ATTACHMENT D

Major Investment Study (MIS)

Commuter Rail Transit System Level Guidelines and Evaluation

Wake Transit Plan

Durham County Transit Plan

GO FORWARD

A COMMUNITY INVESTMENT IN TRANSIT

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Introduction

The purpose of this document is to identify the existing and future transportation problems in the Triangle Region and provide guidelines for design of the Commuter Rail Transit (CRT) system, including stations and performance targets for operations and how these targets will be evaluated. Each of these tasks is a unique standalone item; however, the tasks are combined in this single report for the purposes of review and comment by the Major Investment Study (MIS) technical committees. The tasks documented in this report are:

- System Transportation Problem Identification,
- Design Guidelines and Performance Targets, and
- Evaluation Framework.

The *Commuter Rail Existing Conditions* report provided information and data that are used as input in the development of the System Transportation Problem Identification. The CRT Design Guidelines and Performance Targets were developed based on the *Commuter Rail Peer Review* report, which reviewed 11 peer systems across the United States representing different investment strategies and service levels.

The values from the peer systems provide targets or a benchmark for the reasonableness of MIS results. In this report, the terms guidelines, benchmarks, minimums, and maximums are used for both the definition of the proposed commuter rail service alternatives and the performance measures that will be used to evaluate the range of alternative service plans and station locations. As the project moves into the next phase of project development, including preliminary engineering and the required environmental studies, more specific design guidelines and standards will be developed that further define the project. At this phase of the study, these guidelines and performance measures should only be considered in evaluating the relative differences between the commuter rail alternatives and laying the foundation for advancing the project to the project development phase. The guidelines and performance measures should be revisited at each phase of the advancement of the project through project development, construction, and operations.

1 System Transportation Problem Identification: CRT Corridor

Three overarching challenges will affect mobility and accessibility either now or in the future within the CRT corridor defined in the Wake County Transit Plan and the Durham County Transit Plan. Implementation of CRT is intended to help address these challenges. This section describes the three challenges and documents specific issues within the CRT corridor.

1.1 CHALLENGE ONE: ADDRESS EXISTING AND PROJECTED FUTURE GROWTH AND TRAVEL DEMAND

The Triangle[1] is growing at a rapid pace and is projected to continue growing rapidly decades into the future. Home to 1.7 million people in 2013, the Triangle Region is expected to reach up to 2.9 million in 2045, as noted in the 2045 Metropolitan Transportation Plan (MTP)[2]. This region is also home to major universities and their associated medical centers, Research Triangle Park (RTP), and the North Carolina State Government. According to the outputs of the Triangle Regional Model (TRM),[3] between 2013 and 2045, population in Wake County is projected to grow by 72% (689,000), while population in Durham County is expected to increase by 66% (190,000). The projected population growth in these two counties would account for 76% of the total regional population growth. The Region's economic position is forecasted to remain robust through 2045 with the addition of approximately 430,000 jobs. The largest job growth is expected to occur in Wake County, adding 284,000 jobs (that is, 66% of the Region's total employment growth), followed by Durham County with an addition of 93,500 new jobs (22% of the total employment growth). The remainder of the model region accounts for 12% of the total employment growth, with the majority of the remaining employment growth in Orange County.

The rapid population and economic growth within the Triangle Region will be coupled with large cross-county commuting flows in the region and a steady increase in highway congestion. The 2045 MTP estimated that 82,000 people commuting each day will cross the boundaries of Wake, Durham, and Orange Counties. The *Commuter Rail Existing Conditions Report* has identified some major travel patterns between sub-districts within the CRT corridor: Chapel Hill-Durham-North Durham, Cary-Research Triangle Park-Durham, Raleigh-Cary, Raleigh-Garner-Clayton, and Raleigh-Neuse-Wake Forest. The most heavily traveled roadway in this corridor is the section of I-40 near the Wake County-Durham County line. According to the *Wake Transit Plan*, a trip between Durham and Raleigh during the PM peak hour using NC 147 and I-40 will typically take between 35 minutes to 1 hour and 20 minutes, with today's traffic. As documented in the Commuter Rail Existing Conditions Report, the Average Annual Daily Traffic (AADT) along these major roadway corridors is expected to grow at an annual rate from 0.92% to 2.91%.

Infrastructure investments in the CRT corridor can offer long-term benefits. High quality transit services encourage people who value transit to locate closer to good transit services, which will lead to lower car ownership, higher density, and a reduction in parking requirements. The 2045 MTP stated that about one-quarter to one-third of households today would prefer to live in a compact, walkable neighborhood with a mix of activities where they can be effectively served by transit. This would suggest that by 2045, as many as one million Triangle residents would select a compact, walkable, mixed-use neighborhood if that option is available to them.

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[1] The Triangle Region is defined as the Capital Area Metropolitan Planning Organization (CAMPO), which covers all of Wake county and portions of Franklin, Granville, Harnett, and Johnston Counties; and 2) the Durham-Chapel Hill-Carrboro Metropolitan Planning Organization (DCHC MPO), which covers all of Durham County and parts of Orange and Chatham Counties.

[2] CAMPO and DCHC MPO coordinated to develop the 2045 MTP for the Triangle region.

[3] The regional population and employment numbers reported are outputs from the TRM study area.

1.2 CHALLENGE TWO: IMPROVE TRANSIT SERVICE AND CUSTOMER EXPERIENCE

Bus transit is a vital form of transportation in the Triangle Region. Riders rely on buses to get to their daily destinations including work, school, shopping, and medical appointments. According to the 2015 regional on-board transit survey, 41% of all bus riders belong to zero-car households, 39% of riders earned less than $15,000 (in 2014), and 78% of riders earned less than 150% of the federal poverty level.

Currently, eight regional bus routes[4] serve all or part of the CRT corridor, attracting 3,300 daily boardings on average. The average on-time performance for these bus routes is 83%, with the Route 305 (Lake Pine-Cary-Raleigh) being the lowest (71%), DRX (Durham-Raleigh Express) being 78%, and Route 700 being the highest (96%). With low on-time performance, customers are not able to rely on transit to get them where they need to go in the amount of time expected. An investment in CRT infrastructure could help improve transit service quality in the form of speed and reliability. The commuter rail is envisioned to provide more reliable "45 minutes or better" service for travelers between Durham and Garner at peak times, while bypassing congestion and other motorist delays. Such improvements would help retain and increase satisfaction of existing riders and provide choice and opportunities to attract new riders.

1.3 CHALLENGE THREE: SUPPORT LOCAL PLANNING EFFORTS TO PRESERVE AND ENHANCE THE QUALITY OF LIFE IN THE REGION

Cities and towns, universities, MPOs, counties, the State, and other organizations across the region are all planning for projected growth within the Triangle region. Recognizing the limitations of finite space and resources, these local, regional, and state plans depend on transit investments to help realize their desired outcomes. Anticipating greater demand for transit, a variety of premium transit planning efforts will provide dedicated high-capacity transit corridors in Wake County, Durham County, and Orange County. The Wake-Durham Commuter Rail is envisioned as a key investment of Wake Transit Plan's Big Move 1 – Connect Regionally. The other transit services in the 2045 CAMPO-DCHC MPO coordinated MTP include Light Rail Transit (LRT), Bus Rapid Transit (BRT), and increasing bus service frequency and coverage. The LRT connecting Durham and Chapel Hill is projected to provide more than 26,000 trips a day when complete in 2028.[5]

These plans are built around priorities such as economic development and social equity, focusing growth in specific areas, conserving resources, protecting the environment, increasing affordable housing, and improving multimodal access to opportunities across the region. Providing high-quality transit services would help increase the "fit" between the transit system and the population, leading to increased ridership growth and housing, offices, and retail environments that provide the full range of lifestyle options the market demands.

The City of Raleigh 2030 Comprehensive Plan has land use policies that recommend compact land use patterns to improve transportation networks and undertake studies and plans for growth centers and transit station areas (rail or bus transfer nodes). A major investment in high capacity transit systems like commuter rail transit (CRT) can provide the infrastructure to support this land use policy. In the Cary 2040

[4] GoTriangle Bus routes that serve the CRT corridor include Routes 100, 105, 300, 301, 305, and 700; the Durham-Raleigh Express (DRX); and the Chapel Hill-Raleigh Express (CRX).

[5] Durham County Transit Plan, Progress Report FY2017

Community Plan, support was identified for transportation choices that will allow workers to drive, walk, bike, take the bus, or even possibly ride regional rail to destinations. The Cary plan also sets the stage for regional transit improvements and transit oriented development that will support future transit ridership. The Durham Comprehensive Plan has specific policies directed at rail investment plans including regional rail through policies to invest in implementing the plans that designate compact neighborhoods around proposed regional rail transit stations and the reservation of right-of-way along designated transit corridors.

Enhanced transit investments support the comprehensive land use policies of the communities in the corridor and can also help the Wake-Durham region remain competitive in a global economy by making it easier for employees to get to their jobs, thus helping businesses attract and retain talent.

1.4 CONCLUSION

This section summarizes the challenges faced by residents and commuters located with proximity of the proposed CRT corridor. The Triangle Region's population is growing at a rapid pace and is projected to continue growing rapidly decades into the future. While this growth will bring innovation and new opportunities into the area, the Region must strategically plan for this growth to preserve and enhance the quality of life for current and future residents. The CRT investments called for in the Wake County Transit Plan and Durham County Transit Plan are part of this larger strategic planning effort, aiming to provide price competitive, reliable transportation solutions that will provide a congestion-free alternative, connect regionally, and provide reliable access to jobs.

2 CRT Design Guidelines and Performance Targets

2.1 INTRODUCTION

The 37-mile CRT is proposed to operate between Garner, Downtown Raleigh, NC State University, Cary, Morrisville, RTP and Durham within the existing North Carolina Railroad Company (NCRR) corridor. Norfolk Southern (NSR) operates on the NCRR corridor through a NCRR/NSR Trackage Rights Agreement and a NCRR/NSR Operating and Maintenance Agreement. The segment of the corridor between downtown Raleigh and downtown Cary is shared by NS and CSX; trains in this segment are dispatched by CSX. Freight and Amtrak intercity passenger rail services exist in the Wake-Durham corridor and operate throughout the day.

The proposed CRT will operate on shared tracks with both freight and intercity passenger rail service. Consequently, any commuter rail vehicles must comply with the Federal Railroad Administration's (FRA) crash worthiness standards to operate in this corridor. In addition, temporal separation[6] will not be an option for the Wake-Durham CRT service as the existing freight and intercity passenger rail services operate throughout the day. Therefore, the CRT stations must be planned and designed to allow for both services to operate without being impeded.

Commuter rail operations and the provision of service vary by peer system and often reflect features and circumstances that are unique to the rail corridor, ownership, types of rolling stock operating on the line, and the transit agency size and resources. The CRT design guidelines and performance targets were developed following a peer agency review (see *Commuter Rail Peer Review Report*), and a review of the American Railway Engineering and Maintenance-of-Way Association (AREMA) Manual for Railway Engineering, North Carolina Railroad Company (NCRR) Criteria & Guidelines for Engineering & Construction, Norfolk Southern Passenger Station Requirements, Transit Capacity and Quality of Service Manual, and other agency guidelines including VRE System-Wide Service Standards and Policies. The CRT design guidelines are consistent with the AREMA, NCRR Criteria & Guidelines for Engineering & Construction, and Norfolk Southern Passenger Station Requirements. The performance targets are largely informed by the systems included in the peer review report.

Within the *Peer Review Report*, 11 systems across the United States were selected to represent different investment strategies and service levels, and their applicability to the Wake-Durham Commuter Rail Project was explored. The purpose of this section is to offer a range of design guidelines, not to set a universal standard for the system. The values from the peer systems provide a benchmark for the reasonableness of the MIS results. These peers may have some components that are applicable to Wake-Durham CRT and others that might not; accordingly, the peer review simply establishes criteria for initial evaluation and is not intended to state final design criteria or standards. They can be revisited if needed to adjust to targets that are more reasonable and feasible based on tradeoffs elected during the project development.

The performance measures for the CRT peer systems were pulled from standard National Transit Database (NTD) reports for 2016, the most recent year available. Measures include operating expenses per vehicle

[6] Temporal separation is defined as the separation of the operation of conventional freight/commuter rail trains and equipment that does not comply with Federal Railroad Administration crashworthiness standards at distinct periods of the day and with established procedures to ensure strict observation of the defined operating window.

revenue mile, operating expenses per passenger boarding, farebox recovery, and passenger boardings per vehicle revenue hour. An appendix to this document shows how these numbers are pulled from the NTD reports. In these reports, the term *vehicle* is used for rail as well as other modes (bus). For commuter rail systems, a vehicle is the same as a passenger or coach car. Multiple passenger cars make up a single train. Take the Virginia Railway Express (VRE) as an example – if a single train has four coach or passenger cars, then 60 passenger boardings/vehicle (passenger coach) revenue hour will be equivalent to 240 passengers per train per revenue hour. Table 1 provides a summary of key features for the peer CRT systems reviewed in the *Commuter Rail Peer Review Report*.

Table 1 | Peer CRT System Core Elements

Commuter Rail System	Number of Round Trips Per Day	Peak (Off Peak) Headway	System Miles	Number of Stations	Average Station Spacing (in Miles)	Operating Expenses[1] per Vehicle (Passenger Coach) Revenue Mile[2] (in 2016 dollar)	Operating Expenses per Passenger Boarding (in 2016 dollar)	Farebox Recovery[3]	Passenger Boardings per Vehicle (Passenger Coach) Revenue Hour
A-Train (Denton, TX)	30	22 min (40 – 60 min)	21	6	4.2	$19.8	$23.4	6%	21
MetroRail (Austin, TX)	18	30-40 min (1 hour)	32	9	4.0	$77.3	$28.6	9%	64
SunRail (Orlando, FL)	18	30 min (1-2 hour)	32	12	2.9	$48.1	$34.3	6%	45
Music City Star (Nashville, TN)	6	45 min (No Service)	33	6	6.6	$25.6	$18.6	17%	37
Tri-Rail (Miami, FL)	25	20-40 min (1 hour)	71	18	4.2	$25.0	$21.2	15%	34
Virginia Railway Express (Washington, DC)	8 (Manassas Line)/ 8 (Fredericksburg Line)	30 min (Limited Off Peak)	35 (Manassas Line) / 54 (Fredericksburg Line)	10 (Manassas Line) / 13 (Fredericksburg Line)	3.9 (Manassas Line)/ 4.5 (Fredericksburg Line)	$30.5	$16.1	54%	61
Trinity Railway Express (Dallas-Fort Worth, TX)	32 trains to Dallas/31 trains to Fort Worth	30 min (1 hour)	36	10	4.0	$24.0	$13.6	32%	42
Northstar (Minneapolis, MN)	12	30 min (No Service)	40	7	6.7	$31.0	$23.5	14%	52
Coaster (San Diego, CA)	11 to San Diego/12 from San Diego	30-40 min (1-3 hour)	41	8	5.9	$12.2	$10.8	41%	45
FrontRunner (Salt Lake City, UT)	31	30 min (1 hour)	89	17	5.6	$8.4	$10.0	15%	29
University of Colorado A Line (Denver, CO)[4]	72	15 min (30 min)	23	8	3.3	$28.1	$10.8	12%	57
Peer System Average	**25**	**30 min (1 hour)**	**46**	**11**	**4.7**	**$30.0**	**$19.2**	**20%**	**44**

[1] Operating expenses are the expenses associated with the operation of the transit agency, and classified by function or activity, and the goods and services purchased. The basic functions and object classes are provided in the *Glossary of Terms* at the end of this report. Source: National Transit Database (NTD) Glossary, https://www.transit.dot.gov/ntd/national-transit-database-ntd-glossary.

[2] Federal Transit Administration - NTD Transit Agency Profiles. Retrieved from https://www.transit.dot.gov/ntd/transit-agency-profiles. Vehicle is equivalent to a passenger car or coach, and multiple passenger cars make up a single train.

[3] Farebox recovery is calculated by dividing the Commuter Rail expenses by the Commuter Rail Fare Revenue, as reported in the NTD Transit Agency Profile.

[4] University of Colorado A Line was opened in April 2016, and B line was opened in July 2016, so the 2016 NTD report only covers the partial year and is for both lines.

2.2 INFRASTRUCTURE DESIGN GUIDELINES

Infrastructure design guidelines set the benchmark components and features for construction and operation of CRT service. The guidelines were developed following a review of national peer system practices (refer to the *Commuter Rail Peer Review Report*), American Railway Engineering and Maintenance-of-Way Association (AREMA) Manual for Railway Engineering, North Carolina Railroad Company (NCRR) Criteria & Guidelines for Engineering & Construction, Norfolk Southern Passenger Station Requirements, Transit Capacity and Quality of Service Manual, and other agency guidelines including VRE System-Wide Service Standards and Policies.

The purpose of setting these guidelines in this document is to achieve the desired objectives and components of the proposed CRT, including connecting the region and supporting local planning efforts to preserve and enhance the quality of life in the region. The peer review simply establishes criteria for initial evaluation and is not intended to be the final design criteria or standards. They can be revisited if needed, to adjust to targets that are more reasonable and feasible based on tradeoffs elected.

Station Spacing

While there are no fixed requirements for station spacing, general rules of thumb are seeking to balance speed and access:

a. Longer spacing allows higher running speeds, improving its competitiveness with auto commuting;

b. Closer spacing increases overall accessibility and reduces the travel distance between stations and potential trip origins/destinations.

As noted in AREMA Chapter 11, "Station spacing should be sufficiently close to capture the available ridership without imposing large travel time penalties associated with an excessive number of station stops." The average station spacing for the peer systems, which is documented in the *Commuter Rail Peer Review Report* and also shown in Table 1, ranges between 2.9 and 6.7 miles.

In areas of moderate to high density and more activity generators, closer station spacing is warranted to provide access to destinations. In low-density areas, speed is prioritized to ensure that CRT service provides a compelling alternative to driving. Stops may be spaced farther apart than the guideline if there are no connections or destinations that warrant service. Based on

existing land use, moderate- to high-density areas are defined as having 10 or more people and jobs per acre; low-density areas are defined as having fewer than 10 people and jobs per acre. Figure 1 and 2 show the existing and projected 2045 population and employment densities, based on the TRM outputs.

To achieve the appropriate balance between speed and accessibility, CRT stations are assumed to be spaced between 2 and 5 miles apart, as prescribed in the *Wake Transit Plan*. The general CRT station spacing guideline is shown in Table 2.

Table 2 | Station Spacing Guideline (in miles)

Average Station Spacing in Miles	CRT Service	Peer Review
Medium to High Density Areas	2	The station spacing ranges between 2.9 and 6.7 miles for the peer CRT systems, with an average of 4.7 miles (Table 1).
Low Density Areas	5	

Figure 1 | Station Spacing Guideline Based on Existing Population and Employment Density

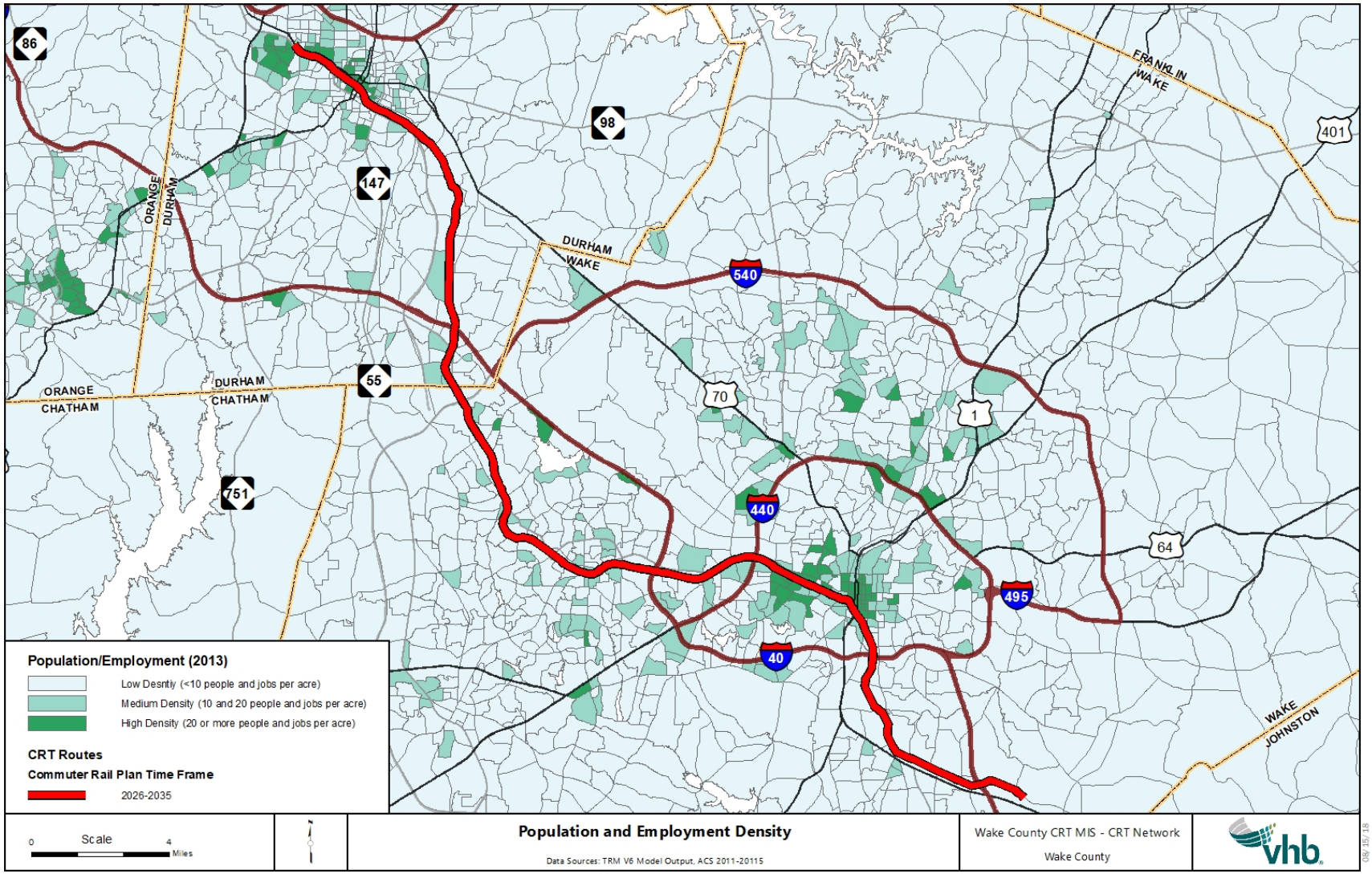
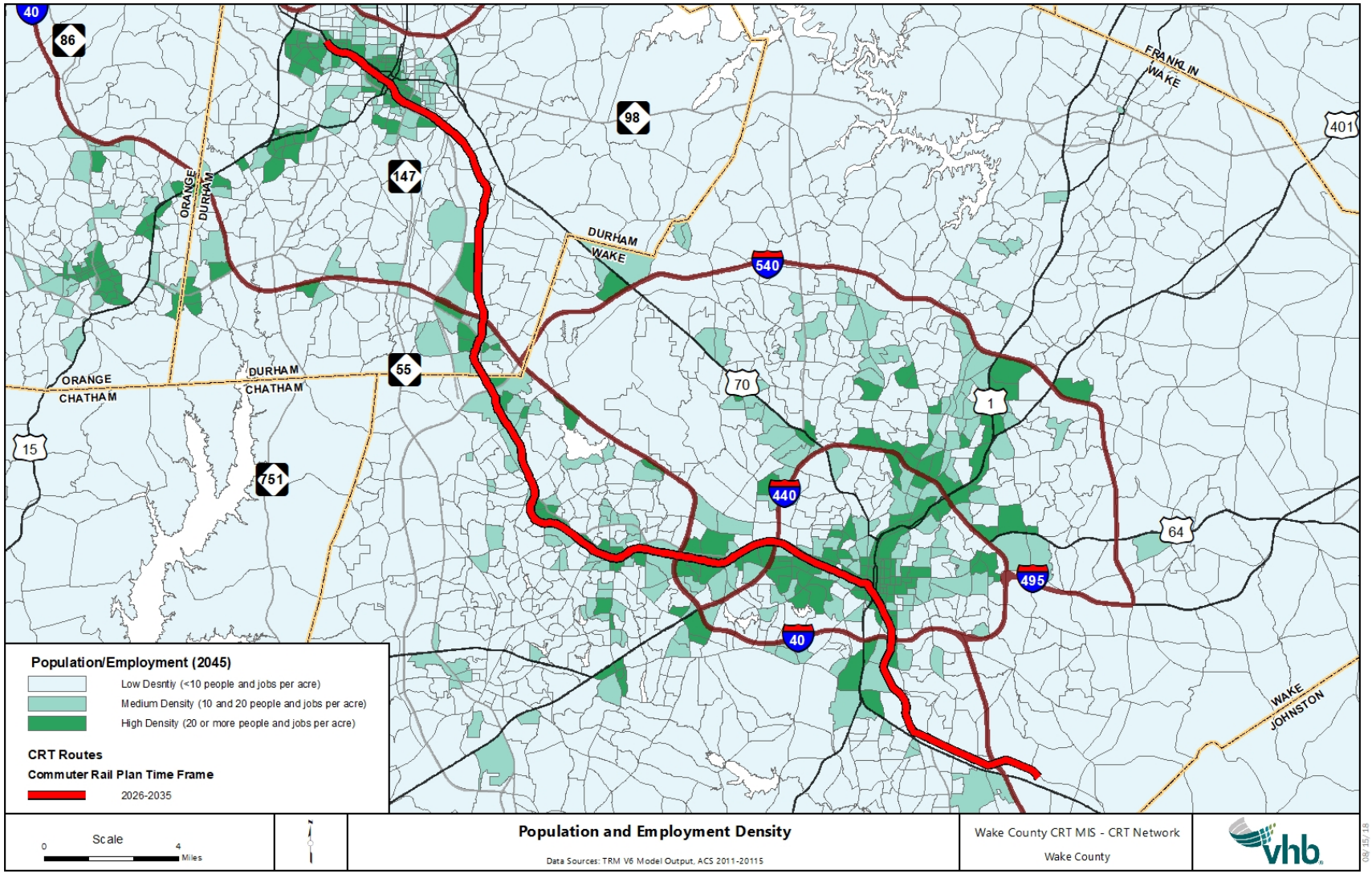


Figure 2 | Station Spacing Guideline Based on 2045 Population and Employment Density



CRT Station Design and Amenities

CRT stations, defined as stops within the CRT infrastructure, are an integral part of the passenger experience. Their design and amenities can impact the attractiveness of the service as well as the speed of service. The commuter rail station can be an enhanced platform, a building dedicated as the station, or part of a mixed-use building. Pedestrian accessibility, weather protection, and security are important considerations for station design (see Figure 3).

Figure 3 | CRT Station Example

VRE Rolling Road Station (Burke, VA)

All CRT stations are recommended to include the following features:

- **Platform:** Passenger access to commuter rail trains can be from high- or low-level platforms. It is not possible to provide high-level platforms on tracks that are shared with freight trains, as freight cars cannot operate adjacent to the high-level platforms. Given the shared freight and passenger rail service in the corridor, low-platform stations are the likely standard for any new commuter rail stations. Stations must meet the NCRR Criteria & Guidelines for Engineering and Construction and Norfolk Southern Passenger Station Requirements, as well as any accessibility requirements outlined by the FRA and AREMA Manual for Railway Engineering. The 2011 DOT Platform Rule requires full-length, level-boarding platforms (where the platform surface is level with the floor of the train cars) in new and substantially reconstructed commuter and Amtrak stations where no track passing through the station and adjacent to the platforms is shared with existing freight rail operations.

- **Ticket Vending Machines (TVMs):** Every station should require fare payment prior to boarding the vehicle. Every station should be equipped with appropriate technology for customers to purchase tickets for CRT service using cash or debit/credit card. In addition, a pass validator should be included for customers with passes or stored-value cards.
- **Real-time passenger information systems:** Audio and digital announcements of train arrivals, departures, and track information should be provided at stations. Having access to real-time information reduces passengers' anxiety during wait time.
- **Schedule and route information:** Stations should include maps and schedules for CRT service, displayed in an easy-to-read format and kept up to date with schedule or service changes that may occur.
- **Enhanced comfort:** Stations should include platform canopy to provide protection from sun and rain. Stations should provide appropriate and sufficient seating. Stations should be well lit to promote safety and security. Waste and recycling receptacles should also be provided.
- **Park-and-ride facility:** As distance from the trip origin to transit service increases, more passengers use automobiles as an access mode. Throughout the country, the automobile is the primary access mode for commuter rail, making park-and-ride facilities necessary. The size of a park-and-ride facility depends on factors such as estimated parking demand, bus service frequencies, street system capacity, availability of reasonably priced land, and environmental constraints. Estimated parking demand is a function of the station type (for example, terminus stations typically draw from a larger catchment area than other stations along the line), the overall service population (population and employment in an area), density of uses adjacent to the station, proximity of special generators, and walkability. Park-and-ride lots should not be located at major commuter destinations such as North Carolina State University, downtown Raleigh, or Durham.
- **Bicycle parking:** Stations should be equipped with bicycle parking.
- **Special pavement markings:** Station should include surface area striping and pavement markings to identify directional paths for station functions. Special pavement markings, which may include pavement texture and/or color changes, should be used to indicate areas of special concern, including tactile warning strips of distinct color and/or texture from the platform surface marking the boarding edge of platforms.
- **Americans with Disabilities Act (ADA) accessibility:** As stated in AMTRAK Engineering Station Standard Design Practices (SDP), all spaces used by passengers and employees as well as access to and from those spaces, Public Right of Ways, parking lots, platforms, and other related locations shall comply with the ADA standards for Transportation Facilities, effective 11/29/2006 (2006 DOTAS), which can be found: http://www.access-board.gov/ada-aba/ada-standards-dot.cfm.

2.3 SERVICE DESIGN GUIDELINES

This section summarizes the service design guidelines for CRT, including definitions for span, frequency, and train loadings. The service design guidelines were developed following a review of national best practices (refer to the *Commuter Rail Peer Review Repor*t), and service design guidelines from other agencies including VRE System-Wide Service Standards and Policies. The service guidelines below represent the minimum levels of each service item. Higher levels of service in terms of service periods and frequency of service throughout the day will be evaluated

in the CRT alternative analysis. The peer review simply establishes criteria for initial evaluation and is not intended to state final design criteria or standards. They can be revisited, if needed, to adjust to targets that are more reasonable and feasible based on tradeoffs elected.

Minimum Span of Service

The span of service guidelines establishes the required base span of service for CRT. The span of service depends on the amount of activity, and consequently the need or demand for transit service. The guidelines reflect the *shortest* period of time that CRT service should operate.

The recommended minimum spans of service are shown in Table 3.

Table 3 | Minimum Span of Service

Weekdays	CRT Service	Peer Review Example
AM Peak	6:00 to 10:00 AM	VRE Manassas Line (5:00 AM to 6:30 PM); VRE Fredericksburg Line (5:00 to 9:00 AM and 3:00 to 8:30 PM); MBTA Weekday (7:00 AM to 10:00 PM) and Saturday (8:00 AM to 6:30 PM)
PM Peak	3:00 to 7:00 PM	

Minimum Service Frequency

Service frequency measures the number of trains within a certain period (typically 1 hour) traveling in the same direction on a given line or combination of lines. It is a general indicator of the level of service provided along a line or route. Service frequencies are often set to ensure there are enough trains on the route to accommodate passenger volumes while not exceeding recommended loading guidelines. Service frequency could have a significant impact on CRT ridership. Observed headway elasticities range from -0.7 to -0.9 for headways greater than 50 minutes (that is, a 1% increase in headway results in a 0.7 to 0.9% decrease in ridership), and from -0.4 to -0.6 at shorter headways (TCQSM, 2017).

Most of the commuter rail systems reviewed in the *Commuter Rail Peer Review Report* operate with 30-minute peak period headways. The *Wake Transit Plan* proposed that CRT service operates up to eight trips each way in each direction during the peak period, with one to two trips during the midday and evening hours. Recommended minimum frequencies for CRT service are shown in Table 4. The recommended CRT service frequency is subject to change, upon commuter demand, the operating windows and slots allowed in any potential future operating contract with its host railroads (NS, CSX, and NCRR).

Table 4 | Minimum Service Frequency

Weekdays	CRT Service	Peer Review Example
AM Peak (6:00 to 10:00 AM)	One train per hour per direction	A-Train headway (22 min); MetroRail/ SunRail/Trinity Railway Express/VRE (30 min) (Table 1)
PM Peak (3:00 to 7:00 PM)	One train per hour per direction	

Train Loadings

Train load or load factor is expressed as the number of passengers per train or the ratio of passengers to the number of seats on a train at its maximum load point. It is used to determine the extent of likely overcrowding, to assign equipment (for example, number / type of rail cars), and to make subsequent adjustments by lengthening or shortening trains.

Up to 100% seated load is often used as a service standard for commuter rail and commuter bus services, where passengers may be on the vehicle for long periods (TCQSM, 2017). VRE's standard is to not exceed the total number of seats available, plus allow no more than 15 standees per coach for the midweek average on any single train traveling in the peak direction and hour.[7]

The recommended maximum loading on CRT service is shown in Table 5.

Table 5 | Train Loading Maximum

	CRT Service	Peer Review Example
Peak	100%	Up to 100% seated load (TCQSM, 2017); 111% (VRE), allowing no more than 15 standees per coach
Off-Peak	100%	

[7] VRE System-Wide Service Standards and Policies, 2018. https://www.vre.org/about/board/board-agenda-minutes/2018/February/9e-attachment-vre-system-standards-and-policies-final-pdf/.

2.4 PERFORMANCE TARGETS

Performance measures consist of a set of focused metrics that capture the critical aspects of service productivity, efficiency, effectiveness, reliability, and speed; at the same time, these performance measures can be easily reproduced and communicated. As the CRT project moves closer to implementation, targets may need to be adjusted to targets that are more reasonable and feasible based on tradeoffs elected. Generally, CRT service should meet performance targets related to productivity after 24 months of operation, which would allow time for the rider market to mature. Performance targets for on-time performance and average operating speed are expected to be met at the time of service opening. One thing to note about the Operating Expenses per Vehicle (passenger coach) Revenue Mile, and Passenger Boardings per Vehicle (passenger coach) Revenue Hour is that a vehicle is the same as a passenger car or coach. Multiple passenger cars make up a single train.

On-Time Performance

On-Time Performance (OTP) evaluates how closely a route matches its published schedule. Measuring on-time performance provides information on whether a customer can count on a train being there as scheduled. To precisely measure on-time performance, a definition of on-time must be established. The recommended definition of on-time is that trains shall arrive at their final destination at or within 5 minutes of their scheduled arrival time, and no revenue train is allowed to leave an intermediate station before it is scheduled to depart, unless noted otherwise on passenger timetables.

Commuter rail OTP is measured as the percentage of on-time trains divided by the total scheduled revenue trains. Trains cancelled or annulled due to force majeure events (for example, flooded right-of-way, government shutdowns, etc.) are excluded from the calculation of OTP.

The benchmark for on-time performance is shown in Table 6, which is subject to change based on negotiations with the railroads.

Table 6 | On-Time Performance

On-Time Performance	CRT Service	Peer Review Example (2016 Observed OTP)
% of trips arriving at or within 5 minutes of scheduled time at their destination	95%	SunRail (96%); VRE (90%); MBTA (93.8%); SEPTA (90%)

Average Operating Speed

A number of design, environmental, planning, and regulatory elements influence the average operating speed. Commuter rail ridership and performance is dependent on being reliable and competitive from a travel time perspective. National experience shows that the CRT speeds of successful systems are over 30 miles per hour.

The target for the average operating speed is 35 miles per hour to provide a significant enhancement to travel time for passengers (Table 7), as guided by the national average CRT speeds.

Table 7 | Average Operating Speed

Average Operating Speed	CRT Service	Peer Review Example
Average operating speed (in mph)	35	National average CRT speed: 32 (2017 APTA fact book)

Passenger Boardings per Vehicle (Passenger Coach) Revenue Hour

One common and reliable way to track transit service productivity is the number of passenger boardings for each hour of active service, or passenger boardings per revenue service hour of each passenger coach. As guided by the peer agencies, the CRT benchmark for passenger boardings per vehicle revenue hour of each passenger coach is 45 boardings per vehicle revenue hour (see Table 8).

Table 8 | Passenger Boardings per Vehicle (Passenger Coach) Revenue Hour

Boarding per Vehicle (Passenger Coach) Revenue Hour	CRT Service	Peer Review Example
Boardings/ vehicle (passenger coach) revenue hour	45	Boardings/vehicle (passenger coach) revenue hour for the peer CRT systems range between 21 and 64, with an average of 44 (Table 1)

Operating Expenses per Vehicle (Passenger Coach) Revenue Mile

Operating expenses per vehicle (passenger coach) revenue mile is a commonly used measure of service efficiency. Operating expenses[8] are the expenses associated with the operation of the service, including salaries, wages, benefits, materials and supplies, as well as purchased transportation and others operating expenses. The basic functions and object classes are provided in the Glossary of Terms.

The benchmark for operating expense per vehicle (passenger coach) revenue mile for CRT service is $30 or less (in 2016 dollars), based on the reviewed peer agencies' operating expenses (see Table 9).

[8] National Transit Database (NTD) Glossary, https://www.transit.dot.gov/ntd/national-transit-database-ntd-glossary.

Table 9 | Operating Expenses per Vehicle (Passenger Coach) Revenue Mile

Operating Expense per Vehicle (Passenger Coach) Revenue Mile	CRT Service	Peer Review Example
Operating expenses/vehicle (passenger coach) revenue mile	$30	The operating expenses/revenue mile for the peer CRT systems range between $8.4 and $77.4, with an average of $30.0 (Table 1)

Operating Expenses per Passenger Boarding

The operating expenses per passenger boarding reflects the cost of serving each passenger boarding. It is calculated by dividing operating expenses by the total number of passenger boardings. The benchmark operating cost per passenger boarding on CRT service is $20 or less (in 2016 dollars) shown in Table 10. The operating expense target or benchmark should be adjusted for cost escalation in the future year of implementation.

Table 10 | Operating Expenses per Boarding

Operating Expense per Passenger Boarding	CRT Service	Peer Review Example
Operating expenses/boarding	$20	The operating expenses per boarding for the peer CRT systems range between $10.0 and $34.3, with an average of $19.2 (Table 1)

Farebox Recovery

Farebox recovery is the percentage of operating expenses recovered by farebox revenues. The benchmark for farebox recovery target is shown in Table 11.

Table 11 | Farebox Recovery

Farebox Recovery Ratio	CRT Service	Peer Review Example
Fares as a proportion of operating expenses	15%	The farebox recovery ratio for the peer CRT systems range between 6% and 53%, with an average of 20% (Table 1);[9] *Wake Transit Plan* assumes farebox revenue of 20% of operating expenses.

[9] Farebox recovery in the NTD Transit Agency Profile is reported per agency, which may combine the farebox recovery rates for all modes of transit applicable to the agency.

3 CRT Evaluation Framework

3.1 OVERVIEW

The proposed 37-mile CRT will operate on shared tracks with freight and Amtrak trains in the NCRR corridor with no temporal separation. The *Wake Transit Plan* envisioned up to eight trips each way in each direction during the peak period, with one to two trips during the midday and evening hours. As part of the Major Investment Study (MIS), the CRT service defined by the *Wake Transit Plan* and *Durham Transit Plan* will be further refined into specific service hours/frequencies and station locations.

Some of the metrics in the Evaluation Framework are based on data points that factored into the FTA Capital Investment Grant (CIG) funding criteria. The CIG criteria ensure that projects prioritized as part of the MIS process have characteristics that are required for federal funding. Not all measures described below are a part of the FTA funding process, and instead are intended to ensure that the proposed projects integrate into the existing transit system in the region.

The evaluation framework will be applied to understand the relative performance of different scenarios of operating plans and station locations, and their ability to meet the community's goals. The evaluation metrics shown in Table 12 were developed to allow potential CRT service scenarios to be compared to one another in order to identify which alternative has the potential to be most successful, and advance to the project development phase. Data sources for the evaluation metrics are a combination of publicly available data sets and projections that will be developed as part of the MIS process. The Census American Community Survey (ACS) and TRM model outputs will be used to evaluate demographic and employment characteristics of the areas surrounding the CRT corridor. The MIS will produce CRT station-to-station travel times and speed estimates. These estimates, along with frequency of service, will be used to prepare the ridership estimates used to compare predicted performance of potential CRT operating and station scenarios.

It is important to note that the evaluation framework developed for the MIS is designed to serve as a decision-making aid in understanding potential operating scenarios and potential station areas. The mix of quantitative and qualitative metrics in the framework will allow additional potential scenarios to be compared to each other and to communicate the relative merit of each scenario. However, additional evaluation must be integrated in a future project development study with community and stakeholder input, to ultimately identify a set of preferred operating plans and station locations.

Table 12 | Evaluation Framework

Category	Prioritization Metric	Evaluation Methodology	Data Source
Speed & Travel Time Competitiveness	Transit speed improvement	Calculate the change in average speed in the corridor by comparing existing bus speeds to anticipated CRT speed. Example output: 1.3 mph improvement	Existing bus speeds operating in mixed traffic and projected CRT speeds to be developed as part of the MIS based on station spacing, dwell time, and rail running times.
	Travel time competitiveness with automobile	This measure compares CRT travel time to automobile travel times. Example output: 1.1	Congested peak period auto travel times from TRM V6 and the real travel times on roadways. CRT speeds based on station spacing, dwell times, and rail running times. One-way transit travel trip times are averaged.
Connectivity	Connections to frequent transit	Determine the number of planned routes that will operate at least every 15 minutes that can provide a transfer opportunity at the CRT stations[10] Example output: 5 frequent transit routes connecting	*Wake County Transit Plan* and *Durham County Transit Plan* network shapefile.
	Ease of Access*	Calculate the intersection density within ½ mile† of the corridor, excluding interstates and ramps.	Road network shapefile

[10] One-half mile is considered a reasonable walking distance to transit stations. Guerra, Erick, Cervero, Robert, and Tischler, Daniel. The Half Mile Circle: Does it Best Represent Transit Station Catchments? UC Berkley Center for Future Urban transport, 2011: https://escholarship.org/uc/item/68r764df

* These metrics are based on inputs to the FTA CIG evaluation process.

† All calculations of half-mile buffers will be completed using the road network to measure distance rather than straight-line distance. This will more accurately capture what is within one-half mile of the corridor, an acceptable walking distance to premium transit.

Category	Prioritization Metric	Evaluation Methodology	Data Source
Equity	Affordable housing access*	Calculate the ratio of legally binding affordability restricted housing units to all housing units within ½ mile† of each station location. Example output: 21% affordable units	TJCOG (http://www.preservationdatabase.org/) Recent 5-year ACS (block group)
	Minority access	Calculate the ratio of minority residents to all residents living within ½ mile† of station. Definition of minority will be consistent with TRM definition. Example output: 36% minority residents	Recent 5-year ACS data (block group)
	Low-income households	Calculate the ratio of low-income households within ½ mile of station.	Recent 5-year ACS data (block group)
	Transit dependent access*	Calculate the ratio of zero vehicle households to all households located within ½ mile† of station Example output: 15% zero vehicle households	Recent 5-year ACS data (block group)
Ridership	Vehicle (Passenger Coach) Boardings/Revenue Hour*	Calculate the CRT vehicle boardings per revenue hour Example output: 45 vehicle boardings/revenue hour	TRM v6 ridership model output or STOPS model and CRT service operating plan. The number of vehicles or passenger coaches per train will be assumed to be two vehicles per train for purposes of this analysis.

* These metrics are based on inputs to the FTA CIG evaluation process.

† All calculations of half-mile buffers will be completed using the road network to measure distance rather than straight-line distance. This will more accurately capture what is within one-half mile of the corridor, an acceptable walking distance to premium transit.

Category	Prioritization Metric	Evaluation Methodology	Data Source
Transit Supportive Land Use	Total People + Jobs served*	Calculate the total number of residents and jobs within ½ mile† of stations. Example output: 110,800 people + jobs	2045 projections from TRM v6
	Concentration of People + Jobs*	Calculate the number of residents and jobs within ½† mile of stations divided by the ½ mile network buffer around the stations. Example output: 17,100 people + jobs per square mile	2045 projections from TRM v6
Sustainability	Environmental impact	Quantitative assessment of potential negative impacts on existing features due to construction of CRT infrastructure. Example output: The sum of potential impacts created by CRT infrastructure	GIS layer of EMS stations, fire stations, hospitals, libraries, parks, police departments, schools, cemeteries, places of worship, utility lines, waterways/floodplains, wetlands, biodiversity & wildlife habitat, hazardous waste sites, water resources & water supplies, historic properties, and public open spaces.
Regional Access	Parking opportunities	A preliminary, qualitative evaluation of constrained land uses or usable space surrounding each station that could be potentially used to provide parking.	This is not a measurement of parking demand at stations. This evaluation could be conducted during a later project development phase.

* These metrics are based on inputs to the FTA CIG evaluation process.

† All calculations of half-mile buffers will be completed using the road network to measure distance rather than straight-line distance. This will more accurately capture what is within one-half mile of the corridor, an acceptable walking distance to premium transit.

Category	Prioritization Metric	Evaluation Methodology	Data Source
	Typical parking cost	Calculate the CBD typical cost per day near stations.	TRM v6 parking inventory data

3.2 EXPLANATION OF METRICS

Speed improvement

Travel time savings is a primary feature of successful CRT systems in the U.S. By measuring the difference in average operating speed between existing bus service operating in mixed traffic and proposed CRT service, this metric indicates the potential travel time savings that riders would experience. A larger change in travel time savings will be considered a positive characteristic of a potential CRT corridor.

Travel time competitiveness with automobile

This metric compares transit travel time to automobile travel times, by scenario. A low score indicates a scenario is not competitive with auto travel. A medium score indicates a scenario is mostly competitive with car travel. A high score indicates travel by rail transit is almost equal to the same route by car.

Connections to frequent transit

CRT functions best if the investment will create and strengthen connections and access to other transit routes. In particular, connections to frequent routes (defined as those that operate at least every 15 minutes) are important because riders experience minimal wait times when transferring. This metric will indicate the degree to which a potential CRT corridor will integrate with the planned frequent network.

Ease of access

Most commuter rail will either begin and/or end their trip as pedestrians, walking some distance to or from the train station. Ridership on CRT is likely to be higher in places that people can easily and conveniently access the station from the surrounding neighborhood. Intersection density is a common way to measure the density of the road network surrounding the corridor and therefore the number of pedestrian as well as bicycle connections. Areas where the street network is made of small blocks are easier for pedestrians and bicyclists to traverse because destinations can be accessed without out-of-direction travel. Areas with large blocks and circuitous roadways are less accessible because they often do not provide a direct path to a destination.

Affordable housing access

Locating CRT near affordable housing units can have significant long-term benefits for residents, lowering their transportation costs and connecting them to greater regional job accessibility. The FTA *Guidelines for Land Use and Economic Development Effects* refer to "legally binding affordability restricted housing" as units with a lien, deed of trust, or other legal instrument attached to a property and/or housing structure that restricts the cost of the housing units to be affordable to renters and/or owners with incomes below 60% of the area median income for a defined period of time.

Minority access

Wake County is committed to investing in a way that ensures regional equity and access to opportunities. Investment in CRT should ensure that service design and operations practices do not result in discrimination on the basis of race, color, or national origin, as required by Federal law, as described in FTA Circular 4702.1B, "Title VI Requirements and Guidelines for Federal Transit Administration Recipients", which became effective October 1, 2012. Minority access will measure the ratio of minority households in the CRT corridor.

Low-income access

Low-income households are defined per Census guidelines based on household size and reported income, which includes: 1) household size of fewer than four people and household income of less than $15,000; 2) household size between four and six people and household income of less than $25,000; or 3) household size of seven or more people and household income under $35,000.

Transit dependent access

CRT can particularly benefit households that do not have regular access to a vehicle by providing a reliable and fast connection to the region. Zero-vehicle households also often align with households with low income and are more likely to use transit. The FTA uses the ratio of zero-vehicle households in a corridor to evaluate eligibility for potential CRT funding.

Vehicle (Passenger Coach) Boardings per Revenue Hour

This measure will reflect both the ridership estimates and the levels of service provided, giving a good comparative metric between the multiple service operating scenarios. TRM v6 ridership model output or STOPS model will be used for the ridership estimates.

Total people + jobs served

The number of people living and working along transit corridors can indicate potential ridership levels and likelihood of sustaining the investment over time. Total population and employment indicates the degree to which transit supportive land uses are in place.

Concentration of people + jobs served

By developing land at higher residential densities and a higher percentage of mix of uses, more origins and destinations become located within walking, bicycle and transit proximity. While the total number of people and jobs is important to understand the scale of the impact of a potential CRT corridor, this metric ensures that shorter corridors with dense development are considered positively, even if the total number of people and jobs may not be as high as a longer, less dense corridor.

Environmental impact

Based on a high-level review of the natural and built entities within the CRT corridor, this metric will indicate the degree to which construction of CRT could potentially impact the environment. It is important to understand the likelihood of an environmental impact because of the effect it may have on ability of a project to move forward, the need for mitigations, or the timeline for construction.

Regional access

Regional access will be evaluated through parking opportunities and parking cost. Parking opportunities would be a preliminary, qualitative evaluation of available land uses or usable space surrounding each station that could be used to provide parking. Parking cost will calculate the CBD typical cost near stations.

4 Glossary of Terms

- **Guideline**: a general rule, principle, or piece of advice. A guideline is a statement by which to determine a course of action. A guideline aims to streamline particular processes according to a set routine or sound practice. By definition, following a guideline is never mandatory. Guidelines are not binding and are not enforced.
- **Benchmark**: a standard or point of reference against which things may be compared or assessed. Benchmarking is comparing one's business processes and performance metrics to industry bests and best practices from other companies. In project management benchmarking can also support the selection, planning and delivery of projects. Dimensions typically measured are quality, time and cost.
- A **standard** sets the minimum investment required to achieve the desired characteristics of CRT.
- A **measure** is a reference point against which performance is evaluated. Measures are evaluated against a target.
- **Target**: a goal to be achieved. A target is the defined value set for individual measures. For example, the target for the on-time performance is 90%.
- **Commuter Rail** is an electric- or diesel-propelled railway for urban passenger travel on the general railroad system between a central city and adjacent cities and suburbs.
- **CRT infrastructure** is defined as the 37 miles with which CRT-related infrastructure improvements will be implemented according to the *Wake Transit Plan*. CRT infrastructure includes stations and tracks that will be shared with both freight and intercity passenger rail service throughout the day.
- **CRT service (Example):** It is envisioned to operate up to eight trips each way in each direction during the peak period, with one to two trips during the midday and evening hours in the *Wake Transit Plan*.
- **Vehicle**: For commuter rail systems, a vehicle is the same as a passenger or coach car. Multiple passenger cars make up a single train.
- **Operating Expenses:**[12] The expenses associated with the operation of the transit agency and goods and services purchased for system operation. It is the sum of either the functions or the object classes listed below:

  An **Operating Expense Function** is an activity performed or cost center of a transit agency. The four basic functions are:

  Vehicle Operations, which includes all activities associated with the subcategories of the vehicle operations function: transportation administration and support; revenue vehicle operation; ticketing and fare collection; and system security.
  Vehicle Maintenance, which includes all activities associated with revenue and non-revenue (service) vehicle maintenance, including administration, inspection and maintenance, and servicing (cleaning, fueling, etc.) vehicles.

[12] APTA Fact Book Glossary, https://www.apta.com/resources/statistics/Documents/FactBook/APTA-Fact-Book-Glossary.pdf

Non-Vehicle Maintenance, which includes all activities associated with facility maintenance, including: maintenance of vehicle movement control systems; fare collection and counting equipment; structures, tunnels and subways; roadway and track; passenger stations, operating station buildings, grounds and equipment; communication systems; general administration buildings, grounds and equipment; and electric power facilities.

General Administration, which includes all activities associated with the general administration of the transit agency, including transit service development, injuries and damages, safety, personnel administration, legal services, insurance, data processing, finance and accounting, purchasing and stores, engineering, real estate management, office management and services, customer services, promotion, market research and planning.

An **Operating Expense Object Class** is a grouping of expenses on the basis of goods and services purchased. Nine Object Classes are reported as follows:

Salaries and Wages are the pay and allowances due employees in exchange for the labor services they render on behalf of the transit agency. The allowances include payments direct to the employee arising from the performance of a piece of work.

Fringe Benefits are the payments or accruals to others (insurance companies, governments, etc.) on behalf of an employee and payments and accruals direct to an employee arising from something other than a piece of work.

Employee Compensation is the sum of "Salaries and Wages" and "Fringe Benefits."

Services include the labor and other work provided by outside organizations for fees and related expenses. Services include management service fees, advertising fees, professional and technical services, temporary help, contract maintenance services, custodial services and security services.

Materials and Supplies are the tangible products obtained from outside suppliers or manufactured internally. These materials and supplies include tires, fuel and lubricants. Freight, purchase discounts, cash discounts, sales and excise taxes (except on fuel and lubricants) are included in the cost of the material or supply.

Utilities include the payments made to various utilities for utilization of their resources (for example, electric, gas, water, telephone, etc.). Utilities include propulsion power purchased from an outside utility company and used for propelling electrically driven vehicles, and other utilities such as electrical power for purposes other than for electrically driven vehicles, water and sewer, gas, garbage collection, and telephone.

Casualty and Liability Costs are the cost elements covering protection of the transit agency from loss through insurance programs, compensation of others for their losses due to acts for which the transit agency is liable, and recognition of the cost of a miscellaneous category of corporate losses.

Purchased Transportation is transportation service provided to a public transit agency or governmental unit from a public or private transportation provider based on a written contract. Purchased transportation does not include franchising, licensing operation, management services, cooperative agreements or private conventional bus service.

Other Operating Expense is the sum of taxes, miscellaneous expenses, and expense transfers.

5 Appendix – Sample NTD Report (Virginia Railway Express, 2016)

http://www.vre.org/
1500 King Street
Suite 202
Alexandria, VA 22314-2730

Virginia Railway Express

2016 Annual Agency Profile

CEO: Mr. Doug Allen

General Information

Urbanized Area Statistics - 2010 Census
Washington, DC-VA-MD
1,322 **Square Miles**
4,586,770 **Population**
8 **Pop. Rank out of 498 UZAs**

Other UZAs Served
0 Virginia Non-UZA, 231 Fredericksburg, VA

Service Area Statistics
730 **Square Miles**
2,238,365 **Population**

Service Consumption
145,777,038 **Annual Passenger Miles (PMT)**
4,352,814 **Annual Unlinked Trips (UPT)**
17,713 **Average Weekday Unlinked Trips**
6,938 **Average Saturday Unlinked Trips**
0 **Average Sunday Unlinked Trips**

Service Supplied
2,289,083 **Annual Vehicle Revenue Miles (VRM)**
71,671 **Annual Vehicle Revenue Hours (VRH)**
97 **Vehicles Operated in Maximum Service (VOMS)**
120 **Vehicles Available for Maximum Service (VAMS)**

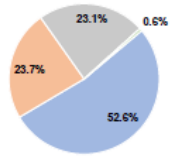
Database Information
NTDID: 30073
Reporter Type: Full Reporter

Financial Information

Sources of Operating Funds Expended

Fare Revenues	$37,696,913	52.6%
Local Funds	$16,971,472	23.7%
State Funds	$16,572,077	23.1%
Federal Assistance	$0	0.0%
Other Funds	$403,370	0.6%
Total Operating Funds Expended	$71,643,832	100.0%

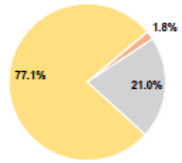
Operating Funding Sources



Sources of Capital Funds Expended

Fare Revenues	$0	0.0%
Local Funds	$851,661	1.8%
State Funds	$9,826,428	21.0%
Federal Assistance	$36,042,993	77.1%
Other Funds	$0	0.0%
Total Capital Funds Expended	$46,721,082	100.0%

Capital Funding Sources



Modal Characteristics

Modal Overview

Mode	Vehicles Operated in Maximum Service: Directly Operated	Vehicles Operated in Maximum Service: Purchased Transportation	Uses of Capital Funds: Revenue Vehicles	Uses of Capital Funds: Systems and Guideways	Uses of Capital Funds: Facilities and Stations	Uses of Capital Funds: Other	Uses of Capital Funds: Total
Commuter Rail	-	97	$24,549,525	$17,059,304	$5,112,253	$0	$46,721,082
Total	-	97	$24,549,525	$17,059,304	$5,112,253	$0	**$46,721,082**

Table 1 Column 9, Farebox Recovery (CR) = $37,696,913 / $69,874,827 = 54%

Summary of Operating Expenses (OE)

Salary, Wages, Benefits	$6,102,600	8.7%
Materials and Supplies	$3,211,518	4.6%
Purchased Transportation	$23,384,826	33.5%
Other Operating Expenses	$37,175,883	53.2%
Total Operating Expenses	$69,874,827	100.0%
Reconciling OE Cash Expenditures	$1,769,005	
Purchased Transportation (Reported Separately)	$0	

Operation Characteristics

Mode	Operating Expenses	Fare Revenues	Uses of Capital Funds	Annual Passenger Miles	Annual Unlinked Trips	Annual Vehicle Revenue Miles	Annual Vehicle Revenue Hours	Fixed Guideway Directional Route Miles	Vehicles Available for Maximum Service	Vehicles Operated in Maximum Service	Percent Spare Vehicles	Average Fleet Age in Years[a]
Commuter Rail	$69,874,827	$37,696,913	$46,721,082	145,777,038	4,352,814	2,289,083	71,671	173.6	120	97	19.2%	12.5
Total	$69,874,827	$37,696,913	$46,721,082	145,777,038	4,352,814	2,289,083	71,671	173.6	120	97	19.2%	

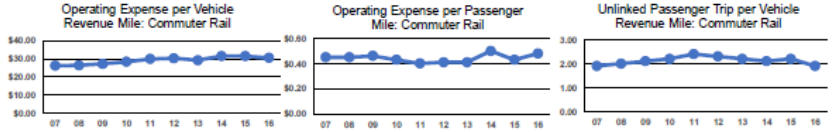
Performance Measures

Service Efficiency

Mode	Operating Expenses per Vehicle Revenue Mile	Operating Expenses per Vehicle Revenue Hour
Commuter Rail	*Table 1, Column 7* $30.53	$974.94
Total	$30.53	$974.94

Service Effectiveness

Mode	Operating Expenses per Passenger Mile	Operating Expenses per Unlinked Passenger Trip	Unlinked Trips per Vehicle Revenue Mile	Unlinked Trips per Vehicle Revenue Hour
Commuter Rail	$0.48	*Table 1, Column 8* $16.05	1.9	*Table 1, Column 10* 60.7
Total	$0.48	$16.05	1.9	60.7



Notes:
[a]Demand Response - Taxi (DT) and non-dedicated fleets do not report fleet age data.