Appendix E Microtransit Technical Memorandum

Envision My Ride: Bus Priority Study Technical Memorandum | Task 9 Microtransit Recommendations – FINAL

June 24, 2022

1 INTRODUCTION

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 microtransit 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 memo summarizes common uses of microtransit, describes CATS peer agencies with microtransit services, and reviews the results of the microtransit service design analysis conducted for the Charlotte region.

1.1 What is Microtransit?

Multiple definitions of microtransit have emerged in recent years. SAE International's 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." 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", a key distinguishing feature of microtransit 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, specifically for groups of riders such as elderly or those with disabilities, these services have traditionally required advanced scheduling ranging from 24-hours to a week out from the anticipated trip, and usually have eligibility requirements. While SAE International's definition mentions both dynamic and fixed routing, microtransit is assumed to be a service that has the capability of offering dynamic routing to accommodate new trip requests. Microtransit operations also typically utilize minibuses or vans because of these vehicles' efficiency compared to larger (e.g., 40+-foot) buses, as well as their flexibility operating on smaller streets or residential neighborhoods.

1.2 State of the Practice

Microtransit services are operated all around the country, in rural, urban, and suburban areas, and by agencies of different sizes. 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 microtransit services.[1] This memo focuses on a selection of services, but the number and geographic range of microtransit services continues to grow.

[1] 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/.

1.3 Service Use Cases

This study has identified three microtransit use cases, new service / neighborhood circulation, first- / last-mile connections, and fixed- / deviated-route replacement, that can be used as either a complement to a traditional transit fixed-route system or as an independent system itself.

New Service / Neighborhood Circulation

This service acts more like a neighborhood circulator route, providing curb-to-curb access to neighborhood attractions and activity centers. This service can act as extended routes for existing transit routes.

First- / Last-Mile Connections

This service provides connections to higher frequency transit or planned transit facilities (such as Level II and Level III stops on CATS' high-frequency network). Services like this can supplement or replace existing fixed-routes that feed into a high-frequency network.

Fixed- / Deviated-Route Replacement

This service replaces or supplements existing fixed-route or deviated service, with either an equal or higher level of service. This is often an effective solution for transit agencies trying to remove underperforming fixed routes without removing access to service.

1.4 Typical Benefits of Microtransit

In addition to the typical benefits associated with public transportation, microtransit's wide umbrella of potential vehicles, service models, and compatibility with other modes gives it a wide array of potential benefits for the transit provider, the transit rider, and the community. The primary and second benefits of these use cases are outlined in **Table 1**.

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. Microtransit programs generally 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 on a one-seat ride. Additionally, microtransit's use of technology allows riders more access to information regarding their trip, such as pick-up and drop-off times.

Increased Ridership / Connection 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. Microtransit 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. In

Montgomery County, MD in the RideOn Flex microtransit zone designed around two Washington Metropolitan Area Transit Authority (WMATA) Metrorail stations, approximately 32 percent of the trips started or ended at a WMATA Metrorail station.[2]

Increased Productivity / Cost Savings

It is often the case that the transition to microtransit is done with the idea of improving productivity, particularly when microtransit 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 in Baldwin County, AL noted more productive service (in terms of passengers per hour) with microtransit compared to its previous demand response service. SacRT in Sacramento, CA observed that productivity of service increased *as the supply of microtransit service increased*, going from 2.5 passengers per revenue hour to 3.6 once service was expanded.[3]

Increased Coverage

Microtransit 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 microtransit are showing positive initial results.[4] Microtransit can expand network coverage, potentially more cost-effectively. For example, RTC's FlexRide in Washoe County, NV began as a replacement service for two underperforming fixed routes in Sparks. It has since expanded to provide service to a larger area at a lower cost.[5]

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. Microtransit can provide a needed service in a situation where 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 microtransit safety benefits relative to fixed-route transit.

Table 1. Typical Benefits of Microtransit

BENEFIT	NEW SERVICE / NEIGHBORHOOD CIRCULATION	FIRST / LAST MILE CONNECTIONS	FIXED-ROUTE / DEVIATED FIXED-ROUTE REPLACEMENT
IMPROVED CUSTOMER EXPERIENCE	⊙	⊙	●
INCREASED RIDERSHIP OR CONNECTION TO HIGHER CAPACITY NETWORK	⊙[6]	●	⊙

[2] "Ride On Flex Microtransit Performance Assessment," Metropolitan Washington Council of Governments, August 2020, https://www.mwcog.org/assets/1/6/FY20_Montgomery_-_Flex_Microtransit.pdf.
[3] TCRP Synthesis 141: Microtransit or General Public Demand Response Transit Service: State of the Practice (2019), http://www.trb.org/Main/Blurbs/178931.aspx.
[4] 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.
[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/.
[6] Where relevant

BENEFIT	NEW SERVICE / NEIGHBORHOOD CIRCULATION	FIRST / LAST MILE CONNECTIONS	FIXED-ROUTE / DEVIATED FIXED-ROUTE REPLACEMENT
INCREASE PRODUCTIVITY AND/OR COST SAVINGS	–	⊙	●
INCREASED COVERAGE	●	●	⊙
ENHANCED SAFETY	⊙	⊙	⊙[7]

● Primary intended benefit ⊙ Secondary/potential benefit

1.5 Analysis of Peers

In addition to considering the qualities and strengths of different microtransit service models directly, this memo aims to review CATS' peer transit agencies' microtransit services and models. It provides a comparison between these agencies' demand response (which usually encompasses microtransit services) and van pool services which provides a comparable commuter focused on-demand service. This section will also provide an additional perspective on how various microtransit models perform in contexts like geographic region, urban development and physical conditions, and connectivity with other transit modes.

Table 2. Select NTD Statistics for Microtransit and/or Analogous Modes (CATS, 2020)[8]

METRIC	DEMAND RESPONSE	VANPOOL
URBANIZED AREA POPULATION	1,249,442	
SERVICE AREA POPULATION	1,302,619	
VEHICLES OPERATED IN MAXIMUM SERVICE	73	46
OPERATING EXPENSES (% OF TOTAL)	$13,335,002 (8.2%)	$1,512,496 (.09%)
ANNUAL UNLINKED TRIPS (% OF TOTAL)	205,685 (1.0%)	85,334 (.04%)
COST PER REVENUE MILE/HOUR	$6.73/$107.04	$1.81/$93.42

NeighborLink (Orlando, Florida)

Orlando and Charlotte are both major cities in the Southeastern United States, with population densities of 2,775 and 3,012 people per square mile respectively. The Central Florida Regional Transportation Authority runs NeighborLink, a microtransit service consisting of 10 zones that generally operate between 5:30 a.m. and 7:30 p.m. NeighborLink service is an on-demand service available to the general public, who can use the service to travel anywhere within a single zone or to connect to LYNX fixed-route service. Residents in a designated zone can request a trip via phone, mobile app, or on the LYNX website. NeighborLink also offers a subscription service for travelers who make regular trips to the same location at the same time/day each week, relieving regular passengers of having to book those trips in advance. NeighborLink served 10,593 monthly trips in September 2019, though this had decreased to 5,926 monthly trips in September 2020[9].

[7] Especially for late-night service
[8] Charlotte Area Transit System 2020 Annual Agency Profile
[9] 2020 Lynx Ridership Year-End Review

Table 3. Select NTD Statistics for Microtransit and/or Analogous Modes (Lynx, 2020)[10]

METRIC	DEMAND RESPONSE	VANPOOL
URBANIZED AREA POPULATION	1,510,516 ↑	
SERVICE AREA POPULATION	2,134,411 ↑	
VEHICLES OPERATED IN MAXIMUM SERVICE	191 ↑[11]	193 ↑
OPERATING EXPENSES (% OF TOTAL)	$26,050,233 (18.7%) ↑	$1,779,144 (1.3%) ↑
ANNUAL UNLINKED TRIPS (% OF TOTAL)	500,239 (2.8%) ↑	334,032 (1.9%) ↑
COST PER REVENUE MILE/HOUR	$3.71/$60.81 ↓	$0.85/$28.01 ↓

Pickup (Austin, Texas)

Austin and Charlotte are both major cities in the Southern United States, with population densities of 3,006 and 3,012 people per square mile respectively. CapMetro runs Pickup, a reformed microtransit service launched in the Summer of 2017 to improve an underutilized dial-a-ride service. This on-demand service is accessed via app, and aimed to connect rural and high-growth exurb commuters to downtown Austin by facilitating first/last-mile connections. Over the first year, ridership increased from 400 passengers per month to 3,200 passengers per month, with app bookings growing twice as fast as phone bookings. Fares are identical to those of fixed-route bus service, and the cost per trip also decreased 79 percent to $23.00. In response to this initial success, CapMetro added an additional six zones in a variety of urban, suburban, and rural areas. These zones range in purpose, from replacing fixed-route service to extending transit service to new areas. Despite COVID-related decreases in transit ridership (including some microtransit zones seeing a 50 percent decrease in ridership), CapMetro continued to add new zones in 2020 and 2021.

Table 4. Select NTD Statistics for Microtransit and/or Analogous Modes (Capital Metro, 2020)[12]

METRIC	DEMAND RESPONSE	VANPOOL
URBANIZED AREA POPULATION	1,362,416 ↑	
SERVICE AREA POPULATION	1,318,322 ↑	
VEHICLES OPERATED IN MAXIMUM SERVICE	191 ↑	266 ↑
OPERATING EXPENSES (% OF TOTAL)	$41,344,741 (18.0%) ↑	$2,385,786 (1.0%) ↑
ANNUAL UNLINKED TRIPS (% OF TOTAL)	550,702 (2.4%) ↑	432,153 (1.9%) ↑
COST PER REVENUE MILE/HOUR	$9.24/$101.21 ↓	$0.63/$25.51 ↓

Via to Transit (Seattle, Washington)

Seattle and Charlotte are both major cities with expanding light-rail networks, with population densities of 9,396 and 3,012 people per square mile respectively. Seattle's microtransit service (provided by King County Metro) is limited to four zones around light rail stations south of Downtown Seattle, serving as first/last mile connections for light rail trips. These zones were selected after recognizing that lower-income communities had limited fixed-route options for accessing light rail stations and that high demand for parking meant that lots could fill up as early as 6:30 a.m.) The fare structure for this service is identical to standard bus service. Ridership observations since implementation have seen a decrease in nearby local bus routes, though ridership gains on the light rail network are anticipated. The service can be accessed either by

[10] Central Florida Regional Transportation Authority 2020 Annual Agency Profile
[11] ↓ indicates a value lower than CATS, ↑ indicates a higher value than CATS
[12] Capital Metro 2020 Annual Agency Profile

phone or mobile app and has grown from a preliminary six vehicles to 18 today. The service sees 6,000 riders per week, with 14 passengers per vehicle during the peak period.

Table 5. Select NTD Statistics for Microtransit and/or Analogous Modes (King County Metro, 2020)[13]

Metric	DEMAND RESPONSE	VANPOOL
URBANIZED AREA POPULATION	3,059,393 ↑	
SERVICE AREA POPULATION	2,260,800 ↑	
VEHICLES OPERATED IN MAXIMUM SERVICE	453 ↑	1,670 ↑
OPERATING EXPENSES (% OF TOTAL)	$60,890,108 (7.6%) ↑	$8,433,948 (1.1%) ↑
Annual Unlinked Trips (% of total)	541,851 (0.9%) ↑	1,084,802 (1.8%) ↑
Cost per Revenue Mile/Hour	$12.64/$136.20 ↑	$1.59/$57.16 ↓

1.6 Potential Service Strategies

The following sections describe three potential service strategies that could be employed for a CATS microtransit service—a Transportation-as-a-Service (TaaS) or "Turnkey" Strategy, a Software-as-a-Service (SaaS) Strategy, and a Hybrid Strategy—and describes how each potential strategy would work.

TaaS Strategy: Turnkey Operation

Under this strategy, CATS would contract with a vendor that would supply the technology, vehicles, and drivers to operate the microtransit service. The vendor would provide all of the technical and customer support functions as well. CATS' role in the microtransit service is to define the service parameters and requirements and oversee the service's and vendor's performance. The vendor would be responsible for managing driver and vehicle availability to meet performance targets such as wait time limits set by CATS. This strategy is similar to the Via to Transit service in the Seattle region.

Associated Costs:

- Operating Costs: $50 - $60 / vehicle revenue hour
- Generally, assumes a minimum contract size of $800,000

SaaS Strategy: New Technology, CATS-Operated Service

Under this scenario, CATS would procure a technology platform to use to provide microtransit service. The technology would enable riders to book trips via mobile application or by calling CATS. CATS qualified operators would operate the service and would be dedicated to responding to trip requests in a single zone or multiple nearby zones. This scenario is similar to Austin CapMetro's Pickup service.

Associated Costs:

- Technology Set-up: $15,000 - $20,000
- Vehicle Costs: $90,000 to purchase vehicle(s)
- 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

[13] King County Metro 2020 Annual Agency Profile

Hybrid Strategy: TNC + CATS-Operated Service

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

- They could book directly in-app with participating TNC(s) (or other service provider(s) offering app-based booking). Trips booked in a participating provider's app that meet the parameters of the microtransit 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 CATS-paid or CATS-subsidized (depending on the fare level) trips. Payment by riders would only be necessary up to the CATS-determined fare. If a fare is required, riders could pay in the app using a credit or debit card. Unbanked riders would be able to purchase cards with promotional codes using cash at CATS-designated sites and/or participating retailers and enter the codes into the app as payment. Providers would invoice CATS for trips provided through the program and CATS would reimburse provider (with details pre-negotiated between the two parties).
- Riders could book by calling CATS. CATS would send one of its vehicles and qualified drivers to provide the trip. Trips would need to be provided within a CATS-defined maximum waiting period.

Several existing services not reviewed in this memo have pursued a similar strategy of allowing riders to choose between multiple providers, including Dayton, OH's RTA Connect service and Richmond, VA's CARE On-Demand service.

Service Model Comparisons

Each of these three scenarios has unique advantages and disadvantages to consider. For each service model scenario, **Table 1** below shows the applicable use cases and contexts, advantages, disadvantages, and notes about other considerations

Table 6: Service Model Scenario Evaluation

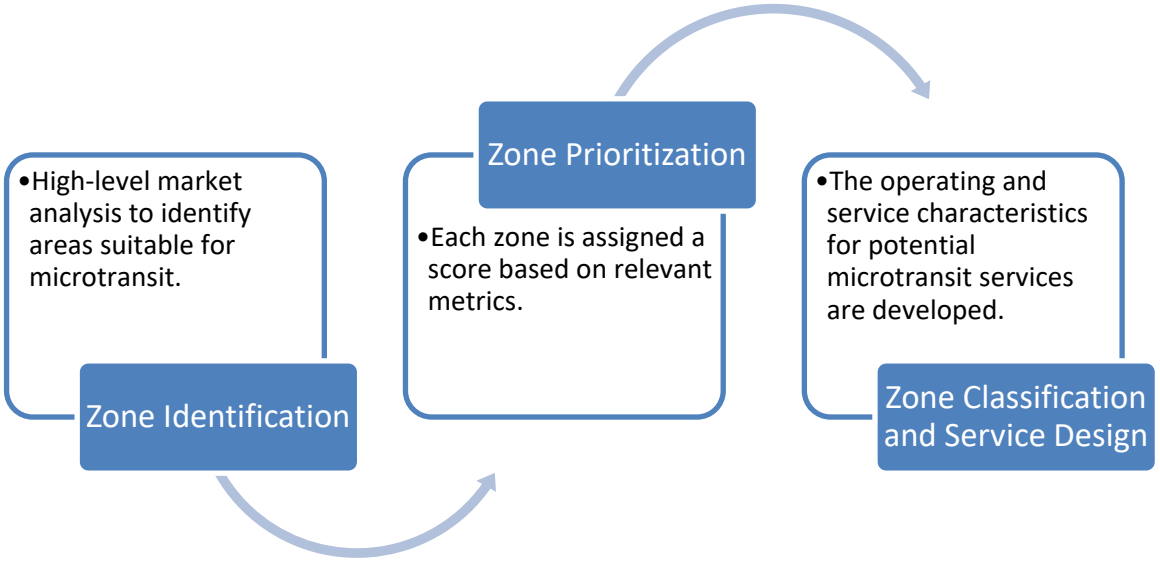
SCENARIO	ADVANTAGES	DISADVANTAGES	OTHER NOTES AND CONSIDERATIONS
TAAS/ TURNKEY	- Least level of effort required by staff for ongoing management - Lower cost option - Ability to specify performance standards - Contractor is responsible for driver recruitment.	- Independent contractors may not be as well trained or compensated as bus operators; the latter could potentially result in higher turnover. - There may be unexpected challenges with implementation and service launch. - Customer service functions may be subpar if outsourced.	- Agencies can set requirements for living wages + benefit subsidies for independent contractors (e.g., King County did so for Via to Transit service) - To address potential challenges associated with launching a new service, conducting a "soft launch" can be helpful. - 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.

SCENARIO	ADVANTAGES	DISADVANTAGES	OTHER NOTES AND CONSIDERATIONS
SAAS	- 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 100% to serving each microtransit zone. - Vehicles should be WAVs.
HYBRID	- Lower cost option - More choices for riders	- Independent contractors may not be as well trained or compensated as bus operators, potentially resulting in higher turnover. - If more than one TNC participates, onus is placed on rider to select provider. - May not be as operationally efficient if multiple providers participate.	- CATS' ability to respond to trip requests and complete trips within a short wait time could require dedicated vehicle and staff if zone is not close to a hub. - TNC drivers may be reluctant to accept trips if they do not expect a tip; method for overcoming this barrier should be considered. - TNC independent contractors may not be well qualified to provide service to people with disabilities. - Ensuring adequate presence of WAVs may also be a challenge.

2 CANDIDATE SERVICE AREAS

2.1 Analysis Methodology

To identify, prioritize, and evaluate potential microtransit zones a three-step process was used:



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

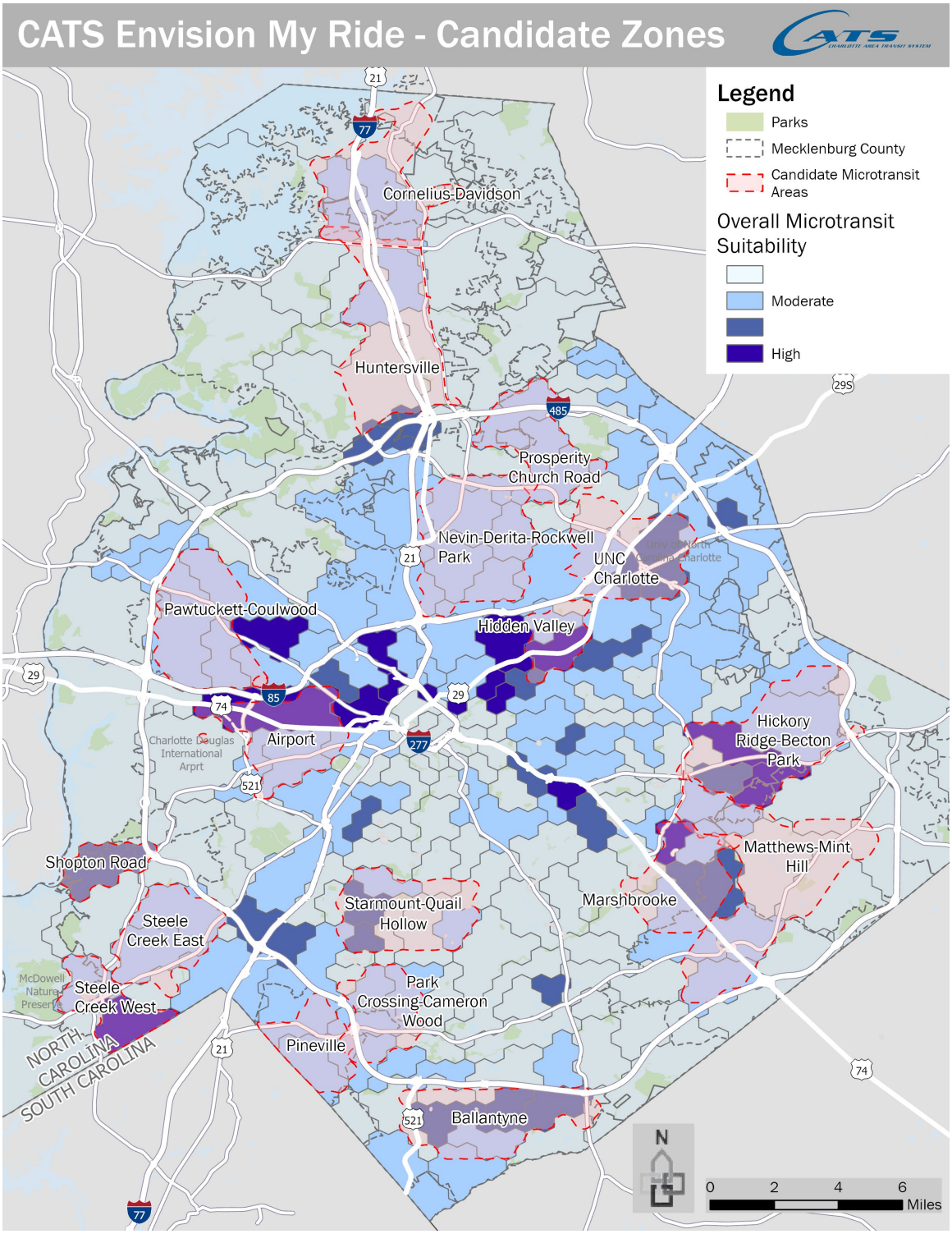
Step 1: Zone Identification

A high-level market analysis was conducted to determine where microtransit could be implemented successfully in the Charlotte region. The market analysis relied on two indices, a Transit Potential index and a Transit Need index. The Transit Potential index is a measure of population and employment density. Microtransit services typically perform better in low- to medium-density areas where smaller vehicles can accommodate the lower demand. The Transit Need index is a measure of socioeconomic characteristics that indicate a higher tendency to use transit, including microtransit service. Transit Need identifies transit-oriented populations and activity-oriented jobs (e.g. retail, medical, recreation, education, and government) that foster trips throughout the day rather than mostly during typical peak periods.[14]

While areas which are identified as high in both Transit Potential and Transit Need are typically strong candidates for fixed-route transit services, microtransit can provide effective service to areas that demonstrate moderate-to-high levels of Transit Need but lack the overall density (and Transit Potential) to support robust fixed-route transit. **Areas more suitable for microtransit will be higher in Transit Need and lower in Transit Potential.** Combining the two measures produces a **microtransit suitability** measure, which is visualized for the Charlotte region in **Figure 1**. **Figure 1** also shows candidate microtransit areas. Candidate areas were created by grouping areas with high microtransit suitability into larger areas of about 10 to 15 square miles, a typical microtransit zone size.

[14] Transit oriented populations are defined by low-income and low-car households (zero or one-car), persons with disabilities, youths, and senior citizens. These socioeconomic characteristics are indicators for persons more likely to us transit or depend upon it.

Figure 1: Microtransit Suitability with Candidate Areas



Step 2: Zone Prioritization and Scenario Testing

Candidate microtransit areas identified in step 1 are distributed relatively evenly across Charlotte and Mecklenburg County, both inside and outside the I-485 beltway. To narrow these areas down, additional factors were analyzed to prioritize areas with the highest probability for microtransit service success.

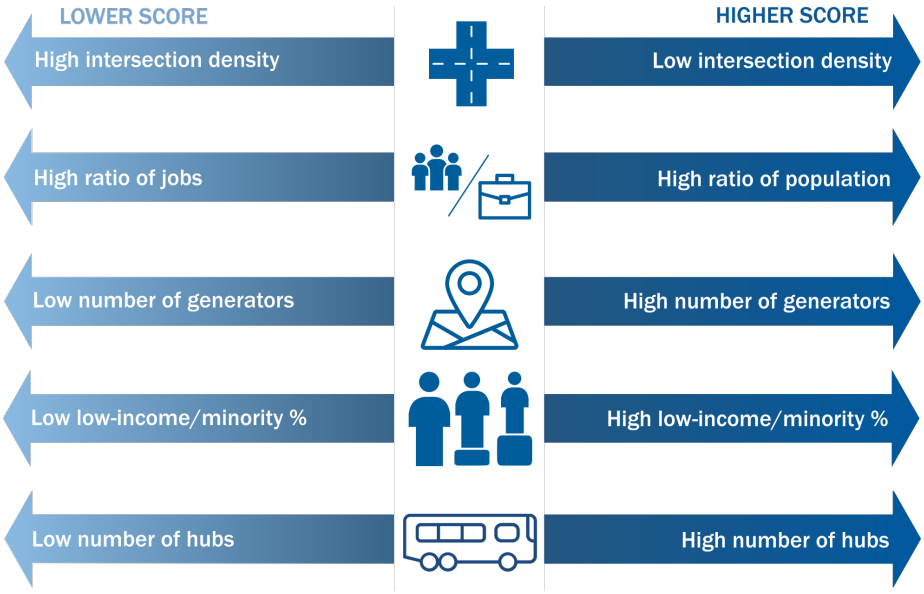
Microtransit service is most successful in environments with certain conditions, including low or moderate intersection density, a higher concentration of residential land uses, and activity generators like medical facilities, shopping centers, and transit stations. Equity is also an important factor to consider in the evaluation and implementation of new microtransit service. The complete microtransit feasibility metrics used for prioritization are described in **Table 6**. Each metric is calculated for each zone, and each zone is scored relative to the others on each metric. Zones with higher scores are more suited for microtransit service (**Figure 2**). **Appendix A** contains a table of raw values of each zone by metric.

Table 7: Evaluation Metrics

Intersection Density		**Intersection density per square mile** *Areas with low intersection density prevent direct fixed-route transit routing. Microtransit can deploy more direct routing for requested trips by skipping areas where passengers aren't actively waiting to be picked up, shortening travel times for transit riders and improving service efficiency.*
Land Use		**Population-jobs ratio** *Microtransit can be most productive in trip generating areas, where there are higher proportions of residential land uses and fewer destinations. 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 peak hours.*
Activity Generators		**Trip generators per square mile** *Trip generators are locations that are likely to generate a trip, including some origins (e.g. apartment complexes) and many destinations (grocery stores, services, retail shops, offices, etc.). Microtransit 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 microtransit.*
Equity		**Minority and low-income population percentage** *Microtransit service should not disparately impact protected populations as defined in Title VI of the 1964 Civil Rights Act.*[15] *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 microtransit service.*
Transit Connections		**Number of proposed mobility hubs** *The Envision My Ride Bus Priority Study – Bus Priority Project identified Mobility Hubs throughout the Charlotte region. Microtransit service is well-suited to provide first/last-mile connections to mobility hubs connecting to additional modes of transportation. Zones that include a major transit hub are more likely to support microtransit service that feeds into the overall transit network, making the service more valuable to the community.*

[15] 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 2: 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. The project team completed a sensitivity analysis to score each zone with different weights in three scenarios, which are described below and in **Table 7**. This sensitivity analysis clarifies how each metric varies across the region and how weights for each metric could impact the areas that were prioritized. Each zone was given a score between 1 and 10 in the three scenarios.

1. ***Internal Movement scenario***: More heavily weights land use and activity generators because these indicators accentuate activities internal to the zone.
2. ***First-Mile / Last-Mile scenario***: More heavily weights transit hub presence, which improves connectivity between a zone and the fixed-route transit network.
3. ***Hard to Reach Areas / Transit Reliant Populations* scenario**: More heavily weights equity metrics.

The result of this sensitivity analysis was an understanding of the interdependency of many of these variables. The results of each scenario were similar but not equal. Scores for each scenario were combined into a composite score, which allowed for an assessment of any zone that could potentially be successful across the three different scenarios.

Table 8: Scenario Weighting

Scenario	Metric Weights			
	Intersection Density	Land Use and Activity Generators	Equity	Transit Hubs
INTERNAL CIRCULATION	10%	60%	10%	10%
FIRST / LAST-MILE	10%	30%	20%	30%
HARD TO REACH AREAS / TRANSIT RELIANT POPULATIONS	30%	20%	30%	10%

Step 3: Zone Classification and Service Design

Microtransit services can be tailored to match the specific needs of each zone, as well as agency and jurisdiction goals. After zone prioritization and scenario testing, top zones were assigned use cases based on their scenario scores and zone characteristics like existing transit service, the presence of transit facilities, and the presence of trip generators. As described in **Section 1.3**, the main types of use case considered were:

- **New Service / Neighborhood Circulation:** These zones could provide curb-to-curb access to neighborhood attractions and activity centers.
- **First / 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 should be considered primary use cases, since a single zone may serve a variety of uses.

2.2 Potential Service Areas

The three zones described in this section were selected as the candidates for initial microtransit implementation in the Charlotte region, based on microtransit potential and need, prioritization scoring, use case suitability, and coordination with CATS' Coordinated Human Services Transportation Plan. The Coordinated Human Services Transportation Plan identified the Charlotte Douglas International Airport and Mint Hill as areas of focus, and both areas scored highly in the microtransit scoring process.

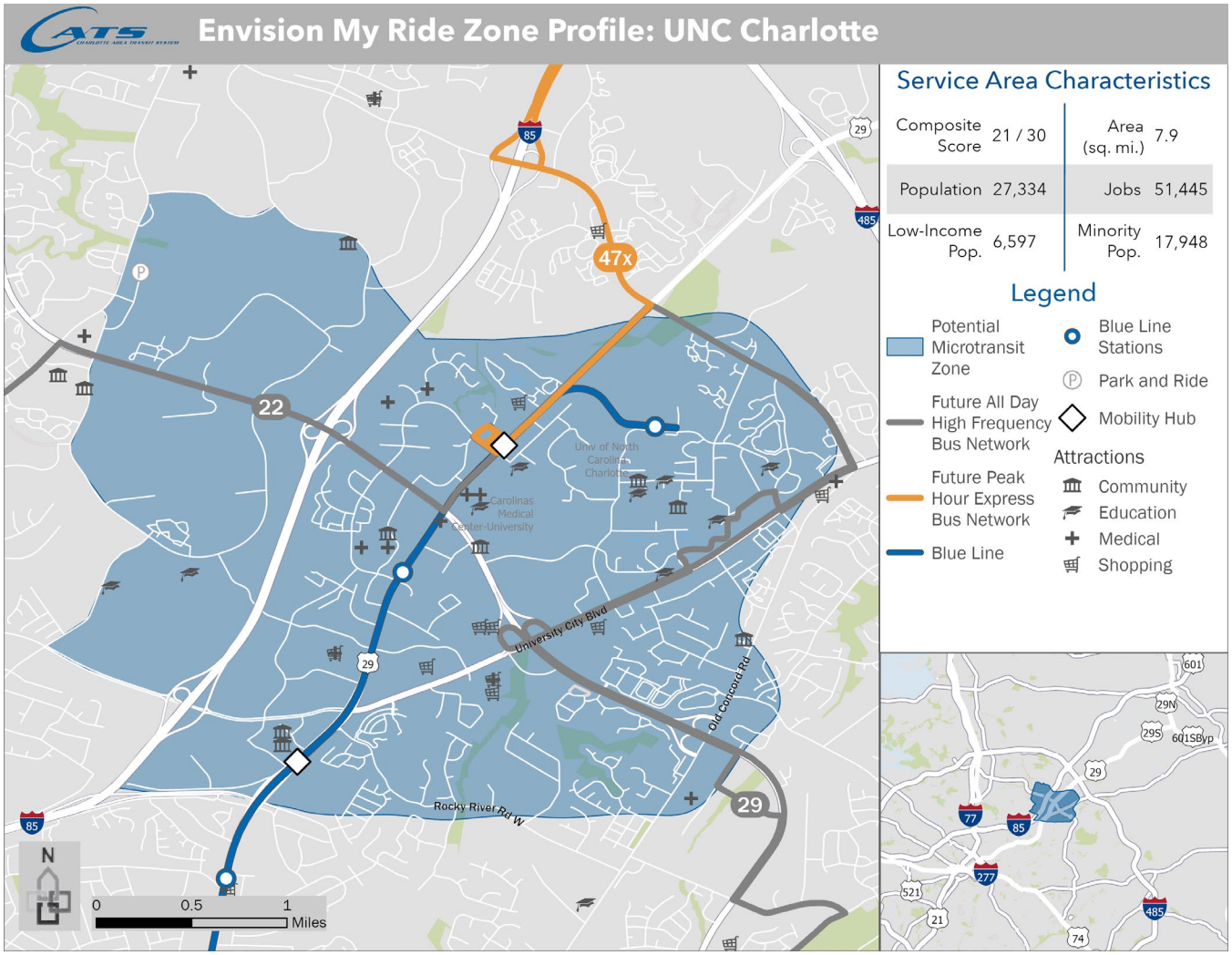
UNC Charlotte (University Research Park): Neighborhood Circulation

This 7.9 square mile zone would provide neighborhood circulation service to UNC Charlotte, as well as destinations and neighborhoods close to the UNC Charlotte campus. In addition to UNC Charlotte, the zone would serve multiple apartment complexes, medical service providers, supermarkets, and commercial plazas.

A major consideration for this zone would be interaction with existing CATS and Niner Transit transit service. The Envision My Ride Bus Priority Study identifies CATS Routes 22 and 29 as future high-frequency bus lines and Route 47x as a future peak hour express route serving the zone. The zone contains three LYNX Blue Line light rail stations (**Figure 3**). Transfers are possible between Route 22, Route 47x, and the Blue Line at JW Clay Boulevard Station, which has been identified for improvement to a Level III Mobility Hub facility. UNC Charlotte provides Niner Transit service within the UNC Charlotte campus and to select destinations off-campus.

The zone's many destinations and transit services make for a potentially productive microtransit service, which could improve internal circulation to and from destinations within the zone while improving connectivity with existing and planned regional transit. However, a curb-to-curb service could compete for internal trips with existing transit service, particularly Niner Transit's campus-focused routes. If this happens, the zone could be reworked as a first / last mile service, with trips allowed only to or from specific destinations and transit facilities.

Figure 3: UNC Charlotte Zone Profile

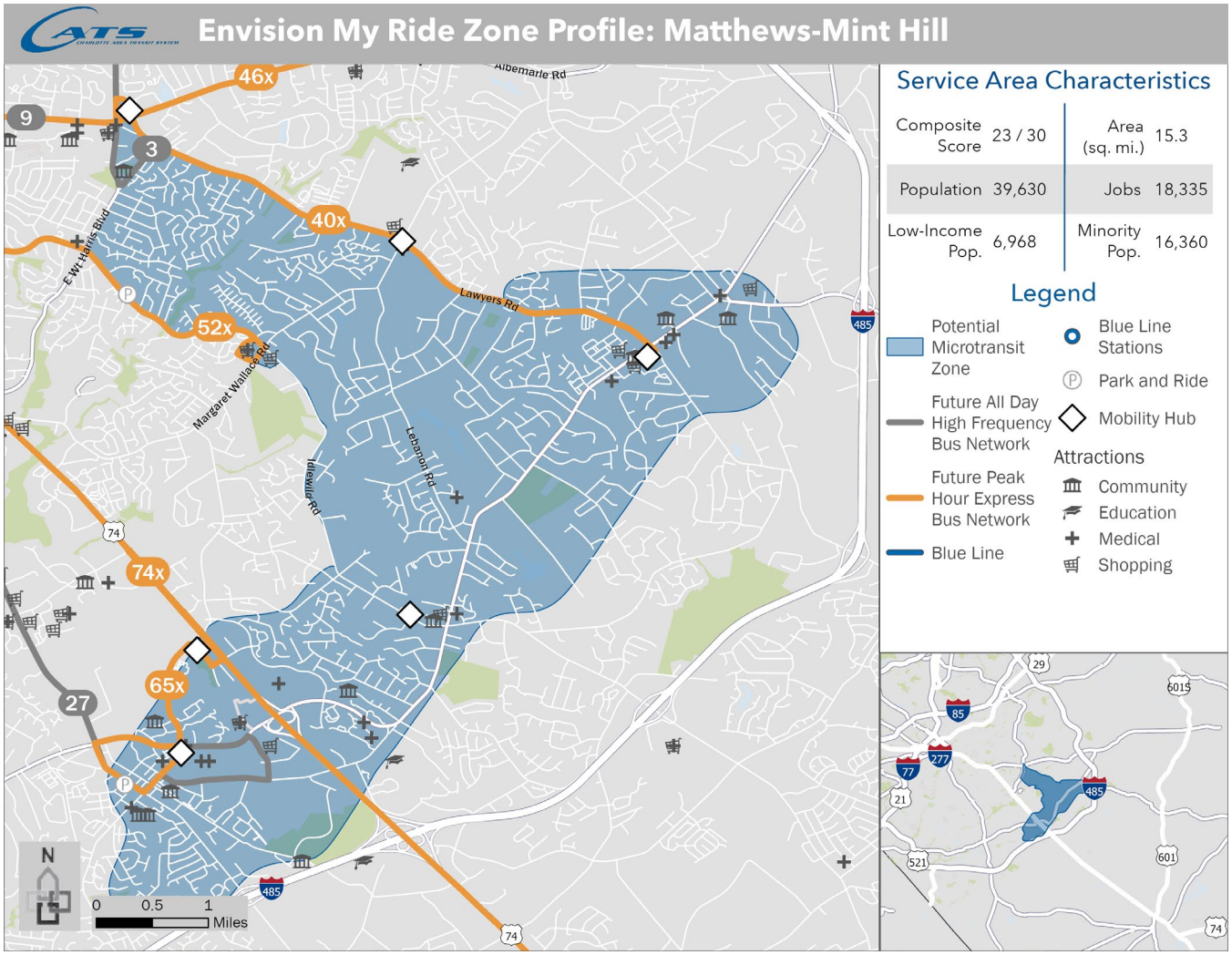


Matthews-Mint Hill: First / Last Mile

The Matthews-Mint Hill zone would serve Charlotte, Matthews, and Mint Hill. At 15.3 square miles, the proposed zone is large, making efficient operation as an internal circulation service potentially difficult without the dedication of multiple vehicles. A first / last mile model would improve efficiency by only allowing trips that connect to the zone's transit facilities. However, these facilities are located near concentrations of medical and commercial trip generators, potentially allowing the zone to also provide some within-zone circulation.

The zone is served by future high frequency CATS Routes 3, 9, and 27, as well as future peak hour express Routes 40x, 52x, 65x, and 74x. Five Level II and Level III Mobility Hub facilities are planned for the zone. The zone would allow connections to all of these services, allowing travel to many additional regional destinations. The zone would also allow circumferential travel along Matthews-Mint Hill Road, for which no fixed-route transit service is planned.

Figure 4: Matthews-Mint Hill Zone Profile

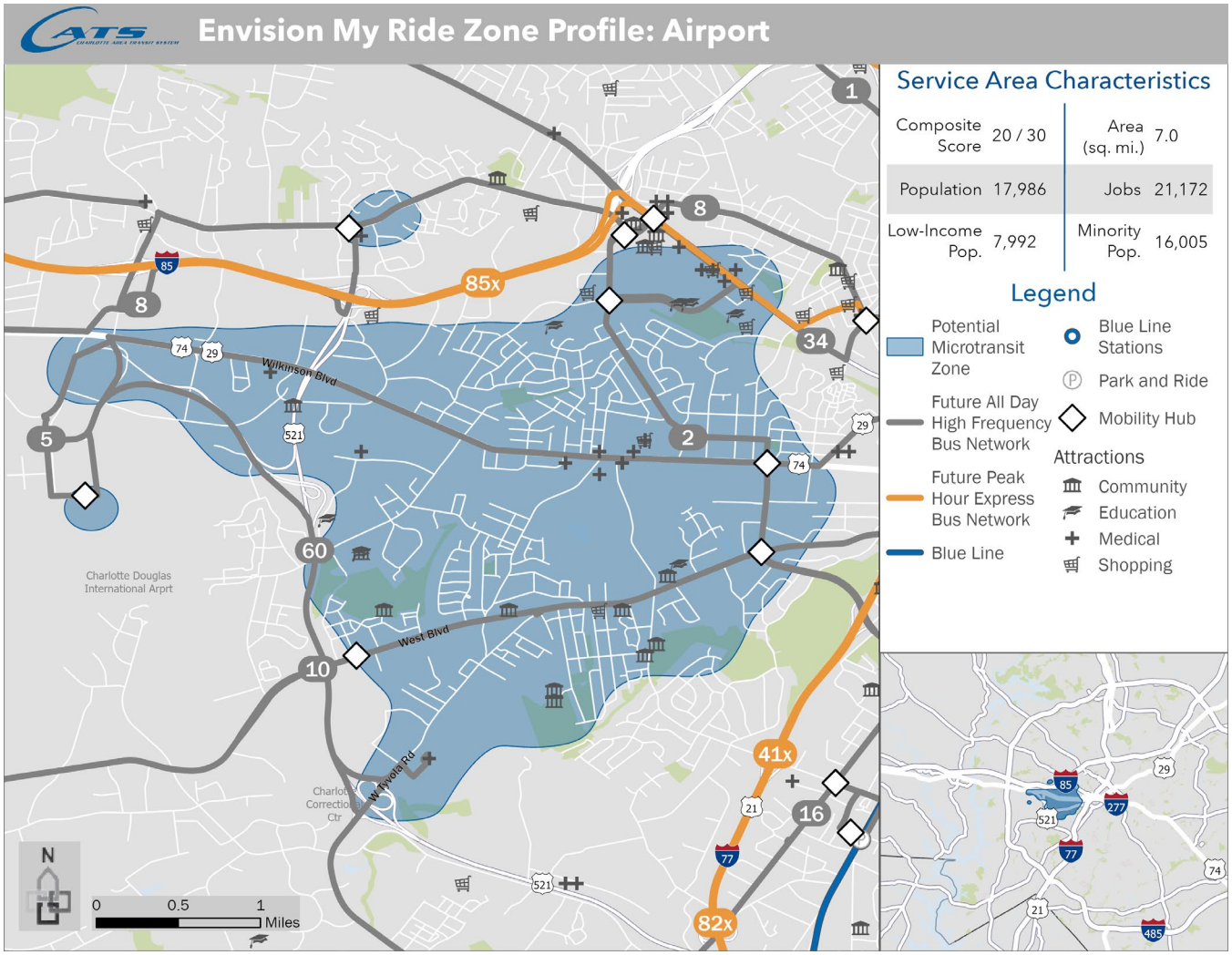


Airport: Fixed-Route Replacement

The Airport zone would provide service to the Charlotte Douglas International Airport, as well as a large area east of the airport along West Boulevard / NC 160, Wilkinson Boulevard / US 74, and Freedom Drive / NC 27. The zone will be served by CATS all day high frequency Routes 2, 5, 8, 10, 34, and 60, in addition to the peak hour express Route 85x. As a fixed-route replacement zone, the Airport zone could provide more productive service than the existing Route 235 circulator.

The zone contains six planned Level II and Level III Mobility Hub facilities. These would facilitate new or more direct connections to the airport from certain routes. Riders on Route 10 or 2, for example, might connect to the airport via the Level II facility at West Boulevard and Remount Road. Like the Matthews-Mint Hill zone, this zone could also provide connections between fixed-route service and within-zone destinations, including Harding University High School, the Charlotte Mecklenburg West Boulevard branch, retail locations, and medical service providers.

Figure 5: Airport Zone Profile



3 IMPACTS ON BUS PRIORITY STUDY

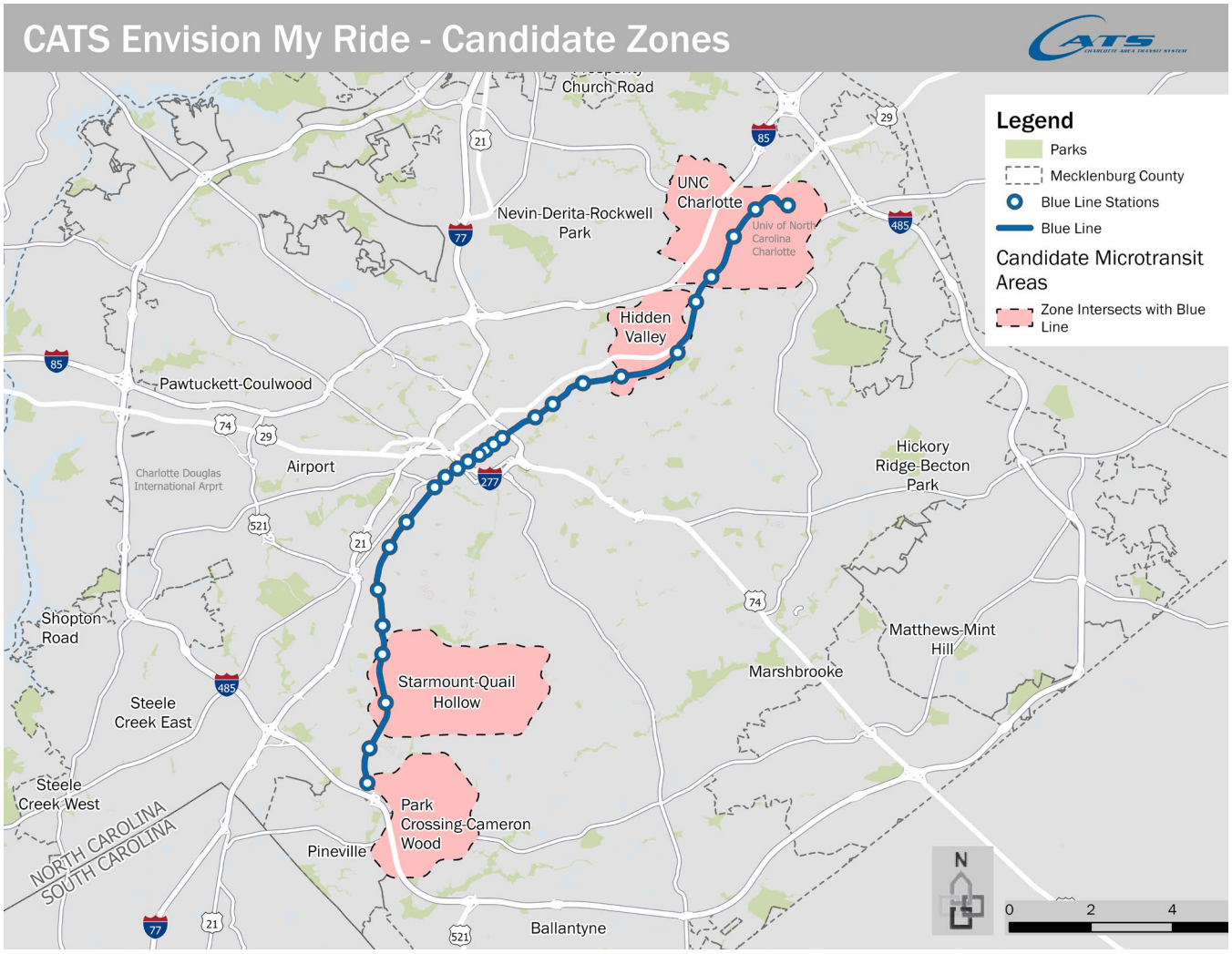
Microtransit in Charlotte may have several impacts on the corridors and analysis from the Bus Priority Study:

- **Changes in ridership** – implementing microtransit zones may have positive or negative impacts on high-frequency bus route ridership. Routes that act as feeders may connect new trip generators and attractions to corridors, increasing that corridor's appeal. Inversely, large microtransit zones that share a significant area with an existing corridor may be in direct competition for riders, and "steal" riders from the established corridor.
- **Changes in ranking –** the scoring methodology used to assess and rank the corridors did not account for any nearby or intersecting microtransit routes or zones. Depending on CATS' priorities, microtransit may or may not be included as an additional variable in route scoring or ranking directly.

4 FIRST- / LAST-MILE STRATEGIES

Specifically for this study, each zone was scored upon its ability to apply the first- / last-mile use case. There are four zones that specifically connected with the Blue Line (**Figure 6**), these were: UNC Charlotte, Hidden Valley, Starmount-Quail Hollow and Park Crossing-Cameron Wood. While only the UNC Charlotte zone is moving forward with the recommendation for a pilot program, to support the Charlotte 2040 vision of 10-minute neighborhoods, additional first-/last-mile connections to frequent routes and services will continue to be explored.

Figure 6: Zones with Connection to the Blue Line



APPENDIX A – PRIORITIZATION METRICS

Table 8 contains values for all the scoring metrics described in **Section 2.1**. Using the weights in **Table 7**, each zone is scored relative to the others on three different scenarios: Internal Circulation, First / Last-Mile, and Hard to Reach Areas / Transit Reliant Populations. Potential use cases were assigned based on zones' scenario scores, if a zone scored more than six for a particular scenario it was assigned to that use case, otherwise the highest scoring use case was applied to the zone. The Overall Score column in **Table 8** reports each zone's combined score as the total of all three scenario scores. In general, a higher Overall Score value indicates a zone performs better than others under all scenarios. Estimated vehicle need is based upon the best case scenario forecasted microtransit demand by time period within the zone.

Table 9: Prioritization Metrics

ZONE	POTENTIAL USE CASE	ESTIMATED VEHICLE NEED	INTERSECTION DENSITY (PER SQ. MI.)	POPULATION TO JOBS RATIO	ACTIVITY GENERATOR DENSITY (PER SQ. MI.)	LOW INCOME DENSITY (PER SQ. MI.)	MINORITY DENSITY (PER SQ. MI.)	TRANSIT FACILITIES	OVERALL SCORE
HUNTERSVILLE	Replacement	2	458	1.4	3	0.2	0.7	2	16
CORNELIUS-DAVIDSON	Replacement	2-3	669	1.4	3	0.4	0.7	5	13
SHOPTON ROAD	Circulation; First- / Last-Mile	2	586	4.6	1	0.3	2.3	1	11
STEELE CREEK WEST	First- / Last-Mile	2	363	3.9	3	0.6	2.7	2	22
BALLANTYNE	Circulation; First- / Last-Mile	2-3	599	1.8	3	0.4	1.7	3	13
PROSPERITY CHURCH ROAD	First- / Last-Mile	2	515	3.1	1	0.4	2.7	2	15
PAWTUCKETT-COULWOOD	Circulation	2	334	4.8	1	0.8	2.2	1	16
STEELE CREEK EAST	Circulation	2	361	0.9	1	0.4	2.5	1	10
MATTHEWS-MINT HILL	First- / Last-Mile	2-3	344	2.2	3	0.5	1.3	6	23
MARSHBROOKE	Circulation	2	334	2.1	3	1.3	3.1	1	20
HICKORY RIDGE-BECTON PARK	First- / Last-Mile; Circulation	2	391	6.3	1	1.1	3	3	25
STARMOUNT-QUAIL HOLLOW	Circulation	2	623	1.3	4	1.2	2.3	5	18

ZONE	POTENTIAL USE CASE	ESTIMATED VEHICLE NEED	INTERSECTION DENSITY (PER SQ. MI.)	POPULATION TO JOBS RATIO	ACTIVITY GENERATOR DENSITY (PER SQ. MI.)	LOW INCOME DENSITY (PER SQ. MI.)	MINORITY DENSITY (PER SQ. MI.)	TRANSIT FACILITIES	OVERALL SCORE
PINEVILLE	First- / Last-Mile; Circulation	2	344	0.9	1	0.7	1.5	2	13
PARK CROSSING-CAMERON WOOD	Circulation; First- / Last-Mile	2	505	1.4	5	0.8	1.7	1	12
NEVIN-DERITA-ROCKWELL PARK	Circulation; First / Last-Mile	2	393	2.4	2	0.8	3	2	24
AIRPORT	Replacement	2	472	0.8	7	1.2	2.4	5	20
HIDDEN VALLEY	First- / Last-Mile	2	500	2.9	7	2.2	4.9	4	22
UNC CHARLOTTE	Circulation	2-3	401	0.5	5	0.9	2.5	6	21