching to app booking can be successful.
- **Micro-transit can provide a cost-competitive and popular alternative to unproductive fixed-route service.** Some of **Capital Metro**'s most popular micro-transit zones replaced more expensive fixed-route service, and York, PA's **rabbittransit** has found the cost per revenue hour of its micro-transit service to fall in the same range as its fixed-route service.
- **Commonly used micro-transit platforms (e.g., Via, TransLoc) each have unique benefits and drawbacks, but generally allow flexible adjustment of service parameters.** Agencies noted that micro-transit platforms allow adjustment of zone boundaries, service hours, and other parameters as needed. **Capital Metro** and Albany's **CDTA**, for example, have been able to adjust parameters in real-time to address challenges or meet new needs identified as the service matures.

Common Challenges and Lessons Learned.

While the focus of this section is "common" challenges, the reality is that challenges varied a lot between agencies and services. Many differences could be attributed to the services' different service models, goals, and service areas. A micro-transit service intended to provide a cost-effective countywide alternative for paratransit riders may have different challenges than one intended to replace a poorly performing fixed route in one area of a city. Nonetheless, the interviews revealed some common themes, which are noted below.

- **There is value in piloting micro-transit service.** This allows trying out different parameters (taking advantage of the flexibility of micro-transit platforms), developing service standards, raising awareness of the service among riders, policymakers, and other stakeholders. It enables agencies to iron out any technical or service issues before the services is rolled out more widely, when such issues would attract a higher level of attention.
- **Clearly define the purpose, expectations, and guidelines for the service.** While there are uncertainties inherent to implementing a new micro-transit service, as with any transit service, having clearly defined goals for the service can help ensure a successful launch. As the service develops, creating service guidelines and standards ensures that modifications and expansions occur in an objective and cost-effective way.
- **Zone size is very important**. Although increasing zone sizes allows serving more destinations, agencies strongly recommended keeping zone sizes manageable. Albany's **CDTA** experienced high wait times due

to the initially planned number of vehicles not being able to provide the desired level of service in a 17 square mile zone, and Austin's **Capital Metro** strives to keep all zones less than 6 square miles in area, with urban zones less than 3 square miles. **Capital Metro** has found its service standards help defend choices to limit zone size for operational reasons. Keeping smaller zone sizes may be particularly valuable if an agency is intending for the service provide first and last mile connections and not detract from fixed-route ridership.

- **Education and marketing help get a service off the ground and explain it to riders who are unfamiliar with app-based trip booking.** Multiple agencies launched their services alongside marketing and education targeted at potential users, particularly those who might have trouble transitioning to an app. In addition to the senior center outreach described above, some agencies also contact paratransit users whose residence location or trip patterns suggest they could use the new service.
- **It cannot be assumed that a large majority of riders will book their trips by mobile app. MATS** saw significant reluctance to switch to app booking among its riders, and most agencies noted continued use of call-in booking by many older riders and riders who find smartphone use difficult. Some agencies do not make increasing app usage a goal, but those who do have launched efforts to increase it. Austin **Capital Metro** and York, PA's **rabbittransit**, for example, hold outreach events at senior centers to explain the service and how to use the app, and **Capital Metro** appoints volunteer "superusers" who help other residents to use the app.
- **Both struggling to keep up with demand, as well as low ridership, were challenges.** Albany's **CDTA** mentioned that its greatest challenge has been keeping up with the volume of trip requests in a zone of 17 square miles. Muskegon's **MATS**, on the other hand, found ridership did not meet expectations, though this may be due to the service's launch during the pandemic. Other agencies, like York, PA's **rabbittransit**, have found micro-transit to be their only mode to gain ridership during the pandemic.
- **Common micro-transit platforms have shortcomings that affected agencies in different ways.** Austin's **Capital Metro** (using Via) and Albany's **CDTA** (using TransLoc) have found the standard performance reports lacking, and they have supplemented them with their own data analysis. Platforms' use of Amazon Web Services has led to problems during outages, which have affected both Delaware's **DART** and **rabbittransit** in York, PA, leading them to develop plans for platform outages.

4.4 Operator Meetings

4.4.1 SUMMARY OF OPERATOR INPUT

The project team met with all four demand response service providers operating in the CVTA region in an effort to understand the current services offered, identify operational challenges and opportunities, and gather input on both the providers' vision for how micro-transit could further help meet the transportation needs of the region's residents as well as the providers' interest in potential coordination in the provision of micro-transit service. Interviews were one hour long. As with the peer interviews, the operator interviews included general questions applicable to all operators and operator-specific questions (**Appendix C**). The following tables provide background information about each operator's service, as well as a summary of key takeaways from each of the interviews.

4.4.2 BAY TRANSIT (OPERATED BY BAY AGING)

TABLE 10: BAY TRANSIT INTERVIEW SUMMARY TABLE

About the Service	Key Take-Aways

• **Service model and type:**
  • Bay Transit's service is directly operated, with the agency employing its own staff.
  • Most (90-95 percent) of service is demand response, operating across 12 counties, including very rural areas with long average trip distances. Counties it serves within the CVTA region include Charles City County and New Kent County.
  • Since July 2021, Bay Transit is operating a DRPT-funded micro-transit pilot replacing two fixed routes in Gloucester Courthouse, using Via technology jointly procured with Mountain Empire Older Citizens in western Virginia. The service covers a 10 square mile area for eight hours a day using one vehicle operated directly by Bay Transit.
• **Eligibility:**
  • General public.
• **Fares:**
  • $2 per trip.
	• Very interested in better connecting its riders to GRTC's services (have reached out to GRTC within the last year about commuter service between New Kent and Richmond). A joint or regional program could help attract private operators, who have been reluctant in the past to provide service in their service area.
	• Currently in process of acquiring new scheduling and dispatch software with additional capabilities to assist in delivery of all the agency's services (beyond the pilot).
	• Bay Transit's micro-transit pilot provides roughly 100 trips per week with one vehicle. Wait times have been seven to nine minutes consistently since July, with more than 90 percent of trip requests completed.
	• Compared to the booking process for traditional demand response, users appreciate the micro-transit booking process once they try it. But it has been challenging to get long-term demand response riders to switch.
	• Bay Transit sees a challenge in serving the rural areas of its service area with micro-transit, given their pre-pandemic average trip length of 10 miles.

ACCESS CHESTERFIELD AND ACCESS ON DEMAND (OPERATED BY CHESTERFIELD COUNTY)

TABLE 11: ACCESS CHESTERFIELD INTERVIEW SUMMARY TABLE

About the Service	Key Take-Aways

• **Service model:**
  • Uses non-dedicated service providers (NDSPs) UZURV, Dependacare, and Roundtrip to provide trips. Dependacare provides both Access Chesterfield and Access On Demand trips, while the other two vendors provide only On Demand trips. (Per the study team's interview with Hanover DASH, UZURV uses TNCs like Uber and Lyft to provide backup service during periods of high demand.) Customers contact their preferred provider directly to schedule, and provider is reimbursed a per-trip cost (for Access Chesterfield trips) or based on distance (for Access On Demand trips).
  • Any trip can be made within Chesterfield County, but trips outside Chesterfield County are limited to certain trip types (e.g., medical trips, or employment trips for riders with disabilities).
  • Reservations for Access Chesterfield trips must be made by 4:00 p.m. the day before. Bookings for Access On Demand trips must be made at least two hours in advance.
  • Both Access Chesterfield and Access On Demand are shared ride services.
• **Eligibility:**
  • Riders must be registered with Chesterfield Mobility Services as aged 60 or older, having a disability, or being low-income.
• **Fares:**
  • $6 per trip, paid by voucher for Access Chesterfield trips and by credit or debit card for Access On Demand trips. Riders purchase voucher in booklets of six by mail and in person at various county offices.
• **Other notes:**
  • Chesterfield County conducts regular operator records checks, as well as public engagement and customer satisfaction surveys.
	• IT department is currently building in-house a new software to manage booking, trip assignments, etc. Interviewee had little knowledge of current status or capabilities, however.
	• The largest potential challenge is funding, and there is potential for administrative barriers (Chesterfield has been unable to receive state grants in the past due to administrative and legal issues from the county government).
	• Demand response trip costs are set by contracts between the NDSP vendors and the county. Access Chesterfield costs are $33 per trip, and Access On Demand trips are reimbursed at a rate of $11 for trips between zero and six miles and $27 for trips between six and 10 miles in length.
	• The services have a budget of roughly $2 million, with almost all funding from Chesterfield County's general fund.
	• Chesterfield County does not perceive much demand from the general public for these types of service.

GRTC CARE ON-DEMAND (OPERATED BY GRTC)

TABLE 12: GRTC INTERVIEW SUMMARY TABLE

About the Service	Key Take-Aways

• **Service model:**
  • Uses NDSPs UZURV and Roundtrip, which riders can choose between as desired. Riders book same-day, non-shared rides either by app or calling in. All vehicles must be wheelchair accessible, and UZURV and Roundtrip contract with non-emergency medical transport services to provide some of these trips. (Per the study team's interview with Hanover DASH, UZURV also uses TNCs like Uber and Lyft to provide backup service.)
• **Eligibility:**
  • Riders must qualify for CARE paratransit service.
• **Fares:**
  • $6 "co-pay" per trip; GRTC reimburses up to $15 of any additional cost, after which the rider covers all costs (i.e., trips above $21).
• **Other notes:**
  • Started in August 2017 with the goal of providing a cost-effective way of serving some paratransit demand.
  • GRTC has little direct operational involvement, with NDSPs providing app and call-in booking as well as rides. NDSPs provide monthly reports to GRTC, who also do spot checks and directly contact riders about their satisfaction.
	• In the process of procuring a new technology platform
	• GRTC is satisfied with its UZURV and Roundtrip partnerships. The service has >90 percent on-time performance, and both partners happily share data.
	• CARE paratransit service has been free during the pandemic, while CARE On-Demand has not. Still, about 15 percent of CARE customers are CARE On-Demand customers, an even higher rate than before the pandemic. GRTC attributes this to the flexibility of on-demand service, in addition to generally higher paratransit demand leading more customers to book CARE On-Demand trips when paratransit wait times are higher.
	• GRTC is piloting an on-demand service open to the general public to cover early morning and late evening service gaps.[43] Bookings can be made through the Uber app, and call-in bookings with UZURV can be made by calling GRTC. The service will allow rides between bus stops on routes where service gaps have been identified.

[43] For more information, see: https://rvahub.com/2022/01/11/grtc-pilots-new-on-demand-bus-service-program/.

HANOVER DASH (OPERATED BY HANOVER COUNTY)

TABLE 13: HANOVER DASH INTERVIEW SUMMARY TABLE

About the Service	Key Take-Aways

• **Service model:**
  • Trips are provided by NDSP company UZURV, which is reimbursed for each trip based on distance, time, and vehicle type. Trips must be booked at least 24 hours in advance, and all trips are non-shared, though riders can bring a companion. UZURV uses TNCs like Uber and Lyft to provide backup service, which improves driver availability for rural service.
  • Service is provided to all of Hanover County, as well as areas within 7 miles of the county line and some out-of-county destinations like hospitals.
  • Currently, no app- or web-based booking is available, but UZURV plans to make that available next year. Roundtrip, their previous contractor, had app-based booking which worked well.
• **Eligibility:**
  • Riders must be aged 60 or older, or have a disability
• **Fares:**
  • $6 “co-pay” per trip.
• **Other notes:**
  • Service started in December 2019 with Roundtrip as a partner. UZURV was selected as the new partner in September 2021, after a re-bid for the service.
	• Hanover County is very interested in providing more transportation service to a larger portion of the population, as well as collaborating with GRTC to provide micro-transit.
	• Past challenges included service providers, particularly TNC drivers, being unwilling to pick up passengers from peripheral parts of the county (particularly the northwest) due to low productivity of those trips (i.e., drivers would not want to drive to or stay in more rural areas due to lower changes of finding a rider or likelihood of more deadhead). Roundtrip used TNC drivers to provide some trips.
	• UZURV’s rate structure of a platform fee, base fee, per mile fee, and minimum fee results in an average cost of $31 per ride for ambulatory trips and $63 per ride for non-ambulatory trips. Ambulatory trips have an average length of 10 miles per trip.
	• Hanover County is interested in providing Sunday service, as well as service for the general public, potentially via regional coordination.

4.4.3 OPERATOR MEETING TAKE-AWAYS

The operator meetings provided insight into operators' current offerings, as well as their opinions on potential micro-transit services in the CVTA region. Demand response operators in the CVTA region provide service in Charles City County, Chesterfield County, Hanover County, New Kent County, and the City of Richmond. All except Bay Transit use NDSPs in at least some capacity (if not exclusively), and NDSPs like UZURV supplement their demand response service with rides provided by TNCs. Fares charged to riders, eligibility criteria, and vendor rate structures vary among operators. Major takeaways are noted below.

- **With the exception of Bay Transit, the demand response services available in the region today are provided to specific populations, not the general public.** A new micro-transit service open to the general public in the region may not share a ridership base with existing demand response services, but existing demand response riders who find a micro-transit service meets their needs could use micro-transit as a replacement or complement for demand response service.
- **Operator interest in coordination and ongoing communication is common.** Bay Transit expressed interest in providing more direct connections between its service and GRTC service. Hanover County expressed interest in offering transportation services to the general public via regional coordination. All of the operators were pleased to participate in the meetings and looked forward to seeing the findings of this study.
- **Operators commonly partner with the same NDSPs, but there are service and service model differences.** All operators except Bay Transit make use of one or more of the following providers, some of which operate as NDSPs: Dependacare, Roundtrip, and UZURV. Operators generally are satisfied with their partnerships with their providers, but their service models incorporate these providers differently. The services set different fares, use different payment methods, use different booking methods, and offer both shared and non-shared trips. The ability of riders to choose from multiple NDSPs is intended to enhance competition, resulting in more pressure on providers to perform highly so that riders will book their services again. It is, however, less operationally efficient in terms of ride aggregation and the matching of riders with the closest driver based on their location. It also puts the onus on the customer to decide which provider to use, potentially with limited information to inform that decision.
- **Existing demand response services are all countywide or serve large, mostly rural service areas, which are more difficult to serve with on-demand service.** Bay Transit trips are 10 miles in distance on average, and TNC drivers' reluctance to serve rural areas caused initial problems for Hanover County's DASH service. Any on-demand service in rural areas would require dedicated providers to ensure a high level of service quality and would be unlikely to achieve high levels of operational or financial productivity. This could be a reason for GRTC to pilot services in multiple contexts and observe the differences. It may even make sense to initially pilot micro-transit in a location where it is more likely to be productive and potentially even enhance fixed-route ridership.
- **Most operators are currently developing or procuring new demand response platforms, and some are already piloting micro-transit or similar services.** GRTC is already piloting a micro-transit service open to the general public to address early morning and late-night service gaps using in app-booked Uber trips, and Bay Transit has operated a micro-transit pilot in Gloucester Courthouse since the middle of 2021. Chesterfield County is building a new, in-house booking platform for its Access Chesterfield services. This represents an opportunity for coordination, as well as consideration of micro-transit-related technology needs that could be addressed with regional cooperation.
- **There are significant fare differences among operators.** GRTC CARE On-Demand, Hanover DASH, and Access Chesterfield all charge at least $6 per trip. GRTC CARE On-Demand riders pay a base $6 fare per trip, in addition to any remaining cost above GRTC's additional $15 ride subsidy. Access Chesterfield riders pay for each trip with one $6 voucher, while Chesterfield County's Access On-Demand

riders pay at least $6 per trip, with higher fares for some longer trips. (Bay Transit charges a flat $2 fare per trip.) A lower-cost micro-transit service operating within the current service areas of providers with higher fares could attract some of their customers seeking lower-cost transportation options.

- **Some operators noted potential challenges include funding and administrative hurdles.** Access Chesterfield, for example, has faced difficulties from the county's legal department in getting approval to receive state and federal transportation funds. Other operators noted challenges similar to those noted in the peer interviews, including riders who have trouble using app-based booking.

4.5 Conclusion and Next Steps

The interviews with peer agencies and meetings with the region's demand response operators provided valuable information about potential opportunities and challenges in operating micro-transit services around the country, as well as information about the current offerings of operators in the CVTA region. The interviewed peer agencies use micro-transit to serve a variety of needs, from providing coverage service in large suburban or rural areas to providing connections to transit in small urban zones. A similar range of use cases is possible in the Richmond region, and the lessons learned will help identify possible benefits and difficulties for Richmond region micro-transit service. Demand response service is provided in portions of the Richmond region for some populations, and the operator interviews document the state of that service and suggest how it could be integrated into, as well as differentiated from, potential new micro-transit service.

Findings from both sets of interviews inform the final recommendations for micro-transit service presented in the following section.

5. RECOMMENDATIONS AND IMPLEMENTATION

5.1 Section Overview

This section builds on the findings in previous sections to identify operating scenarios for micro-transit service in the Richmond region. It also outlines the study team's recommendations regarding service models; zones to prioritize for micro-transit service; service goals, objectives, and standards; costs; implementation planning; and other general recommendations. These recommendations are based on in-depth quantitative analysis as well as qualitative input provided by the public (via a public survey) and stakeholders. Stakeholders were engaged through a series of meetings with each jurisdiction in the region in early 2022 and were also briefed in August 2022. At that meeting, they provided input to inform GRTC's prioritization of the zones recommended in this memo.

5.2 Service Model Overview

This section identifies three service model scenarios that GRTC could use to provide micro-transit service—The Transportation-as-a-Service (TaaS) or "Turnkey" scenario, the Software-as-a-Service (SaaS) scenario, and the Hybrid scenario—and describes how each service model would work.

TaaS Scenario: Turnkey Operation

Under this scenario, GRTC would contract with a vendor that would supply the technology, vehicles, and drivers to operate the micro-transit service. GRTC would define the micro-transit service parameters and requirements and oversee the service's and vendor's performance. The vendor would offer an application (app)-based booking option and provide all of the technical and customer support functions for the service. The vendor would be responsible for managing driver and vehicle availability to meet performance targets such as wait time targets set by GRTC. This scenario is most similar to the Go2 service provided by MATS in Michigan and Via to Transit in the Seattle region (described in more detail in the Task 3 and Task 4 memos).

SaaS Scenario: New Technology, GRTC-Operated Service

Under this scenario, GRTC would procure a technology platform to provide micro-transit service. The technology would enable riders to book trips via mobile app or by calling GRTC. CARE-qualified operators would operate the service using vehicles similar to those in the CARE fleet. These operators would be dedicated to responding to trip requests in a single zone or group of nearby zones. This scenario is most similar to the service provided by rabbittransit in York, Pennsylvania.

Hybrid Scenario: TNC + GRTC-Operated Service Scenario

Under this scenario, riders would have two booking method options:

1. Using a software application with participating TNC(s) or other service provider(s) offering app-based booking. Trips booked in a participating provider's app that met the parameters of the micro-transit service (i.e., are within the zone boundaries, are booked during the designated service hours, and have elected to take a shared trip) would automatically appear as GRTC-paid or GRTC-subsidized trips depending on the fare level. Riders would only need to pay up to the GRTC-determined fare (if any). If a fare were required, riders could pay in the app using a credit or debit card. Unbanked riders would be able to use cash to purchase cards with redeemable codes at GRTC-designated sites and/or participating retailers and use the app to redeem the card balances as payment. Providers would invoice GRTC for trips provided through the program and GRTC would reimburse provider (with details pre-negotiated between the two parties).

2. Calling GRTC. GRTC would send one of its vehicles and CARE-qualified/-trained drivers to provide the trip. Trips would need to be provided within a GRTC-defined maximum waiting period.

This service would be most similar to the RTA Connect service in Dayton, OH, and has some similarities to the existing CARE On-Demand and Access On Demand in Chesterfield County, in which riders can choose from multiple providers.

5.2.1 SERVICE MODEL COMPARISONS

Each of these three scenarios has unique advantages and disadvantages to consider. In addition, not all of these scenarios will be feasible for every context. For each service model scenario, **Table 14** below shows the applicable use cases and contexts, advantages, disadvantages, and notes about other considerations.

TABLE 14: SERVICE MODEL SCENARIO EVALUATION

Scenario	Applicable Use Cases and Contexts	Advantages	Disadvantages	Other Notes and Considerations
TaaS/ Turnkey scenario	Any context with internet access, any use case. May be more difficult to find a vendor in an especially rural area.	• Least level of effort required by staff for ongoing management. • Lower-cost option. • Ability to specify performance standards. • Contractor is responsible for driver recruitment and direct management.	• Independent contractors may not be as well trained or compensated as bus operators; this could potentially result in higher turnover. • There may be unexpected challenges with implementation and service launch. • Customer service functions may be subpar if outsourced and not closely monitored for quality.	• Agencies can set requirements for living wages + benefit subsidies for independent contractors (e.g., King County Metro did so for Via to Transit service). • Conducting a “soft launch” may help address potential challenges associated with beginning a new service. • There is a need to ensure adequate supply of wheelchair-accessible vehicles (WAVs). • Consider requiring vendor to have a local presence and trained customer service staff with knowledge of the area.
SaaS scenario	Any context with internet access, any use case. Most applicable where the service area is close to existing vehicle facilities.	• Gives agency the most control over operations. • Agency has ability to directly train and manage operators.	• Higher-cost option • Responding to changes in demand and resolving issues requires higher level of staff effort, as well as more operational flexibility to respond. • Driver recruitment is an additional responsibility and potential challenge.	• Would require at least one vehicle and driver to be dedicated to serving each micro-transit zone. • Vehicles should be WAVs.
Hybrid scenario	Urban or suburban only. Consistent presence of TNCs is assumed. Zone location would influence viability.	• Lower cost option. • More choices for riders. • Could build on GRTC’s existing TNC partnership(s).	• Independent contractors may not be as well trained or compensated as bus operators, potentially resulting in higher turnover. • If more than one TNC participates, riders must choose between providers. • May not be as operationally efficient if multiple providers participate.	• GRTC’s ability to respond to trip requests and complete trips within a short wait time could require dedicated vehicle(s) and staff(s) if zone is not close to a hub. • TNC drivers may be reluctant to accept trips if they do not expect a tip; methods for overcoming this barrier should be considered. • TNC drivers may not be well qualified to provide service to people with disabilities. • Ensuring adequate presence of WAVs may also be a challenge.

5.2.2 SERVICE MODEL RECOMMENDATIONS

For the Richmond region, the study team recommends two different service models based primarily upon proximity to existing GRTC facilities, as well as other considerations including productivity, customer experience, and service accessibility for people with disabilities. These are the TaaS and SaaS models. These models would cover two different areas, broken out as follows:

Zones in the City of Richmond and in Henrico and Chesterfield Counties would operate with a SaaS model.

- GRTC would provide the operators and fleet and would procure a technology platform to use to provide micro-transit service.
- This service model is beneficial within the existing GRTC service area primarily due to lower deadhead (cost of non-revenue service).
- Associated Costs:
  - Technology Set-up: $15,000 - $20,000
  - Vehicle Costs: $90,000 per vehicle
  - Operating Costs: $50 - $55 / vehicle revenue hour and $425 - $475 per vehicle monthly for technology
  - Technical and Consulting Support (required technology fees): $3,000 - $4,000 / month

Zones in the Town of Ashland and in Goochland, Powhatan, Charles City Counties would operate with a TaaS model.

- GRTC would contract with a vendor or other operator that would supply the technology (technical and customer support), vehicles, and drivers to operate the micro-transit service.
- GRTC would define the service parameters and requirements and oversee the operator's performance.
- Associated Costs:
  - Operating Costs: $50 - $60 / vehicle revenue hour
  - Generally, assumes a minimum contract size of $800,000

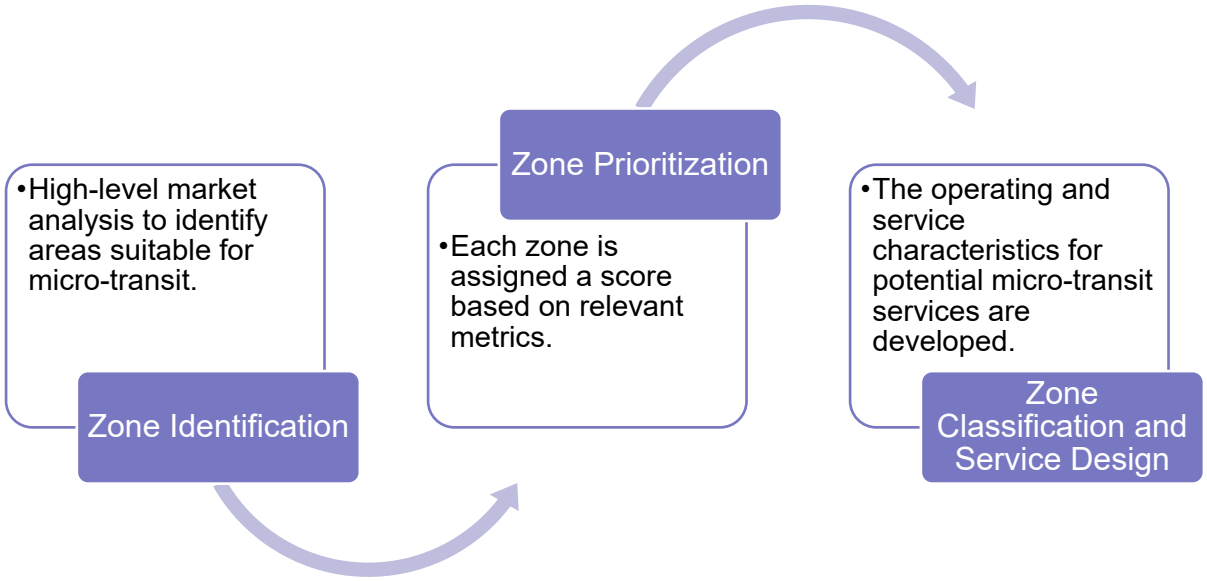
The two technologies could be integrated using singular interface for the passenger to ensure a seamless passenger experience between the various zones and the fixed-route service. We also expect that GRTC's interface would allow for consistent data collection and service monitoring.

5.3 Micro-transit Zone Prioritization

This section describes the process used to identify the most suitable zones for micro-transit service, and how the study team prioritized them for pilot consideration. While the zone identification and prioritization methodologies are very data-driven, public and stakeholder input and best practices findings also played a significant role in both defining the approach as well as influencing the results in terms of zone selection as well as, in some cases, zone boundary adjustments to best meet the needs of the region.

5.3.1 METHODOLOGY

To identify, prioritize, and evaluate potential micro-transit zones, the study team used a three-step process:



Each step and associated results are described in more detail in the following sections.

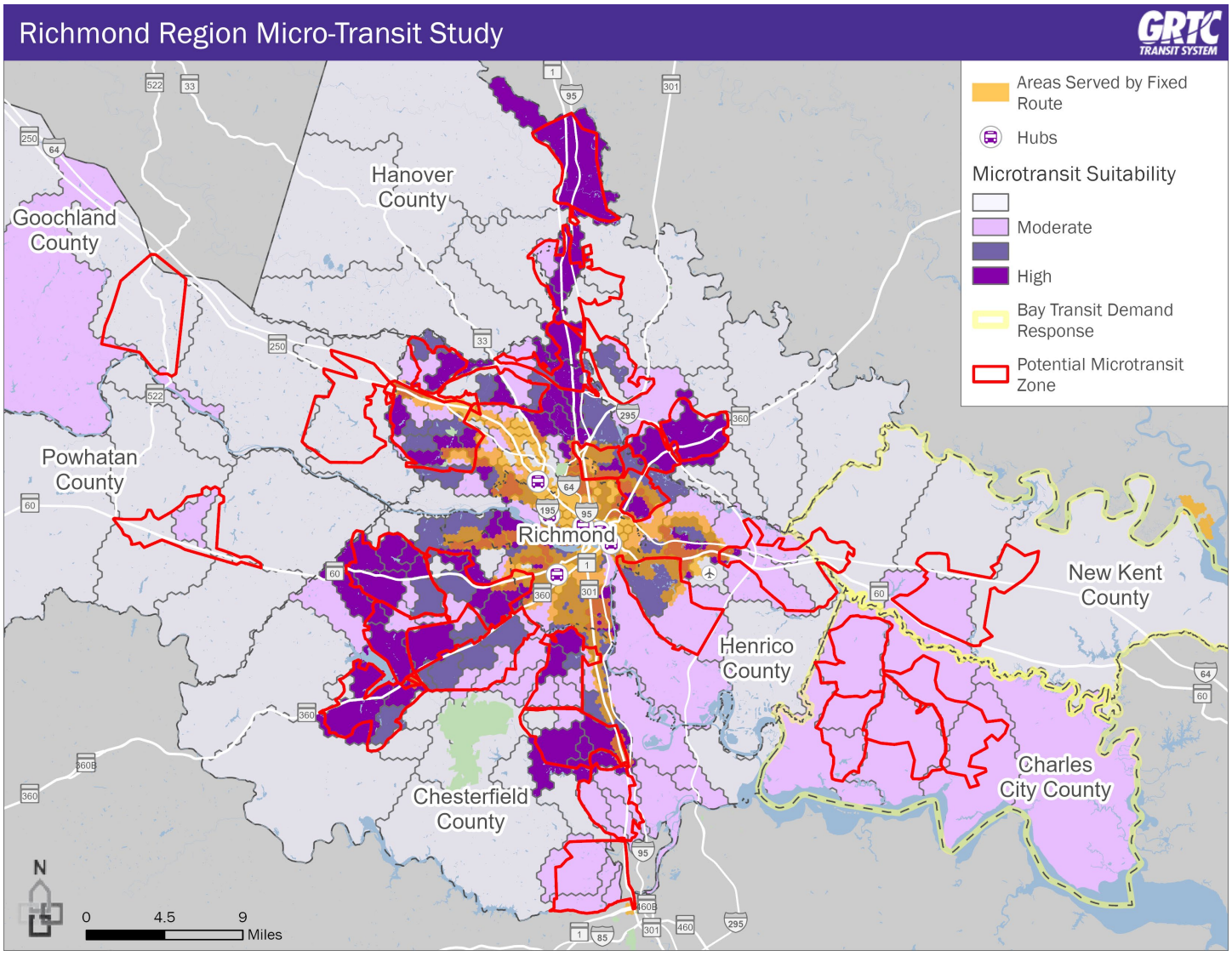
Step 1: Zone Identification

The study team conducted a market analysis to determine where micro-transit could be implemented successfully in the Richmond region. The market analysis relied on two indices, a Transit Potential index and a Transit Need index. The Transit Potential index measures population and employment density. Micro-transit services typically perform better in low- to medium-density areas where smaller vehicles can accommodate lower demand more efficiently. The Transit Need index measures socioeconomic characteristics that indicate a higher tendency of the people in the area to use transit, including micro-transit service. Transit Need identifies transit-oriented populations and activity-oriented jobs (e.g., retail, medical, recreation, education, and government) that involve trips throughout the day, as opposed to mostly during typical peak periods.[44]

While areas identified as having high Transit Potential and high Transit Need are typically strong candidates for fixed-route transit services, micro-transit can provide effective service to areas that demonstrate moderate-to-high levels of Transit Need but lack the overall density (Transit Potential) to support fixed-route transit. **Areas more suitable for micro-transit have higher Transit Need and lower in Transit Potential.** Combining the two measures produces a **micro-transit suitability** score. **Figure 16** shows the region's scoring as well as candidate micro-transit areas outlined in red. Candidate areas group smaller areas with high micro-transit suitability into larger areas of between 5 and 15 square miles. In some cases, boundaries between candidate areas where drawn based on natural barriers (highways, waterways, rail lines, parks, etc.).

[44] Transit-oriented populations are those with higher rates of a combination of low-income and low-car households (zero or one-car), persons with disabilities, youth and young adults, and senior citizens. These socioeconomic characteristics are indicators for people who are more likely to use or depend on transit.

FIGURE 16: MICRO-TRANSIT SUITABILITY WITH CANDIDATE AREAS



Step 2: Zone Prioritization and Scenario Testing

In Step 1, the study team found that areas with higher micro-transit suitability are most heavily concentrated along the north-south axis of the region between the City of Ashland and Chesterfield County, while moderately suitable areas are more prevalent in the rural areas of Charles City, Henrico, and Goochland Counties. To prioritize candidate areas, the study team then looked at additional factors such as the presence of key destinations like grocery stores to narrow in on the areas with the highest potential for micro-transit service success. These areas were considered draft zones, which the study team reviewed with the jurisdictions through a series of meetings. Based on the jurisdictions' input, the team made some adjustments to zone boundaries. The team then conducted a prioritization exercise on these zones.

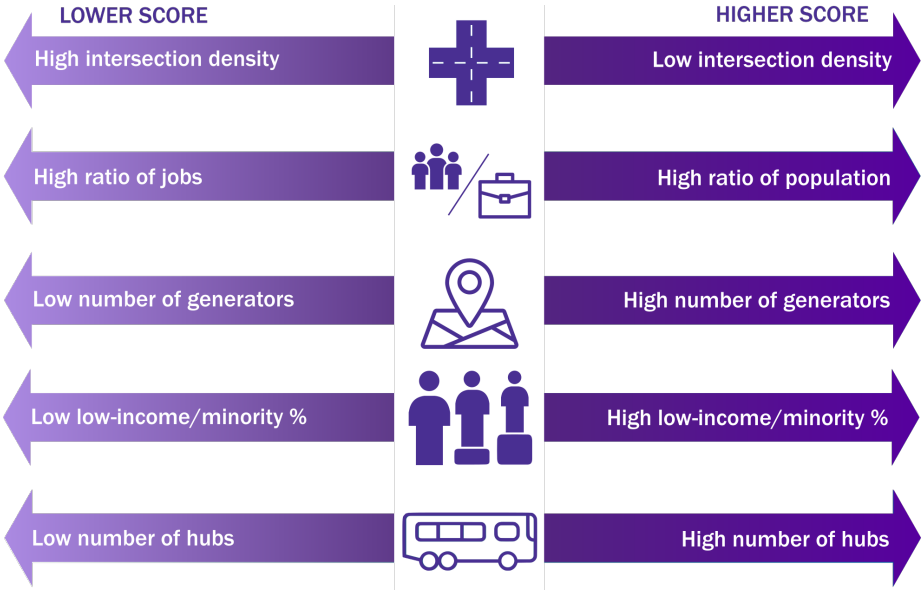
Micro-transit service is most successful in environments with certain additional conditions besides high micro-transit suitability, including low or moderate roadway intersection density, as well as higher concentrations of residential land uses and activity generators like medical facilities, shopping centers, and transit stations. Social equity is also an important factor to consider in the evaluation and provision of new micro-transit service. The complete micro-transit feasibility metrics used for prioritization are described in **Table 15**. Each metric is calculated for each candidate zone, and then each is scored relative to the others on each metric. Zones with higher scores are more suited for micro-transit service (**Figure 17**). **Appendix F** contains a table of raw values of each candidate zone by metric.

TABLE 15: EVALUATION METRICS

Intersection Density		**Intersection density per square mile** *Areas with low intersection density prevent direct fixed-route transit routing. Micro-transit can deploy more direct routing for requested trips by skipping areas where passengers are not actively waiting to be picked up, shortening travel times for transit riders and improving service efficiency.*
Land Use		**Population-jobs ratio** *Trip demand in highly residential areas is temporally less predictable than in areas with higher levels of employment, where trips are more likely to be concentrated around typical working hours. Micro-transit is most productive in trip-generating areas with more residential land uses and fewer destinations.*
Activity Generators		**Trip generators per square mile** *Trip generators are locations where trips are likely to begin, including some origin types (e.g., apartment complexes) and many destinations (grocery stores, services, retail shops, offices, etc.). Traditional transit is difficult to operate in areas where trip generators are further apart. Micro-transit can aggregate multiple riders in a single zone and transport them to or from activity generators, points of interest, or transit centers. A higher density of generators can produce more intrazonal trips suited to micro-transit.*
Equity		**Minority and low-income population percentage** *Micro-transit service should not disparately impact protected populations as defined in Title VI of the 1964 Civil Rights Act.*[45] *Low-income and minority populations also have a higher propensity for transit use, suggesting that areas with higher proportions of protected populations are suitable for micro-transit service.*
Transit Connections		**Number of proposed mobility hubs** *Transit is more effective for riders when connections are easier. In some cases, micro-transit service is well-suited to provide first mile / last mile connections to mobility hubs that connect to additional transportation services. Zones that include a major transit hub are more likely to support micro-transit service that feeds into the overall transit network, making the service more valuable to the community. The Envision My Ride Bus Corridor Study – Bus Priority Project identified Mobility Hubs throughout the Charlotte region.*

[45] Title VI of the Civil Rights Act of 1964 protects people from discrimination based on race, color, and national origin in programs and activities receiving federal financial assistance.

FIGURE 17: EVALUATION METRIC SCORES



Some metrics, such as the existence of a transit hub and the number of activity generators, are more relevant to specific use cases for micro-transit. The study team's prioritization scored each candidate zone with customized weights for three use case scenarios described below. **Table 16** shows the weights used in each use case scenario. This analysis clarifies how each metric varied across the region and how weights for each metric could impact the candidate zone prioritization . Each zone w received a score between 1 and 10 for each scenario.

3. ***Internal Movement scenario***: More heavily weighted land use and activity generators to indicate the need for travel within a zone.
4. ***First Mile / Last Mile scenario***: More heavily weighted transit hub presence, to emphasize connectivity between a zone and the fixed-route transit network.
5. ***Hard to Reach Areas / Transit-Reliant Populations scenario***: More heavily weighted equity metrics and intersection density.

The results of this analysis demonstrate the interdependency of many of these variables. The results of each scenario were similar but not identical. Scores for each scenario were combined into a composite score, which allowed for identification of candidate zones that could be successful across the three different scenarios.

TABLE 16: SCENARIO WEIGHTING

Scenario	Metric Weights			
	Intersection Density	Land Use and Activity Generators	Equity	Transit Hubs
Internal Circulation	10%	60%	10%	10%
First Mile / Last Mile	10%	30%	20%	30%
Hard to Reach Areas / Transit-Reliant Populations	30%	20%	30%	10%

Step 3: Zone Use Case Classification and Service Design

Micro-transit services can and should be tailored to match the specific needs of each zone, as well as the priorities and goals of the relevant agencies, jurisdictions, and the public. After prioritization of candidate zones based on the above-described scenarios and metrics, top-scoring zones were assigned (a) use case(s) based on their scenario scores, and their zone characteristics were examined in greater detail. In some cases, the zone boundaries were adjusted using feedback from the local jurisdictions provided through a series of nine stakeholder meetings. As described in the **Task 3 State of the Practice** memo, the main use cases considered were:

- **New Service / Neighborhood Circulation:** These zones could provide curb-to-curb access to neighborhood attractions and activity centers.
- **First Mile / Last Mile Connections:** These zones could provide connections to higher frequency transit or planned transit facilities.
- **Fixed-Route / Deviated Fixed-Route Replacement:** These zones could replace or supplement underperforming fixed-route or deviated fixed-route service at an equal or higher level of service.

The use cases assigned below are primary use cases, and a single zone may serve a variety of uses.

5.3.2 PILOT RECOMMENDATIONS

The study team used the evaluation of zones by use case as a starting point to develop a set of top candidate zones. Portions of each of the region's jurisdictions were included in at least one zone (with some zones crossing jurisdictional boundaries) among that group of top candidate zones. After discussions with jurisdictions at multiple Richmond Regional Transportation Planning Organization's Technical Advisory Committee meetings, the study team identified zones for inclusion in a list of zones recommended to serve as pilots based on the jurisdictions' feedback on the feasibility, usefulness/population need, and readiness of each zone (in terms of confirmed need among the community for the service, political support, and resources to market and educate residents about the service).

Figure 18 shows the top candidate zones the project team identified after receiving the jurisdictions' feedback and **Table 17** summarizes jurisdictions' feedback related to zone readiness for implementation. The Woodlake zone was replaced with the North Chesterfield (East) zone as a top candidate, and the Innsbrook-Glen Allen zone was added as a top candidate to reflect the high potential and need of the Innsbrook-Glen Allen area.

The region's jurisdictions identified zones that could be ready for launch within one year, which are listed at the top of **Table 17**. These 1-year pilot zones (**Figure 19**) are those that jurisdictions judged to most ready for implementation. During GRTC's Phase 2 Microtransit Study, final zone boundaries will be developed, which could include combining parts of different zones. In addition, GRTC will work to identify funding sources for each pilot zone.

FIGURE 18: TOP CANDIDATE ZONES

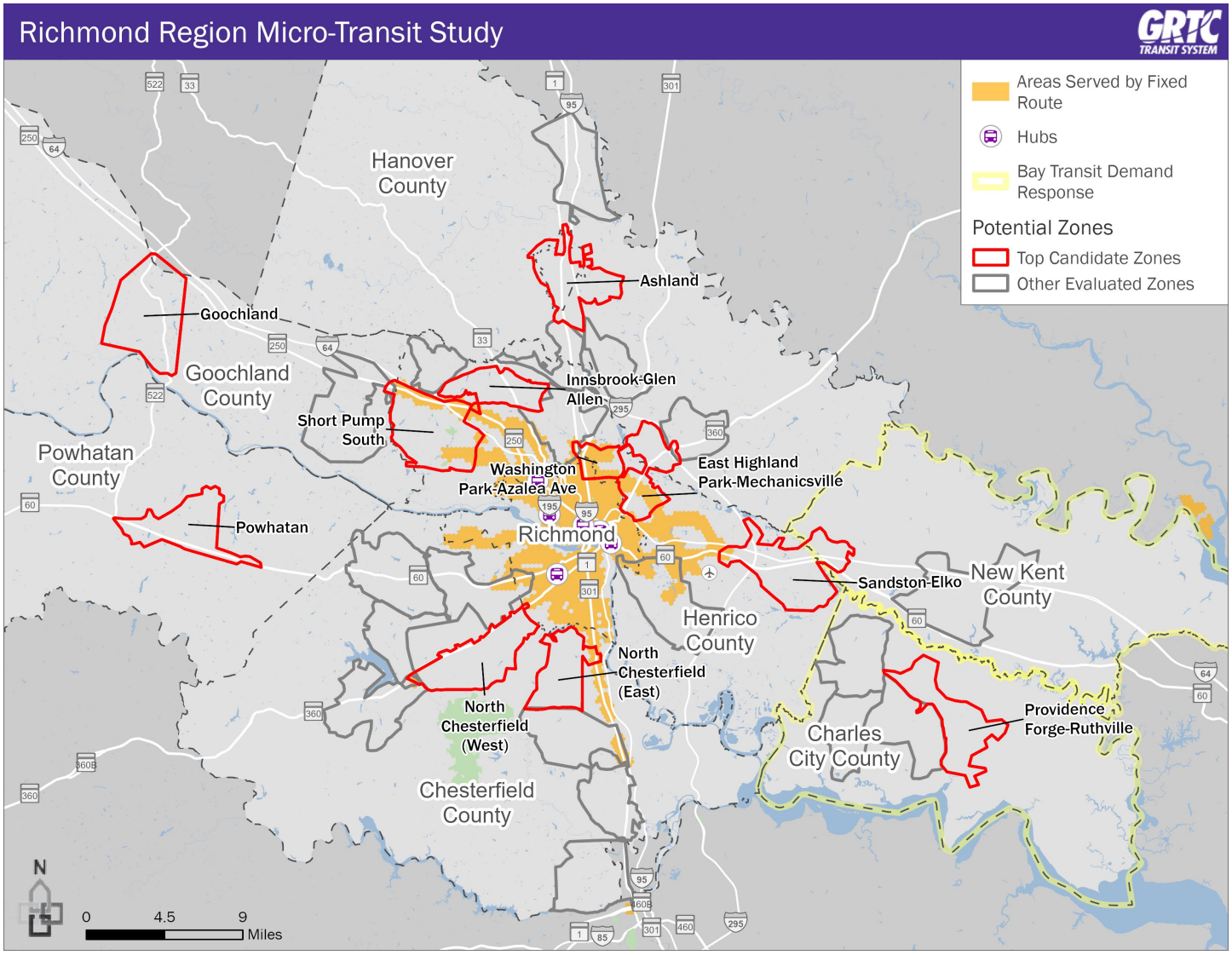
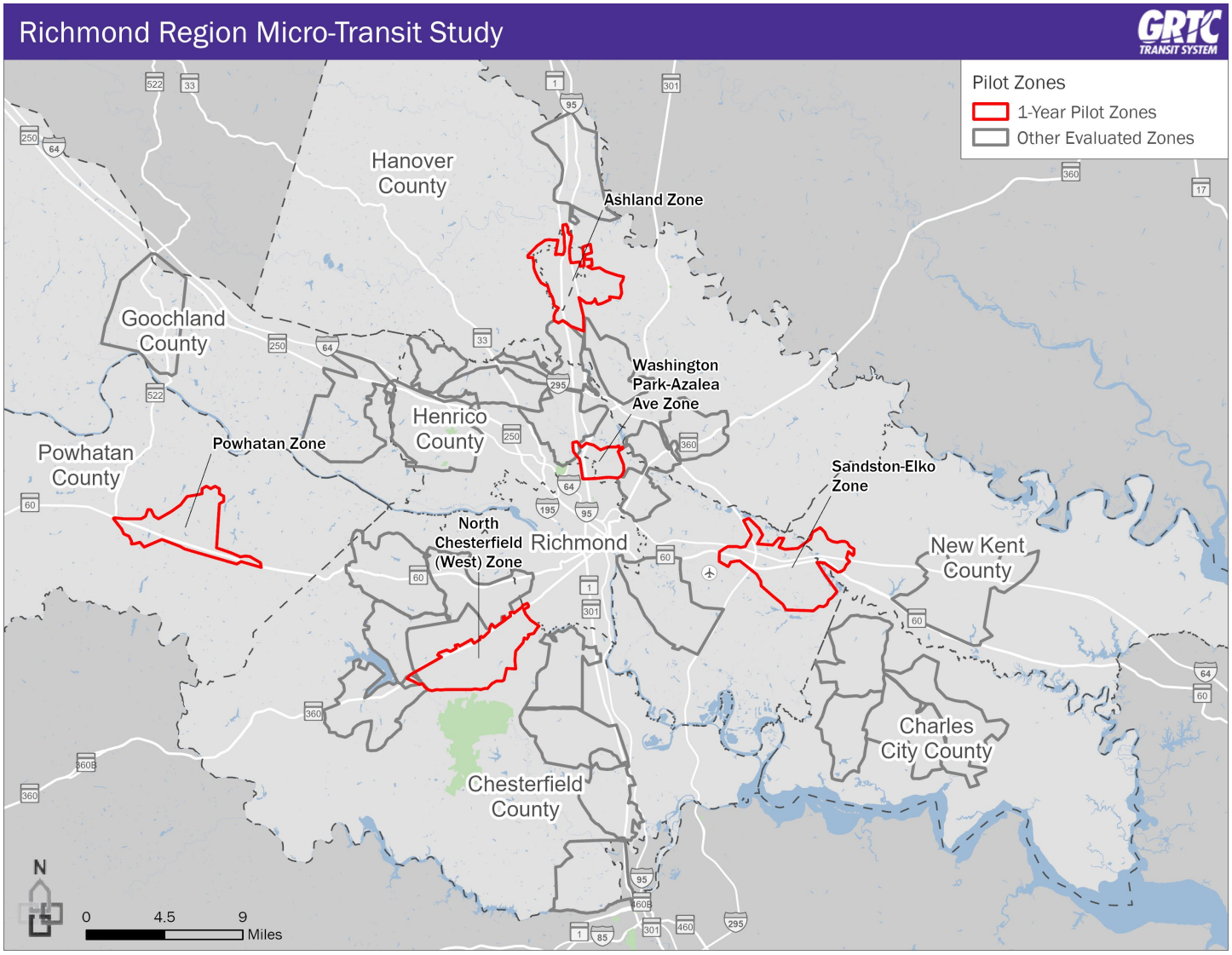


TABLE 17: JURISDICTION FEEDBACK SUMMARY REGARDING ZONE READINESS FOR IMPLEMENTATION

Readiness/ Timeline	Zone	Adjustments to Initial Zones
Within 1 year (1-year pilot zones)	Washington Park – Azalea Ave.	Current readiness confirmed. Recommendation to combine with Mechanicsville (Hanover County) portion of East Highland Park–Mechanicsville zone. Hanover/Mechanicsville portion could be added in Phase 2. GRTC's specialized transportation fleet could accommodate this to operate directly.
	Ashland	Current readiness confirmed; need for service in this area has been recognized since 2008.
	Sandston-Elko	Current readiness confirmed with jurisdictional representatives.
	Powhatan	Current readiness confirmed with jurisdictional representatives.
	North Chesterfield (West)	Readiness could be within 1-2 years, and the zone is a higher priority for the jurisdiction compared to North Chesterfield (East).
1-3 years	North Chesterfield (East)	Scored similarly to North Chesterfield (West). Readiness was confirmed to be within 1-2 years.
	Providence Forge – Ruthville	In Phase 2, consider extending zone to cover Providence Forge Food Lion.
	East Highland Park – Mechanicsville	Readiness within 2 years. One portion to considered for phased inclusion in pilot zone.
	Innsbrook-Glen Allen	Not considered for pilot implementation, but the Innsbrook portion of the zone is a higher priority for service.
	Goochland	Jurisdiction felt it would be ready for implementation within 1-3 years.
3-5 years	Short Pump South	Not a pilot priority from jurisdiction's perspective. Innsbrook portion of the zone is a priority for service, however; this may be reflected in changes to the boundaries of the Innsbrook-Glen Allen zone).
Other	Woodlake	Chesterfield County considers Manchester and North Chesterfield (East) zones to be higher priority; no longer in consideration for a pilot.

FIGURE 19: ZONES IDENTIFIED FOR IMPLEMENTATION AS PILOTS WITHIN ONE YEAR

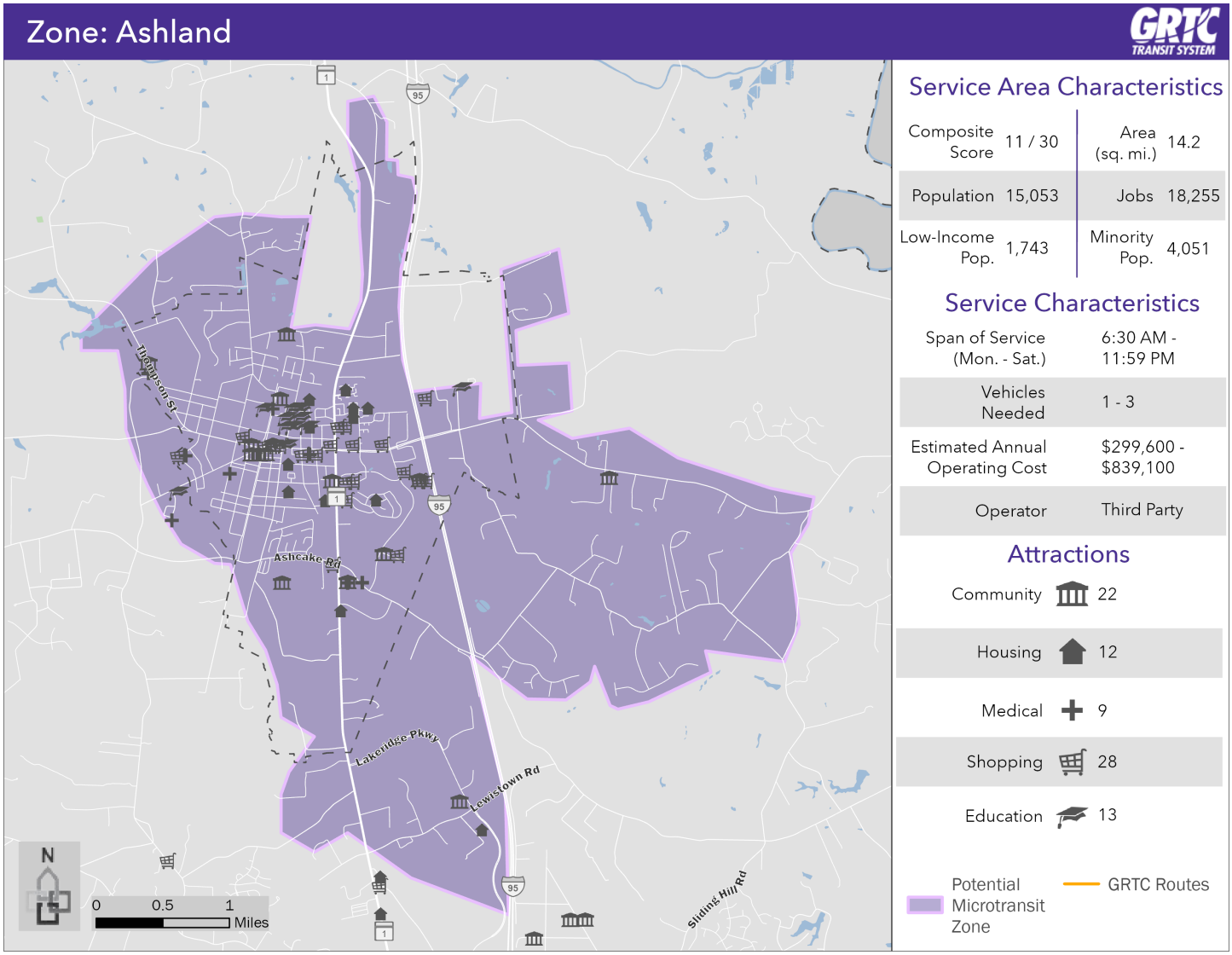


5.3.3 MICRO-TRANSIT ZONE PROFILES

Ashland

Use Case(s): New Service / Neighborhood Circulation
Key Activity Centers: Randolph-Macon College; Ashland Junction Shopping Center; Ashland Hanover Shopping Center

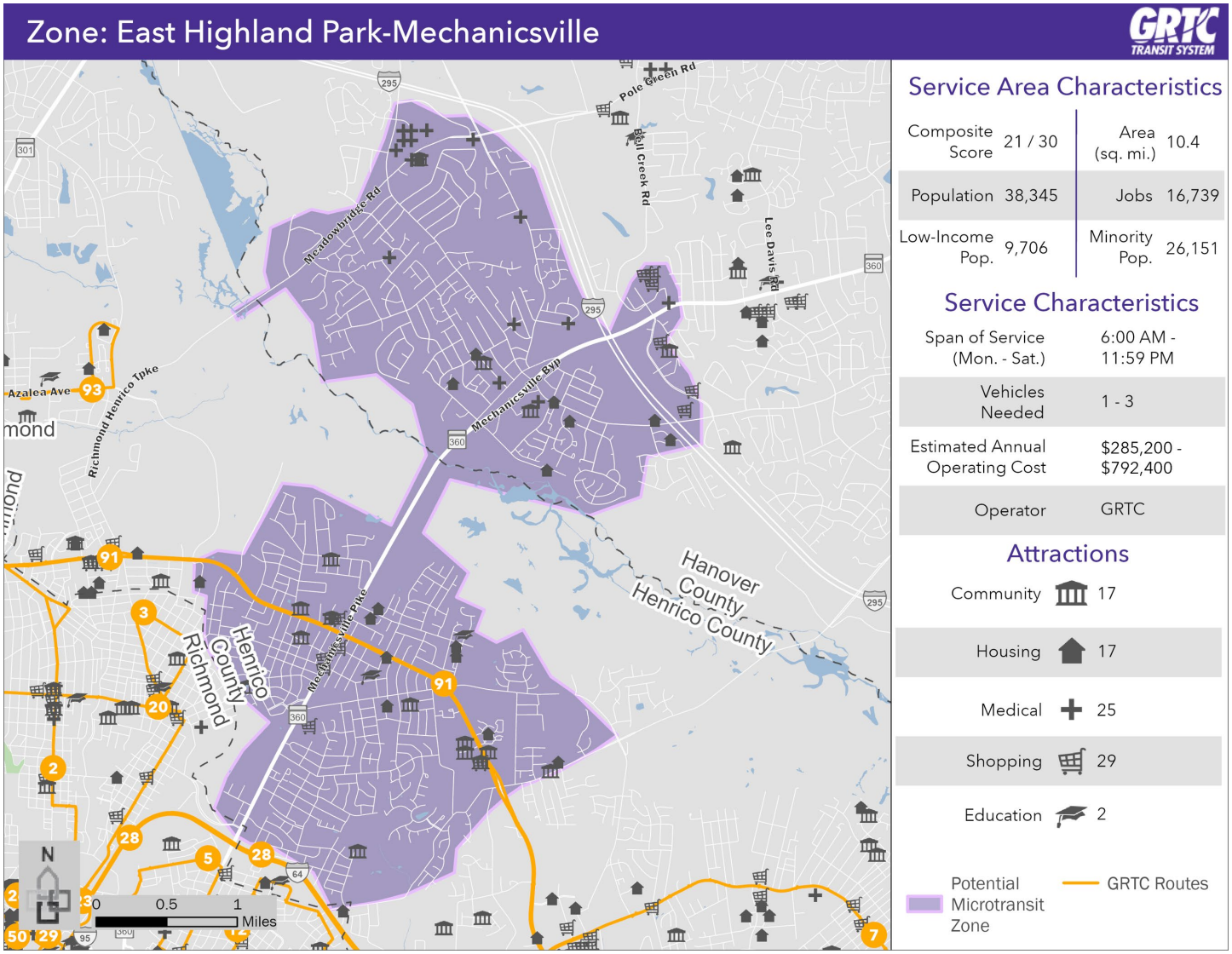
The Ashland zone would provide internal circulation to destinations in central Ashland and a large part of the surrounding area along US Route 1 and I-95. In Hanover County the zone would serve industrial areas between Route 1 and I-95 and rural areas east along Patrick Henry Road and Mt. Hermon Road.



East Highland Park-Mechanicsville

Use Case(s): New Service / Neighborhood Circulation; First Mile / Last Mile Connections
Key Activity Centers: N. Laburnum Ave. at Watts Ln. apartments, library, and recreation centers; Bon Secours Medical Center; Hanover Square Mall

The East Highland Park-Mechanicsville zone would serve destinations on either side of the Mechanicsville Pike in both Henrico County and Hanover County, extending from I-64 in the southwest to serve the Hanover Square Mall just past I-295 in the northeast. The zone includes numerous apartment complexes, commercial destinations, medical offices, supermarkets, and other trip generators. In addition to allowing internal circulation to those destinations, the zone would provide connections to GRTC Route 91.

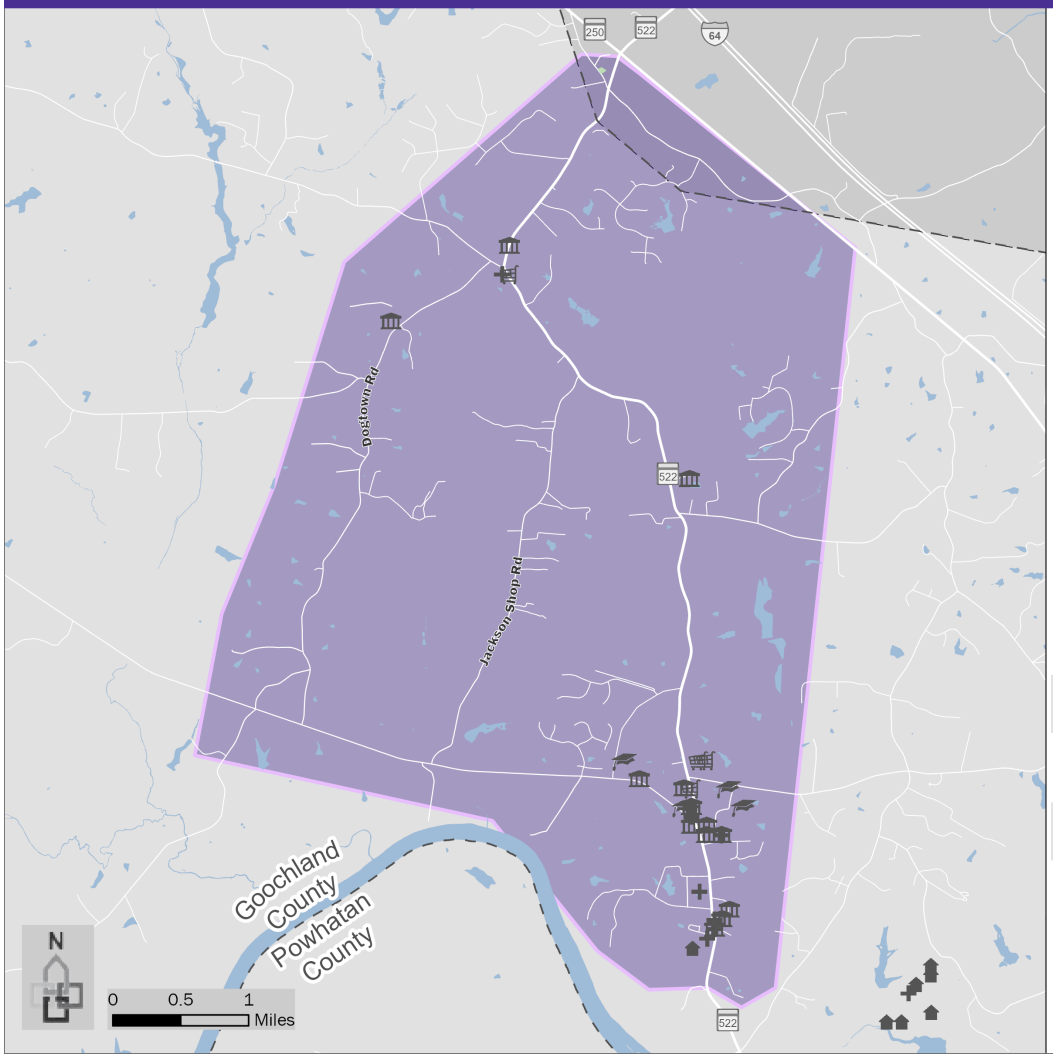


Goochland

Use Case(s): New Service / Neighborhood Circulation
Key Activity Centers: Food Lion; Reynolds Community College

The Goochland zone would provide internal circulation to destinations along Sandy Hook Road (Us Route 522), as well as a large area on either side of that road. Major destinations include the Food Lion and Reynolds Community College, along with other destinations near the intersection of Sandy Hook Road and Rider Road West. The study team attempted to limit zone sizes to no more than 15 square miles, but the Goochland zone is significantly larger than that guideline at almost 22 square miles. Depending on agency priorities and rider needs, this zone could be expanded further to allow trips to and from other parts of Goochland County or shrunk to reduce average trip distances and improve efficiency.

Zone: Goochland



Service Area Characteristics

Composite Score	13 / 30	Area (sq. mi.)	21.9
Population	8,537	Jobs	2,493
Low-Income Pop.	652	Minority Pop.	2,320

Service Characteristics

Span of Service (Mon. - Sat.)	6:30 AM - 7:00 PM
Vehicles Needed	1 - 2
Estimated Annual Operating Cost	$214,200 - $462,700
Operator	Third Party

Attractions

Community	24
Housing	2
Medical	12
Shopping	4
Education	4

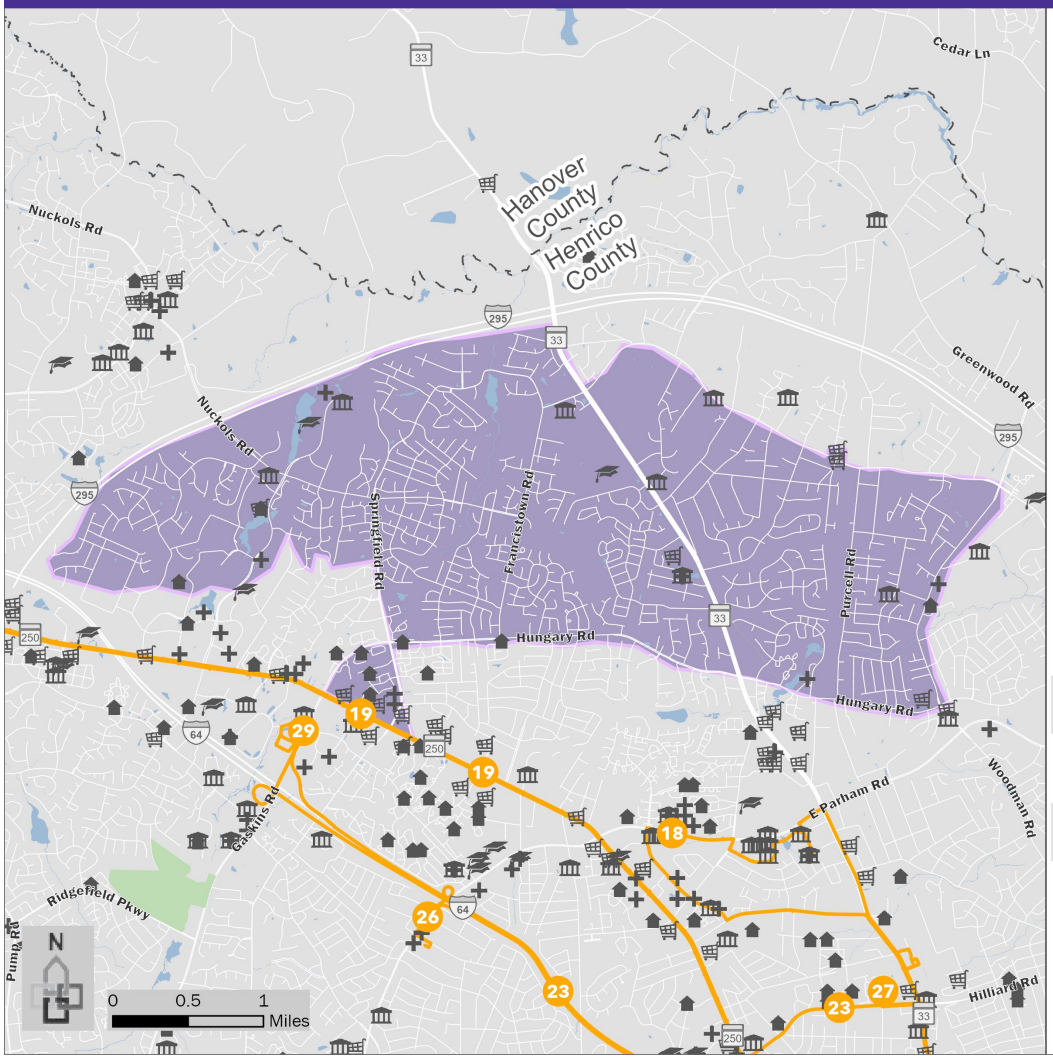
Potential Microtransit Zone
GRTC Routes

Innsbrook-Glen Allen

Use Case(s): New Service / Neighborhood Circulation; First Mile / Last Mile Connections
Key Activity Centers: Publix (Staples Mill Rd.); Publix (W. Broad St.); Multifamily housing at Springfield Rd. and Hungary Rd.

The Innsbrook-Glen Allen zone would serve parts of Innsbrook in the west and parts of Glen Allen in the east. The zone would provide internal circulation to destinations along Cox Road, Springfield Road, and Staples Mill Road, including multiple supermarkets, shopping destinations, multifamily housing complexes, and medical offices. In addition, the zone would provide a connection to Route 19 on W. Broad Street. In the next study phase, the exact boundaries for this zone will be studied in greater detail.

Zone: Innsbrook-Glen Allen



Service Area Characteristics

Composite Score	16 / 30	Area (sq. mi.)	9.4
Population	38,439	Jobs	38,925
Low-Income Pop.	3,824	Minority Pop.	15,104

Service Characteristics

Span of Service (Mon. - Sat.)	6:00 AM - 11:59 PM
Vehicles Needed	2-3
Estimated Annual Operating Cost	$570,300 - $633,700
Operator	GRTC

Attractions

Community	7
Housing	8
Medical	7
Shopping	11
Education	2

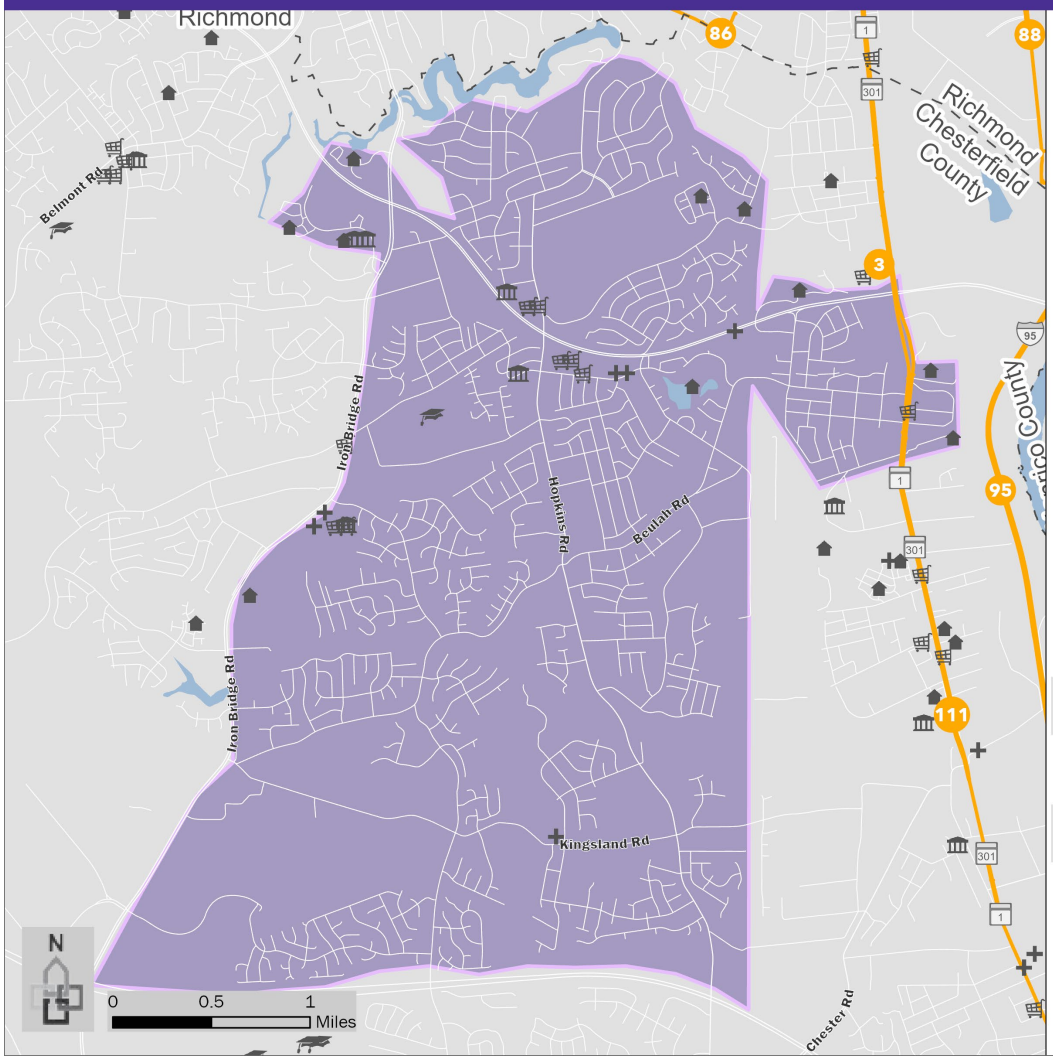
Potential Microtransit Zone
GRTC Routes

North Chesterfield (East)

Use Case(s): New Service / Neighborhood Circulation; First Mile / Last Mile Connections
Key Activity Centers: Chippenham Parkway shopping centers; Iron Bridge Road Food Lion; US Route 1 Food Lion

The North Chesterfield (East) zone would serve destinations along Chippenham Parkway, as well as large areas south of Chippenham Parkway. At its east end the zone would serve destinations along US Route 1, including the Food Lion where first mile / last mile connections to GRTC Route 3 would also be possible. The zone would provide improved internal circulation to a large area of Chesterfield County, while also improving transit connections along a roughly 5-mile stretch of Iron Bridge Road and Hopkins Road.

Zone: North Chesterfield (East)



Service Area Characteristics

Composite Score	22 / 30	Area (sq. mi.)	11.5
Population	35,251	Jobs	7,341
Low-Income Pop.	8,553	Minority Pop.	23,414

Service Characteristics

Span of Service (Mon. - Sat.)	5:00 AM - 8:00 PM
Vehicles Needed	2-3
Estimated Annual Operating Cost	$475,700 - $634,300
Operator	GRTC

Attractions

Community	5
Housing	10
Medical	5
Shopping	16
Education	2

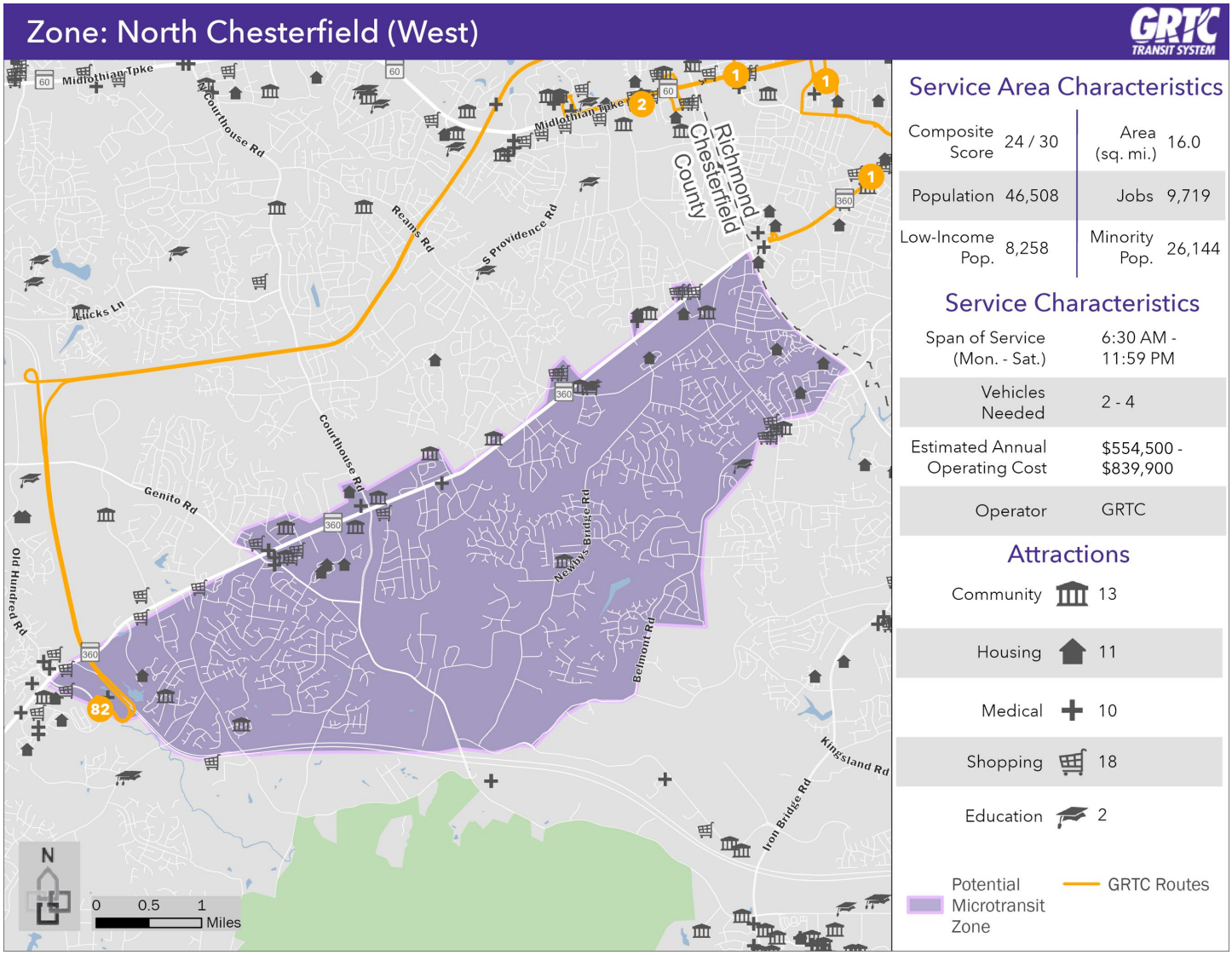
Potential Microtransit Zone

GRTC Routes

North Chesterfield (West)

Use Case(s): New Service / Neighborhood Circulation; First Mile / Last Mile Connections for Commuters
Key Activity Centers: Commonwealth Center Mall; Shopping centers along Route 360

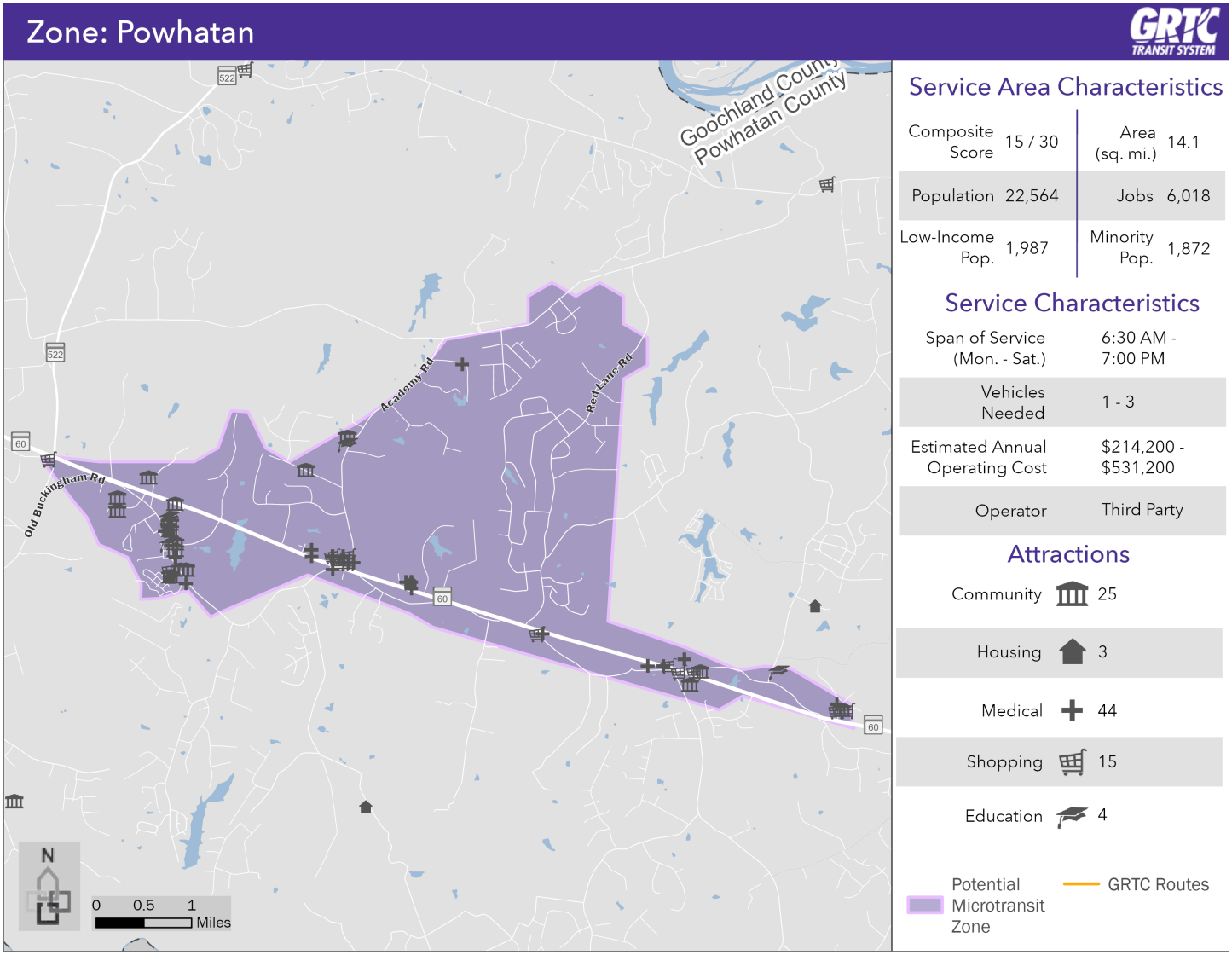
The North Chesterfield (East) zone would serve destinations along Hull Street Road (US Route 360), as well as large areas south of Route 360. At its south border the zone would serve destinations along Belmont Road, including the Food Lion at Belmont road and Turner Road. First mile / last mile connections to GRTC Route 1 and GRTC Route 82 would also be possible. The zone would improve internal circulation in a large area of Chesterfield County along Route 360 between Chippenham Parkway in the east and State Route 288 in the west.



Powhatan

Use Case(s): New Service / Neighborhood Circulation
Key Activity Centers: Powhatan Plaza; Powhatan County Library

The Powhatan zone would allow internal circulation to destinations along US Route 60, including Powhatan Plaza, the South Creek Shopping Center, and Old Buckingham Road. The study team attempted to limit zone sizes to no more than 15 square miles, in this case focusing on destination clusters along Route 60 east of Maidens Road. Depending on agency priorities and rider needs, this zone could be expanded to allow trips to and from other parts of Powhatan County.

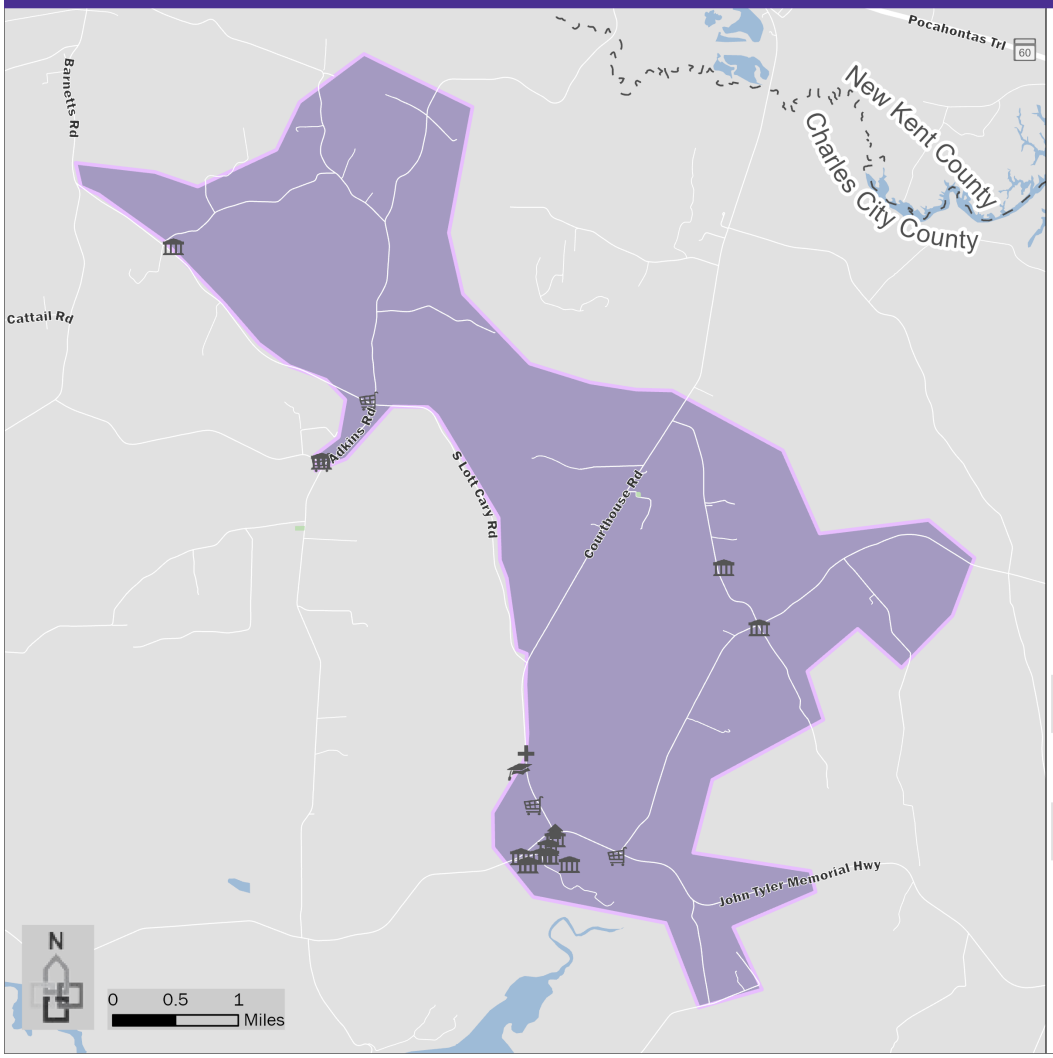


Providence Forge-Ruthville

Use Case(s): New Service / Neighborhood Circulation
Key Activity Centers: Charles City County Social Services; Heritage Public Library; Charles City Regional Health Services

The Providence Forge-Ruthville zone would allow circulation between multiple destinations in Charles City County's Courthouse area, including social and health services offices. The study team attempted to limit zone sizes to no more than 15 square miles. Depending on agency priorities and rider needs, this zone could be expanded to allow trips from other parts of Charles City County.

Zone: Providence Forge-Ruthville



Service Area Characteristics

Composite Score	10 / 30	Area (sq. mi.)	15.7
Population	2,215	Jobs	557
Low-Income Pop.	378	Minority Pop.	1,502

Service Characteristics

Span of Service (Mon. - Sat.)	6:30 AM - 7:00 PM
Vehicles Needed	1 - 2
Estimated Annual Operating Cost	$214,200 - $462,700
Operator	Third Party

Attractions

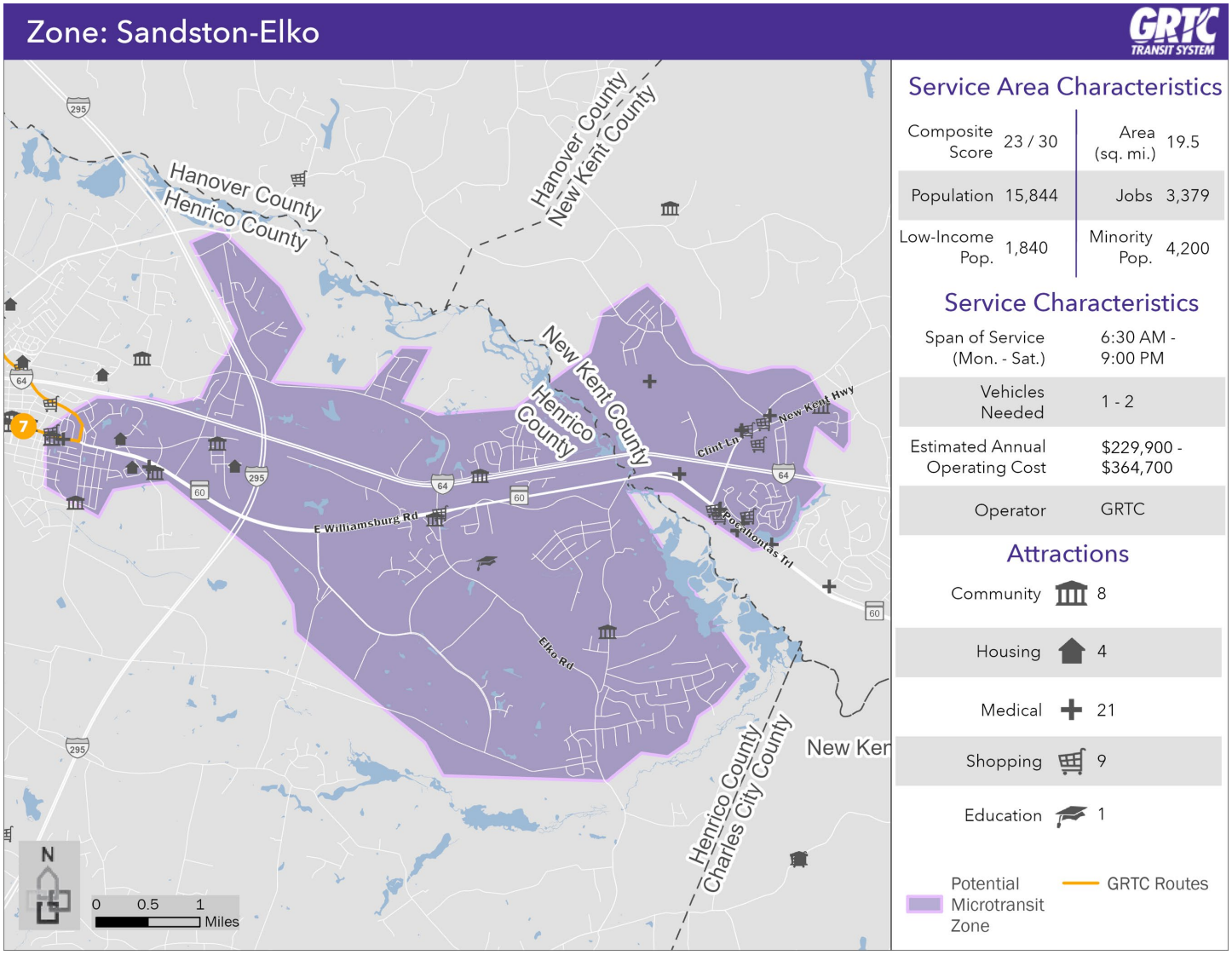
Community	18
Housing	1
Medical	6
Shopping	4
Education	1

Potential Microtransit Zone
GRTC Routes

Sandston-Elko

Use Case(s): New Service / Neighborhood Circulation; First Mile / Last Mile Connections
Key Activity Centers: Social Security Office; VCU Health Emergency Center; Food Lions on US 60 and New Kent Hwy.

The Sandston-Elko zone would connect the eastern edge of Sandston with destinations across I-295, including the VCU Health Emergency Center and several grocery stores in New Kent County. The zone could allow connections to GRTC Route 7 in Sandston, while also serving large areas on either side of-64 in Henrico County and New Kent County.



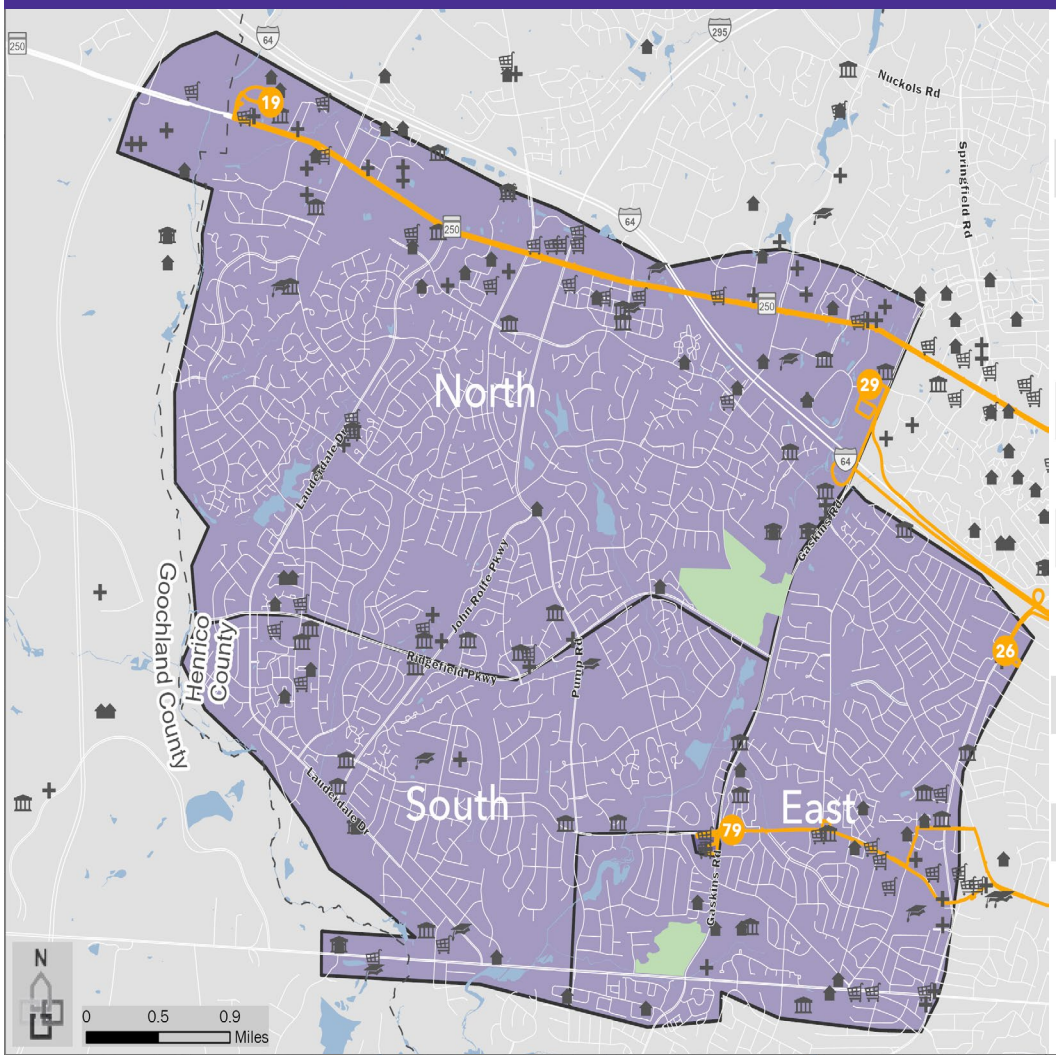
Short Pump South

Use Case(s): New Service / Neighborhood Circulation; First Mile / Last Mile Connections
Key Activity Centers: Regency Square Mall; W. Broad St. Malls; Tuckahoe Village Shopping Center

Initially considered as one zone, the Short Pump South zone covers almost 16 square miles and 80,000 residents. To improve service efficiency, the zone was split into three smaller zones in two scenarios. The updated zones include a North zone serving Innsbrook, destinations along W. Broad Street, and residential areas south of W. Broad Street. The South zone is bounded by Ridgefield Parkway to the north and Pump Road and Gaskins Road to the east. The zone would provide for internal circulation to destinations like the Tuckahoe Village Shopping Center. The East zone is bounded by Pump Road and Gaskins Road to the west and North Parham Road to the east. All three zones would allow connections to GRTC fixed-route service, including Routes 19 and 29 in the North zone and Route 79 in the South and East zones.

The study team recommends first implementing the North zone in the short term due to its potential to serve a large residential area, many destinations, and multiple GRTC routes. This would be followed by a phased implementation of the East zone, then the South zone.

Zone: Short Pump South



Service Area Characteristics

Composite Score	23 / 30	Area (sq. mi.)	15.8
Population	79,202	Jobs	26,735
Low-Income Pop.	8,473	Minority Pop.	22,331

Service Characteristics

Span of Service (Mon. - Sat.)	6:00 AM - 11:59 PM
Vehicles Needed	4 - 9
Estimated Annual Operating Cost	$1,140,700 - $2,107,600
Operator	GRTC

Attractions

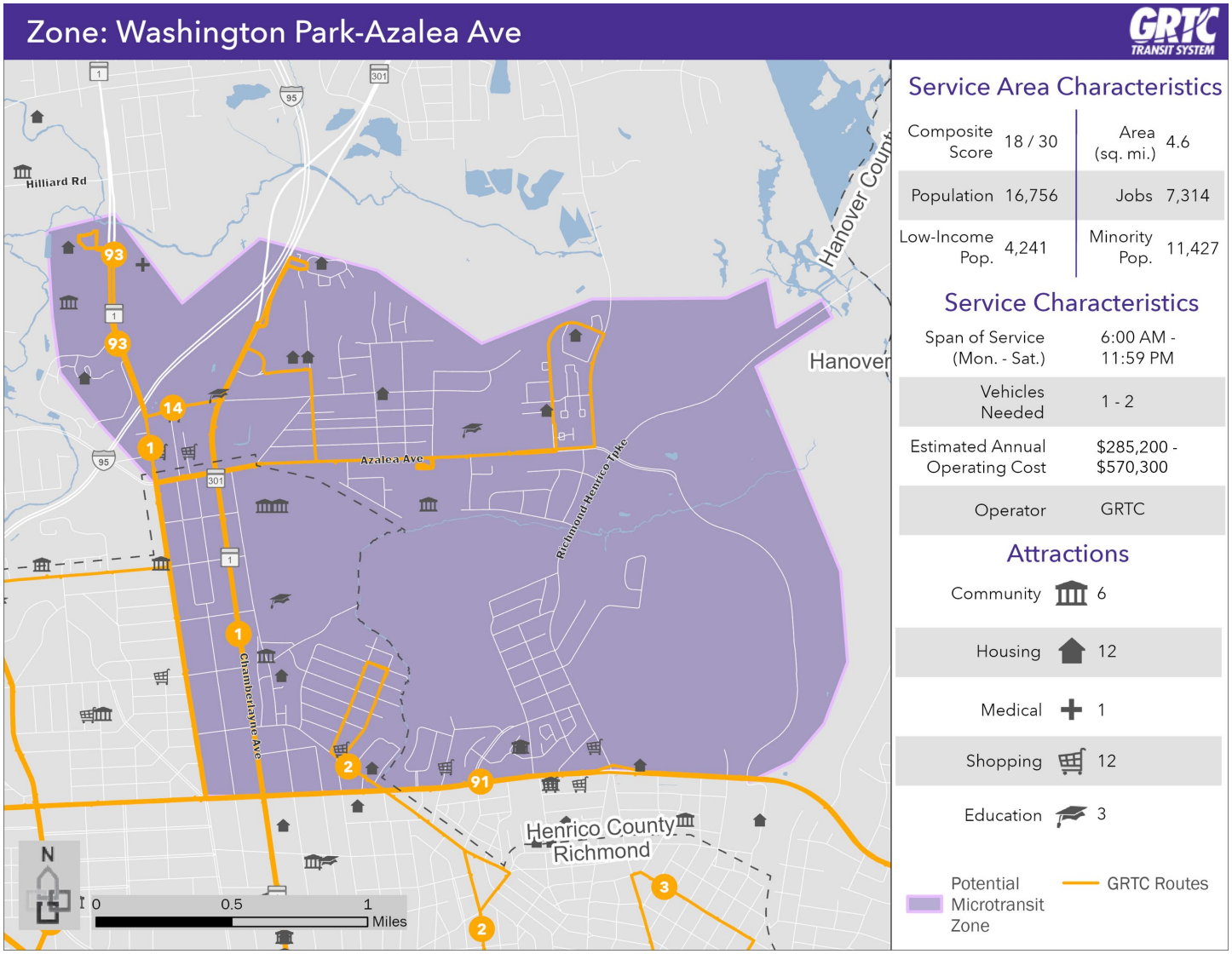
Community	37
Housing	34
Medical	41
Shopping	60
Education	8

Potential Microtransit Zone
GRTC Routes

Washington Park-Azalea Ave.

Use Case(s): New Service / Neighborhood Circulation; Fixed-Route Replacement (Route 93)
Key Activity Centers: Future: Amazon; Brookhill Azalea Shopping Center; Senior apartments served by Route 93

The Washington Park-Azalea Ave. zone would serve destinations near Azalea Avenue, East Laburnum Avenue, and Brook Road in Richmond and Henrico County. These include multiple shopping centers, as well as the site of a future Amazon facility. The zone could deliver improved service and more direct trips for existing riders of GRTC Route 93 Azalea Connector, which currently provides circuitous connections between senior apartment complexes. GRTC Routes 1, 2, and 14 also provide opportunities to connect to fixed-route transit service.



5.4 Micro-transit Goals, Objectives, and Service Standards

The importance of setting clear goals, objectives, and service standards for micro-transit service was a theme throughout the best practices review and was a theme across nearly all of the agency interviews. This section describes recommended goals, objectives, and service standards for micro-transit service in the Richmond region.

5.4.1 RELIABILITY

- **Goal**: Deliver reliable micro-transit service.
- **Objectives**:
  - Meet or exceed on-time performance standard (arrivals within target wait time).
  - Complete most trips (Trips can be marked as completed, canceled, no-showed, not accepted, seat unavailable, or other error.)
- **Target (All Use Cases):**
  - At least 80 percent of trips have a wait time of 20 or fewer minutes. (*Note: Could be adjusted upward for the largest and/or most rural zones*)
  - At least 80 percent of trips completed.

5.4.2 EQUITABLE ACCESS

- **Goal**: Provide greater mobility and accessibility to underserved areas, people with disabilities, older people, people of color, and low-income communities and improve access to jobs, opportunities, and amenities.
- **Objectives**:
  - Ensure ridership within each zone is representative of the population of the zone in terms of ridership by low-income residents, residents with disabilities, seniors, and people with disabilities.
  - Engage with community members representing a variety of population groups to identify and reduce barriers to using micro-transit.
- **Target (All Use Cases):**
  - Percentage of non-white, low-income, senior, and disability populations using micro-transit service in each zone should be the same or higher compared to the total population of the entire zone.

5.4.3 EFFICIENCY/EFFECTIVENESS

- **Goal**: Use public resources wisely.
- **Objectives**:
  - Maintain high performance in passengers per vehicle revenue hour.
  - Maintain a reasonable subsidy per trip.
  - Provide first mile / last mile connections to existing transit.
- **Target (First Mile / Last Mile Connections only):**
  - Connect at least 25% of trips per zone daily to existing transit.
- **Target (All Use Cases):**
  - Urban/Suburban:
    - Serve at least 3.5 passengers per vehicle revenue hour.
    - Subsidy per trip of less than $16.
  - Rural:
    - Serve at least 2.5 passengers per vehicle revenue hour.
    - Subsidy per trip of less than $20.

5.4.4 SUSTAINABILITY

- **Goal**: Reduce greenhouse gas emissions.
- **Objective**: Increase the percentage of trips that are shared/aggregated.
- **Target (All Use Cases):**
  - Urban/Suburban:
    - At least 20 percent of trips are shared.
  - Rural:
    - At least 15 percent of trips are shared.

5.4.5 QUALITY

- **Goal**: Provide high-quality customer service.
- **Objective**: Maintain a high level of customer satisfaction.
- **Target (All Use Cases):**
  - Receive an average 4+ rating (of 5) from customers.

5.5 Cost Considerations and Estimates

5.5.1 RECOMMENDED FARES

Setting fares for micro-transit service primarily involves weighing two competing priorities:

- Ensuring service affordability, particularly for low-income individuals
- Managing demand to maintain a high level of system performance

Lower fares increase the resulting demand for the service. If demand is higher than expected, providers must either tolerate wait time increases (resulting in lower customer satisfaction) or deploy more vehicles to meet the demand.

As micro-transit service is first piloted in the Richmond region, the project team recommends that the service initially be zero-fare in order to create a low barrier for people to try out the service, and thereby grow awareness and ridership. If the service is identified for continued indefinite operation, charging fares would be appropriate because micro-transit would be considered a “premium” service. While GRTC currently operates zero-fare fixed-route service, its previous single-trip fares for local bus service (including Pulse Bus Rapid Transit) cost between $1.50 to $1.75 per trip, and between $2.00 and $3.50 for express bus trips If micro-transit were considered a premium service, it would make sense to charge *at least* $2.00 per trip. GRTC’s CARE service charges $3.00 per trip, so setting fares at that level would create a fare system that is relatively intuitive and easy to remember and communicate.

A review of micro-transit fares charged by nearly 30 other agencies from around the U.S. indicates that standard base fares for micro-transit trips range from as low as $0.75 per trip to as much as $5.00 or more per trip. Most agencies, however, charge between $1.50 and $3.50 per trip, so a fare of between $2.00 and $3.00 per trip for GRTC’s micro-transit service would be in line with national averages.

Ultimately, the decision on what fare to charge is one of policy and on which the GRTC Board would likely have some input. A per-trip cost of $2.00 would keep the emphasis on fare affordability, while $3.00 would be the most straightforward and ensure the service is clearly priced as a premium service.

5.5.2 OPERATING COST ESTIMATION

To estimate the cost of providing micro-transit service, the study team first developed estimates for the number of micro-transit trips that would occur in each zone. This figure was then used as an input to estimate the number of vehicles needed to serve those trips.

Trip and Vehicle Estimates

Daily internal trips for each zone were estimated using data sourced from Replica, which uses an agent-based travel model to simulate travel behavior by mode.[46] To develop vehicle needs estimates, the project team used baseline trips by mode from Replica to estimate the number of potential micro-transit trips that would be made in each zone, assuming a micro-transit mode share of 0.4 percent (in keeping with industry standards). In other words, if a zone had 30,000 daily trips occurring within a defined zone, 120 of those trips (0.4% x 30,000) would be assumed to be micro-transit trips. In addition, other trip characteristics were assumed to increase the chance of a trip converting to micro-transit. The conversion rate of trips by Uber or Lyft, for example, was assumed to be 10 percentage points higher than non-Uber/Lyft trips (**Table 18**).

Vehicle requirements were estimated using the study team's proprietary tool. The estimates are based on each zone's estimated micro-transit trips, along with assumptions about target wait time, trip sharing, and vehicle speed (**Table 18**). The study team developed low and high estimates of vehicle requirements for each zone. To develop the low estimate, vehicle need was calculated over the zone's entire span (spans are provided in **Table 20**). To develop the high estimate, vehicle need was calculated for multiple time periods within the span, and a zone's vehicle need was designated as the maximum vehicle need of those periods. This method produces higher estimates of vehicle need by accounting for higher demand during morning and afternoon peak periods.

TABLE 18: TRIP AND VEHICLE ASSUMPTIONS

Factor	Amount	Source
Target Wait Time	20 minutes	Recommended service standard
Percent of Trips Shared	15%	Conservative assumption based on other micro-transit services
Spare Ratio	1.2 (20%)	Industry standard
Average Vehicle Speed	17.97 mph	Average GRTC demand response speed (NTD 2019)
Micro-transit Trip Conversion Rates		
Baseline	0.4%	Industry standard micro-transit mode share
Non-Car Households	2%	Assumptions (higher conversion rates for some trip types)
Vehicle-Light Households	0.5%	
Senior	0.5%	
On-Demand (Ride-hailing) Trip	10%	
Low-Income	0.5%	

Cost Estimates

The study team developed cost estimates based on the estimated number of vehicles and vehicle revenue hours for each zone, as well as fees associated with the service models recommended for each zone. **Table 19** shows the assumptions used for the cost estimates, and **Table 20** summarizes zone spans, vehicle needs, potential ridership, and estimated costs.

The zone spans were identified using the micro-transit trip estimates. Services were planned to run from 6:30 a.m. through midnight by default and were then adjusted to end earlier in locations where the number of trips was so low that offering service would not be warranted.

[46] For more information, see: https://replicahq.com/how-it-works/.

TABLE 19: COST ASSUMPTIONS

Factor	Amount	Source
Operating Costs		
Hourly Operating Cost (2020)	$47.91	GRTC demand response hourly operating cost for (NTD)
GRTC Operator Yearly Pay Increase	4.0%	GRTC bargaining agreement through 2023
Hourly Operating Cost	$51.82	Inflated by 4 percent per year to estimate cost in 2022 dollars
SaaS Program Costs		
Setup Fee	$100,000 – $150,000	Previous quote from a major industry vendor, adjusted to 2022 dollars
Annual Vehicle Fee	$49,500	Previous quote from a major industry vendor, adjusted to 2022 dollars
Additional Vehicle Fee	$550 - $1,100 per vehicle	Previous quote from a major industry vendor, adjusted to 2022 dollars
TaaS Program Costs		
Hourly Fee	$56	Previous quote from a major industry vendor, adjusted to 2022 dollars

Factor	Assumed Cost (2022$)
Operating Costs	
Hourly Operating Cost	$51.82
SaaS Program Costs	
Setup Fee	$100,000 – $150,000
Annual Vehicle Fee	$49,500
Additional Vehicle Fee	$550 - $1,100 per vehicle
TaaS Program Costs	
Hourly Fee	$56

Sources: NTD, Bureau of Labor Statistics, GRTC. A major industry vendor provided a quote for estimated program costs.

TABLE 20: ZONE CHARACTERISTICS

Zone	Span (Monday – Saturday)	Max. Vehicles (w/ spares)	Forecasted Annual Ridership	Estimated Annual Costs
SaaS (GRTC-operated)				
East Highland Park-Mechanicsville	6:00 a.m. - 11:59 p.m.	1 - 3	31,000 – 39,100	$285,200 - $792,400
Innsbrook-Glen Allen	6:00 a.m. - 11:59 p.m.	2 – 3	17,100 – 40,000	$570,300 - $633,700
North Chesterfield (East)	5:00 a.m. – 8:00 p.m.	2 – 3	24,600 – 38,400	$475,700 - $634,300
North Chesterfield (West)	6:30 AM - 11:59 PM	2 – 4	42,400 - 44,900	$554,500 - $839,900
Sandston-Elko	6:30 a.m. - 9:00 p.m.	1 - 2	8,600 – 11,600	$229,900 - $364,700
Short Pump South	6:00 a.m. - 11:59 p.m.	4 - 9	123,400 – 163,600	$1,140,700 - $2,107,600
Washington Park-Azalea Ave	6:00 a.m. - 11:59 p.m.	1 - 2	10,700 – 12,700	$285,200 - $570,300
	Subtotal	**15 – 30**	**310,800 – 379,900**	**$3,541,500 – $5,942,800**
				TaaS (Third party-operated)
Ashland	6:30 a.m. - 11:59 p.m.	1 - 3	31,300 – 43,400	$299,600 - $839,100
Goochland	6:30 a.m. - 7:00 p.m.	1 - 2	7,300 – 9,600	$214,200 - $462,700
Powhatan	6:30 a.m. - 7:00 p.m.	1 - 3	9,300 – 15,400	$214,200 - $531,200
Providence Forge-Ruthville	6:30 a.m. - 7:00 p.m.	1 - 2	800 – 1,100	$214,200 - $462,700
Subtotal		**4 – 10**	**48,700 – 69,500**	**$942,200 - $2,295,700**

Table 21 shows the estimated annual operating costs for all of the zones shown above, start-up costs for both categories of zones, and total costs for the first year of operation (start-up + annual operating costs). The TaaS cost estimates have fewer components because the hourly fees charged for this service model have all vehicle and technology fees built into them.

TABLE 21: COST SUMMARY

	Est. Annual Operating Costs		Est. Startup Costs		Total First-Year Costs
SaaS zones	**Operating costs:** **Vehicle fees:** **Support costs:**	$3,541,500 $70,800 $37,000	**Capital costs:** **Installation fee:**	$1,404,000 $14,500	$5,067,800
TaaS zones		$942,200		-	$942,200
Total		**$4,591,500**		**$1,418,500**	**$6,010,000**

5.6 Implementation Plan

Figure 20 shows a typical micro-transit implementation process assuming a 12-month timeline. The timeline will likely need to be further customized for GRTC based on its unique internal processes and considerations such as, for example, whether purchasing new vehicles or repurposing existing ones. For the zones recommended for the TaaS service model, the set-up can be as brief as 2-4 months; however, it is critical to ensure there is adequate capacity among staff to plan for and conduct adequate and effective outreach to the community in which the service will operate to ensure a successful launch and quicker adoption.

FIGURE 20: IMPLEMENTATION PROCESS

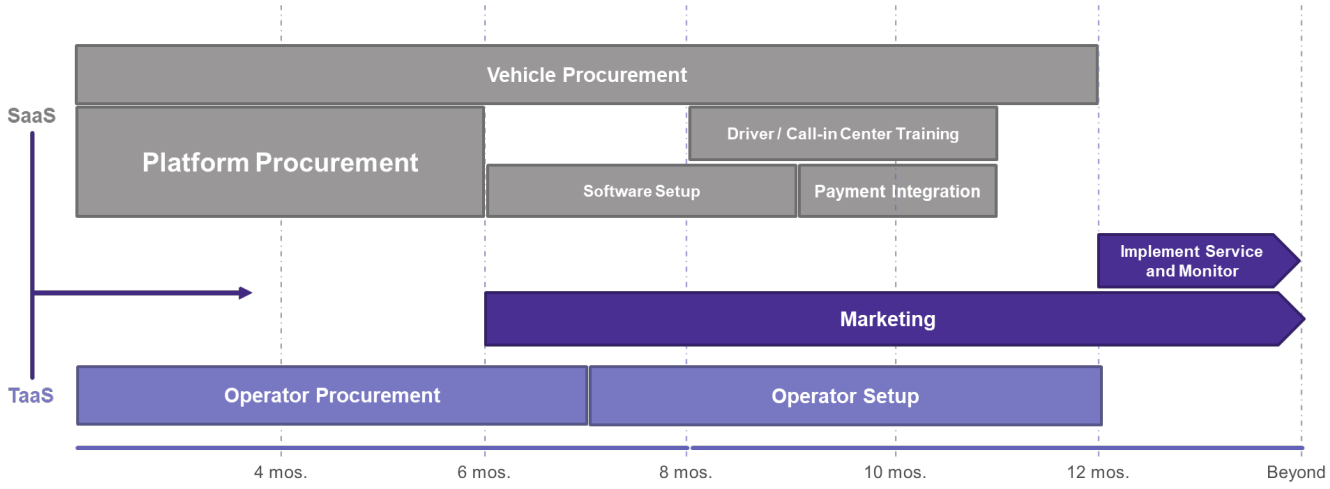


Table 22 describes the basic implementation steps shown in **Figure 20** in greater detail.

TABLE 22: IMPLEMENTATION OF STEP DESCRIPTIONS

Step	Duration	Details
Platform procurement	4 to 6 months	• Outline preferred software features • Identify a vendor • Release RFP • Evaluate responses and select a vendor
Vehicle procurement (SaaS only)	6 to 12 months	• Design vehicle layout and capacity • Vehicle branding (may require additional procurement for wrapping) • Hardware installation (tablets + data plan) • Lead time for vehicles to arrive, if new vehicles are being purchased

Software setup and training	2 to 3 months	• Customize app interface
		• Set service parameters
		• Finalize and set zone boundaries
		• Identify key pick-up locations
		  ○ Any in zone (no additional time)
		  ○ Virtual stops (add additional month)
		  ○ Out-of-zone stops (no additional time)
		• Migrate rider profiles from paratransit or other DR software (as applicable)
		• Train drivers
		• Train call center staff (if in-house call center is used)
		• Train planners on reporting, service performance monitoring, etc.
		• Testing

Marketing	6 to 12 months	• Develop a brand for the new service • Develop a how-to guide with stylized zone maps and an FAQ section • Community outreach • Advertising
Payment integration		• Set-up/testing • Train accounting staff
Service monitoring / adjustment	Ongoing	• Key metrics: ridership, productivity, wait times, trip times • Possible adjustments: zone boundaries, pick-up locations, vehicles in service, service hours, fares

5.7 General Recommendations

This section contains general recommendations for GRTC's consideration in further planning for micro-transit service implementation. These are based, in particular, on the findings from the literature review, interviews with peer agencies, the public survey, and meetings with jurisdictional partners.

5.7.1 ADDITIONAL PLANNING

- Given that GRTC is already piloting an on-demand service to cover early morning and late evening service gaps, the lessons learned from implementing this service should be documented and built upon in planning and implementation of additional micro-transit service.
- In addition to service standards, GRTC should establish a clear plan for performance tracking and evaluation for its micro-transit services. For first mile/last mile zones, GRTC should ensure it has a method for monitoring which trips involved transfer to or from a fixed route.
- Service standards should also inform expansion plans; GRTC should be prepared for local requests for new micro-transit zones and have an already-implemented, transparent process for determining whether to pursue implementation of additional zones.
- GRTC should establish policies related to whether walk-up trips will be accepted.
- GRTC should conduct further market analyses to estimate what percentage of riders in each zone will likely book using the app, set targets for percentage of trips booked using the app, and develop a plan for encouraging the use of app-based booking (relates to next category).

5.7.2 ENGAGEMENT, EDUCATION, AND MARKETING

- Prior to implementation, GRTC should consider reaching out to all residents within micro-transit zones to inform them about the new services and how they can receive additional information about the service.
- A robust education and marketing campaign must accompany implementation of micro-transit service. Marketing and customer education and assistance should be ongoing and involve regular trainings in how to use the app. It could potentially include the practice of designating "super-users" to assist other riders in their communities (e.g., at nursing homes, community-based organizations, senior centers, etc.)
- It is recommended that a new micro-transit service be branded differently from GRTC's existing CARE and CARE On-Demand services to make it clear that all riders are eligible for the service.

5.7.3 DRIVER TRAINING

- Drivers operating micro-transit should receive training prior to service implementation related to interfacing with riders with disabilities and how to handle challenging situations. Similarly, call center staff should be local to the area and well-trained in assisting micro-transit riders, including those with disabilities, in accessing the service.

5.7.4 PROCUREMENT AND OPERATIONS

- GRTC should first pilot the service in one or two locations and use the findings from these pilots to inform any expansion plans or other service changes.
- Procurement of technology should include careful consideration of requirements for parameter customization, branding, user interface, access to customer and travel data, payment options for unbanked riders, and data reporting and analytics.
- Preferably all vehicles in the fleet should be WAVs to maximize efficiency; if this is not possible, at least half should be.
- GRTC should engage with its provider to implement contingency plans in case of a platform outage.

5.7.5 PARTNER ENGAGEMENT

- As applicable based on destinations included in micro-transit zones, a portal enabling key partner organizations (social services organizations, healthcare providers) to book trips on behalf of clients could be considered, either in the short- or long-term. GRTC could implement “agency fares” for these trips if desired.

APPENDIX A: CASE EXAMPLE SUMMARY

Agency and Service Title	Use Case and Service Design (Area size and characteristics)	Service Model and Technology	Outcomes/Findings/Lessons Learned
BRATS On-Demand, BRATS Public Transport., Baldwin County, AL	• Replacement for service that had been fixed route with some on-demand deviations • Large (>1500 sq. mi.), mostly rural service area covering the county • Zone-based service replaced with countywide service due to impact of Hurricane Sally	SaaS (Via)	• Cost per passenger is trending down as pooling improves • Riders respond very positively to the service's flexibility • Most riders still book by phone, but app booking is increasing over time • It can be hard to draw zones without making arbitrary boundaries that sometimes force long trips
DART Connect, Delaware Transit Corp.	• Replacement of two fixed routes serving low-density, rural communities • Service provided to a 9 sq. mi. zone covering those communities • $2 flat fare per trip • Launched in April, 2021	SaaS (Via)	• More ridership at launch than both replaced routes (from 25 riders per day to 87); current daily ridership of 107 • Wait times of less than 10 minutes • App available in Spanish • Funded through an FTA Accelerating Innovative Mobility grant for $317,692
RTC FlexRide, Regional Transportation Commission of Washoe County	• Pilot replacement of underperforming fixed route service in Sparks, NV with micro-transit service • Flat fare of $2 per trip, with reduced fares of $1 • After the pilot, service has expanded to multiple zones beyond Sparks	Unknown	• 2019 revenues almost covered operating costs of $2 million • Saved $10,200 per month in operations costs • Micro-transit can be used to expand the geographic coverage of service for lower costs
Rides to Wellness, Flint Mass Transportation Authority	• Partnership with 14 local human services agencies and medical service providers • Clients and patients in Flint can use R2W to access services • Free to eligible riders (via partnerships)	Call-in reservations ("ride-hailing-like" model with dynamic routing and short response times)	• Partnerships key to program success • Success allowed expansion beyond original scope—now serves veterans and general public
TD Late Shift, Pinellas Suncoast	• Partnership with mobility services—e.g., taxi services and wheelchair transport providers	Call-in reservations (with dynamic routing and shot response times)	• $613,000 savings in monthly operating costs, compared with new fixed route service • Program made possible by partnerships with local taxi operators and rideshare companies

Agency and Service Title	Use Case and Service Design (Area size and characteristics)	Service Model and Technology	Outcomes/Findings/Lessons Learned
Transit Authority	• Eligible Transportation Disadvantaged clients can add Nigh Shift service for $9/month, for a total monthly cost to riders of $20/month		• State grants important to success
WeGo, Hall Area Transit	• Replaced all fixed route and demand response service • Large (400 sq. mi.) service area covering both urban and rural areas • $2 fare for trips less than 5 miles, plus $0.50 per mile after 5 miles, with a maximum fare of $18	SaaS (Via)	• Costs have declined to be almost on par with fixed route service (from $25-30 per trip to $8-12 per trip) • Ridership quickly exceeded previous fixed route and demand response service • Driver shortage affecting wait times • Riders have adapted well to app-based booking, with app tutorials planned for call-in riders • CARES Act funding can pay for new micro-transit services
CDTA Flex, Capital District Transportation Authority	• New, 16 sq. mi. service in one zone covering central Albany • $3 per trip • Target wait time of 15 - 20 minutes • Span of 6 a.m. – 9 p.m. weekdays, and 10 a.m. – 6 p.m. weekends	SaaS (TransLoc)	• Balances convenience and productivity with a single zone that allows trips to specific destinations outside the zone • Ridership of 3 riders in the service's first week, which grew to 80 per day after two and a half months • Funded through agency operating funds, and the agency is pursuing FTA grants for expansion
RTD Van Go!, San Joaquin Regional Transit District	• Re-launched in 2021 as a single, countywide zone in response to feedback • $4 for trips of up to 5 miles, and $0.50 for each additional mile	Unknown (potentially SaaS but unconfirmed)	• Takes advantage of Section 5311 funding for rural transit providers
ACCESS LYNX	• Provides service to eligible riders using a variety of services including taxi and TNC companies ("mobility management" model) • Fares depend on distance and riders are informed of their fare on booking	TaaS with call-in reservations	• Takes advantage of federal Section 5310 and 5317 funding, as well as state-level funds for transportation disadvantaged individuals
SmaRT Ride Flyer, Sacramento Regional Transit District	• Multiple zones across Sacramento County • $2.50 basic fare, with discounted fares for eligible riders and the option to purchase daily passes	SaaS (Via)	• One of the largest micro-transit systems in the U.S. • Funded at the county level by ordinance (Measure A) • More than 10,000 monthly rides, with a smaller than typical pandemic-related drop
ReadiRide, Jacksonville	• Multiple zones around the Jacksonville area	Call-in reservations	• Steady expansion by adding multiple zones over several years

Agency and Service Title	Use Case and Service Design (Area size and characteristics)	Service Model and Technology	Outcomes/Findings/Lessons Learned
Transportation Authority	• $2 per ride		
RideKC Metro Micro Transit, Kansas City Area Transportation Authority	• Successor to Bridj pilot • Curb-to-curb service in low-density areas of Kansas City	SaaS (TransLoc)	• Unlike Bridj pilot, takes advantage of federal funding • Wait times improved relative to fixed route transit
Via Jersey City, City of Jersey City	• One central and one outer zone • $2 fare for trips between zones • $2 fare plus $0.50 per mile for trips entirely within the outer zone	TaaS (Via)	• Rider survey shows about half of riders use the service as a replacement for transit • More than 1,600 daily riders, with steady growth and wait times of roughly 15 minutes • Service initially provided for free, with fares introduced several months after launch
Via WRTA, Worcester Regional Transit Authority	• First-mile/last-mile connections to/from MBTA rail stations, with coverage of central Worcester • $2 fare per ride, and discounted fares of $1 for rides to or from MBTA stations	TaaS (Via)	• Launched with state funding from innovation grant • First-mile/last-mile use is encouraged with discounted fares
GATRA Go, Greater Attleboro-Taunton Regional Transit Authority	• Replacement of fixed route service in response to the pandemic • 4 zones with limited overlap and some connections to remaining fixed route service • $2 fare per ride	SaaS (Spare and NEXT)	• Service initially provided for free, with fares introduced several months after launch
STARNow, STAR Transit	• Planned replacement of fixed route service expanded due to pandemic • Several zones across service area, with travel allowed between zones • $2 fare per ride, with discounted fares of $1	SaaS (Spare)	• Allows both call-in reservations and app booking • About half of riders book using the app • About 30 percent of trips are on-demand and 70 percent scheduled in advance
Stop Hopper, Central Pennsylvania Transportation Authority	• 3 zones connecting commercial and residential areas east of York, PA • $2 fare per ride, with free service for seniors	Unknown	• Allows both call-in reservations and app booking

Agency and Service Title	Use Case and Service Design (Area size and characteristics)	Service Model and Technology	Outcomes/Findings/Lessons Learned
Pickup, Capital Metropolitan Transportation Authority	• Multiple small/medium-sized zones around Austin, TX • $1.25 fare per ride (identical to bus fares)	SaaS	• Funded by local transit funding ordinance • Allows both call-in reservations and app booking • Zones have a variety of purposes: one replaced a fixed route service, one is a partnership with a nearby municipality, and others are new service offerings • Significant pandemic-related ridership decline in some zones (>50%)
Via to Transit, King County Metro	• Aims to provide first-mile/last-mile access to Link light rail • Four zones centered on light rail stations • Fares identical to bus fares ($2.75 for adults, with $1.00-1.50 reduced fares and free transfers to other transit)	Unknown	• Rider survey shows about a quarter of riders used the program as a replacement for fixed route bus service • But overall likely a ridership increase on Link
Ride On Flex, Montgomery County, Maryland	• 2 zones providing first-mile/last-mile service to rail transit • $2 fare per ride (fares remain free through the end of 2021)	SaaS	• Uses how-to videos to explain new service type to riders (for example at this link)

APPENDIX B: PEER AGENCY INTERVIEW GUIDE

Note: Questions were customized for each peer agency based on specifics of their service.

Purpose and Goals

- What challenge or gap in service was micro-transit intended to address?
- What prompted your agency to consider micro-transit service as solution?

About the Service

- Can you describe the size of your micro-transit service area(s)?
- How many vehicles are in service during peak periods?
  - How did you determine this and were your projected vehicle needs consistent with what you found once service was up and running?
- How do most customers make their reservations?
  - Have you taken any actions to encourage use of the app?
- What forms of payment do you accept, both off and on board the micro-transit vehicle?
  - Are there any discounted passes available for riders?
  - How is the service accessible to "unbanked" riders?
- Are you working with an outside vendor to provide the service? If so, can you say which vendor and please describe their role?
- What kind of vehicle(s) do you use to provide the micro-transit service?
  - What is the seating capacity?
  - How many wheelchair-accessible vehicles do you operate? Has that been enough?
- What funding sources are you using to fund the program?

Experiences

- What was the process like of getting the service up and running?
  - Were there any bumps in the road? If so, what was the cause and how were they resolved?
- What has your experience been with wait times?
  - Do you have a target?
  - Have they been higher or lower than expected?
- Has working with an outside vendor been a smooth experience?
  - Are there any specific challenges when working with an outside vendor that you think other agencies should be aware of?
- How is the service performing so far?
  - Are you using specific performance metrics to monitor how the program is doing?
  - If so, what are the results you are achieving in terms of performance indicators? Would you be willing to share them with us?
  - Has your experience with performance monitoring changed (for the better/worse)?

- Have you done any customer satisfaction surveys and/or do you have other ways to measure customer satisfaction with the service?
    - Anecdotally, what kind of feedback have you heard from riders?
- Do you have any plans to expand the service? At what point do you plan to evaluate the program's success and consider whether to expand the service?

Lessons Learned

- Do you have other advice for agencies considering micro-transit service?

APPENDIX C: RICHMOND REGION OPERATOR INTERVIEW GUIDE

Questions for All Operators

- Do you see a need for this type of service in the Richmond region?
  - If so, are there particular locations you think micro-transit should serve?
- What potential opportunities and challenges do you foresee with operating micro-transit in the region?
- Do you have thoughts on comingling of paratransit trips and trips among the general public?
- If GRTC were to procure new technology that would enable mobile booking, scheduling, payment, and sharing of real-time information – or make its current technology available to you to support more coordination – would you be interested in using it to support your current operations?
- There are a number of potential service models the project team is considering for this service. [Describe] Do you have any opinions on the service model you think would work best for the region? For your agency specifically?
- How, if at all, would you want your agencies to be part of this service?
- Are there any other considerations or pieces of feedback you have for our team as we proceed with the study?

Customized, Operator-Specific Questions

CARE (GRTC) – Operated by FirstTransit + VanGo

- FirstTransit is the primary operator, and VanGo fills in when additional capacity is needed – is that correct? Are other providers such as UZURV, roundtrip, etc. also involved?
- Who oversees the technology, and who uses it on a daily basis – GRTC staff or FirstTransit? (Or both?)
- Do you currently use RouteMatch for online booking?
  - How well is it currently working for you?
  - Are you considering any changes in the coming year or two?
  - Do you feel it would be a tool you could scale up to serve the entire region, possibly brokering trips between operators?
  - Are many people booking their trips through the app?
- If GRTC were to take a lead role in the new micro-transit service, what type of arrangement or service model do you think would work best? (Assuming other operators were flexible in the arrangement)
- What other considerations would you want our team to keep in mind? Do you have any questions or concerns?

Bay Transit

- I understand you are operating a (relatively?) new service called Bay Transit Express that is operated by Via. Can you tell us more about that service and how it is working?
  - What was the impetus for that service? Is it addressing the need intended?
- Are you still using RouteMatch? How well do you feel it is currently working?
- We understand that you operate in two of the counties in the Richmond region but that the majority of your operations are outside the region.

Given this, do you have thoughts on the best way for Bay Transit to collaborate or partner with GRTC for this service?

Access Chesterfield

- The Chesterfield Access service is a more traditional paratransit service, whereas Access On Demand is a brokered third-party subsidized ride program, is that correct? How long has the Access On Demand service been offered? Do any of the Access On Demand operators offer mobile booking?
- Is there any brokering being done by your agency, or do the users just pick the Access On Demand provider they prefer?
    - Are those providers simultaneously serving GRTC Care trips (or trips offered through other programs)?
- Can you please describe the platform you currently use for scheduling trips (for your regular paratransit service)? How well do you feel it is currently working?

Hanover DASH

- We understand your operator is UZURV and your riders book directly through them. Can you please describe the county's role in providing the service? Are UZURV drivers operating throughout the region (beyond your service area) at any given time? Do you reimburse UZURV the difference between the fare and the full price of the trip?
- Can you please describe the platform you currently use for scheduling trips? How well do you feel it is currently working?

APPENDIX D: DETAILED INFORMATION AND PERFORMANCE RESULTS FOR PEER AGENCIES

Table 23 contains more detailed information about the micro-transit services offered by interviewed peer agencies. Note that some of the information is based on interviewee's verbal responses to the questions (not documentation provided) and may be rough estimates.

TABLE 23: PEER AGENCY AND REGIONAL OPERATOR MICRO-TRANSIT METRICS

Agency/ Service	Launch date	# of zones & sizes	Vehicles in zone	Ridership and productivity metrics	Cost metrics	% shared rides	App usage	Service model/ platform	Fare	Wait time
Capital Metro (Pickup)	June 2019	11 zones, most are 3-6 sq. mi.	2 for 3 sq. mi. zones; 4-5 VOMS for zones larger than 3 sq. mi.	In performance dashboard	To be included in performance dashboard	To be included in performance dashboard	Varies by zone; 30-35 percent book by phone; 65-75 percent by app	SaaS (Via); Agency vehicles and operators	$1.25 per ride	Goal: 15 min.
CDTA (CDTA Flex)	January 2020	2 zones, one 17 sq. mi. and the other ~12 sq. mi.	2-3 vehicles for smaller zone; 3-4 vehicles for larger zone	140 passengers per day	-	50 percent	25-30 percent by phone; 60-65 percent by app; 10 percent walk-ups	SaaS (TransLoc); Agency vehicles and operators	$3 per ride	Goal: 20-25 min.
DART (DART Connect)	April 2021	Single, noncontiguous 10 sq. mi. service area	3 vehicles	10,000 trips since launch (April 2021 to December 2021)	$52 per revenue hour	-	50 percent by phone; 50 percent by app	SaaS (Via); First Transit operates service; Agency operates call center	$2 per ride	Observed: 9 min. average; 20 min. during busiest periods
MATS (Go2)	June 2021	Single 50 sq. mi. service zone	5-vehicle fleet; 3 typically in service at one time	1.7 trips per revenue hour	-	-	"Still a high number booking by call-in"	TaaS (Via)	$4 base fare; $2 reduced fare;	Observed: 8-10 min.

Agency/ Service	Launch date	# of zones & sizes	Vehicles in zone	Ridership and productivity metrics	Cost metrics	% shared rides	App usage	Service model/ platform	Fare	Wait time
									$8 fare for trips that are pre-booked or from outside jurisdictions	
rabbittransit (Stop Hopper)	August 2018	4 zones, 3 between 5 and 10 sq. mi., plus a small zone serving apartment complex	5 vehicles in service at peak	2.6-2.75 passengers. per hour; 75-85 trips per day	$72 per revenue hour	33 percent	20-30 percent by phone; 70-80 percent by app	SaaS (Via); Agency vehicles and operators	$2 per ride; Free for seniors 65 and older	Observed: 10-12 min.
Greater Dayton RTA (RTA Connect On-Demand)	June 2017	6 zones, between 5 sq. mi. and 26 sq. mi. in size	-	500 passengers per day; 6,000 trips per month at busiest	$11-15 per trip	Negligible	60 percent by phone; 40 percent by app	Hybrid model: TaaS (Uber, Lyft, and non-dedicated service providers); Agency also operates with accessible vehicles	Free	Goal: 30 min.
Bay Transit (Bay Transit Express)	July 2021	Single, 10 sq. mi. zone covering points of interest in Gloucester Courthouse and nearby rural areas	1 vehicle, with plans to expand to 2 or 3 depending on funding	100 trips per week	-	-	-	SaaS (Via); Agency vehicles and operators	$2 per ride	Observed: 7-9 min.

APPENDIX E: OTHER INFORMATION AND RESOURCES FROM CAPITAL METRO'S PICKUP SERVICE

Austin Capital Metro provided education materials developed for outreach to the public and elected officials. The materials outline Capital Metro's zone selection and scoring process, which is based on the agency's service standards developed while operating the Pickup micro-transit service. Key graphics are included below as **Figure 21**, **Figure 22**, **Figure 23**, and **Figure 24**.

FIGURE 21: PICKUP ZONE CREATION AND EVALUATION PROCESS

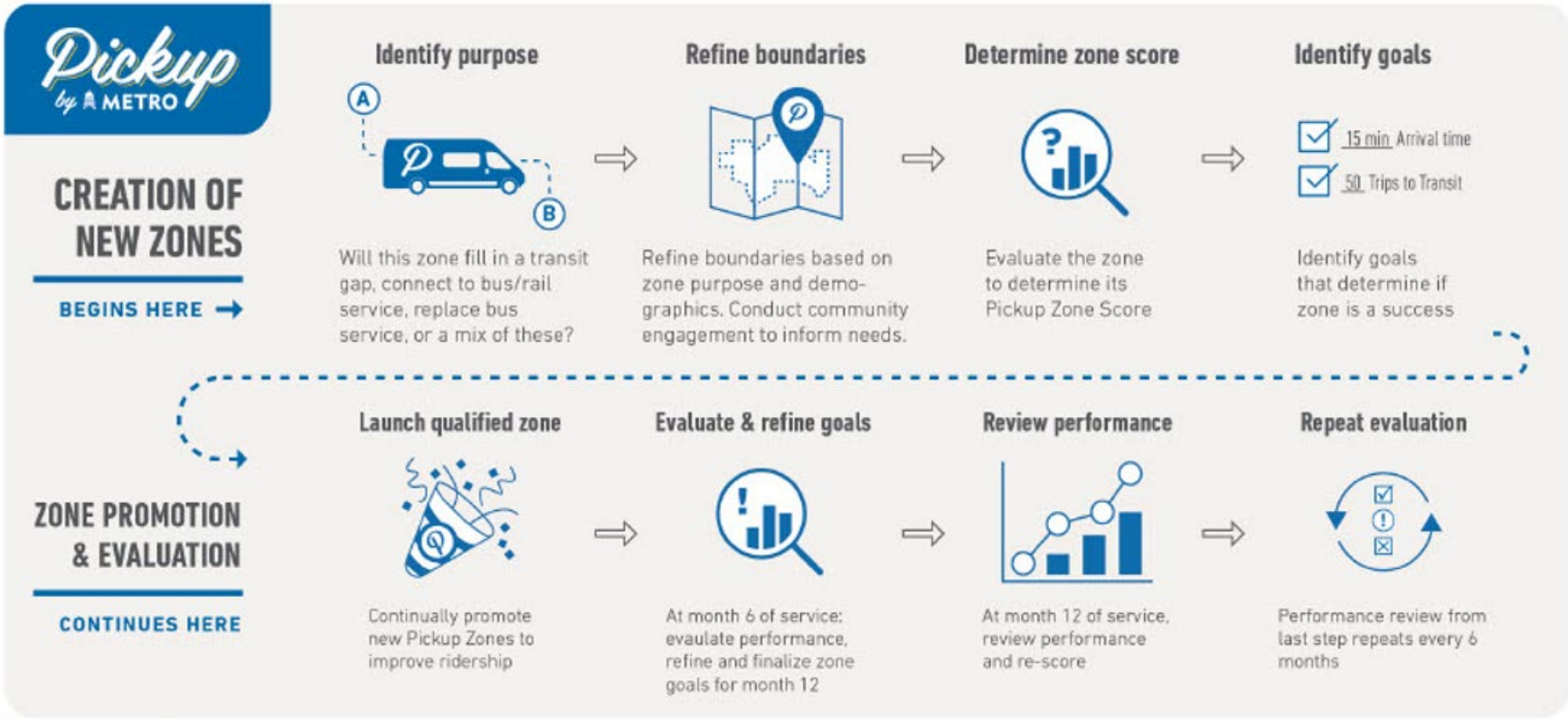


FIGURE 22: PICKUP ZONE PURPOSES

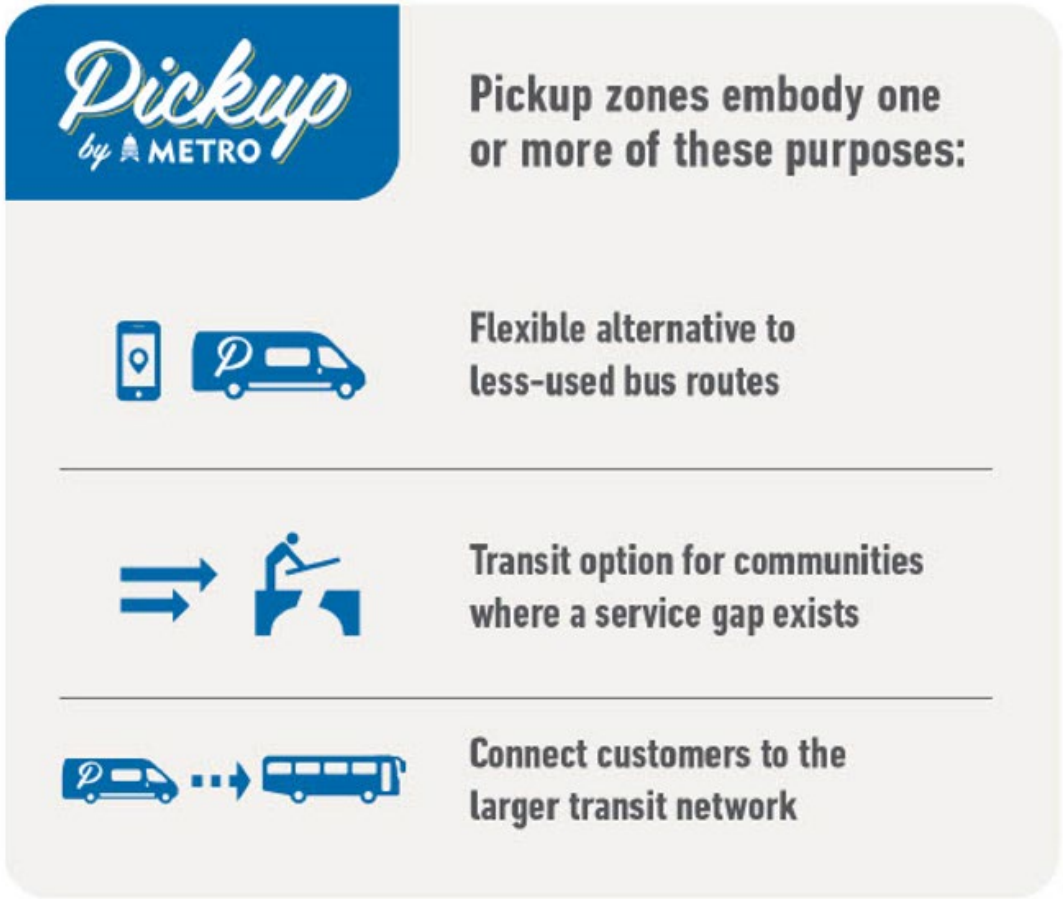


FIGURE 23: PICKUP ZONE SCORING BREAKDOWN

CATEGORY	MEASURES / KPI	CRITERIA	POINTS AVAILABLE	
Community Characteristics	Population Age 65 and Over	Zone scores higher the further it surpasses the service area mean	5	30 PTS
	Zero Car Households	Zone scores higher the further it surpasses the service area mean	5	
	Median Household Income	Zone scores higher the further it is below the service area mean	5	
	Households in Poverty	Zone scores higher the further it surpasses the service area mean	5	
	Minority Population	Zone scores higher the further it surpasses the service area mean	5	
	Essential Services (medical, grocery, schools, shopping centers, affordable housing)	Serve significant destination needs within service zone. One point for each essential service type included in the zone.	5	
Service Quality	Passenger Wait Time	15 minutes or less	10	30 PTS
	Square Mileage	Ideal of 3 sq. miles in-town and ideal of 6 sq. miles suburban	10	
	Ridership	Total Ridership; Riders per service hour	10	
Sustainability	Cost Effectiveness	Pre-designated generalized cost per passenger trip	10	30 PTS
	MetroAccess Customers on Pickup	Zone compared to overall population demographics	10*	
	Mobility Impaired Passengers	% of disability assistance request trips		
	Shared Rides	% of trips shared with other passengers	10	
		TOTAL POSSIBLE POINTS	90	

FIGURE 24: PICKUP TOTAL SCORE CATEGORIES

APPENDIX F: METRICS FOR PRIORITIZED ZONES

Table 24 contains geographic, employment, population, and fixed-route transit access data for the Prioritized zones.

TABLE 24: ZONE PRIORITIZATION METRICS

Zone	Intersection Density (per sq. mi.)	Population to Jobs Ratio	Activity Generator Density (per sq. mi.)	Low Income Pop. Density (per sq. mi.)	Minority Population Density (per sq. mi.)	Fixed-Route Transit Presence
Ashland	57.3	0.8	5.1	0.2	0.4	No
East Highland Park-Mechanicsville	93.0	2.3	7.0	1.5	3.9	Yes
Goochland	13.3	3.4	2.0	0.04	0.2	No
Innsbrook-Glen Allen	82.4	1.0	2.9	0.64	2.5	Yes
North Chesterfield (East)	88.5	4.8	2.4	1.2	3.2	Yes
North Chesterfield (West)	77.4	4.8	2.7	0.8	2.6	Yes
Powhatan	21.3	3.7	6.2	0.2	0.2	No
Providence Forge-Ruthville	18.3	4.0	1.7	0.03	0.1	No
Sandston-Elko	25.1	4.7	2.0	0.1	0.3	Yes
Short Pump South	119.6	3.0	9.2	0.8	2.2	Yes
Washington Park-Azalea Ave	79.5	2.3	4.8	1.5	3.9	Yes

APPENDIX G: COUNTYWIDE SERVICE COST AND VEHICLE ESTIMATES

During the course of the study, the project team received an inquiry to evaluate the vehicle requirements and estimated operating costs for offering on-demand countywide service in select counties in the study area using the TaaS service model. Estimates developed by the project team are shown in **Table 25** below. The vehicle requirements estimates are based on an assumed average wait time of 60 minutes.

TABLE 25: COUNTYWIDE ON-DEMAND SERVICE FORECASTED RIDERSHIP AND ANNUAL OPERATING COSTS

Zone	Span (Monday – Saturday)	Maximum Vehicles	Forecasted Annual Ridership	Estimated Annual Operating Costs
Goochland County	6:30 AM - 7:00 PM	8	50,000	$1,713,600
Powhatan County	6:30 AM - 7:00 PM	7	65,200	$1,499,400
Charles City County	6:30 AM - 7:00 PM	2	14,100	$428,400