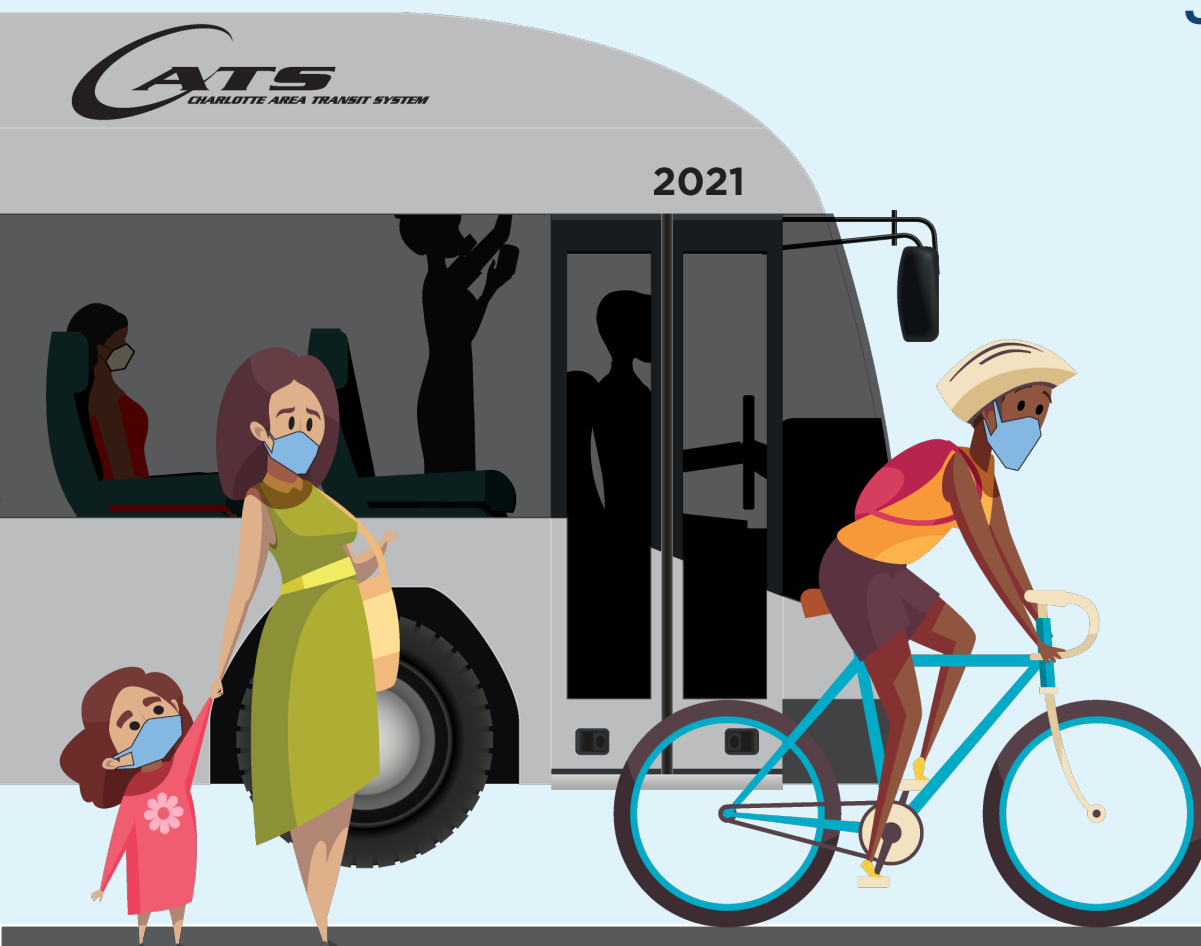


ENVISION MY RIDE



Bus Priority Study Final Report

July 2022



To the Charlotte Community,

Charlotte is a growing and thriving region, with new residents, businesses and developments emerging daily. More than ever, we need a transit system that rises to the challenge.

Our bus network provides vital service and access to riders throughout the Charlotte region. Investing in the CATS bus network supports economic mobility, affordable transportation choices, and community livability. This Envision My Ride: Bus Priority Study will help improve travel time, customer comfort, and reliability on the CATS bus network.

This plan explores our bold vision for a network of 22 high-frequency bus corridors that will minimize travel time to downtown jobs, businesses, shopping centers and recreational destinations. The new bus network aligns with CATS' commitment to provide:

- **Access**—Ease in which community members can use public transit to travel to places of employment, education centers, medical facilities, or to other life necessities.
- **Sustainability**—Environmentally-friendly transit options that work to decrease CO2 emissions in the greater Charlotte area and create a healthier community.
- **Equity**—Providing accessible and affordable transit solutions that benefit community members of all backgrounds and socioeconomic statuses.
- **Safety**—Creating and enforcing safety guidelines that ensure riders, employees, and contractors along the CATS system are able to travel without threats of violence, harm, or crime.

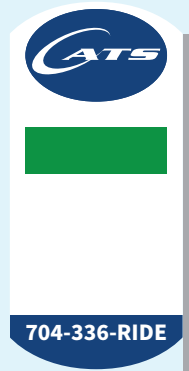
As this study enters its next phase, I look forward to continued collaboration with our municipal partners, residents and riders. I'd like to especially thank the CATS riders who shared their stories. Because of you, we are one step closer to achieving a better bus network for Charlotte.

Let's keep moving Charlotte forward.

Sincerely,

John M. Lewis, Jr.

CEO, Charlotte Area Transit System



Acknowledgments

City of Charlotte

Town of Huntersville

Town of Davidson

Town of Cornelius

Town of Pineville

Town of Matthews

Town of Mint Hill

Charlotte Regional Transportation
Planning Organization

Charlotte Department of Transportation

North Carolina Department of
Transportation

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Appendices Provided as Separate Files



Executive Summary

Executive Summary

Charlotte's rapid growth over the past decade has caused population and demographic shifts that have changed how residents use our bus system. Because the original hub and spoke design of our transit network no longer meets our community's needs, the Charlotte Area Transit System (CATS) began a major overhaul of the region's bus system to be a premium transit service.

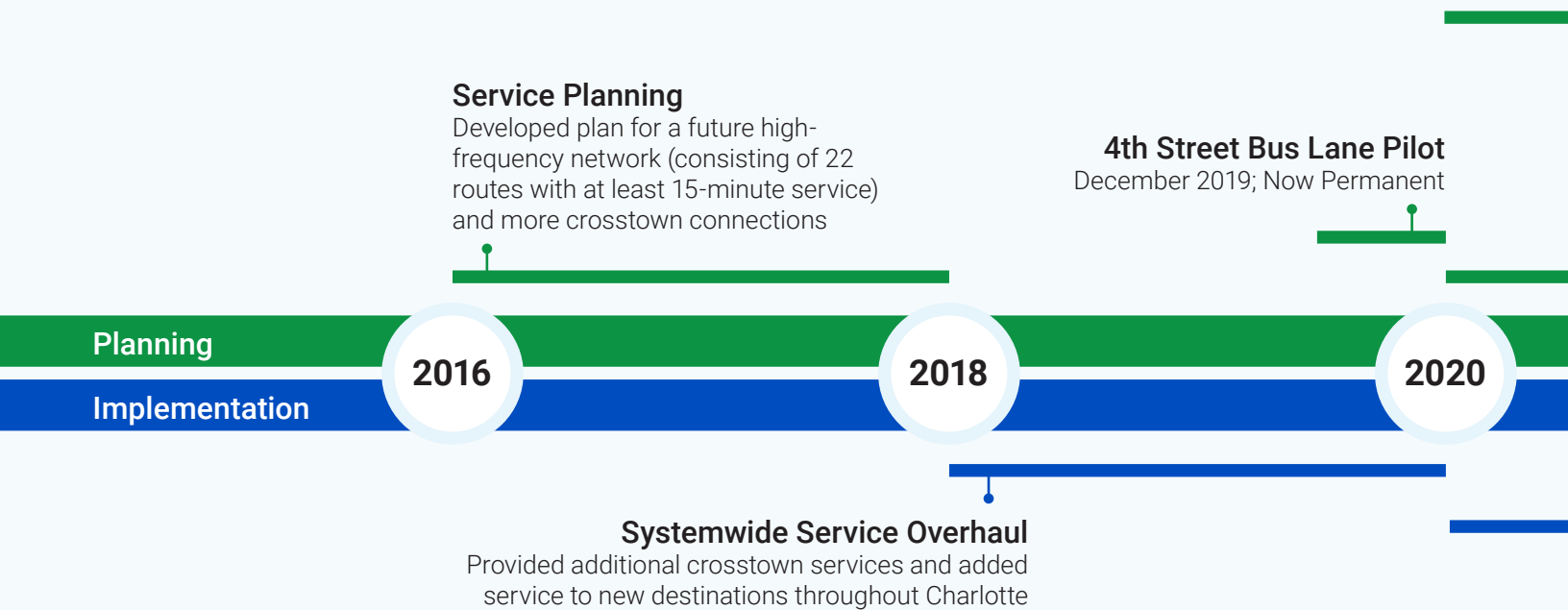
Improvements to existing services have come in three parts.

Part 1: Envision My Ride

Envision My Ride began in 2016 by reevaluating the network's services, facilities, and passenger experiences to better serve our current and future mobility needs. CATS worked closely with stakeholders to identify a high-priority network for focused services and then provided more frequent and reliable service along these routes. This reimagined CATS bus network offers more frequent service, provides better coverage, and supply consistent weekday and weekend service.

Project Timeline

The CATS Bus Priority Study is part of a much longer reimagining of Charlotte's bus system. Infrastructure investment does not happen overnight, and the foundation we lay today will ensure Charlotte's transportation system offers frequent, reliable, and direct service long into the future.



Part 2: Bus Priority Study

The Bus Priority Study began in 2021 and lays the groundwork for a major infrastructure investment program for Charlotte’s bus system. This new program includes:

- Roadway and traffic signal improvements that allow buses to travel faster and more reliably.
- Bus stop improvements that improve user experience, improve transfer opportunities, and upgrade stations to meet Americans with Disabilities Act (ADA) requirements.
- New service strategies (including on-demand microtransit) that connect communities to the high priority network.

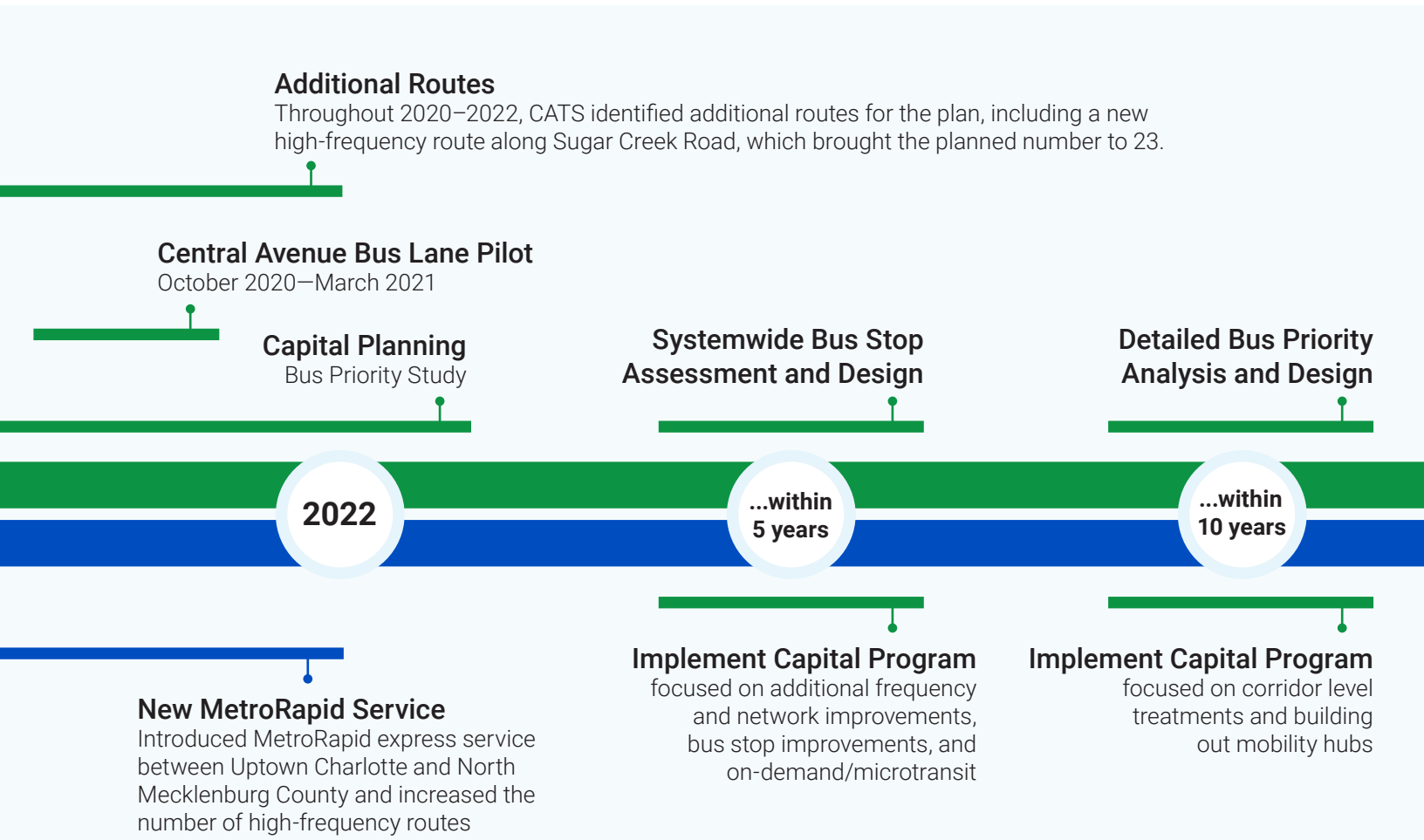
The CATS Bus Priority Study explains how these investments will work together to improve the overall effectiveness of Charlotte’s transit network. This study also provides a list of capital improvements that can be used to pursue federal funding for individual stations, corridors, and new service types.

Part 3: Delivering the Better Bus Network

CATS will use the plans, designs, and recommendations from CATS Bus Priority Study to fund and implement a better bus network.

What is capital planning?

CATS has already made great strides toward a better bus system. Changes to timetables and routes are helpful, but our bus system needs big changes too. Big changes, however, are also more expensive. **Capital planning** looks ahead to the major investments we need considering our larger goals, improvement opportunities, and potential funding sources.



Study Overview

Goals



1 Service Quality

Deliver convenient, frequent, and reliable service



2 Connectivity

Connect the priority bus network to all modes (rail, park and ride, bike share, and other mobility options)



3 Access

Enhance access to opportunities



4 Equity

Provide equitable transit for underserved and vulnerable populations



5 Resiliency

Offer resilient travel options

Public Involvement

Before we can build a bus system with premium amenities and service, we must know what our community needs. More than 5,000 people shared their visions for the future CATS bus system through a public survey. Learning about our residents' and riders' investment priorities, their most valued bus stop amenities, and their assessment of CATS service quality and access will help ensure our future projects meet their needs.

Transit Solutions & Evaluation Frameworks

This study includes toolkits and decision-making frameworks to help us tackle issues that discourage ridership, including passenger delay, long commutes, and uncomfortable waiting experiences. As CATS works to plan Charlotte's better bus network, we'll use this study's recommendations for key areas to make sure we're providing the right solutions in the right place:

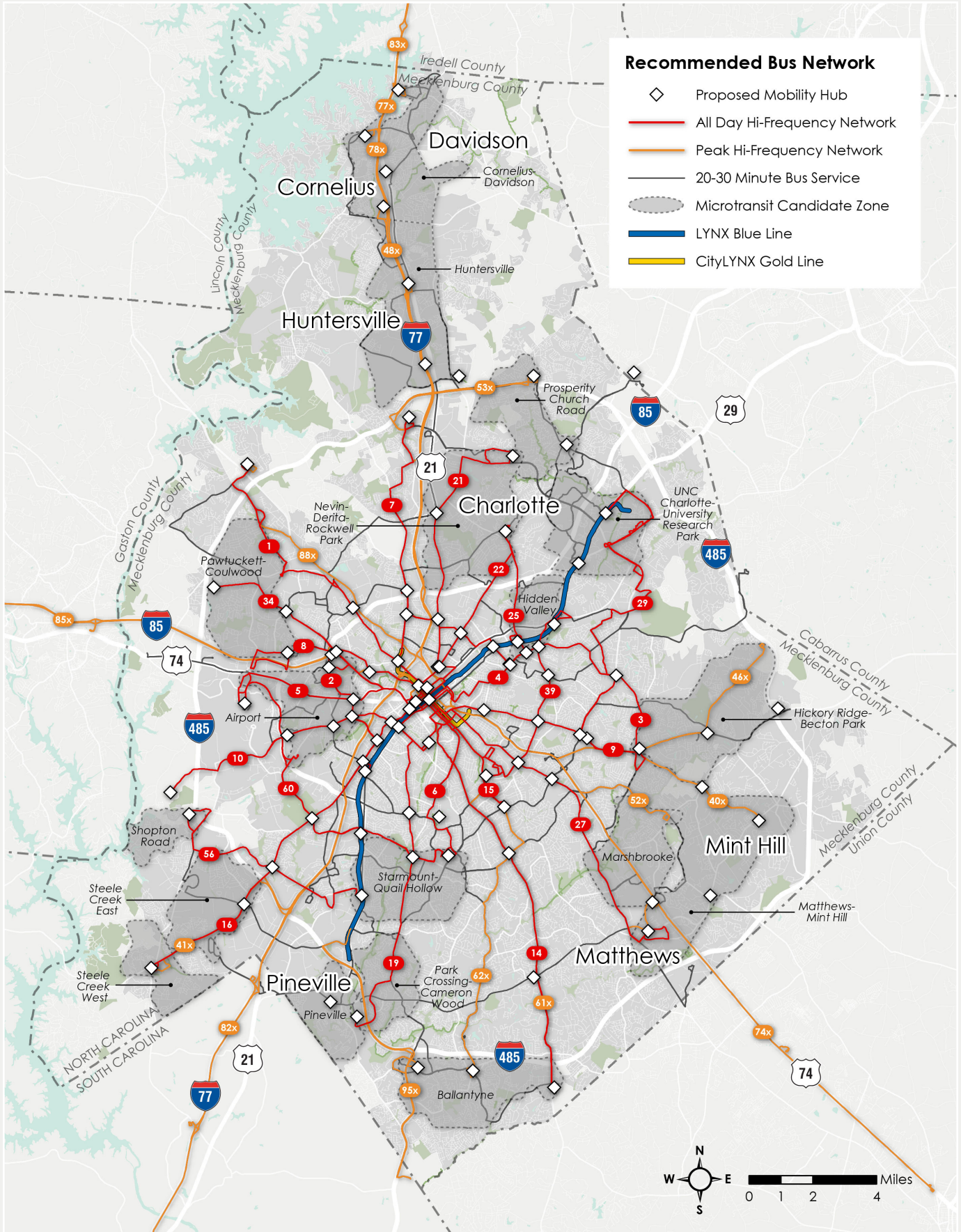
1. Focus Corridors
2. Passenger Facilities
3. Microtransit Zones

Recommendations

The Bus Priority Study is building a bold mobility vision to improve travel time, enhance customer experience, and increase access for existing and future riders. CATS will achieve this vision by implementing the following recommendations:

- A future high frequency network with 15-minute or better service.
- A priority network consisting of six focus corridors that include a higher level of priority treatment recommendations.
- New network and crosstown connections to key hubs and destinations.
- Mobility hub locations to facilitate transfers between high-frequency bus routes and other modes of travel.
- Microtransit zones to support on-demand transit services as well as first- and last-mile connectivity to frequent transit routes and key destinations.
- A microtransit strategy that includes on-demand services within recommended zones and first- and last-mile connections to the LYNX Blue Line.
- Strategies and amenity improvement recommendations to develop a bus capital program as identified in the Envision My Ride Bus Priority Study.
- Improve compliance with the American Disabilities Act (ADA) at bus stops.
- Increase cashless boarding to reduce dwell delay from fare payment.
- Revisit bus lanes in the future if corridor-level bus frequency and ridership increase or for locations where excess auto capacity creates opportunities for lane reallocation. Dedicated transit right of way would expand eligibility for federal funding.
- Improve bus stop data management to support decision-making.

Figure 1: Overall Recommendations





Introduction

Introduction

Building A Better Bus Network

In 2016, the Charlotte Area Transit System (CATS) began a major overhaul of the region’s bus network. Charlotte’s rapid growth over the past decade has caused population and demographic shifts that have changed how residents use our bus system. The current hub and spoke design of our current transit network no longer meets our community’s needs.

During the COVID-19 pandemic, we had a unique opportunity to address changing travel patterns and needs. The result is a re-imagined CATS bus network that will offer more frequent service, provide better coverage, and supply consistent weekday and weekend service.

By investing in our bus system, Charlotte and its surrounding communities can support a more useful, equitable, and modernized transit system for everyone.

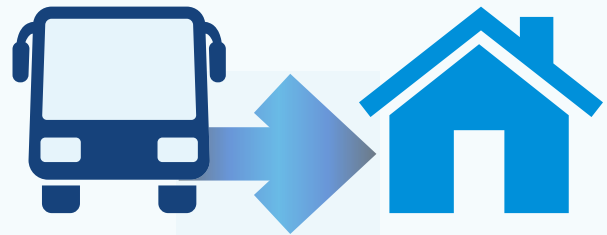
Envision My Ride

Beginning in 2018, the planning initiative Envision My Ride has worked to increase the reliability of Charlotte’s bus system. Working closely with the community over the past five years, we have re-imagined how the network’s route structure, frequency, and connectivity can better serve existing riders, attract new riders, and improve system productivity.

Envision My Ride lays the groundwork for investments that will:



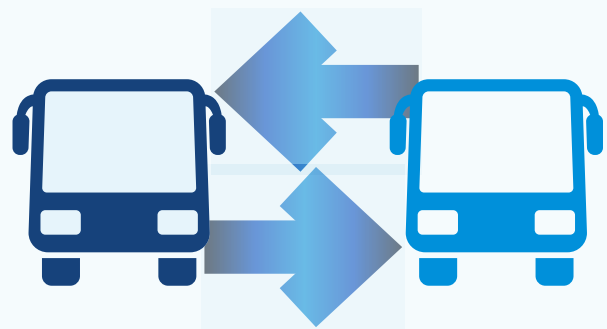
Create more frequent bus service



Create more direct bus service



Develop more crosstown connections



Increase connectivity between different routes

Why Change the Bus System?

For too long, bus systems throughout the United States have been neglected and left behind. Inadequate bus service disproportionately impacts communities of color, people with low incomes, and people with disabilities. A better bus network for Charlotte will help our community be open, accessible, and connected for everyone.

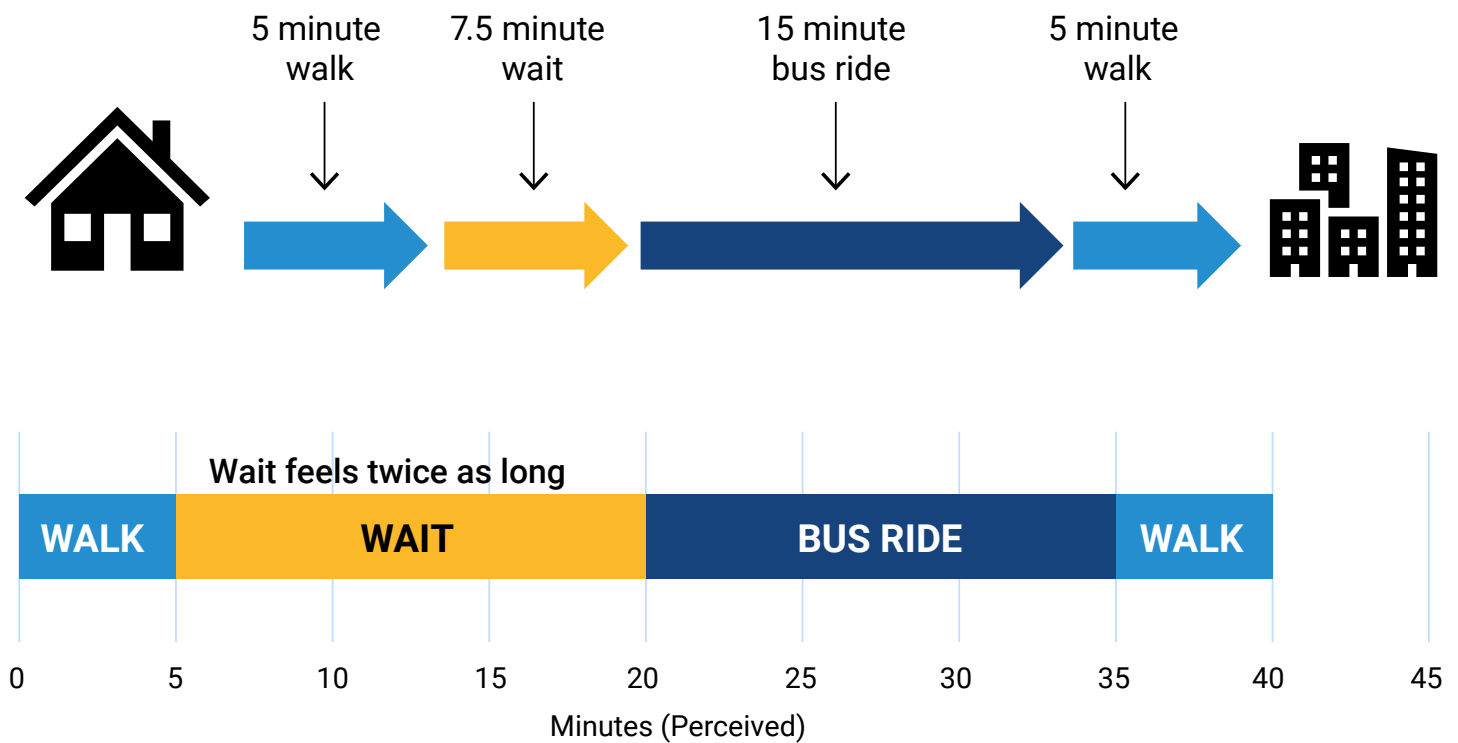
Our current system does not meet today's needs.

While CATS provides many important connections for bus riders throughout the Charlotte area, the network doesn't provide enough service for people who rely on transit the most. Our current bus network faces four central challenges:

- **It has a hub and spoke structure** that requires riders to travel to uptown Charlotte regardless of their destination.
- **It has limited crosstown connections** that lengthen commute times for many riders.
- **It favors peak-hour, weekday trips** at the expense of other time periods, particularly weekends.
- **It lacks modern infrastructure** like comfortable waiting areas and tools to communicate information to passengers.

Today, CATS has only five bus routes that arrive every 15 minutes or more frequently: Route 7—Beatties Ford Road, Route 9—Central Avenue, Route 16—South Tryon Street, Route 27—Monroe Road, and Sprinter Airport. These frequency levels are typically weekday-only, so weekend riders often experience much longer wait times.

Figure 2: Example Trip (Home to Work)



Long wait times, whether real or perceived, can discourage people from riding the bus. Wait times often feel twice as long than they are. Better stop infrastructure can help reduce the perception of wait time.

Investing in the CATS bus system will support mobility, equity, and modernization goals.

Buses move more people.

The CATS bus network carries 60% of the total system's ridership. Depending on traffic flow, bus ridership, and bus infrastructure, buses move 70–400% more people than cars.¹

Bus system investment advances equity.

Of all the transportation investments the Charlotte area can make, improving the bus system is the number one way to address transportation equity. Residents from low-income families, communities of color, and households without a vehicle are more likely to rely on bus transit. People who do not drive, such as older adults, young teenagers, and folks with disabilities, also are more likely to need reliable bus transit to access their destinations.

Bus system investment will help modernize our transportation network.

Improving wait times, upgrading waiting areas, and new ways to communicate real-time passenger information will make the bus a more appealing and realistic option for Charlotte residents and visitors.

Investing in the bus system advances a regional vision.

The CATS bus system is a critical part of Charlotte's connected future. Local and regional plans work toward an equitable, authentic, integrated, and resilient Charlotte and strive to create a safe, connected, and accessible transportation network. Key plans include:

- Charlotte Future 2040 Comprehensive Plan
- CATS 2030 Transit Corridor System Plan
- Charlotte Strategic Mobility Plan
- CONNECT Beyond Regional Transit Study

A better bus system will also support other transit initiatives in Charlotte and the wider region. Charlotte and its surrounding communities are working hard to support transit-oriented development (TOD), which concentrates mixed-use and pedestrian-friendly communities around transit stations. Reliable bus service is a key component to successful transit-oriented development because buses help people make those vital first- and last-mile connections.

¹ <https://nacto.org/publication/transit-street-design-guide/introduction/why/designing-move-people/>

What Changes are Coming?

Recommendations from Envision My Ride will create a bus network that offers more convenience and access for everyone. Key changes include:

More Frequent Service

CATS is working to provide more bus service that arrives at 15 minutes or better every day, weekends included. The future high-frequency bus network will expand frequent service from five to 23 routes and serve major corridors that connect riders to important destinations, including Providence Road, Freedom Drive, West Boulevard, and Eastway Drive.

For a full list of the future high-frequency bus routes, see appendix A.

Better Coverage

To reduce coverage gaps and the amount of time it takes to reach key destinations, CATS is proposing improvements to connect to existing and future developments that are currently outside of the existing network. The plan also includes increased crosstown service including connections between the LYNX Sugar Creek Station and Derita community, Waverly to Ballantyne, and Northlake to the LYNX JW Clay Station.

For a full list of the proposed connections, see appendix A.

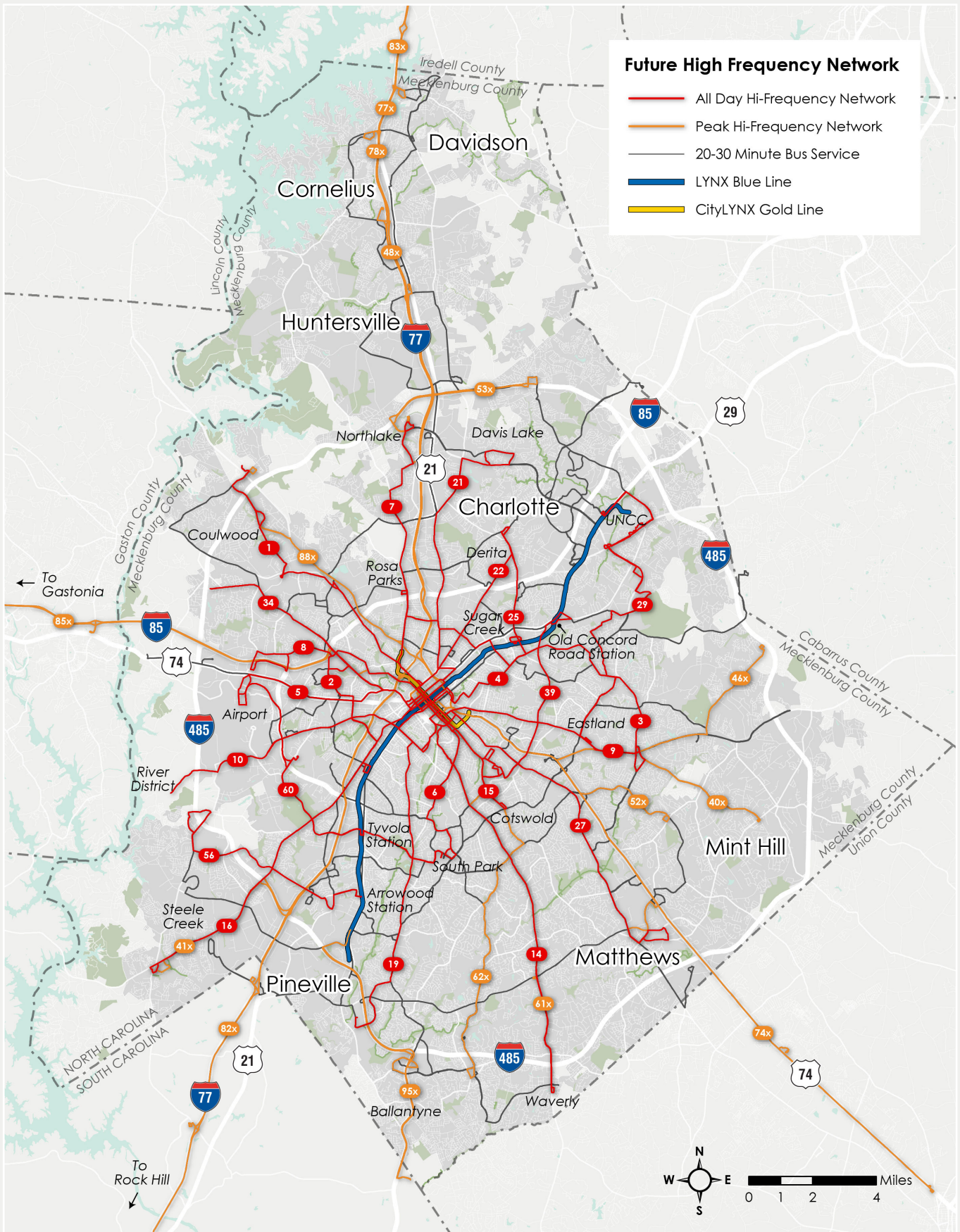
More Weekend Service

The existing CATS network favors weekday commutes, meaning riders are often left with limited-service levels on weekends. To make transit a viable travel option on weekends, CATS will expand weekend service hours and frequency.

For proposed route schedules by day, see appendix A.

More Frequent Service

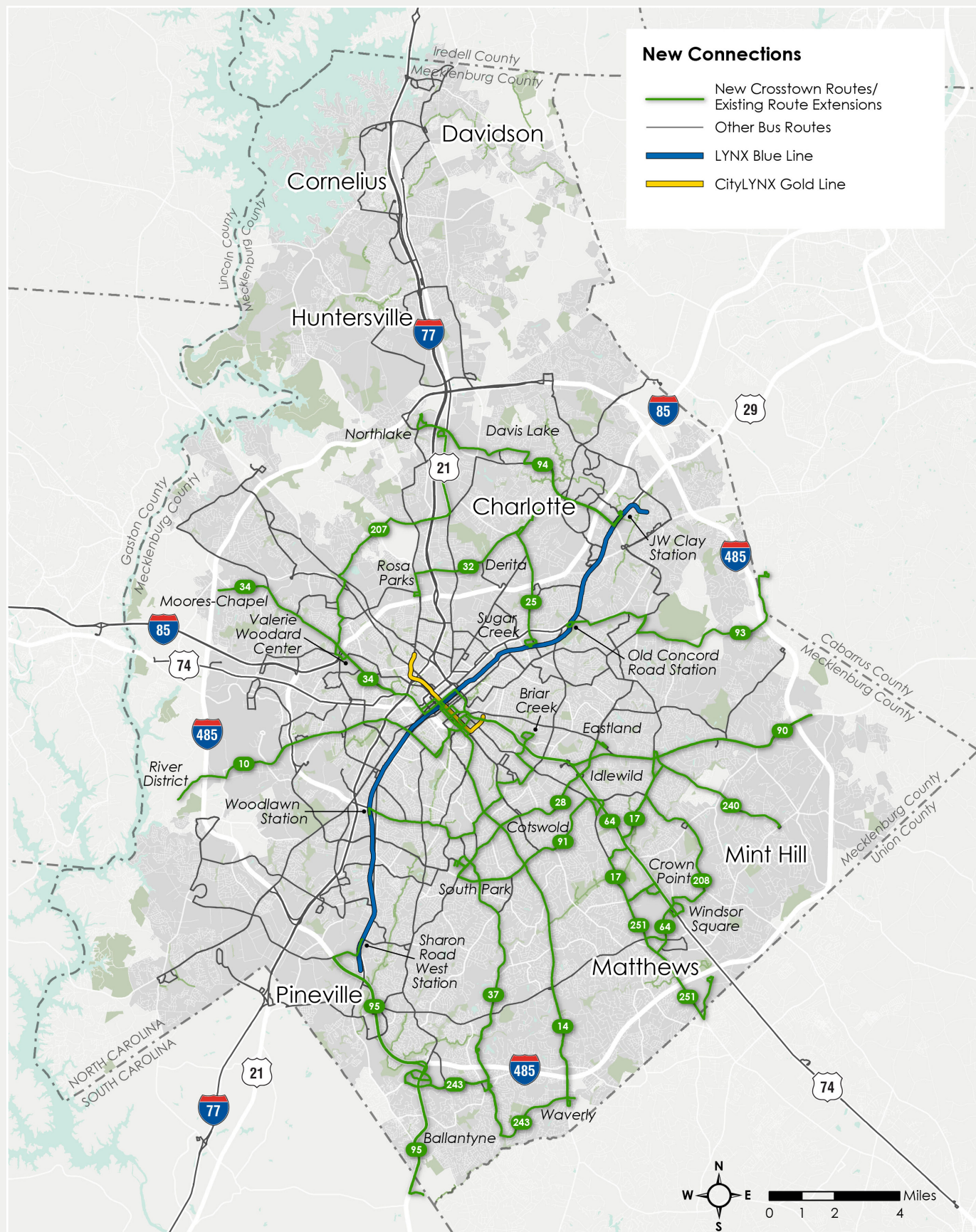
Figure 3: Future High-Frequency Network



Better Coverage

Figure 4: New Connections


(Extending existing routes and creating new crosstown routes)



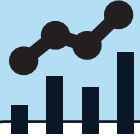
Determining the Future Network

To help ensure our future bus network makes accessible and equitable changes that meet our collective goals, CATS worked through the following process:

Service Planning

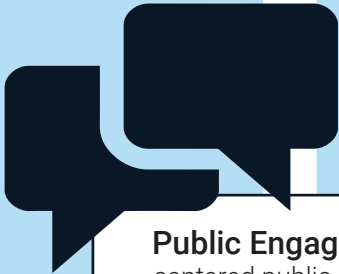


Background Document Review—To understand how the CATS bus network fits into Charlotte region’s transportation, development, and quality-of-life goals, agency staff reviewed existing planning documents, including area and neighborhood plans, the CATS 2030 System Plan, and corridor and regional mobility studies.



Market Analysis—CATS examined current and projected population, employment, major activity center, and demographic characteristics to determine areas in need of transit services.

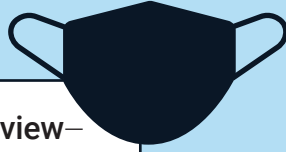
Equity Analysis—To ensure proposed recommendations would not disproportionately impact riders from minoritized communities or those with low incomes, CATS conducted an equity analysis with both Title VI and environmental justice components. Envision My Ride is an ongoing project, and we will repeat this process before implementing any major route changes.



Public Engagement—CATS centered public engagement in Envision My Ride from the outset. Surveys, public meetings, and digital outreach helped CATS identify and draft a network that meets the Charlotte community’s core bus service values.

Existing Conditions—To determine whether route patterns and frequency levels could be adjusted to better serve key areas, CATS studied the existing system’s routes, ridership, frequency, service span, and future land development plans.

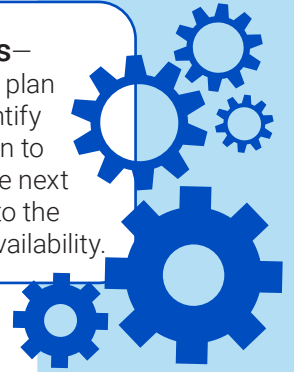




COVID-19 Impact Review—

Due to social distancing requirements, COVID-19 pandemic produced dramatic changes in transit ridership. Pandemic data trends—including current ridership, origin-destination, and employment data—were combined with past data trends to inform the project’s recommendations.

Implement changes—
After the Envision My Ride plan is adopted, CATS will identify funding sources and begin to implement changes over the next five to 10 years according to the tier structure and funding availability.



We are Here

Capital Planning



Bus Priority Study—CATS developed capital recommendations to improve the passenger experience connecting to, waiting for, and traveling on the bus.

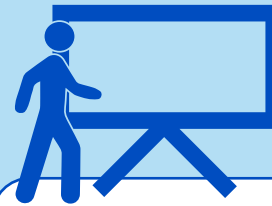
Package and prioritize improvements based on need and funding—

CATS will divide route proposals into recommended tiers for future implementation based on the area’s need, demand, and funding. For each proposed route, CATS will work to evaluate cost, operational needs, and Title VI impacts. Because community needs change over time, staff will evaluate routes prior to implementation to ensure that recommendations are still relevant to passenger needs.



Present final proposal to CATS leadership for adoption—

CATS staff will present the final Envision My Ride plan—including complete route summaries and system map—to CATS leadership for adoption.



What’s next?






Bus Priority Study

The Bus Priority Study continues the work of Envision My Ride and lays the groundwork for a major infrastructure investment plan for Charlotte’s bus system. This study explains how we arrived at this plan and establishes the framework that will guide our investment opportunities moving forward.

Envision My Ride established the foundation for the future CATS bus network. The Bus Priority Study builds upon this effort and includes capital recommendations to improve the overall passenger experience. Corridor-based evaluation of infrastructure investment needs started with the original 22 high-frequency routes CATS identified during Envision My Ride. (The Sugar Creek Road route was not included in this first analysis because it was added later during the study process.)

Study Goals

The study is driven by five goals, each of which can be broken down into specific objectives.

Goals	Objectives
 <p>Service Quality Deliver Convenient, Frequent, and Reliable Service</p>	<ul style="list-style-type: none"> Offer convenient, efficient transit and direct transit trips Provide frequent transit service Provide reliable transit service
 <p>Connectivity Connect the Priority Bus Network with All Modes</p>	<ul style="list-style-type: none"> Provide convenient bus-to-bus connections Provide convenient bus-to-rail connections Provide connections to trails and all-ages-and-abilities bike/scooter facilities
 <p>Access Enhance Access to Opportunities</p>	<ul style="list-style-type: none"> Provide access to existing employment, education, fresh foods, healthcare, and recreational facilities Provide access to future growth areas
 <p>Equity Provide Equitable Transit Access for Underserved and Vulnerable Populations</p>	<ul style="list-style-type: none"> Provide transit service to populations with low jobs to skills match Provide transit service to areas with affordable housing options Provide better transit service to populations that may rely on transit as their primary means of transportation Provide better transit service to people with disabilities and people from minoritized backgrounds
 <p>Resiliency Offer Resilient Travel Options</p>	<ul style="list-style-type: none"> Offer transit service that is flexible and can transform to new and emerging technologies

Plan Highlights

This Bus Priority Study lays the foundation for CATS' capital investment program by providing a series of tools, improvements, decision-making frameworks, and funding strategies. Together, these features will help guide CATS staff as they identify, plan, fund, and implement infrastructure projects at both local stops and the network over the next five to 10 years.

This plan is organized into the following sections:

Public and Agency Involvement

The foundation of this study has been a robust engagement strategy that provided opportunities for Charlotte residents to discuss their needs and what changes would improve their experiences riding the bus. These outreach efforts spanned the entire study and received input from over 5,000 people.

Bus Network Solutions

The Bus Priority Study begins by examining the entire network. Then, it articulates how agency staff can address challenges and opportunities using toolkits developed for regional, corridor, and station-level planning. These toolkits will help us select the right tool to solve a particular bus network issue. Highlights include an improvement library, problem-solving matrix, and a guide to help staff categorize and match amenities to passenger facilities.

Focus Corridors Identification & Evaluation

To find solutions for bus network corridors that need the most help, we created a performance measure framework to prioritize and recommend treatments for six of the 22 high-frequency routes identified by the first part of Envision My Ride.

Passenger Facility Toolkit

This toolkit defines three types of bus stops, then sets a method for deciding where to put which kind and what amenities to include. The passenger facility toolkit also explains how to locate new bus stops and how to decide whether to relocate or remove existing stops to improve bus travel times.

Microtransit Zone Identification & Evaluation

The microtransit evaluation looks systemwide to identify areas with little or no service where a new 'microtransit' service model could create connections to the bus network for new and existing passengers.

Funding Strategy

This section identifies how a capital investment program for the CATS bus system should be allocated by project type and funded from a mix of local and federal sources over the next 10 years.

Centering Accessibility

ADA Bus Stop Improvement Plan

In 1990, the Americans with Disabilities Act (ADA) set accessibility standards for all public facilities. CATS has used this Bus Priority Study as an opportunity to update bus stop designs to ensure that existing and future bus stops meet ADA requirements.

Public & Agency Involvement



Public & Agency Involvement

To find the best solutions for the CATS bus network, we listened to the people who would be most affected by bus system and roadway changes.

During the study, we held three virtual and 12 pop-up community meetings to collect feedback from bus riders at transit stops across the system. We also distributed an online public survey to better understand what parts of the system were working well and what parts had challenges. The survey was promoted online through

social media and the project website, and staff also distributed the survey at the eight pop-up events held in the first phase of outreach. This effort reached over 5,000 respondents. During the final phase of engagement, opportunities were provided for public comment on the final recommendations both at the pop-up community meetings and through an online public comment card. These public involvement activities helped to confirm the goals and objectives of the study, identify the most important amenities and treatments, and assess how future investments might impact of ridership and mode choice.

CATS bus riders were particularly important public partners for this study, and we also worked closely with agency stakeholders as many of our infrastructure recommendations will require partnerships with the City of Charlotte, NCDOT, and towns in Mecklenburg County.

Public Engagement Calendar

2021

Winter

Spring

Summer

Round 1

Community Meeting

May 20, 2021 (Virtual)

We gathered feedback on passenger values, preferences, needs, and barriers to riding the bus.

Pop-up Events

Thursday, June 3, 2021
(Lawyers Road Park & Ride)

Thursday, June 17, 2021
(485 Park and Ride)

Tuesday, June 8, 2021
(Rosa Park Transit Center)

Tuesday, June 22, 2021
(Sugar Creek Park and Ride)

Thursday, June 10, 2021
(JW Clay Parking Deck)

Thursday, June 24, 2021
(Charlotte Transportation Center)

Tuesday, June 15, 2021
(SouthPark Transit Center)

Key Findings

- Access to jobs, schools, grocery stores, healthcare, parks, and other everyday destinations is a top priority.
- Riders want to see real-time bus arrival information at bus stops.
- Bus operators say fare collection is the biggest source of delay and riders say that paying on-board is frustrating.
- Many riders who do shift work or have weekend activities like church rely on weekend and off-peak service.

Agency Stakeholders

- Charlotte Department of Transportation (CDOT)
- Charlotte Planning, Design, and Development Department
- Charlotte Regional Transportation Planning Organization (CRTPO)
- CATS bus operators
- North Carolina Department of Transportation (NCDOT)
- Towns of Cornelius, Davidson, Huntersville, Matthews, Mint Hill, and Pineville

2022

Fall

Winter

Spring

Round 2

Community Meeting

Tuesday, October 26, 2021 (Virtual)

We gathered feedback on types of treatments for initial corridors.

Pop-up Events

Tuesday, November 2, 2021

(Charlotte Transportation Center)

Thursday, November 4, 2021

(Charlotte Transportation Center)

Round 3

Community Meetings

Thursday, March 3, 2022

Charlotte Transportation Center (CTC)
We shared refined recommendations.

Tuesday, March 15, 2022 (Virtual)

We shared refined recommendations.

Pop-up Events

Tuesday, March 22, 2022

(Huntersville-Northcross Park & Ride and Cornelius Park & Ride)

Thursday, March 24, 2022

(Northlake Mall Park & Ride and Huntersville-Gateway Park & Ride)

Tuesday, March 29, 2022

(Albemarle Park & Ride)

and Matthews Park & Ride)

Goals and Priorities Survey

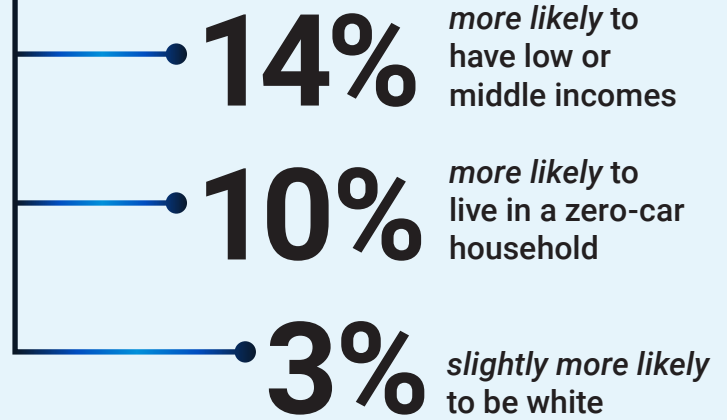
We surveyed more than 5,000 Charlotte area residents to learn what riders and residents most want to see in the CATS bus system. The survey asked respondents to rank their overall goals for the CATS bus system, identify their top five investment priorities, and rank bus stop amenities.

The online survey was advertised during the first community meeting and open from May 18, 2021 to June 25, 2021. The project team held seven pop-up events to publicize the survey, distribute paper surveys, and answer respondents' questions. To incentivize survey completion, CATS offered \$25 gift cards to 10 winners of a drawing.

Survey Results

Demographics

Compared to the regional average, respondents were:



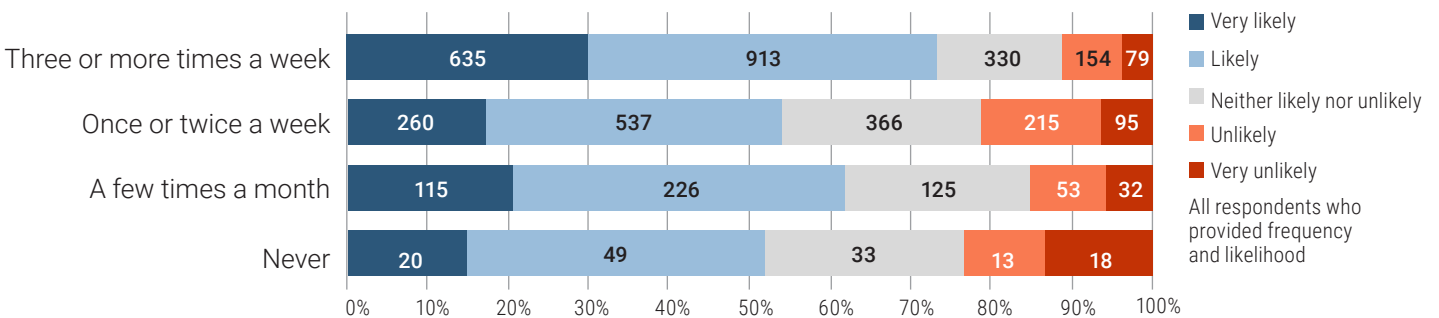
Goals, Investment Priorities, and Amenities

Respondents most want to see CATS invest in service quality and access to key destinations. Real-time arrival information and seating are the two most important bus stop amenities for Charlotte area residents.

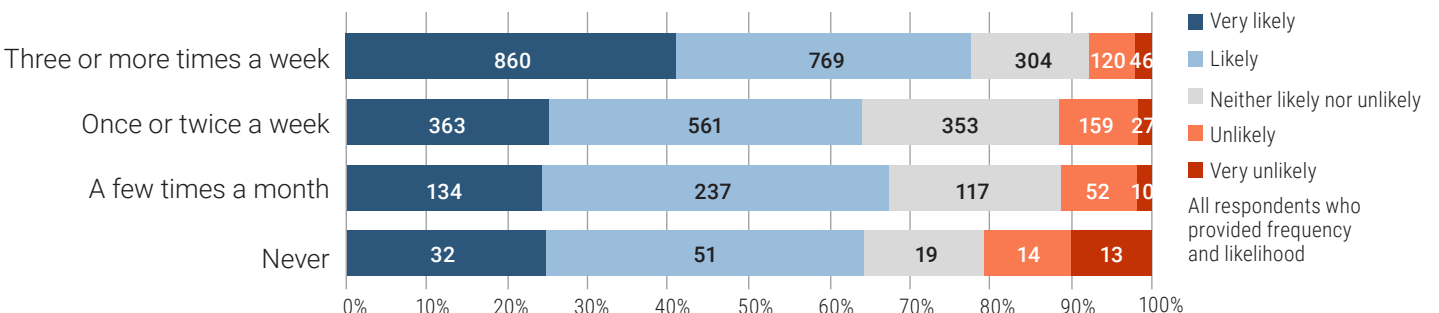
Improvements Impact Rider Choices

Survey respondents confirmed that bus lanes and stop amenities would not only encourage frequent riders to ride even more but that these improvements would persuade new riders to begin using bus services.

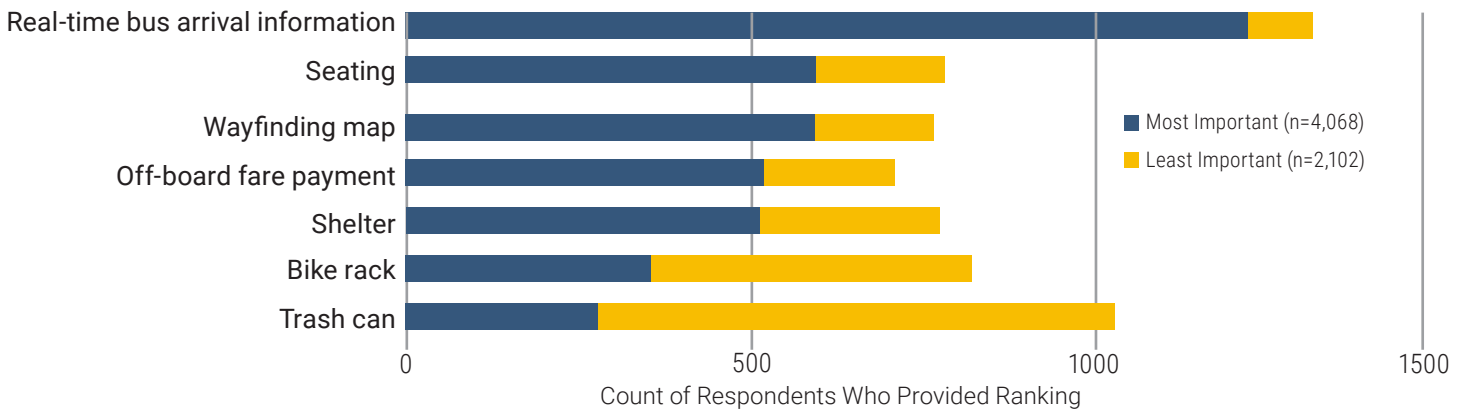
Likelihood of Riding More if Bus Lanes Are Installed (By Frequency Before Pandemic)



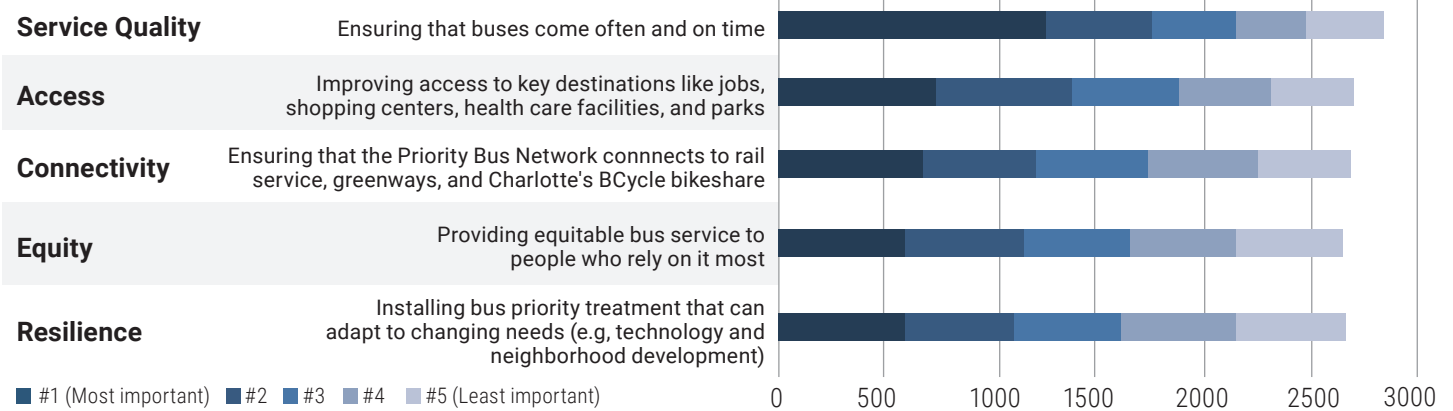
Likelihood of Riding More if Bus Stop Amenities Are Installed (By Frequency Before Pandemic)



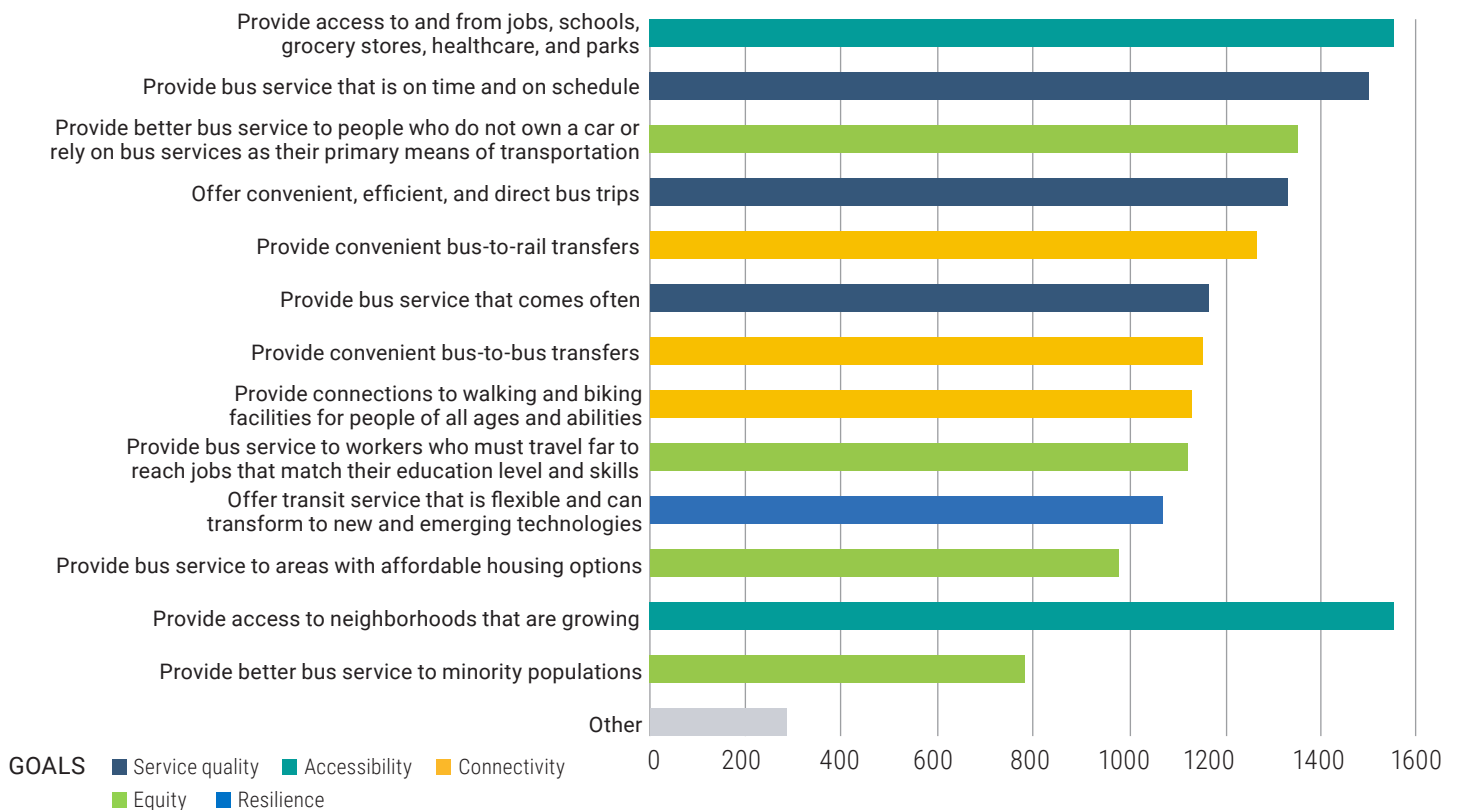
Most and Least Important Bus Stop Amenities



Goals by Ranking: All Respondents



Investment Priorities (Each Respondent Selected Their Top 5 with No Order): All Respondents



Rider Stories

The best way to understand what it's like to ride a CATS bus is to ask the people who ride them. A series of video interviews helped the project team learn more about rider experiences and concerns. Here are some highlights from those conversations:



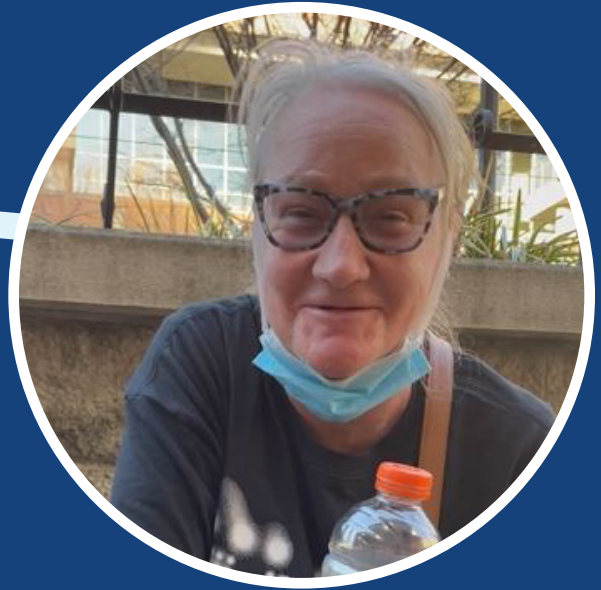
"I use public transportation to go to school, go shopping, go to work, and see friends—I use public transportation like it's my own car. Public transportation is vital to me because I don't own a car, and I don't want to own a car...Public transportation gives me the independence to go wherever I want to go. More reliable buses would give us a better quality of life and independence."

— Ebony



Public transportation is important to me to get to places I need to go, seeing as I don't have a vehicle. I deem it necessary to get around Charlotte."

— Brandi



I use the bus to go look for a job. The bus is my only means of transportation."

— Mary





CATS gets me from point A to point B. My typical ride has got a lot of stops. From the time I get on the bus 'til the time I get downtown is a lot of stops. Public transportation is important to me because I don't have transportation right now. A lot of people aren't fortunate enough to have transportation. You know, you can get on the bus, you can get bus passes—it's convenient. More service would mean I would have a little more time to come and drink some coffee, eat some breakfast, and be ready to go to work. By the time I get on the bus with a lot of stops and a lot of people on the bus, it could be slow. I could be early or I might be late."

— *Nathanial*



More service would help me a great deal. Maybe I could get to the doctor a little bit early, and they could get me in and out a little earlier. I don't like to go anywhere late, and when I go to church, I definitely don't want to be late. Sometimes I can't get there like I want to because of the bus being late."

— *Mary*





Bus Network Solutions

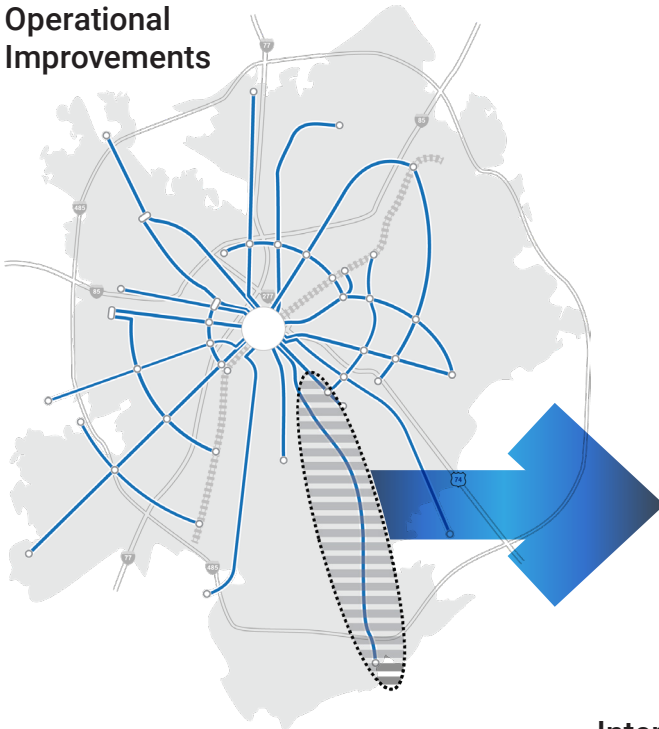
Bus Network Solutions

In this section, we explore the many solutions that CATS can use to enhance the speed, reliability, accessibility, and comfort of the bus system.

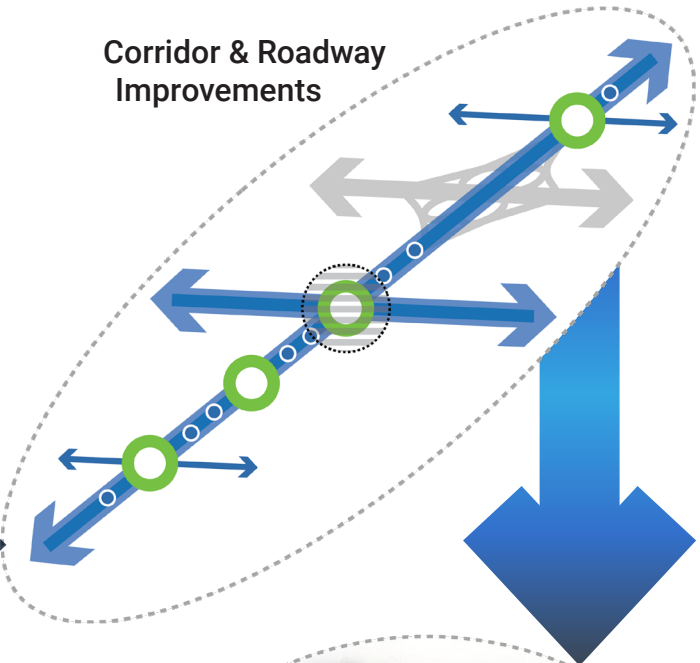
Improvement Library

CATS has a variety of improvements it can use to make your bus trips faster, more reliable, and more enjoyable and help connect you to other mobility options. This improvement library provides an overview of our improvement options organized by four levels:

Systemwide Operational Improvements



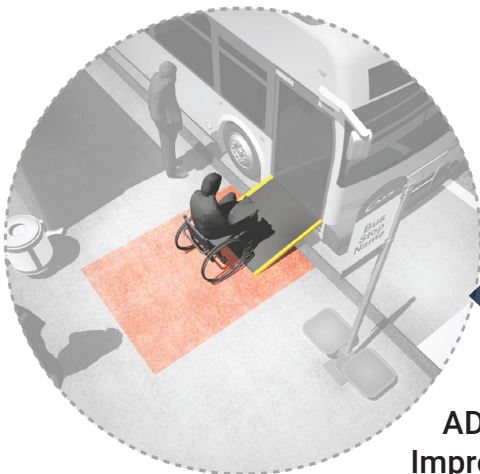
Corridor & Roadway Improvements



Station & Intersection Improvements



ADA Improvements



CATS is also exploring how to use shuttles or vans (microtransit) to provide neighborhood circulator or first- and last-mile service to areas not currently well-covered by existing services

Systemwide Operational Improvements



Level Boarding

- Aligns the bus door with the curb.
- Changes existing buses or stop infrastructure so the curb aligns with the height of bus doors.
- Key benefits
 - Supports people with reduced mobility and those who use wheelchairs or other mobility aids.
 - Removes the need for buses to kneel or fold out ramps.

All-Door Boarding

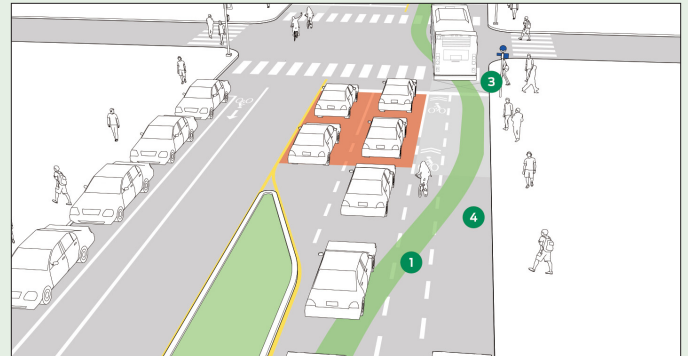
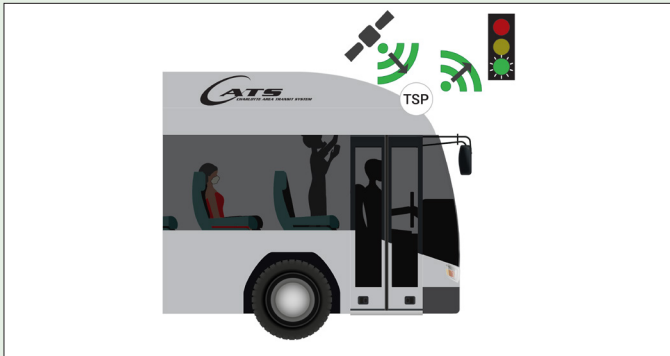
- Allows passengers to board or alight from both doors.
- Provides more space for boarding and alighting.
- Shortens lines and wait time to board.
- Can combine with
 - Stations and stops where passengers prepay
 - Buses with payment processing at both doors



Faster Fare Collection

- Remedies a major cause of dwell delay.
- Reduces transaction time by encouraging riders to use payment apps or scannable fare cards rather than cash.
 - Can be systemwide or implemented at specific high-dwell stops.
- Options:
 - Off-board fare collection—fare is collected prior to boarding, either digitally via app or in person via pay station. Proof of payment can be shown to the bus operator.
 - Scannable fare cards

Corridor and Roadway Improvements



Transit Signal Priority (TSP)

- Lets buses communicate with traffic signals.
- Extends green light for buses approaching an intersection and allows approaching buses to request a green light.

Queue Jumps

- Allow buses to bypass traffic at congested intersections.
- Give buses a special traffic light that allows them to advance through the intersection ahead of traffic.



Dedicated Bus Lanes

- Reduces re-entry delay by removing the need for buses to re-enter traffic.

Yield to Bus Rules

- Can reduce delay, depending on driver compliance.
- Size and type of signage and degree of enforcement can affect driver compliance.

Station and Intersection Improvements



Bus Bulb-Outs

- Reduces re-entry delay by removing the need for the bus to re-enter traffic.

Bus Stop Amenities

- Amenities improve the waiting experience, making the wait feel shorter.
- See the passenger facility toolkit for more details.



Bus Stop Consolidation

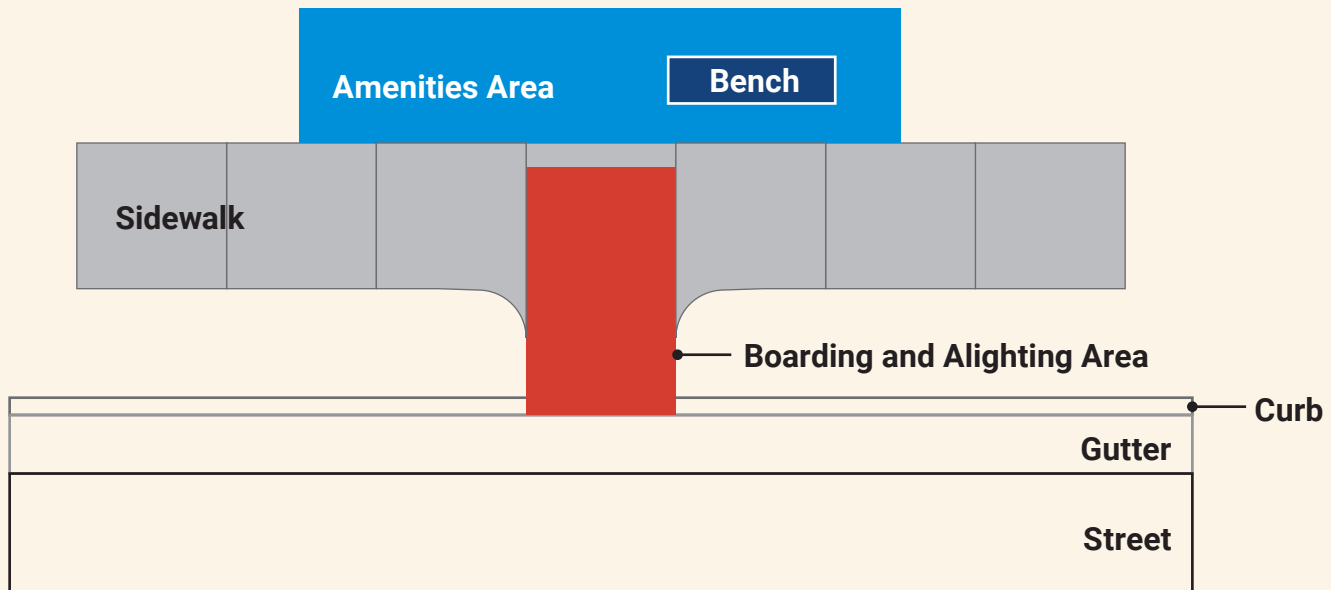
- Fewer stops in some areas can improve bus speeds.

Accessibility Improvements

To provide riders with disabilities equal access to bus services, CATS is committed to providing accessible bus stops and riding experiences.

In alignment with the City of Charlotte’s ADA Transition Plan, we have developed standards to ensure any bus stops we build or upgrade are accessible for people who use mobility aids like wheelchairs, walkers, scooters, canes, and crutches.

Sample Bus Stop Design

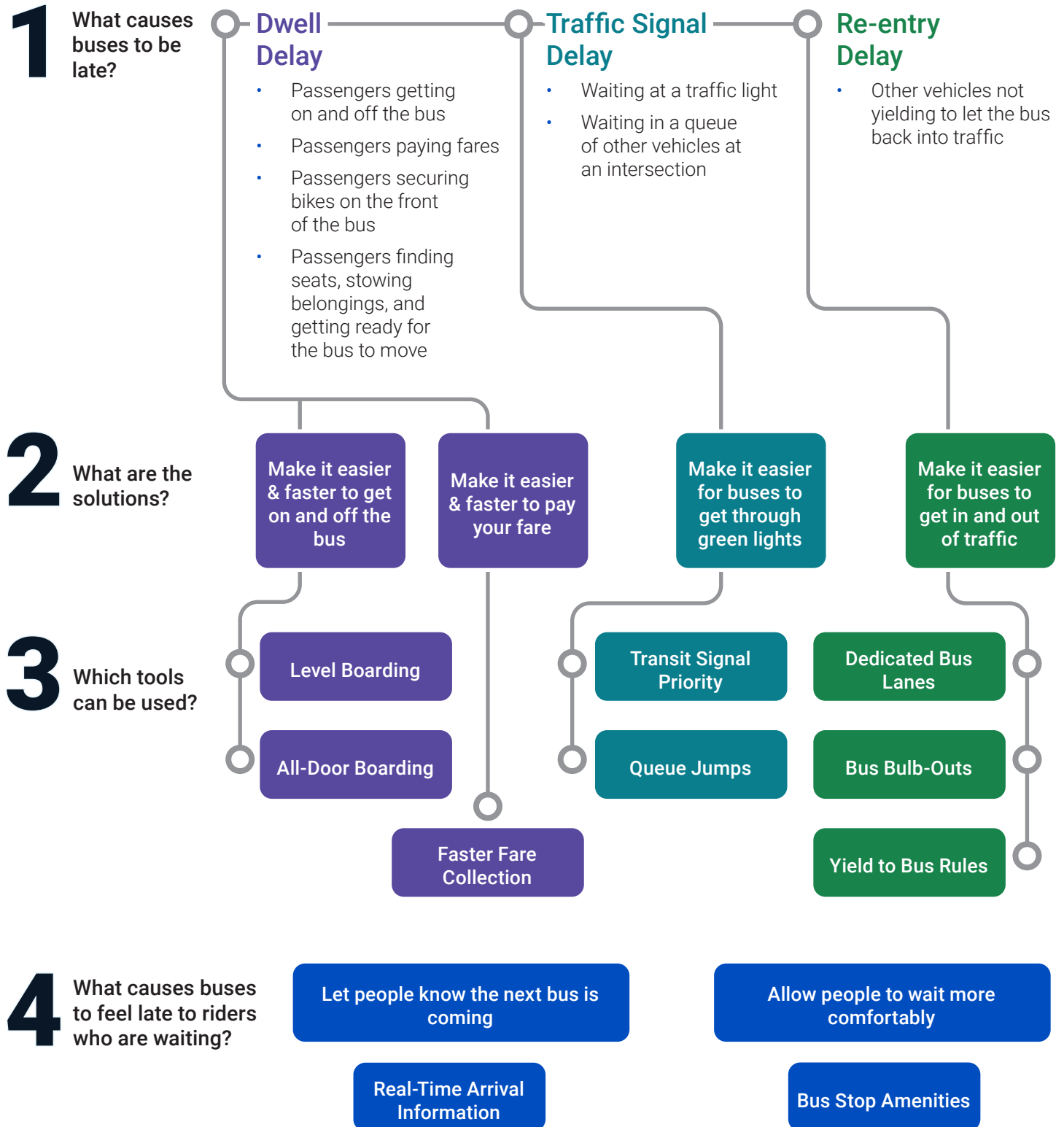


Microtransit Improvements

In addition to improvements on the current bus system, some areas of the Charlotte region do not currently have bus service or have underperforming bus service. In these areas, microtransit can fill in these gaps to connect people to bus corridors and stations. Microtransit uses smaller vehicles, like shuttles and vans, to provide service. Service can either be on-demand, with routes that vary based on passenger requests, or fixed routes that circulate a neighborhood and connect to bus priority corridors or rail. CATS is studying how and where to launch a microtransit pilot. For more on microtransit, see [Microtransit Zone Identification & Evaluation](#).

Reducing Delay

Many of the recommendations and capital improvements identified and evaluated in this study are focused on addressing the different types of delay the bus system experiences. The below flow chart explains what causes the bus to be late and how different treatments help manage that delay, making the bus more reliable and reducing trip and wait time.



• Passenger Facility Toolkit

Passenger Facility Toolkit

The bus stop is a rider's first point of contact with the transit system. A bus stop with inadequate amenities could hinder and deter passengers from accessing the transit network.

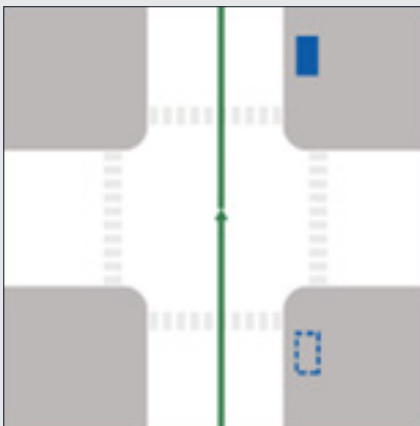
To tackle issues that discourage ridership, including passenger delay, long commutes, and uncomfortable waiting experiences, we have developed a series of toolkits to help make sure our future infrastructure investments provide the right service in the right place.

What types of bus stops do we need?

Stop and Hub Typologies

To determine where to install bus network improvements, we first developed typologies for bus stops and mobility hubs. The Charlotte area has four main stop or hub types.

Bus Stops

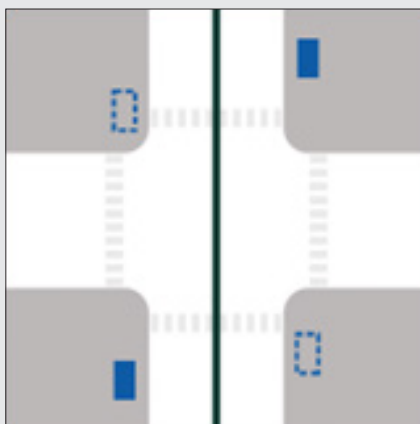


Standard Bus Stop (Level 0)

- Local or neighborhood shuttle bus stops
- On collectors, one-way streets, or streets with similar traffic limitations
- Between activity centers
- At lower population and employment density land uses
- Three sub types:
 - **Type A:** Sign-only; less than 10 people plus jobs per acre
 - **Type B:** Bench; between 10–30 people plus jobs per acre
 - **Type C:** Shelter; more than 30 people plus jobs per acre

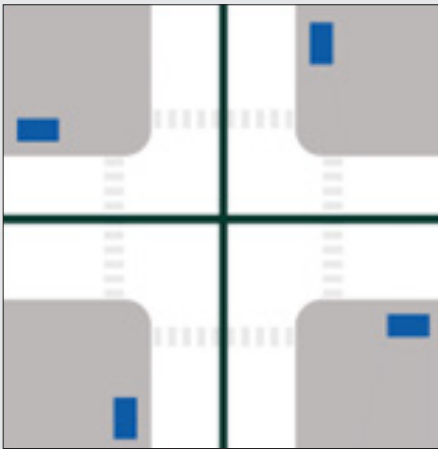
Mobility Hubs

Mobility hubs are bus stops that help passengers make first- and last-mile connections on foot or by bicycle, scooter, ridehailing (like Uber or Lyft), or other modes. With more amenities, hubs provide information, streamlined fare payments, and create a more comfortable waiting experience.



Enhanced Stop Pair (Level 1)

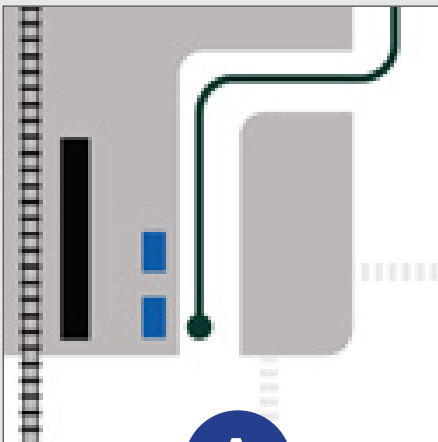
- Bus priority corridors or high-ridership bus stops (Greater than 25 passengers per day)
- Near major activity generators



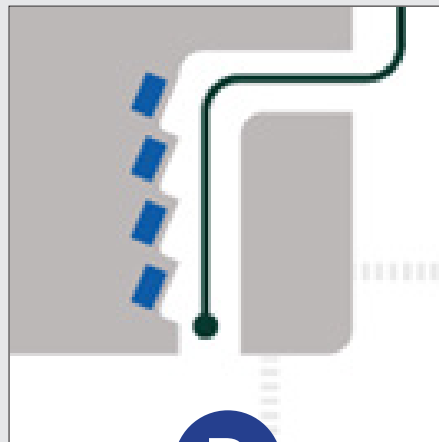
Mobility Plaza (Level 2)

- Intersection of Bus Priority Corridors
- Intersection of two major arterials
- Intersection of high-ridership local neighborhood route/shuttle and bus priority corridor

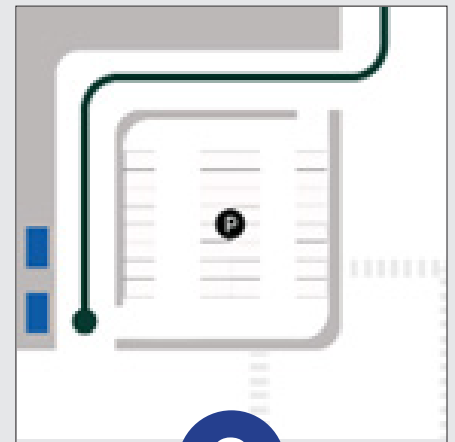
Mobility Center (Level 3)



Type A: Transfers to LYNX Light Rail or Bus Rapid Transit (BRT) stations, commuter buses, or other regional connections



Type B: Major bus transfer locations, route termini, and/or major activity centers



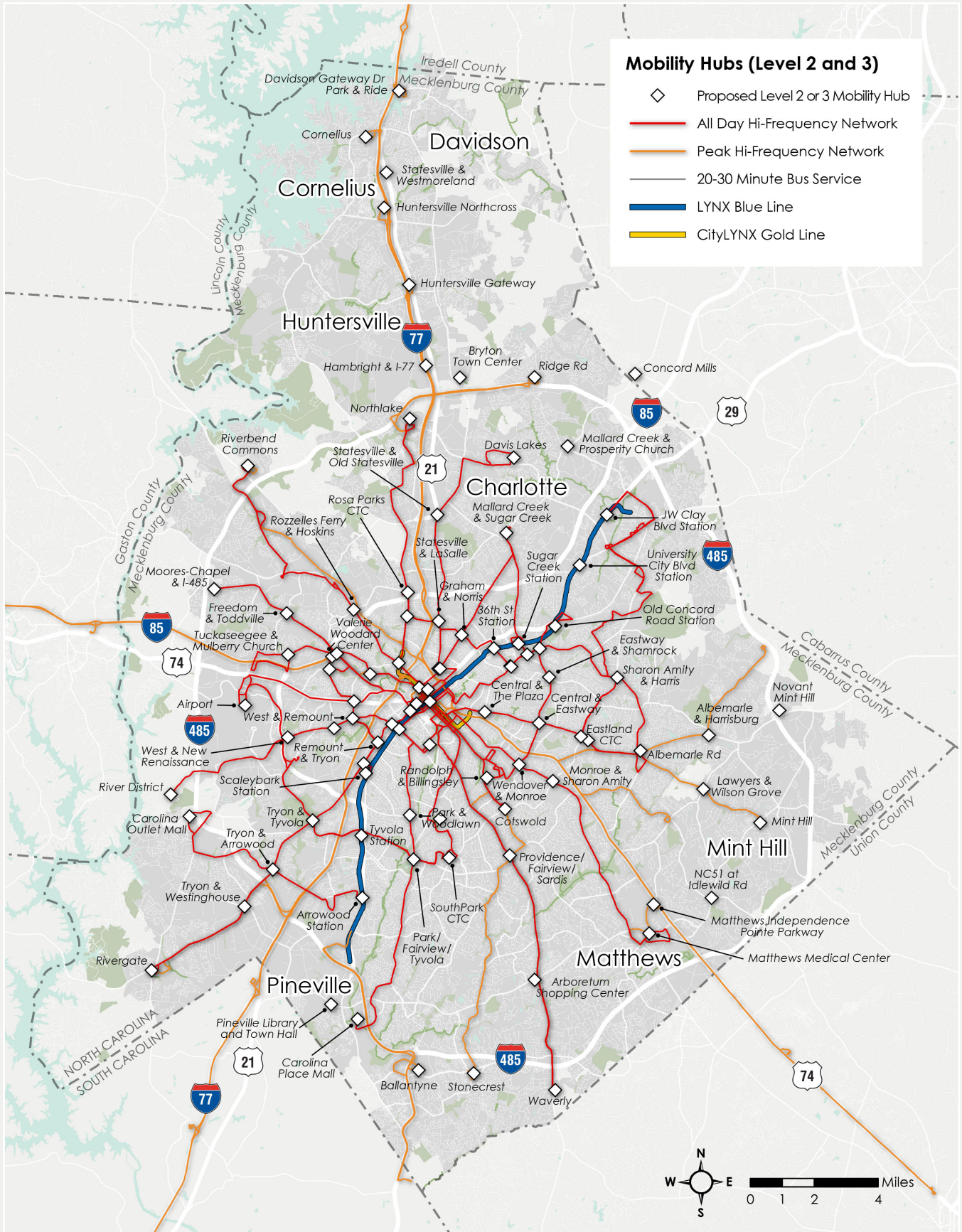
Type C: Availability of a park and ride facility

Recommended Number of Level 1, 2, and 3 Stops Systemwide

Due to the number of enhanced stops in the system, only Level 2 and 3 hubs are shown on the following map and table.

Stop Type	Total Number
Enhanced Stops (Level 1)	582
Mobility Plaza (Level 2)	36
Mobility Center (Level 3)	37
Proposed Mobility Hub (Level 2 or 3—To be determined)	18

Recommended Level 2 and 3 Mobility Hubs in the Charlotte Area



Level 2 and 3 Mobility Hub Recommendations

Mobility Hub Name	Type
36th St & The Plaza	Level 2, Mobility Plaza
36th St Station	Level 3, Mobility Center
Albemarle Rd	Level 3, Mobility Center
Arboretum Shopping Center	Level 3, Mobility Center
Arrowood Station	Level 3, Mobility Center
Ashley & Alleghany	Level 2, Mobility Plaza
Beatties Ford & LaSalle	Level 2, Mobility Plaza
Beatties Ford & Rozzelles Ferry	Level 2, Mobility Plaza
Berry Hill & Thrift	Level 2, Mobility Plaza
Carolina Outlet Mall	Level 3, Mobility Center
Carolina Place Mall	Level 3, Mobility Center
Central & Eastway	Level 2, Mobility Plaza
Central & Sharon Amity	Level 2, Mobility Plaza
Central & The Plaza	Level 2, Mobility Plaza
Charlotte Douglas Intl Airport	Level 3, Mobility Center
CTC	Level 3, Mobility Center
Davidson Gateway Dr Park & Ride	Level 3, Mobility Center
Davis Lakes	Level 3, Mobility Center
East & South	Level 2, Mobility Plaza
Eastland CTC	Level 3, Mobility Center
Eastway & Shamrock	Level 2, Mobility Plaza
Freedom & Ashley	Level 3, Mobility Center
Freedom & Toddville	Level 2, Mobility Plaza
Gateway Station	Level 3, Mobility Center
Graham & Dalton	Level 2, Mobility Plaza
Graham St & Norris Ave	Level 2, Mobility Plaza
Hambright & I-77	Level 3, Mobility Center
Huntersville Gateway	Level 3, Mobility Center
Huntersville Northcross	Level 3, Mobility Center
JW Clay Blvd Station	Level 3, Mobility Center
Matthews Independence Pointe Parkway	Level 3, Mobility Center
Matthews Medical Center	Level 3, Mobility Center
Mint Hill	Level 3, Mobility Center
Monroe & Sharon Amity	Level 2, Mobility Plaza
NC 51 at Idlewild Rd	Level 3, Mobility Center
Northlake	Level 3, Mobility Center
Old Concord Road Station	Level 3, Mobility Center
Park & Woodlawn	Level 2, Mobility Plaza
Pineville Library and Town Hall	Level 3, Mobility Center
Providence/Fairview/Sardis	Level 3, Mobility Center
Randolph & Billingsley	Level 2, Mobility Plaza
Remount & Tryon	Level 2, Mobility Plaza
Riverbend Commons	Level 3, Mobility Center
Rivergate	Level 3, Mobility Center

Mobility Hub Name	Type
Rosa Parks CTC	Level 3, Mobility Center
Rozelles Ferry & Hoskins	Level 2, Mobility Plaza
Scaleybark Station	Level 3, Mobility Center
Sharon Amity & Harris	Level 2, Mobility Plaza
SouthPark CTC	Level 3, Mobility Center
Statesville & Graham	Level 3, Mobility Center
Statesville & LaSalle	Level 2, Mobility Plaza
Statesville & Old Statesville	Level 2, Mobility Plaza
Stonecrest	Level 3, Mobility Center
Sugar Creek & The Plaza	Level 2, Mobility Plaza
Sugar Creek Station	Level 3, Mobility Center
The Plaza & 36th	Level 3, Mobility Center
The Plaza & Eastway	Level 2, Mobility Plaza
Tryon & Arrowood	Level 2, Mobility Plaza
Tryon & Clanton	Level 2, Mobility Plaza
Tryon & College	Level 2, Mobility Plaza
Tryon & Stonewall	Level 2, Mobility Plaza
Tryon & Tyvola	Level 2, Mobility Plaza
Tryon & Westinghouse	Level 2, Mobility Plaza
Tuckaseegee & Mulberry Church	Level 2, Mobility Plaza
Tyvola Station	Level 3, Mobility Center
University City Boulevard Station	Level 3, Mobility Center
Valerie Woodard	Level 2, Mobility Plaza
Waverly	Level 3, Mobility Center
Wendover & Monroe	Level 2, Mobility Plaza
West & Clanton	Level 2, Mobility Plaza
West & Remount	Level 2, Mobility Plaza
West & Tryon	Level 2, Mobility Plaza
Wilkinson & Remount	Level 2, Mobility Plaza
Albermarle & Harrisburg	To be determined
Ballantyne	To be determined
Bryton Town Center	To be determined
Carolinas Medical Center	To be determined
Concord Mills	To be determined
Cornelius	To be determined
Cotswold	To be determined
Lawyers & Wilson Grove	To be determined
Mallard Creek & Prosperity Church	To be determined
Mallard Creek & Sugar Creek	To be determined
Moore-Chapel & I-485	To be determined
Novant Mint Hill	To be determined
Park/Fairview/Tyvola	To be determined
Ridge Rd	To be determined
River District	To be determined
Statesville & Westmoreland	To be determined
West & New Renaissance	To be determined

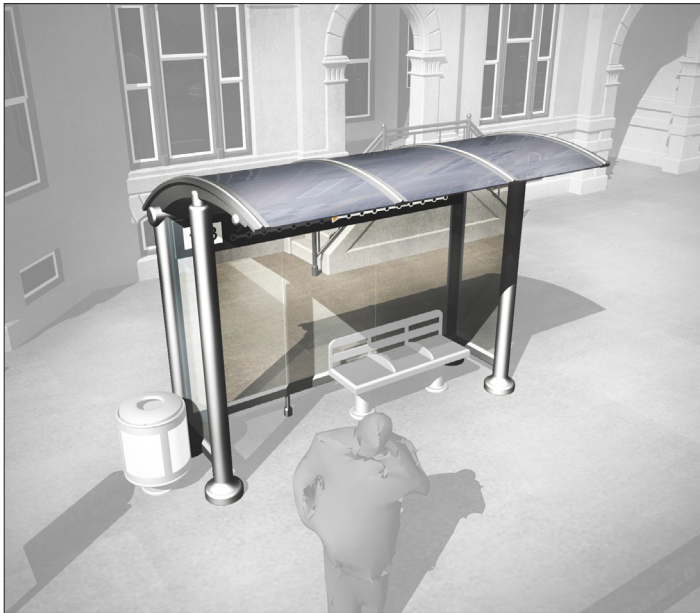
What types of amenities make waiting for the bus a better experience?

Amenities have a tremendous impact on riders' comfort and convenience.

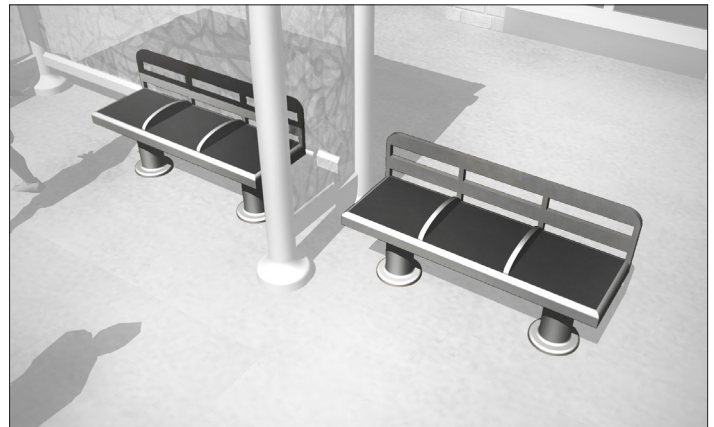
The amenities on this page showcase the many tools we have at our disposal, and table 1 provides a quick overview of which improvements work best at particular station types. For station typology and improvement diagrams, see appendix D.



5x15 Shelter



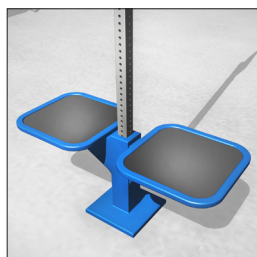
5x10 Shelter



Single Bench



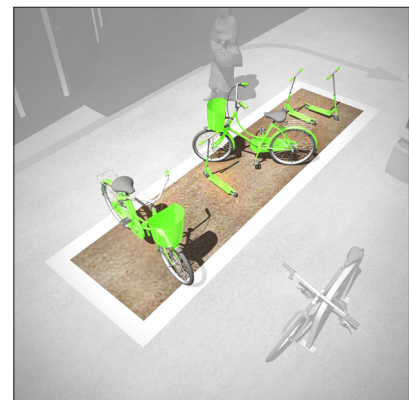
Boarding & Alighting Area



Simme Seats



Lighting Improvements



Scooter & E-Bike Storage



Bicycle Rack



Bus Stop Sign



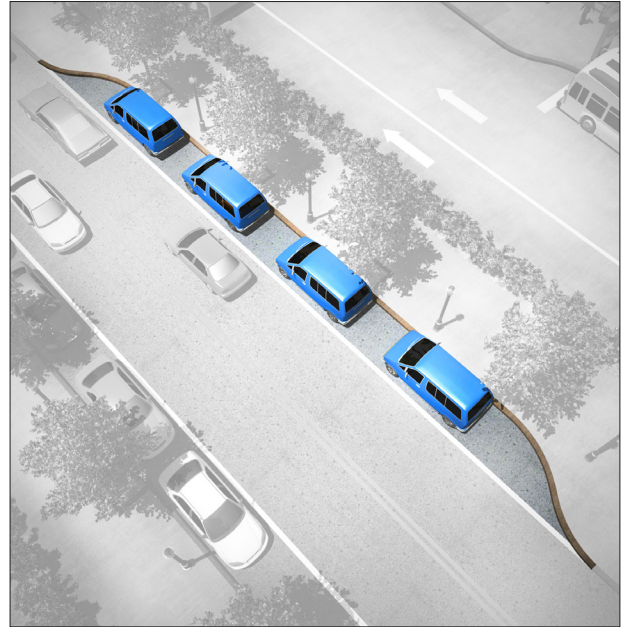
Operator Restroom



Trash Receptor



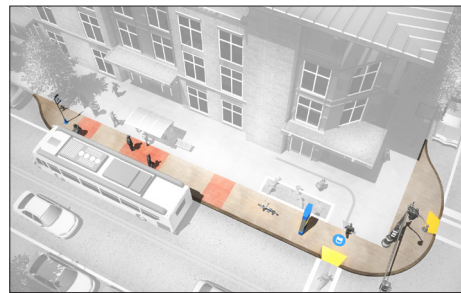
Offboard Fare Payment



Microtransit Pickup/Dropoff Area



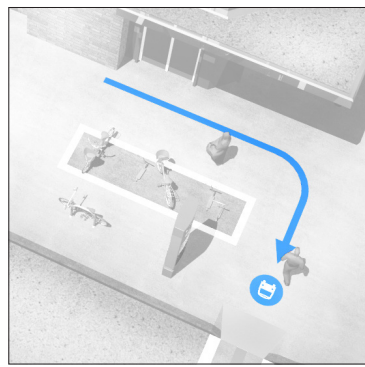
Crosswalk Improvements



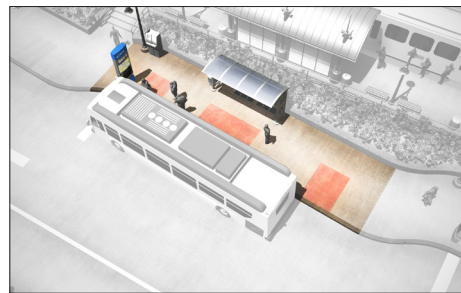
Bus & Sidewalk Bulb



Information Kiosk



Sidewalk Wayfinding



Bus Bay

Putting the right amenity in the right place

Today, CATS primarily uses ridership to allocate stop amenities. To identify the need for amenities in a more holistic way, we developed a scoring system to set the appropriate typology for each bus stop or hub in the CATS network. This system determines a site's typology by first examining the stop quantitatively and then studying its site-specific features. Depending on these findings, we can then adjust the typology to better match the stop's context.

Stops were scored on four metrics:

- 1** Ridership
- 2** Wait Time
- 3** Rider Profile
- 4** Activity Generators

For more detail on evaluation weights and metrics, see appendix D.

Using this process and these four criteria, we assigned each stop or hub type a minimum amenity implementation score. Table 1 matches amenities to the different stop and hub types. The scoring system will result in more types of amenities installed at more stops throughout the system, thus improving passenger waiting experience.

Table 1: Amenities by Stop Level and Type

● Recommended Amenity

Stop Amenity	Standard Bus Stop (Level 0)			Mobility Hubs		
	Type A	Type B	Type C	Enhance Stop Pair (Level 1)	Mobility Plaza (Level 2)	Mobility Center (Level 3, Types A, B, C)
5'X10' Or 5'X15' Shelter			●	●	●	●
Bench		●	●	●	●	●
Simme Seats		●	●			
Trash Receptor	●	●	●	●	●	●
Bicycle Rack			●	●	●	●
Scooter & E-Bike Storage					●	●
Bus Stop Marker: Signpost With Sign	●	●	●			
Bus Stop Marker: Pylon				●	●	●
Sidewalk Wayfinding				●	●	
Boarding & Alighting Area	●	●	●	●	●	●
Crosswalk Improvements			●	●	●	● ¹
Operator Restroom						●
Bus & Sidewalk Bulb				●	●	
Bus Bay						●
Offboard Fare Payment						●
Public Wifi				●	●	●
Microtransit Pickup/Dropoff Area						●
Lighting	●	●	●	●	●	●
Information Kiosks					●	●

Where do we need bus stops?

As part of our passenger facility toolkit, we developed a process to optimize bus stop location on the CATS network. Once we know what type of bus stop is needed, we can use this optimization process to understand where to keep, remove, relocate, or add a stop. This process has three steps:

1 **Understanding bus stop spacing**, or the ideal distance between stops for a service type

2 **Assessing bus stop balancing**, or how stops are located in relation to other stops along the route

3 **Reviewing bus stop placement**, or the configuration of individual stops to improve bus operations

Bus Stop Spacing

Bus stop spacing can have a tremendous impact on the effectiveness of a bus route. If bus stops are too far apart, they may not be convenient to talk to for most passengers. If bus stops are too close to one another, they force the bus to stop too frequently, adding to the overall travel time for a route.

CATS aims to achieve the following average spacing between stops for the given service types:

Service Type	Stop Spacing Guideline
Local and Neighborhood Shuttles	4–6 stops per mile
High-Frequency	4 stops per mile
Express	Limited stops at key destinations

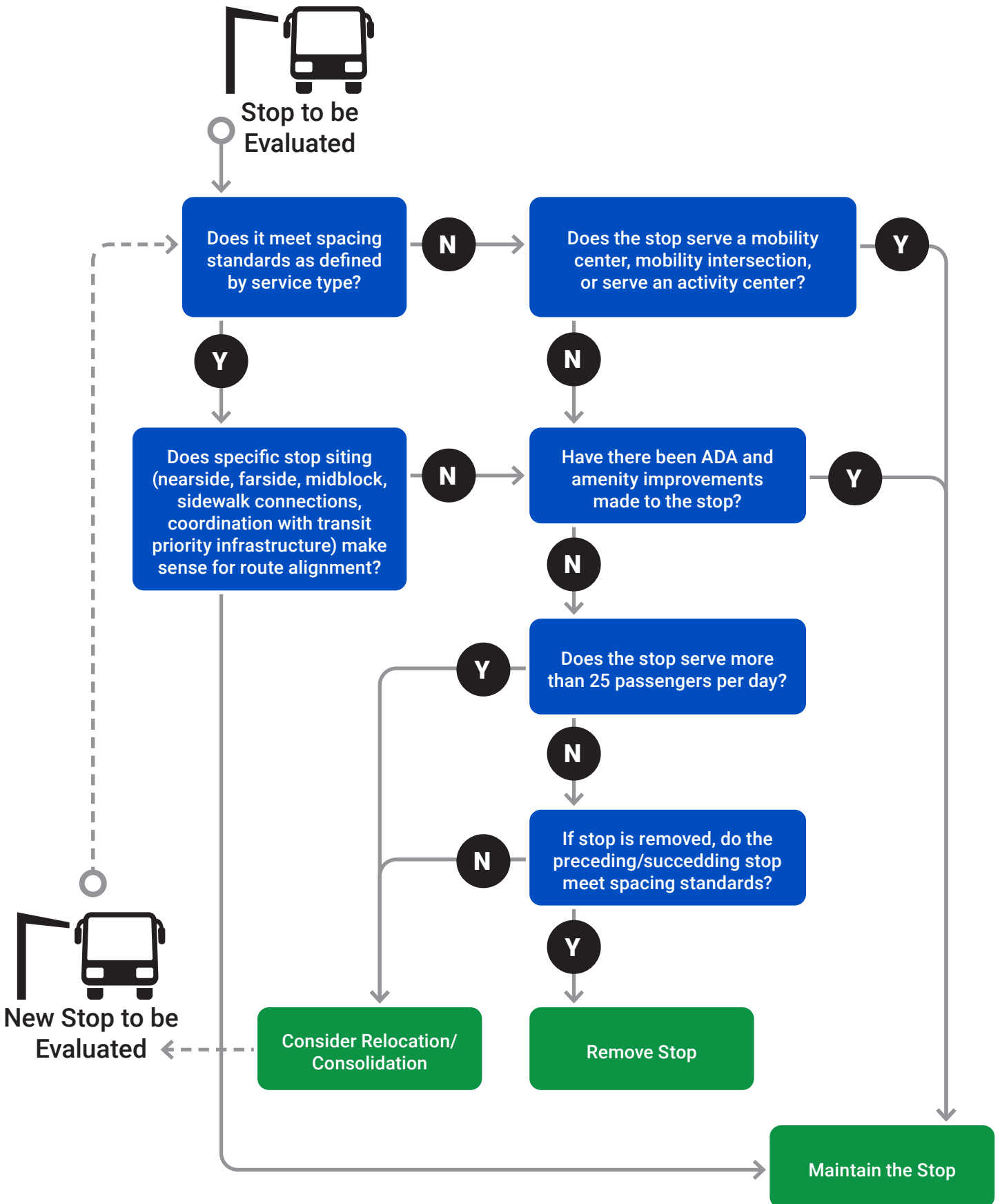
What does this mean for you?

The scoring system will result in more types of amenities installed at more stops throughout the system, improving your waiting experience.

The bus stop spacing adjustments will speed up your bus.

Bus Stop Balancing

CATS will use the following process to evaluate the relative location of bus stops along a route:

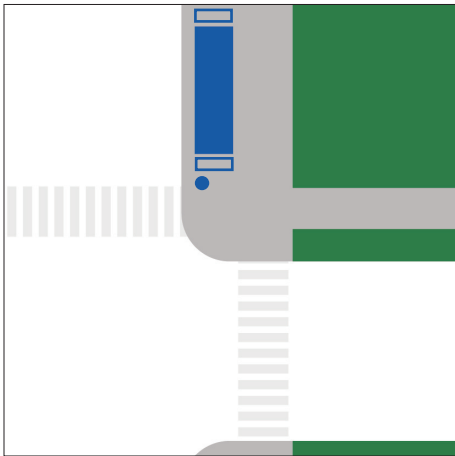


Bus Stop Placement

Once we know whether to keep or relocate a stop, we can determine its location and design. Many factors affect bus stop location, including:

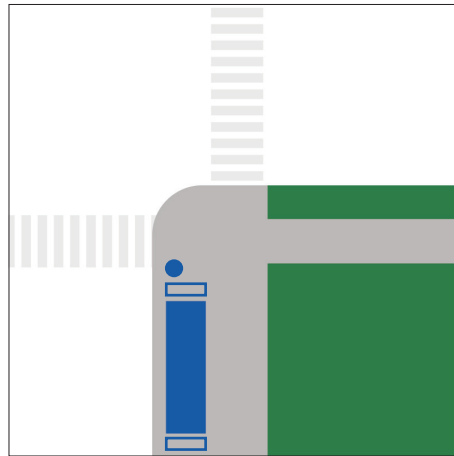
- The availability of land to accommodate a bus stop
- The impact on general traffic of having a bus stop on or to the side of a road
- The presence of traffic signals (and potential impact signals have on bus operations)
- How easily passengers can transfer to other routes near the bus stop

The main siting consideration looks at where a bus stop will be located in relation to an intersection. We have three options: far-side, near-side, and mid-block.



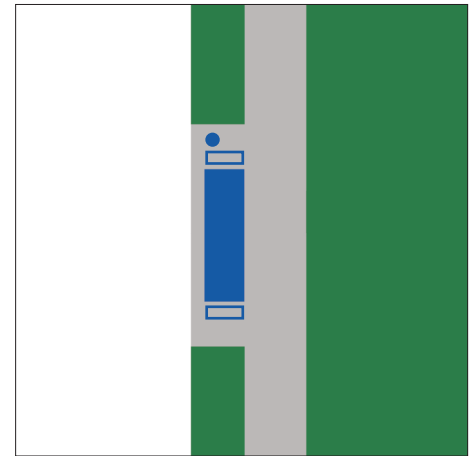
Far-Side Stop

- Reduces delay at red signals
- Improves visibility of pedestrians
- Minimizes conflicts with right-turning vehicles
- Generally recommended, especially at intersections with transit signal priority (TSP) or where the bus turns left



Near-Side Stop

- Can be used at signalized intersections with wide shoulders or multiple lanes
- Can be used on two-lane streets where vehicles will not pass around a stopped bus



Mid-Block Stop

Generally not recommended unless:

- A major origin/destination is located mid-block
- Bus route turns left, and it is infeasible or unsafe to place the bus stop at the far-side of the intersection after the left turn
- Blocks are too long to have all stops at intersections

Focus Corridors



Focus Corridors

Envision My Ride defined 22 existing high-frequency corridors and one new high-frequency corridor on the CATS bus network. Because funding is not yet available to improve all routes simultaneously, we prioritized the routes with the greatest potential to enhance system performance. The evaluation only included the 22 existing corridors.

Prioritization







The Evaluation Process

Step 1

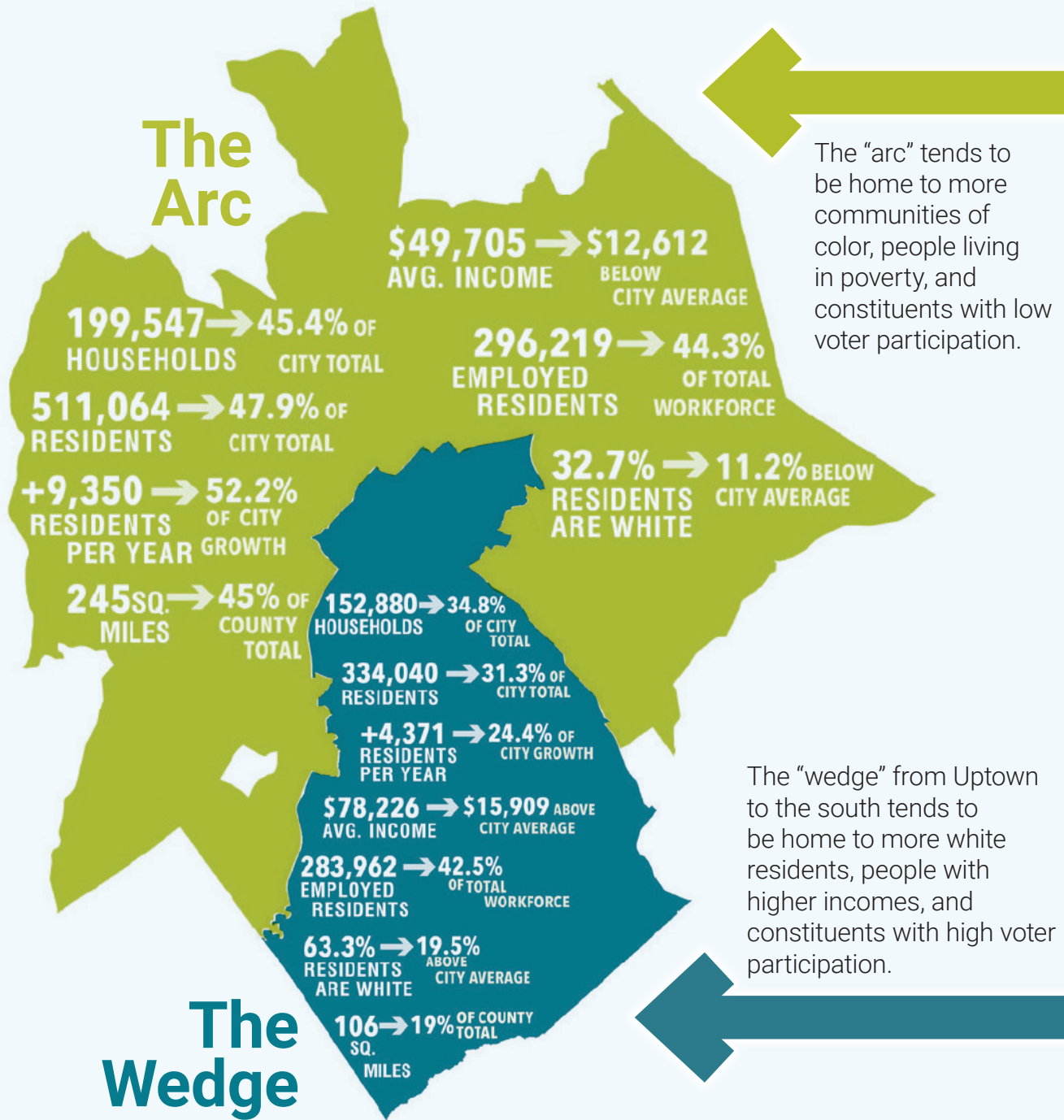
Develop performance measures to understand how selecting a corridor meets systemwide goals and objectives.

We created an initial set of six performance measures to understand which corridors would best meet this plan’s goals. For this first step, we focused on four of the five goals and five of the 13 objectives.

Goals	Objective	What We Wanted to Measure	How We Measured It (Performance Measure)
 Service Quality	Provide frequent and reliable transit service	How often the bus comes	Existing frequency (average weekday daytime headways in minutes)
	Provide convenient bus-to-bus connections	How many bus connections you can make	Highest number of frequent bus routes on any part of the corridor
 Connectivity	Provide convenient bus-to-rail connections	How many rail connections you can make	Number of existing and proposed light rail and streetcar stations on corridor
	Provide access to existing employment, education, fresh foods, healthcare, and recreational facilities	How many people use a route for get to everyday places	2019 ridership (average monthly, used as proxy for access goods and services)
 Access	Provide better transit service to populations that may rely on transit as their primary means of transportation	How many underserved or marginalized people does the bus serve	Ratio of population within ¼ mile of route that are part of the “arc” to the total population within ¼ mile of the route
 Equity			

Equitable Access

This Bus Priority Study measures equitable access to bus services using geographic areas identified as part of the Charlotte Future 2040 Comprehensive Plan:



For more information, see the Charlotte Future 2040 Comprehensive Plan Equity Atlas.

<https://cltfuture2040.com/equity-atlas/>

Step 2

Prioritize 10 out of 22 high-frequency routes using high-level measures.

We applied the performance measures from Step 1 to the 22 high-frequency routes to rank how well improving these routes would meet the goals and objectives. The highest-ranking routes included routes 9, 7, 27, 5, 8, 10, 21, 34, 16, and 1.

Reviewing the initial analysis, the study team recognized that all of the top 10 routes were radial (e.g. providing service from the outskirts of Charlotte to downtown). Because this study is intended to improve mobility across the entire bus network, the team recognized the need to review crosstown routes separately and identify at least one crosstown route for improvements during the next step of the evaluation.

Step 3

Identify six focus corridors using more detailed measures.

During this step, we created performance measures for the full set of objectives. We applied these measures to the top 10 routes from Step 2, all of which are radial routes, and the top four crosstown routes (Routes 2, 3, 29, and 39). We added the scores for each measure to get a total score for each route. Based on these total scores, we identified six focus corridors: Routes 2, 7, 9, 16, 27, and 34.

As shown in table 2, three performance measures capture the potential to achieve multiple goals or objectives. Four performance measures were calculated using composite scores from the [Charlotte Future 2040 Comprehensive Plan Equity Manuals and Metrics](#) to leverage performance measures guiding future development in Charlotte. For details about the performance measures and evaluation, see appendix B.

Figure 5: Evaluation Routes With Six Focus Corridors In Blue

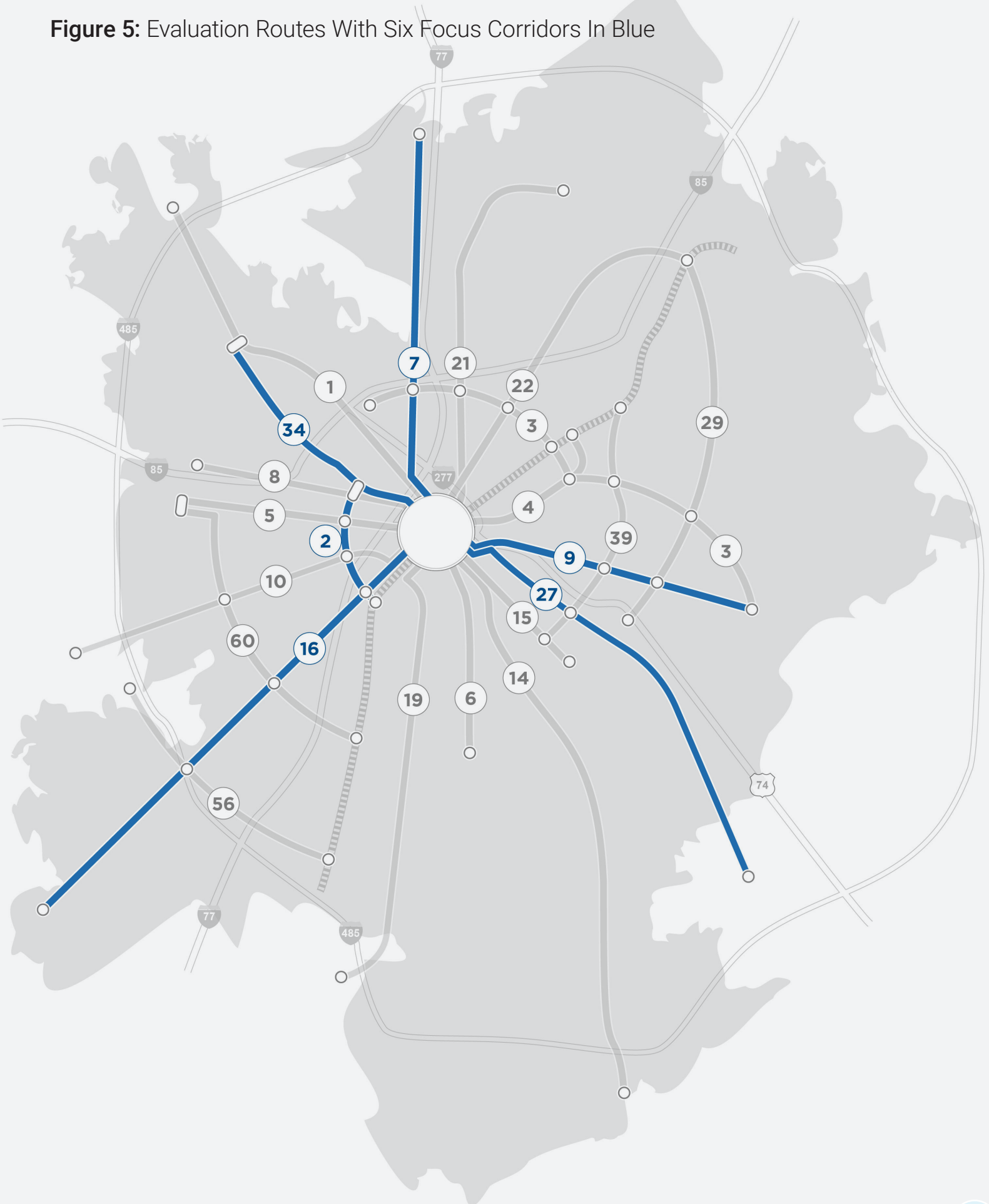


Table 2: Route Evaluation Goals, Objectives, and Performance Measures

Goal	Objective	Performance Measures
Access	Provide access to education/childcare, fresh foods, healthcare & pharmacies, and recreational/ community facilities (parks, open space, trails)	Population density within 1/4 mile
	Provide connections to trails and all-ages-and-abilities bike facilities	Equity Metric #1: Access to Essential Amenities, Goods, and Services composite score from the Charlotte Future 2040 Comprehensive Plan (weighted average within 1/4 mile)
Access	Provide access to existing employment	Equity Metric #3: Access to Employment Opportunities composite score from the Charlotte Future 2040 Comprehensive Plan (weighted average within 1/4 mile)
Equity	Provide transit service to populations with low jobs to skills match	
Access	Provide access to existing growth areas	Percent of land use within 1/4 mile classified as dense existing Charlotte Place Types (i.e., Neighborhood 2, Commercial, Campus, Activity Centers)
Service Quality	Offer convenient, efficient, and direct transit trips	
Connectivity	Provide convenient bus-to-bus connections	Highest number of bus routes on any part of the corridor
	Provide convenient bus-to-rail connections	Number of bus stops that serve multiple bus routes
		Number of existing and proposed light rail and streetcar stations within 1/8 mile of corridor

Goal	Objective	Performance Measures
Service Quality	Ability to provide reliable transit service	Percent of bus trips that met on-time performance standards from October 2019
		Ratio of bus route's 90th percentile travel time to mean travel time from October 2019 (how much worse are the slowest trips compared to the average trips)
	Offer convenient, efficient, and direct transit trips	2019 ridership (average monthly)
		Transfer activity (composite score of total transfers, average transfers, and maximum transfers during January and February 2020, where more transfers indicate less direct routes.
Equity	Provide transit service to areas with affordable housing options	Equity Metric #2: Access to Housing Opportunities composite score from the Charlotte Future 2040 Comprehensive Plan (weighted average within 1/4 mile)
	Provide better transit service to minority populations	Populations Vulnerable to Displacement composite score from the Charlotte Future 2040 Comprehensive Plan (percent of area within a 1/4 mile)
	Provide better transit service to populations that may rely on transit as their primary means of transportation	Percent zero-car households (weighted average within 1/4 mile)

Step 4

Evaluate bus stop and bus priority needs for the six focus corridors.

For each of the six focus corridors, we applied the [Passenger Facility Toolkit](#) to optimize bus stops.

To understand where buses need help to travel faster or stick to the schedule, our analysis asked two key questions:

- Where are buses going slow?
- Does the total number of buses and passengers traveling on the corridor justify bus lanes?

Speeding Up Slow Buses

To spot sluggish buses, we identified segments where buses travel slower than 12 mph. We also identified segments where general traffic travels slower than 15 mph, an indicator that congestion is affecting bus speeds (see figure 6). These slow zones helped shape our recommendations for TSP and queue jumps to reduce signal delay.

What About Bus-Only Lanes?

This bus priority study carefully considered bus lanes for the Charlotte region.

To understand how our peer agencies approached bus lane implementation, we conducted interviews with five organizations:

- Capital Metro in Austin, Texas
- Regional Transportation District (RTD) in Denver, Colorado
- IndyGo in Indianapolis, Indiana
- TriMet in Portland, Oregon
- King County Metro in Seattle, Washington

Through our conversations, we learned that bus lanes can improve both travel time and passenger perception of travel time. In other words, bus lanes helped passengers feel like they were saving more time than they actually were. Our peer agencies also emphasized that bus lane implementation can be contentious and requires support from local stakeholders and agencies responsible for the affected roadways.

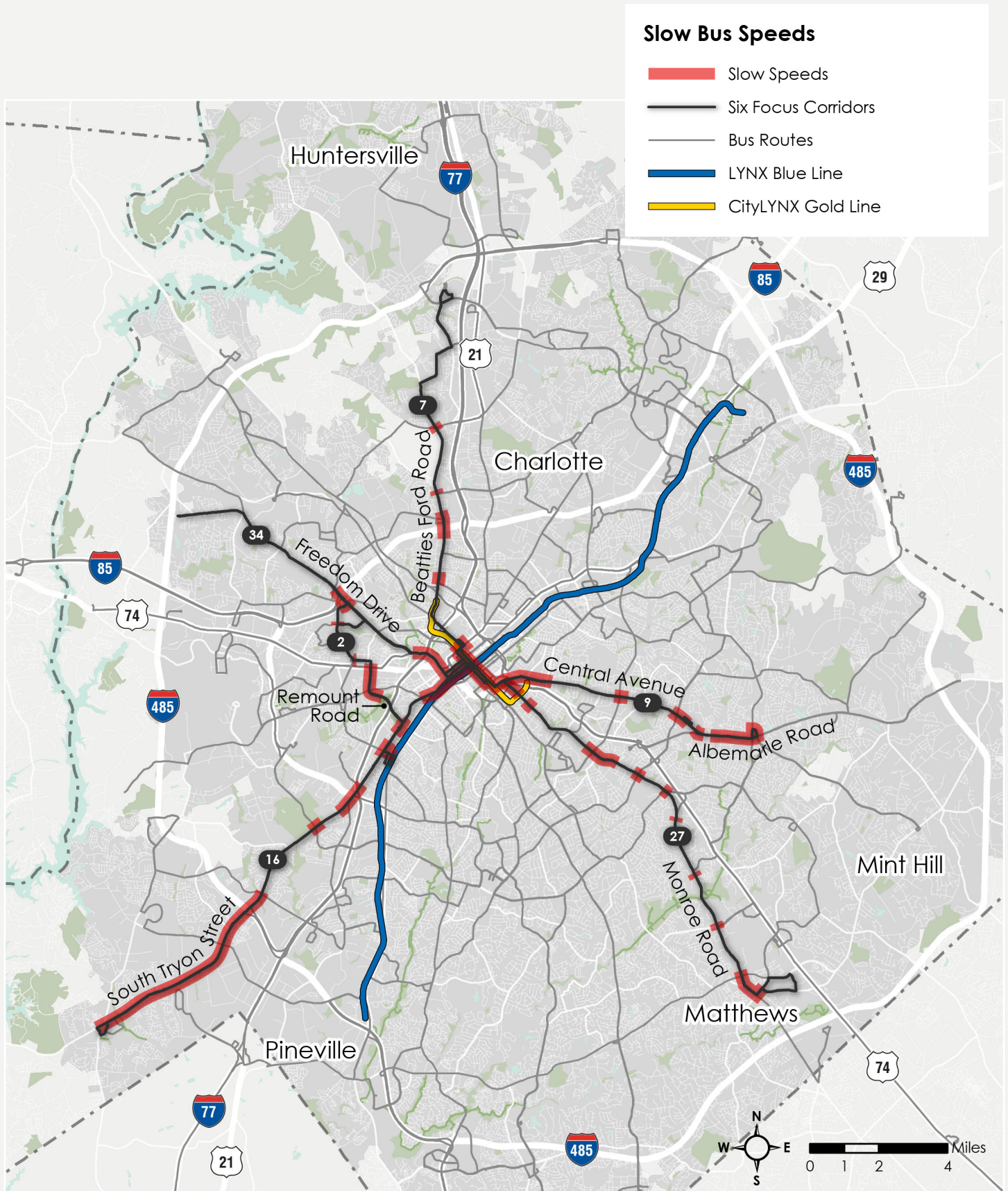
Using industry standards, the study team determined that bus lanes would maximize benefits on corridors with the following initial thresholds:

- At least 24 or more buses travel on the segment during the peak hour in the peak direction (one bus every 2.5 minutes).
- At least 2,000 passengers in the peak hour.

While some Uptown segments meet these thresholds—including the existing 4th Street bus lane—no corridors outside of Uptown currently meet these thresholds. Because most corridors are below these thresholds, this study recommends no new bus lanes at this time. However, this study did indicate that we should consider bus lanes as future improvements if corridor-level bus and passenger volumes increase enough to make new lanes cost-effective.

In the future, CATS may explore developing bus rapid transit (BRT). Future BRT projects should assess the feasibility of bus lanes, which are required for some federal funding programs.

Figure 6: Focus Corridor Slow Zones

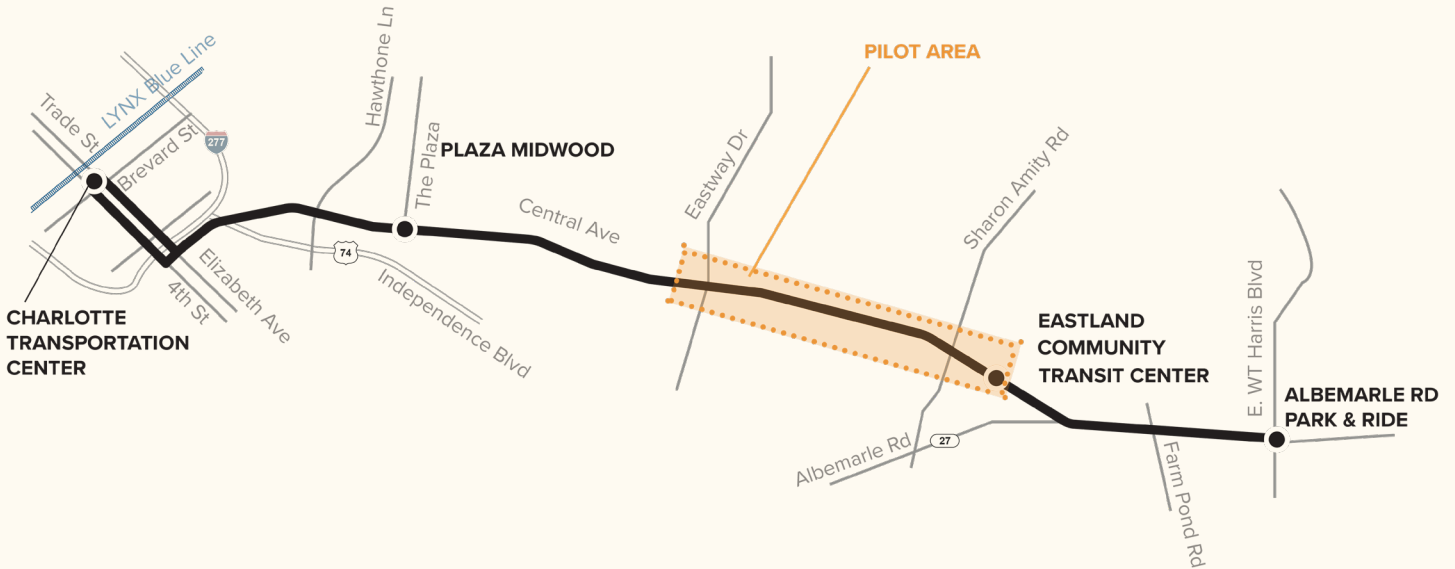


Central Avenue Bus Lane Pilot

From October 2020 to March 2021, we conducted a pilot study on Central Avenue between Eastway Drive and the Eastland Community Transit Center. This project tested a bus- and bicycle-only lane on Central Avenue, which is an important transit corridor. The pilot provided crucial real-world data about the benefits and trade-offs of this lane.

While this pilot project was temporary, it provided invaluable information about the importance of balancing the needs of drivers and transit users and underscored that bus lanes should not be ruled out in the Charlotte region's future.

Central Avenue Bus Lane Pilot Area



Travel Time Impacts

We compared travel times for driving on Central Avenue between Eastway Drive and Albemarle Road for four periods to account for influence of the COVID-19 pandemic on traffic:

- Before the pandemic
- Before the bus lane pilot, during the pandemic
- During the pilot
- After the pilot

We found that the average travel time for rush hour traffic was slightly higher during the bus lane pilot compared to before and after the pilot, but lower than before the pandemic.

Average Vehicle Travel Time from Eastway Drive to Albemarle Road		Pre-Pandemic	Pre-Pilot	Pilot	Post-Pilot
		Avg 2019	May 2020 - August 2020	Oct 2020 - March 2021	May 2021 - August 2021
AM Peak (7-9AM)	Inbound	6.0 min	4.4 min	4.8 min	4.4 min
	Outbound	5.3 min	4.6 min	4.7 min	4.6 min
PM Peak (5-7PM)	Inbound	5.5 min	4.2 min	4.7 min	4.7 min
	Outbound	6.2 min	4.9 min	5.4 min	5.1 min

During the most congested time (afternoon rush hour), drivers experienced, on average, a 30-second increase in travel time, while bus passengers saved an average of 2 minutes.

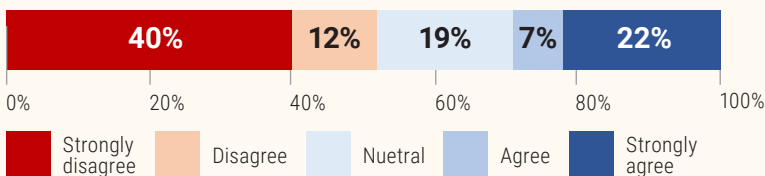
In addition to the bus lane pilot, we modeled the impact of the signal priority recommendations in this report. We found that signal priority treatments would help buses travel 5% faster toward Uptown, while drivers would only experience a few seconds of delay at each intersection.

Pilot Surveys

To understand how community members felt about this the Central Avenue bus lane pilot, we conducted a survey. However, most of the respondents were motor vehicle drivers who felt the reallocated lane did not improve service.

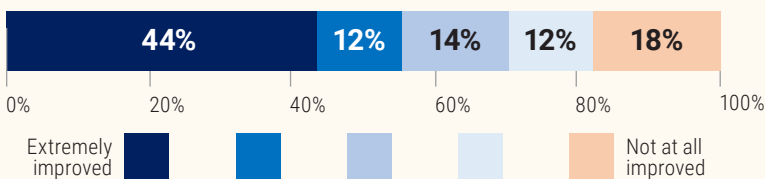
Drivers

Indicate how much you agree or disagree: Dedicated spaces for buses and bikes are an effective way to provide safer and more comfortable environment for cyclists, buses, and cars traveling along a roadway.



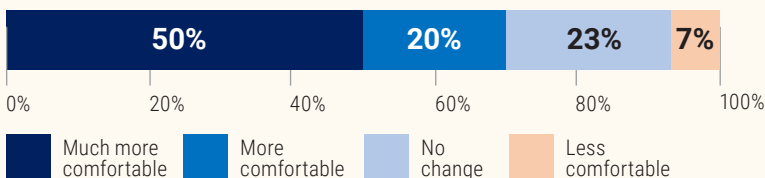
Bus Riders

Did you feel your commute improved because of the bus-only lane?



Bike Riders

Compared to your biking experience in a bike lane next to a lane with cars, rate your experience on the Central Ave bike lane next to a bus-only lane.



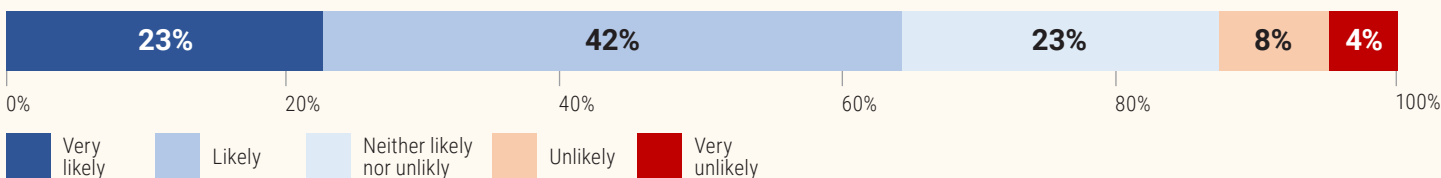
When people first experienced the pilot...

7%
were on a bus

83%
were in a car

3%
were on a bike

When we conducted a second survey as part of this bus priority study, we got more responses from bus riders—often the folks who rely nearly entirely on transit to meet their daily transportation needs. **We heard from over 500 Route 9 passengers who said that a bus lane would encourage them to ride the bus more.**



Focus Corridor Recommendations

For each of the six focus corridors, we applied the passenger facility toolkit to optimize bus stops and assessed speeds to recommend transit signal priority (TSP) treatments

The following maps show recommendations for traffic signals and bus stops. These recommendations are preliminary and will require further evaluation.

TSP and queue jumps will include a detailed engineering feasibility study and public outreach before implementation. Any changes to bus stops will follow an extensive evaluation process that includes public outreach. The CATS Bus Stop Committee will review the preliminary bus stop recommendations, and CATS will conduct public outreach before making any changes to bus stops.

Traffic Signal Recommendations



Queue Jump Candidate

What would it mean for you?

At these intersections, your bus will be able to move ahead of other vehicles that are waiting at the light.



TSP Candidate

At these intersections, your bus will be given priority for a green light.



TSP and/or Queue Jump Candidate

At these intersections, your bus will be able to move ahead of other vehicles that are waiting at the light and/or will be given priority for a green light.

Bus Stop Recommendations

What would it mean for you?

 Keep


Continue to use your current stop.

 New Stop


Consider whether the new stop gets you to where you want to be faster than your current stop.

 Remove Stop

Relocate your current stop to the next closest stop.

 Relocate Stop
(old location)

You'll need to go to the next closest stop.

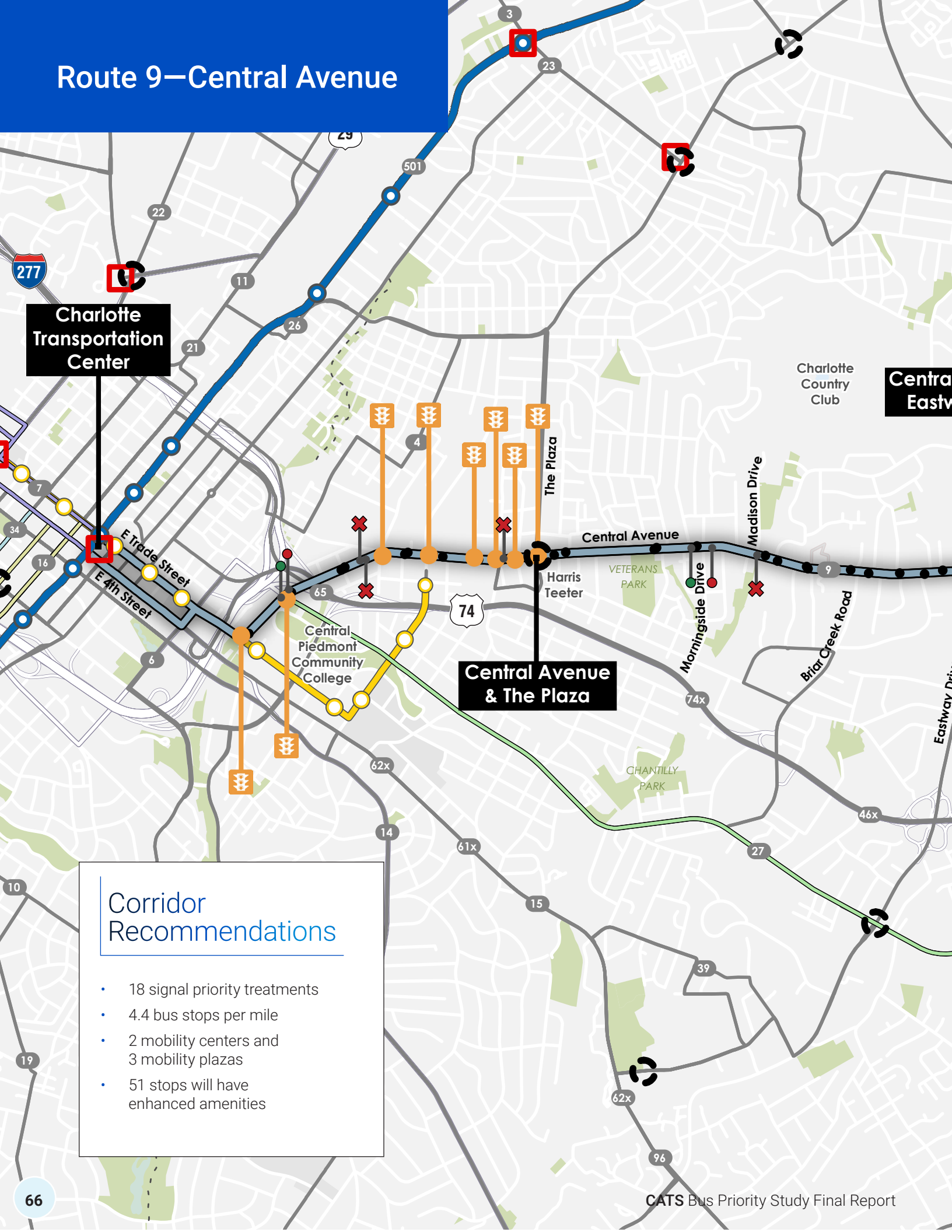
 Relocate Stop (new
location)

You'll need to go to a new stop location.

Focus Corridor Maps

The following maps illustrate the proposed changes for each study's six focus corridors. For each route, we have marked both traffic signal and bus stop recommendations. You can find a full list of proposed changes for each corridor in appendix C.

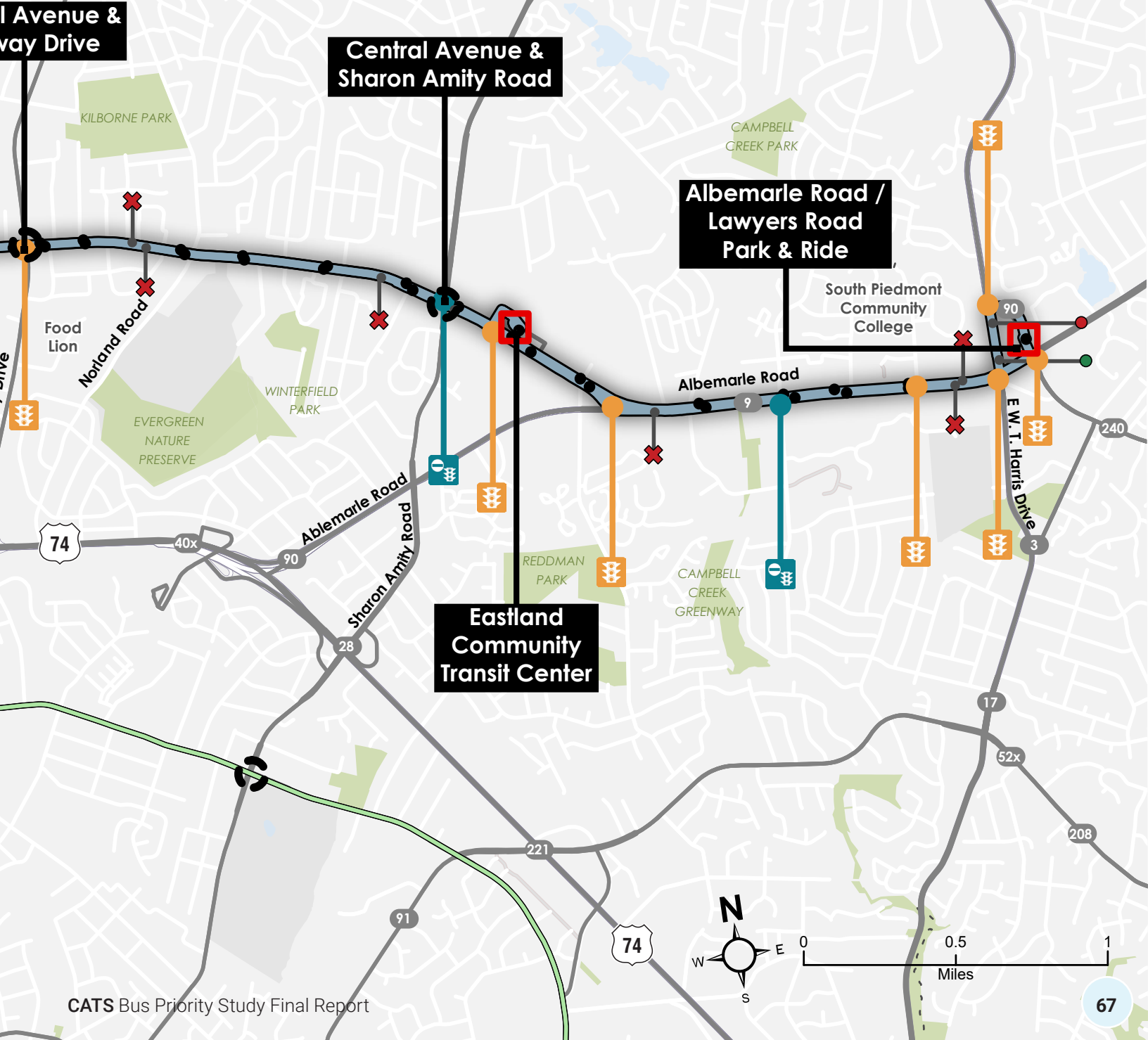
Route 9—Central Avenue



Corridor Recommendations

- 18 signal priority treatments
- 4.4 bus stops per mile
- 2 mobility centers and 3 mobility plazas
- 51 stops will have enhanced amenities

Bus Stop Recommendations	Mobility Hub Recommendations
● Keep	● Level 2 - Mobility Plaza
✚ New Stop	□ Level 3 - Mobility Center
✘ Remove Stop	Traffic Signal Recommendations
● Relocate Stop (old location)	🚦 TSP Candidate
● Relocate Stop (new location)	🚦 TSP and/or queue jump candidate



Route 7—Beatties Ford



Beatties Ford Road & Rozelles Ferry Road

**Trade Street & Graham Street
(Future Charlotte Gateway Station)**

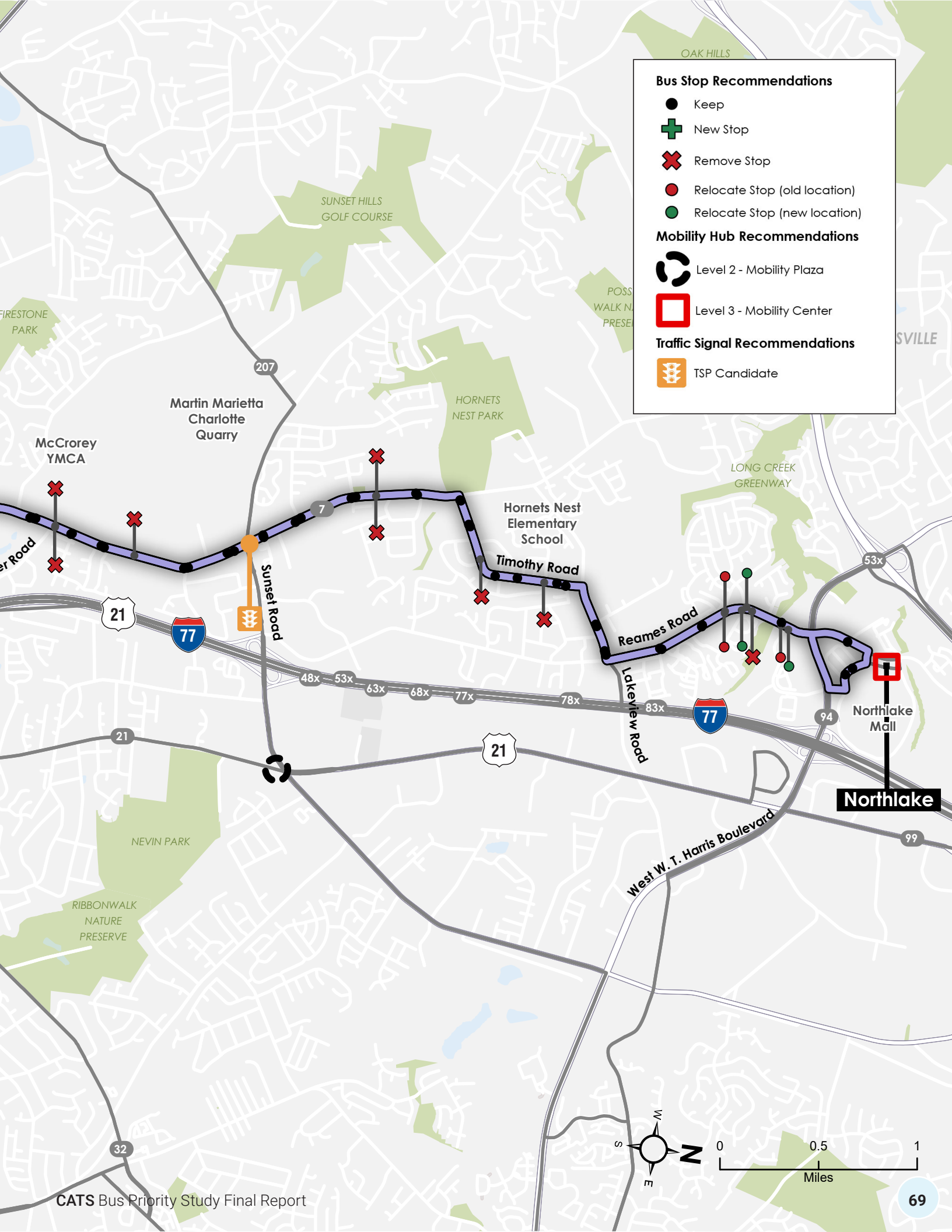
Charlotte Transportation Center

Beatties Ford Road & Lasalle Street

Rosa Parks Transit Center

Corridor Recommendations

- 6 signal priority treatments
- 4.2 bus stops per mile
- 2 mobility centers and 2 mobility plazas
- 69 stops will have enhanced amenities



Bus Stop Recommendations

- Keep
- + New Stop
- ✗ Remove Stop
- Relocate Stop (old location)
- Relocate Stop (new location)

Mobility Hub Recommendations

- Level 2 - Mobility Plaza
- Level 3 - Mobility Center

Traffic Signal Recommendations

- 🚦 TSP Candidate

Route 16—South Tryon

Bus Stop Recommendations

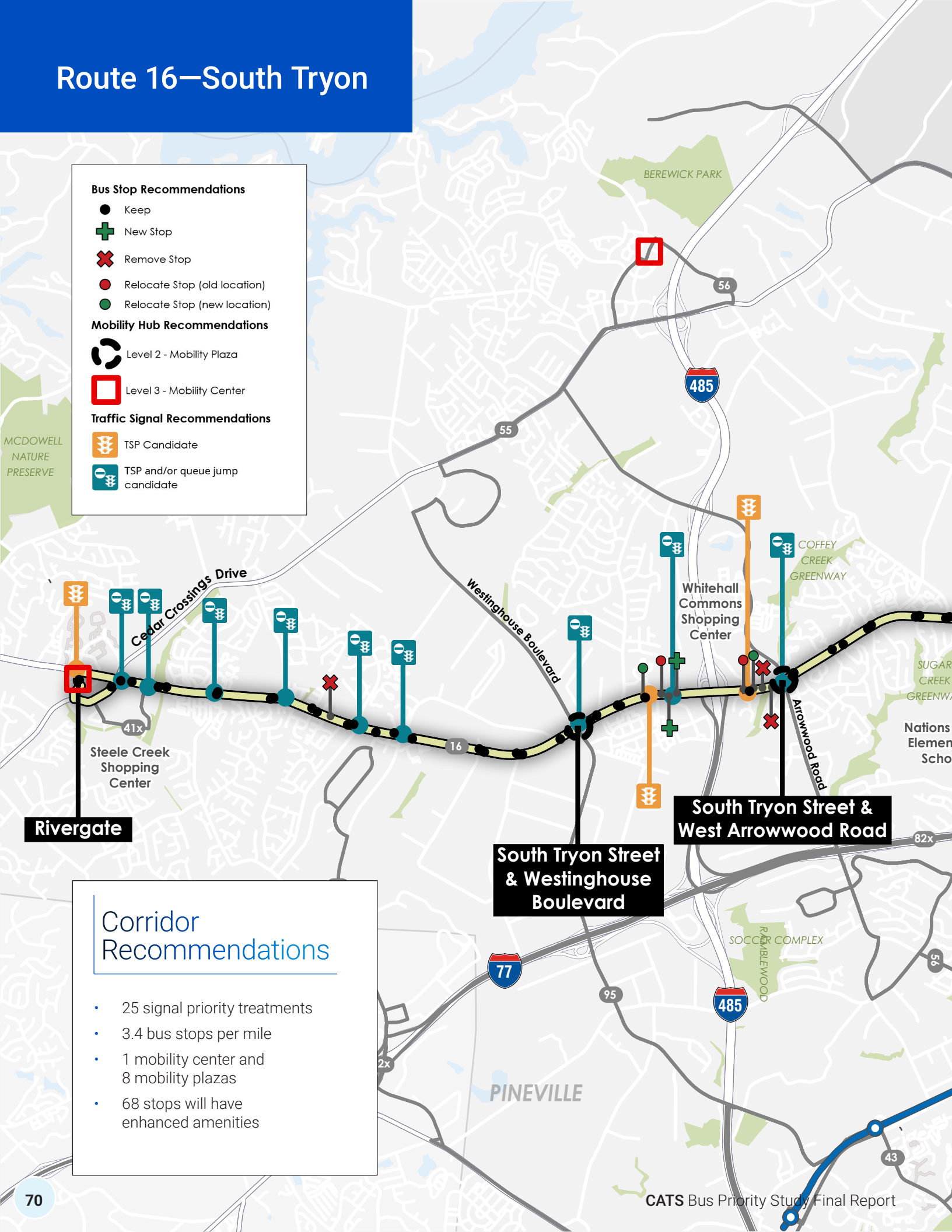
- Keep
- + New Stop
- ✗ Remove Stop
- Relocate Stop (old location)
- Relocate Stop (new location)

Mobility Hub Recommendations

- Level 2 - Mobility Plaza
- Level 3 - Mobility Center

Traffic Signal Recommendations

- 🚦 TSP Candidate
- 🚦 TSP and/or queue jump candidate



Corridor Recommendations

- 25 signal priority treatments
- 3.4 bus stops per mile
- 1 mobility center and 8 mobility plazas
- 68 stops will have enhanced amenities

Charlotte Douglas International Airport

South Tryon Street & Tyvola Road

South Tryon Street & Clanton Road

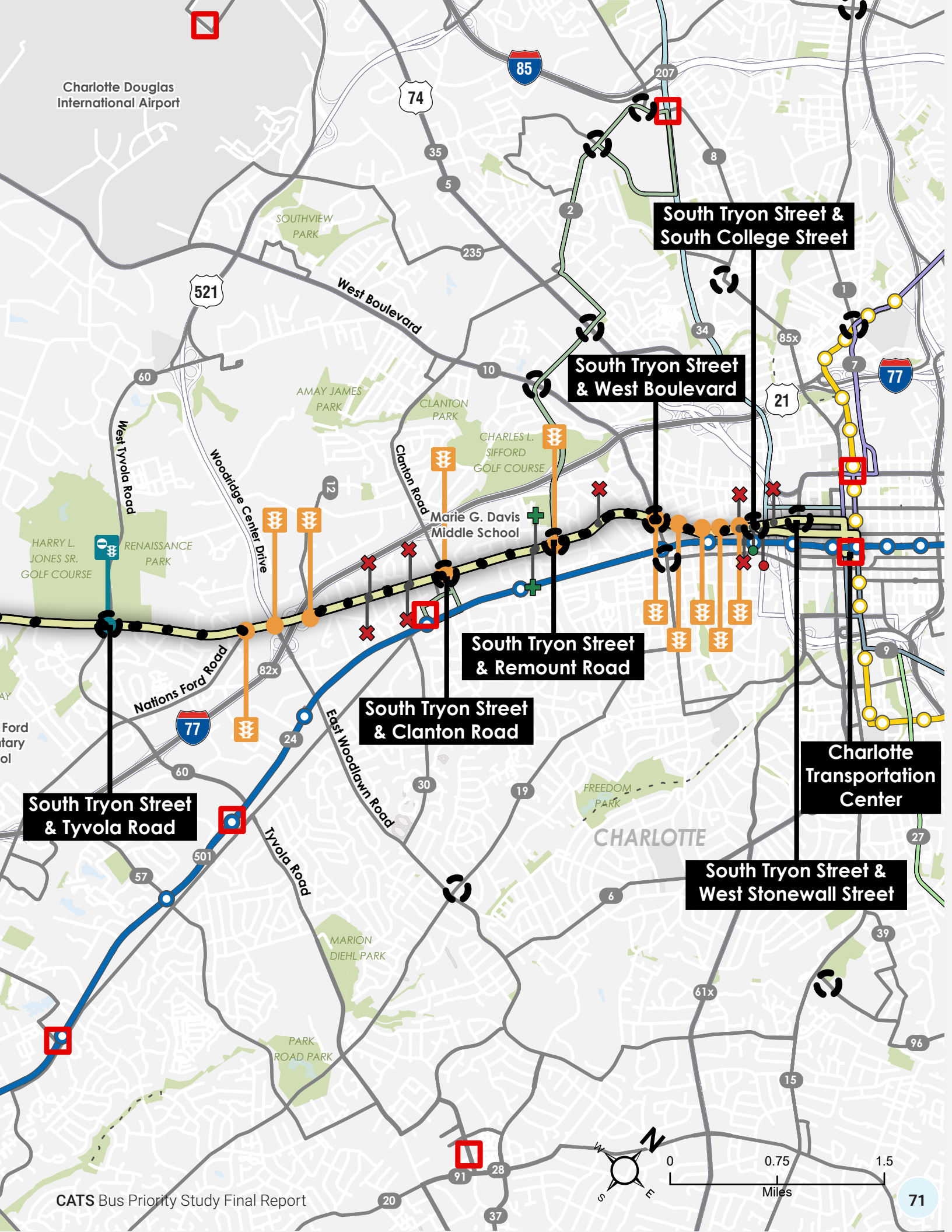
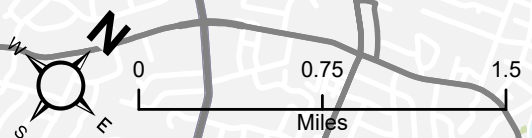
South Tryon Street & Remount Road

South Tryon Street & West Boulevard

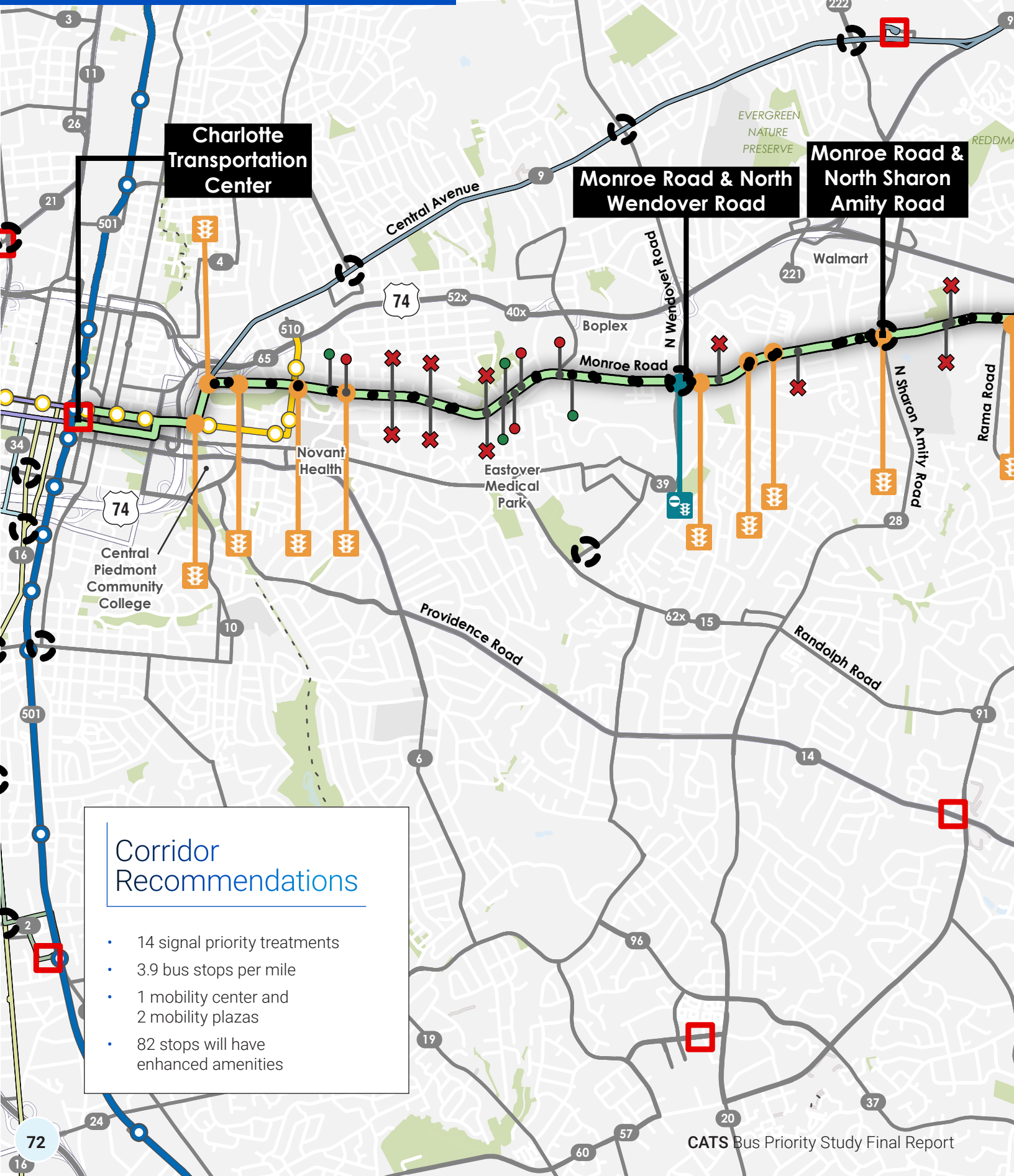
South Tryon Street & South College Street

South Tryon Street & West Stonewall Street

Charlotte Transportation Center



Route 27—Monroe Road



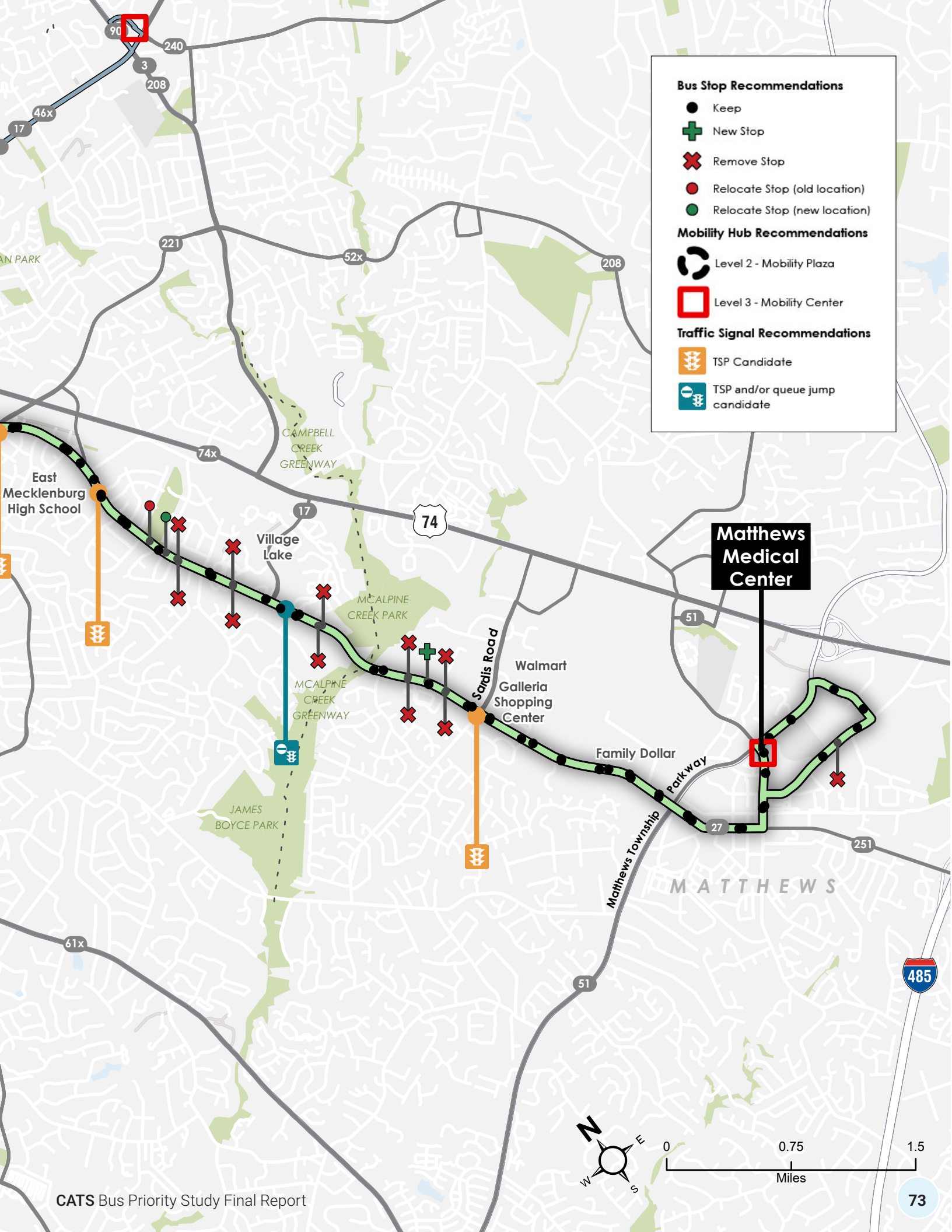
**Charlotte
Transportation
Center**

**Monroe Road & North
Wendover Road**

**Monroe Road &
North Sharon
Amity Road**

Corridor Recommendations

- 14 signal priority treatments
- 3.9 bus stops per mile
- 1 mobility center and 2 mobility plazas
- 82 stops will have enhanced amenities



Bus Stop Recommendations

- Keep
- ✚ New Stop
- ✖ Remove Stop
- Relocate Stop (old location)
- Relocate Stop (new location)

Mobility Hub Recommendations

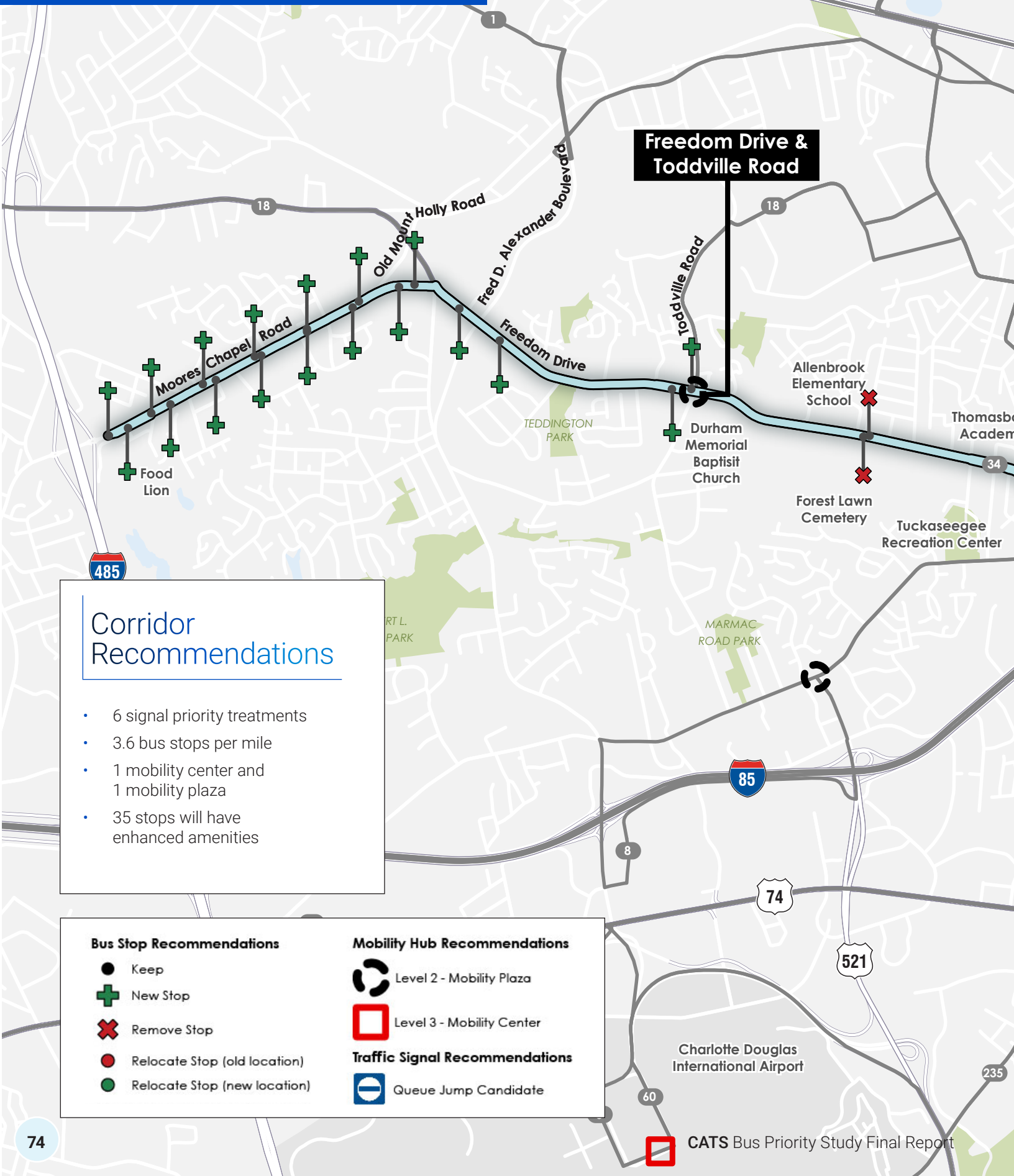
- Level 2 - Mobility Plaza
- Level 3 - Mobility Center

Traffic Signal Recommendations

- 🚦 TSP Candidate
- 🚦 TSP and/or queue jump candidate



Route 34—Freedom Drive



Freedom Drive & Toddville Road

Corridor Recommendations

- 6 signal priority treatments
- 3.6 bus stops per mile
- 1 mobility center and 1 mobility plaza
- 35 stops will have enhanced amenities

Bus Stop Recommendations

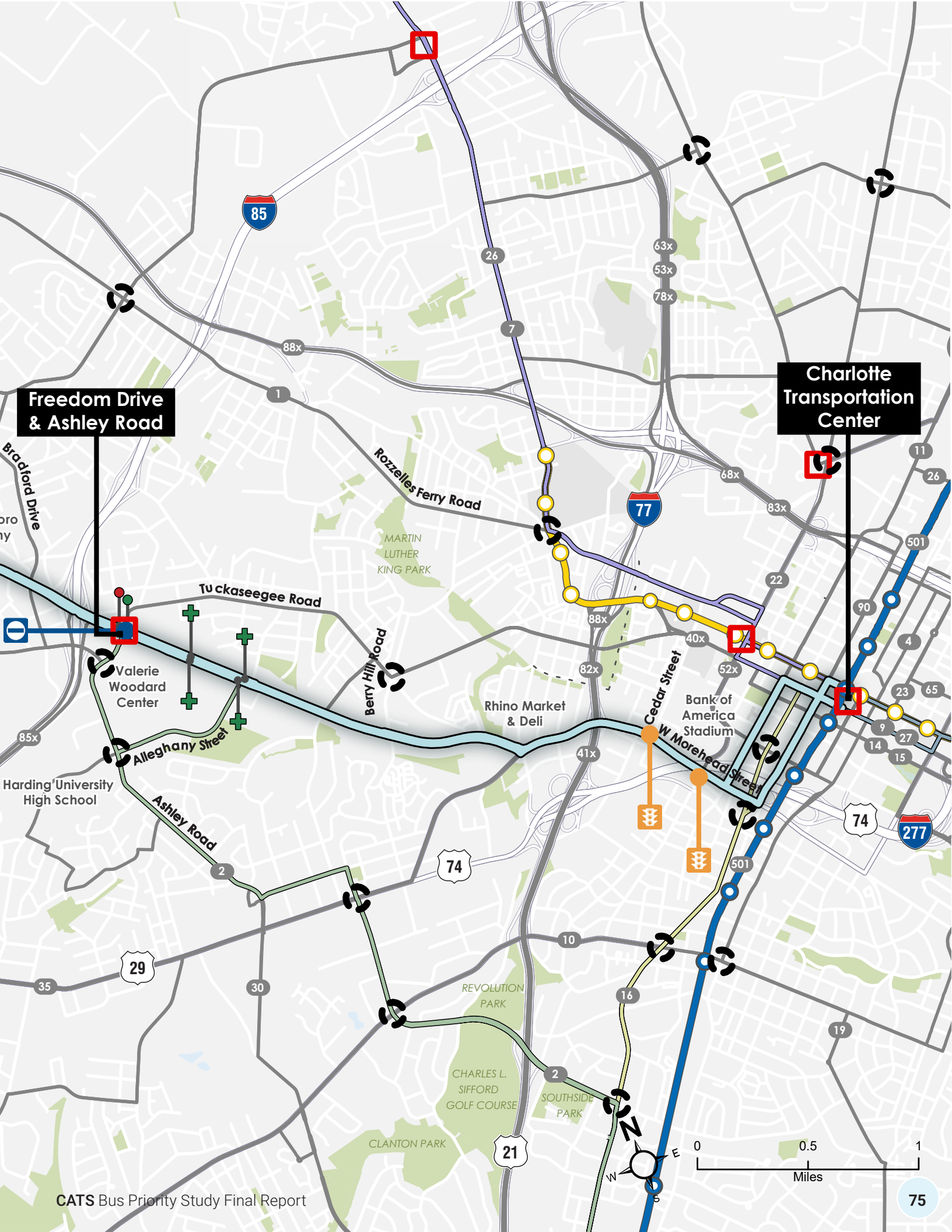
- Keep
- ✚ New Stop
- ✖ Remove Stop
- Relocate Stop (old location)
- Relocate Stop (new location)

Mobility Hub Recommendations

- Level 2 - Mobility Plaza
- Level 3 - Mobility Center

Traffic Signal Recommendations

- Queue Jump Candidate



Freedom Drive & Ashley Road

Charlotte Transportation Center

Route 2—Ashley Road



Corridor Recommendations

- 8 signal priority treatments
- 3.1 bus stops per mile
- 1 mobility center and 7 mobility plazas
- 15 stops will have enhanced amenities



Bus Stop Recommendations

- Keep
- ✚ New Stop
- ✖ Remove Stop
- Relocate Stop (old location)
- Relocate Stop (new location)

Mobility Hub Recommendations

- ⊞ Level 2 - Mobility Plaza
- Level 3 - Mobility Center

Traffic Signal Recommendations

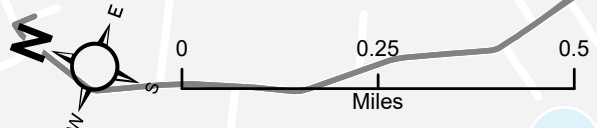
- 🚦 TSP Candidate
- 🚦 Queue Jump Candidate

Remount Road & South Tryon Street

South Tryon Street & Clanton Road

West Boulevard & Remount Road

Scaleybank Station





Microtransit Zone Identification & Evaluation

Microtransit Zone Identification & Evaluation

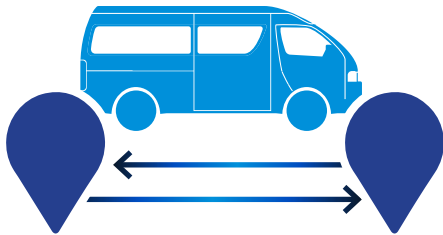
To help achieve our resiliency goals, this bus priority study identified situations and areas where a more flexible 'microtransit' service model could create connections for new and existing passengers. After identifying and prioritizing zones where microtransit could help improve the bus system, we developed service recommendations for a pilot project. The recommendations provide strategic frameworks for different situations and pinpoint areas that experience low frequency routes or have no service at all.

What is microtransit?

Microtransit uses smaller vehicles like shuttles and vans to serve areas without enough ridership to run full-size buses. Service can either be on-demand, with routes that vary based on passenger requests, or fixed routes that circulate a neighborhood and connect to bus priority corridors or rail. Service can be publicly or privately operated.

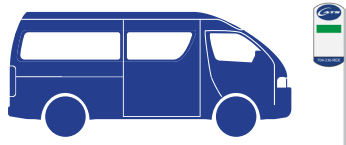
How does microtransit work?

Microtransit can provide on-demand service in areas with low-density and high-need and connect passengers with first- and last-mile solutions to transit and rail in urban areas.



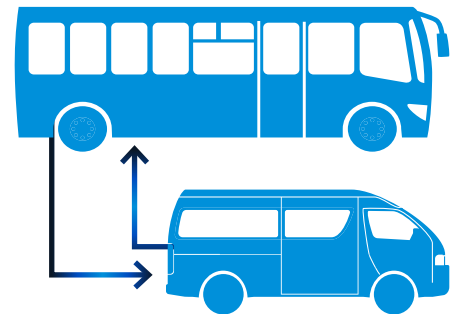
Neighborhood Service Area

- Neighborhood circulator provides curb-to-curb access to neighborhood destinations.



First- and Last-Mile Connections

- Connects passengers to the high-frequency bus network and to rail
- Can supplement fixed routes that feed into the high-frequency bus network



Fixed-Route Replacement

- Replaces or supplements existing, low-performing services with an equal or higher level of service

What would it mean for you?

Microtransit offers our bus system passengers numerous benefits:

- If you don't live near a bus route, you may have new service to major destinations and transit stations from your neighborhood.
- If you live near a bus route that only irregularly serves your neighborhood, you may experience more convenient service.
- Instead of having to walk to a bus stop, you may be picked up at or near your home or at different locations in your neighborhood.

Identifying Microtransit Zones

We used three indicators to identify areas with high transit need, but density levels that work better with microtransit than fixed-route service.

- Demographics
- Destinations
- Density

Who is more likely to need and rely transit on transit, and where do they live?

- Seniors
- Low-income households
- Zero- and one-car households
- Communities of color

Where do people need and want to go?

- Retail/shopping
- Educational facilities
- Medical facilities
- Community centers
- Housing facilities

Where are densities currently too low to support fixed-route service?

Areas with less than five people and jobs per acre are low-density. Though low density makes it difficult to run fixed route service, these are areas where microtransit works best.

Microtransit Recommendations

Candidate Zones

Based on the typical microtransit suitability and destination locations, we identified 17 areas with the potential to improve CATS bus network coverage and connectivity. Figure 7 on the following page maps the 17 candidate zones. To support the Charlotte 2040 vision of 10-minute neighborhoods, we will continue to explore additional first- and last-mile connections to frequent transit routes throughout the network, including the LYNX Blue line. Although our analysis focused on areas with limited or no service, the communities of Camp North End, Wesley Heights, and Oakhurst would also benefit from first- and last-mile solutions.

Zone Prioritization

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 a critical factor when evaluating and implementing new microtransit services. Zones with higher scores are likely to have more successful microtransit services. Figure 8 on the following page illustrates the zone prioritization scoring system. For more on zone prioritization, see appendix E.

Top 3 Microtransit Zones

1. UNC Charlotte—University Research Park
2. Matthews-Mint Hill
3. Airport

Figure 7: Candidate Zones

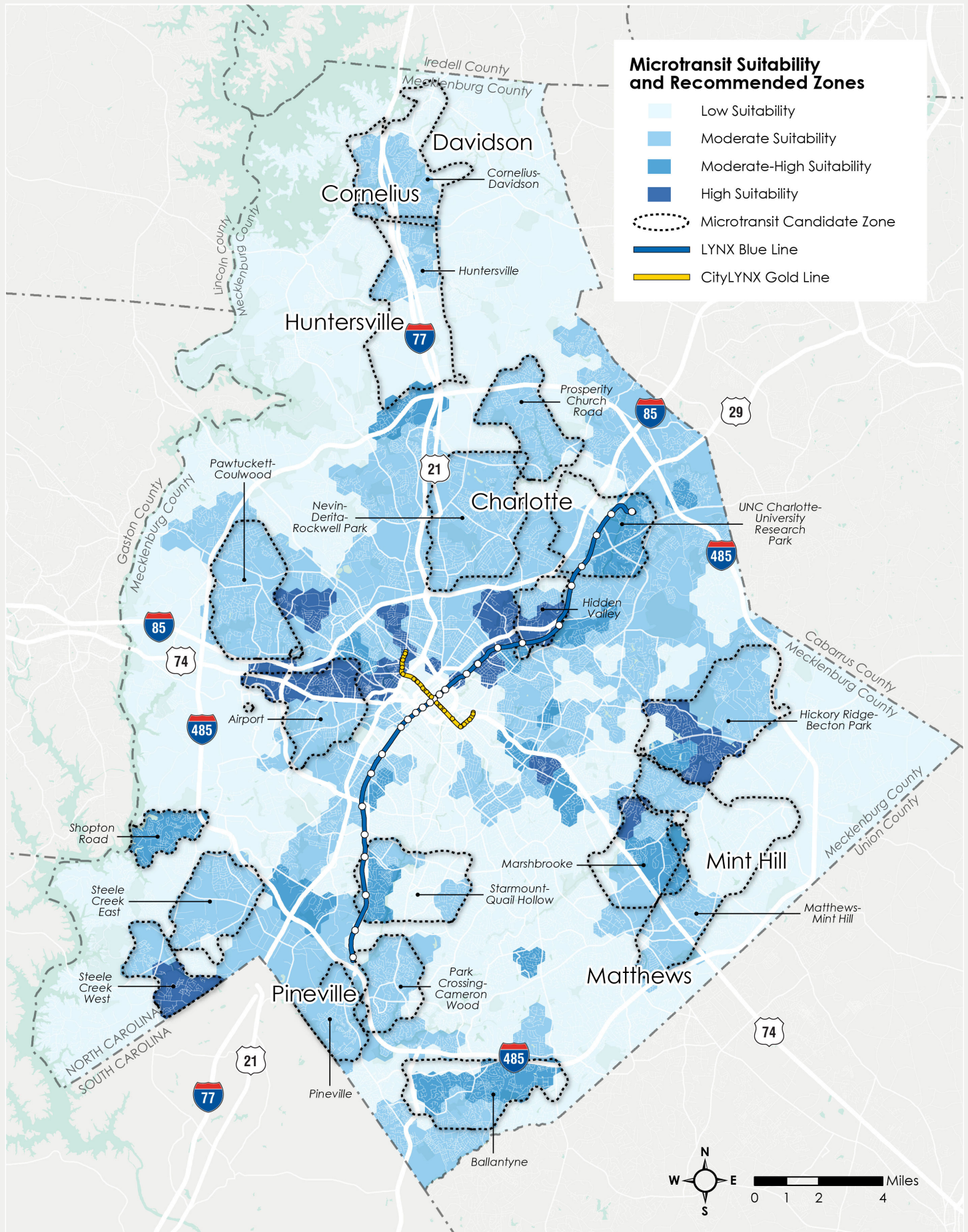
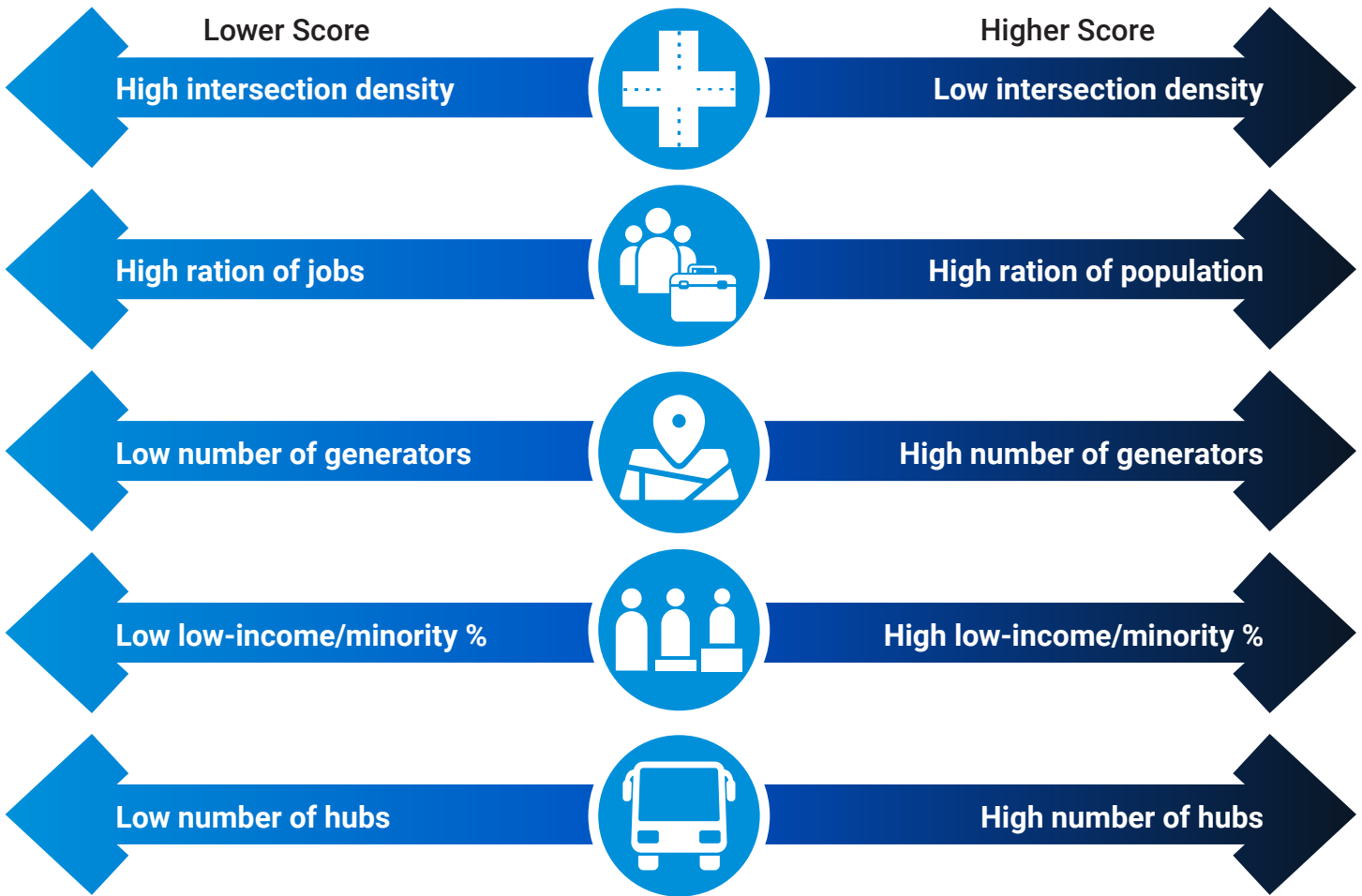


Figure 8: Zone Prioritization Scoring



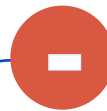
Service Model

We propose that the CATS microtransit strategy use a Software-as-a-Service (SaaS) model. With this model, CATS would procure a technology platform to provide microtransit service, and CATS would provide the operators and the vehicles. The technology would enable riders to book trips via a mobile application or by calling CATS. CATS would operate the service and have dedicated responses to trip requests in nearby single or multiple zones. There are advantages and disadvantages to this service model. For more on the service model recommendations, see appendix E.



Advantages

- Agency has the most control over operations and performance monitoring.
- Agency can directly train and manage operators.



Disadvantages

- Requires higher level of staff effort and flexibility to resolve issues and respond to changes in demand.
- Agency is responsible for driver recruitment, which can be challenging.



Recommendations

Recommendations

The Bus Priority Study is building a bold mobility vision to improve travel time, enhance the customer experience, and increase access for existing and future riders. CATS will achieve this vision through the following actions:

Implement an improved network.

- A high frequency network with 15-minute or better service.
- Bus priority treatments starting on six focus corridors.
- New network and crosstown connections.

Upgrade passenger facilities.

- Mobility hubs systemwide to facilitate transfers between the high-frequency network and other modes of travel.
- Bus stop optimization and amenity upgrades starting on six focus corridors.

Pursue a microtransit strategy.

- Microtransit zones to support first- and-last-mile connectivity, especially to the LYNX Blue Line.
- On-demand service model within recommended zones.

Additional Recommendations

In addition to network, passenger facility, and microtransit recommendations, the study recommends CATS apply the following actions systemwide:

Improve compliance with the American Disabilities Act (ADA) at bus stops.

- Anticipate bus stop expansion needs during initial stop construction to save money in the long term.
- Include ADA-accessible areas that can accommodate future amenities like benches, shelters, and bike racks at new bus stops.

Improve bus stop data management to support decision-making.

- Standardize stop ID across all applications
- When field changes to bus stops are made (e.g., adding an amenity), update the bus stop data to track what has been changed or installed. Coordinate communications for bus stop changes and amenity upgrades to reach all relevant stakeholders and the public..
- Strengthen integrated decision-making as other agencies such as CDOT, social service agencies, and Smart Charlotte may also use bus stop data.

Increase cashless boarding to reduce dwell delay from fare payment.

- Expand use of CATS-Pass.
- Promote use of weekly and monthly passes.
- Consider new farecard strategy.
- Consider offboard fare payment.

Revisit bus lanes in the future to expand eligibility for federal funding.

- Explore corridor-based BRT and other high-capacity transit solutions along Albemarle Road and Freedom Drive.
- Explore freeway- and highway-based transit solutions that use existing and planned express lanes (e.g., a busway on Independence Boulevard and I-485 toll lanes with service to Ballantyne).

Implementation & Next Steps



Implementation and Next Steps

A capital program for the CATS bus system is critical to building a modern, equitable bus network that expands access and connects the Charlotte region.

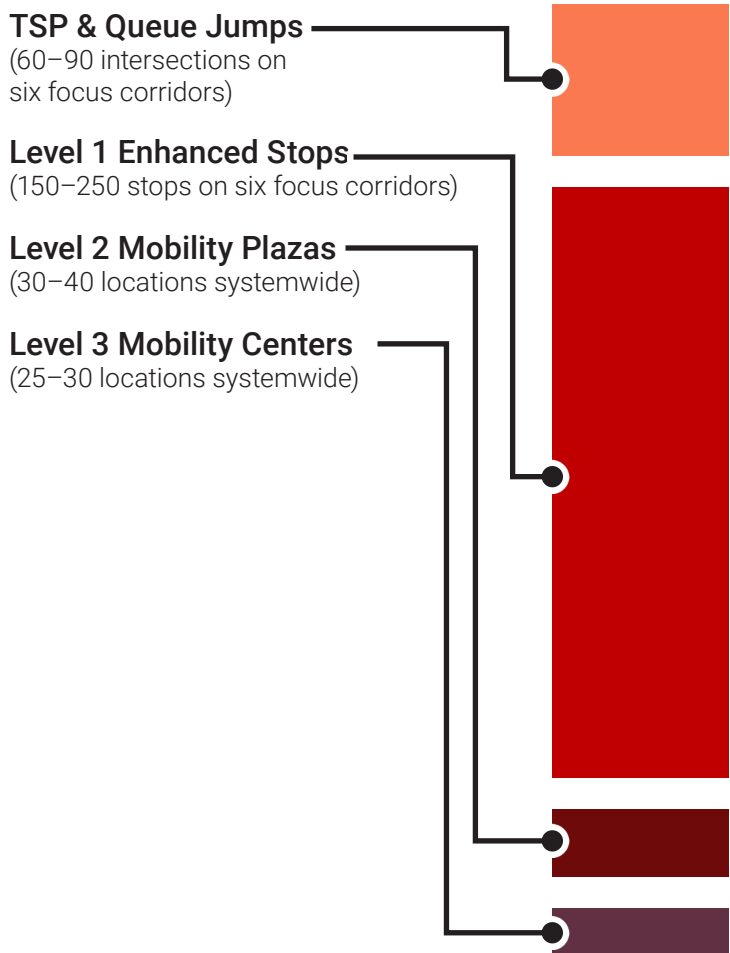
Implementing this bus priority plan will require developing and funding a 10-year capital program. Implementation will consist of the following steps:

- Increase frequencies on 23 corridors within five to 10 years
- Construct mobility hubs systemwide within 5 years
- Design and implement signal priority and bus stop enhancements for six focus corridors within 10 years
- Create implementation plan for remaining 14 high-frequency corridors within 10 years

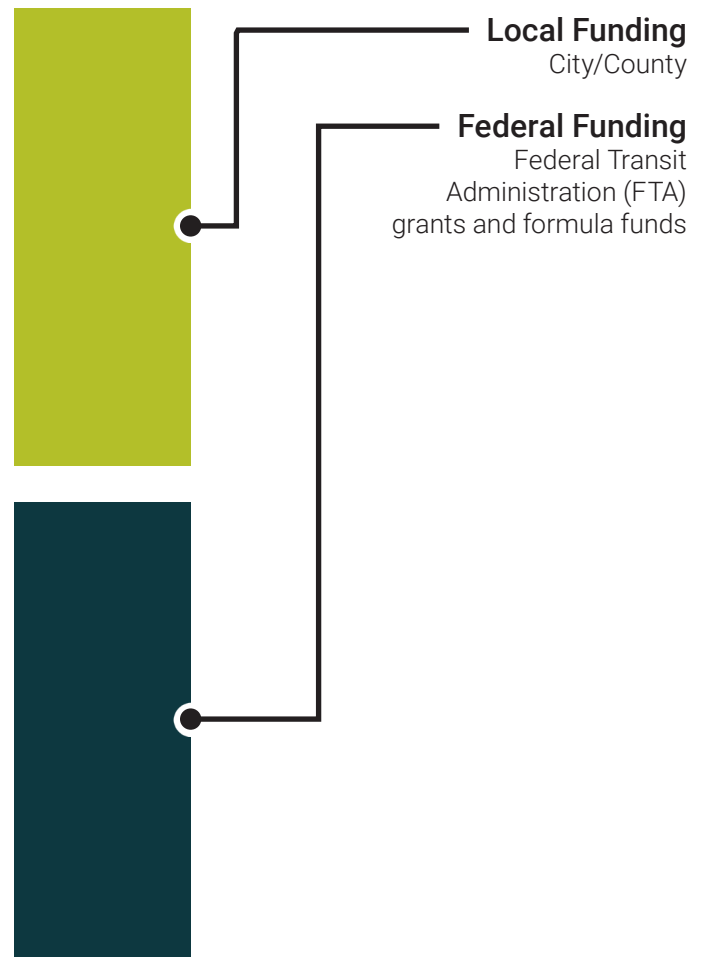
The ability to implement recommended improvements will rely heavily on local funding. Without new local funding, implementation will take longer, be incremental, and have less impact.

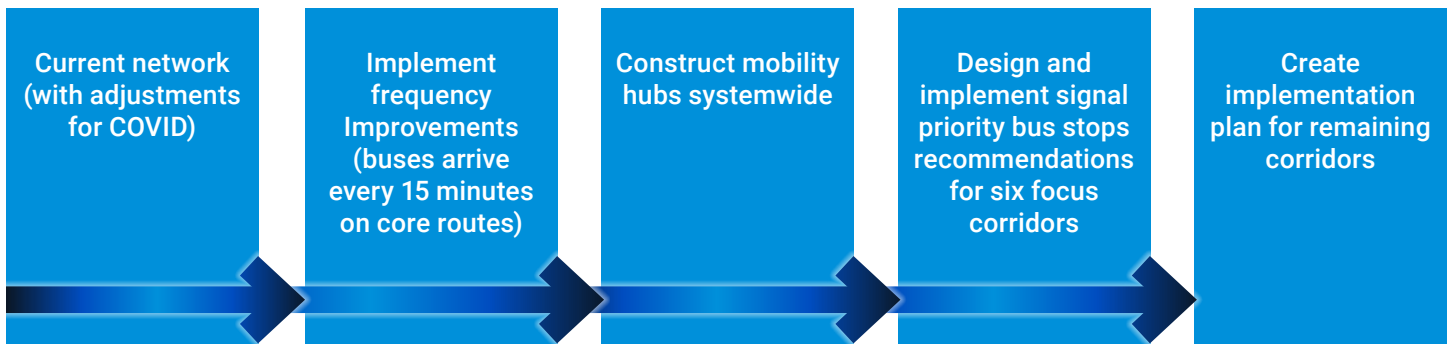
Passenger facility upgrades comprise nearly all of the estimated construction costs, with enhanced amenities for the six focus corridors estimated to comprise half of the overall cost and systemwide mobility hubs (plazas and centers) expected to require nearly half of the overall cost. The cost of installing TSP is low since CDOT's existing signal infrastructure can support activating TSP. CATS will collaborate with NCDOT to upgrade its signals, as needed, on portions of the bus priority corridors. The cost of installing queue jumps will require further study and coordination with CDOT, NCDOT, and other local municipalities.

How much funding is needed?



Where will the funding come from?





Every \$1 of local funding has the potential to be matched with \$1 of federal funding.

Signal priority and passenger facility upgrades on high-frequency corridors could be supported by the Federal Transit Administration (FTA) Capital Investment Grant (CIG) Program. This program offers opportunities under Small Starts and New Starts, and both require at least a portion of a corridor to be operated in bus lanes.

In the future, CATS may decide that bus lanes are required to meet passenger needs. The FTA's CIG program could help fund future bus lanes.

New Starts is a competitive federal grant program that can fund fixed-guideway bus rapid transit (BRT) projects. To qualify, over 50% of the BRT route must operate in a dedicated transit right of way. This program funds projects that have a total project cost of \$300 million or more or are seeking \$100 million or more in federal funds.

Small Starts is a competitive federal grant program that can fund projects for fixed-guideway BRT and corridor-based BRT with high frequencies, transit signal priority, and that meet passenger facility criteria—even if they only operate in a dedicated right of way during peak periods. This program funds projects that have a total project cost of \$300 million or less or are seeking less than \$100 million in federal funds.

In the future, CATS may choose to pursue other federal grant opportunities such as the Rebuilding American Infrastructure with Sustainability and Equity (RAISE) discretionary grant.

A capital program for the bus system will lay the foundation for CATS to pursue multiple funding opportunities.

Recommended Program

It is recommended that a CATS Bus Priority Capital Program be developed to maximize opportunities for federal funding to invest in the bus system.

Scale

\$4–\$15 million in local funding each year for the next 10 years. For more on costs and scale, see appendix F.

Time Frame & Approach

CATS would construct two to three corridors per year to implement bus priority on all 23 high-frequency routes within 10 years.

Funding Sources

50%—Local Capital Funding

50%—Combination of Federal & State Grants/Funding Sources