North Corridor Commuter Rail
Environmental Assessment

Preliminary Draft Report

Submitted to
Federal Railroad Administration

Submitted by
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Table of Contents

Table of Contents

Chapter / Section Numbers and Description		Page No.
2.2.1	Future No-Action Alternative	2-7
2.2.2	TSM Alternative	2-19
2.2.3	North Corridor Commuter Rail Build Alternatives	2-25
2.3	Cost	2-64
2.3.1	Capital Costs	2-64
2.3.2	Operating and Maintenance Costs	2-65
2.4	Fare Policy	2-65
2.4.1	Fare Structure	2-65
2.4.2	Collection System	2-66
2.4.3	Enforcement	2-66
2.4.4	Farebox Recovery Ratio	2-66
3	**AFFECTED ENVIRONMENT and CONSEQUENCES**	**3.1-1**
3.1	Population, Employment, Land Use, and Government Finance	3.1-1
3.1.1	Legal and Regulatory Framework	3.1-1
3.1.2	Methodology	3.1-1
3.1.3	Existing Conditions and Resources	3.1-2
3.1.4	Impacts and Benefits	3.1-20
3.1.5	Mitigation	3.1-29
3.1.6	Literature Citied	3.1-30
3.2	Displacements	3.2-1
3.2.1	Legal and Regulatory Framework	3.2-1
3.2.2	Methodology	3.2-1
3.2.3	Existing Conditions and Resources	3.2-1
3.2.4	Environmental Impacts and Benefits	3.2-2
3.2.5	Displacement Mitigation	3.2-6
3.3	Neighborhoods	3.3-1
3.3.1	Legal and Regulatory Framework	3.3-1
3.3.2	Methodology	3.3-1
3.3.3	Existing Conditions and Resources	3.3-2
3.3.4	Environmental Impacts and Benefits	3.3-14
3.3.5	Neighborhood Safety and Security Mitigation	3.3-15
3.3.6	Literature Cited	3.3-16
3.4	Visual and Aesthetic Quality	3.4-1
3.4.1	Legal and Regulatory Framework	3.4-1
3.4.2	Methodology	3.4-1
3.4.3	Existing Conditions and Resources	3.4-2
3.4.4	Environmental Impacts and Benefits	3.4-10
3.4.5	Mitigation	3.4-11
3.4.6	Literature Citied	3.4-11
3.5	Air Quality	3.5-1
3.5.1	Legal and Regulatory Framework	3.5-1
3.5.2	Methodology	3.5-1
3.5.3	Existing Conditions and Resources	3.5-1
3.5.4	Environmental Impacts and Benefits	3.5-3
3.5.5	References	3.5-9
3.6	Noise and Vibration	3.6-1
3.6.1	Legal and Regulatory Framework	3.6-1

Table of Contents

Table of Contents

Table of Contents

Chapter / Section Numbers and Description		Page No.

PREFACE

TABLE OF CONTENTS

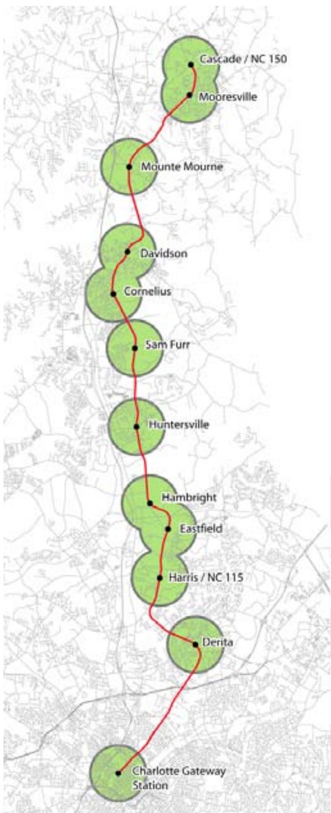
LIST OF TABLES

LIST OF FIGURES

S.0 EXECUTIVE SUMMARY

Project Description

The Charlotte Area Transit System (CATS) proposes to implement of a new North Corridor Commuter Rail (NCCR) service extending from downtown Charlotte through the downtowns of Huntersville, Cornelius, Davidson and Mount Mourne to Mooresville, some 30 miles to the north. The NCCR would operate on existing tracks of the Norfolk Southern Railroad (NS) "O" line, which saw its last passenger train in 1951. The NCCR project includes upgrade of the existing tracks, construction of up to 11 stations north of downtown Charlotte and a vehicle maintenance facility (VMF), acquisition of train equipment, and safety enhancements to 89 at-grade crossings along the route. Trip time from Charlotte to downtown Mooresville would be approximately 45 minutes. Some 4,600 commuters are projected to ride the trains each day. The majority of these are new transit riders who currently travel by single-occupancy vehicle along highly-congested I-77, NC-115 and US-21. Large transit-oriented developments, offering a variety of residential housing options and significant mixed-used commercial space, already are planned or under construction at proposed station locations.



CATS currently plans to phase construction of the project, with the first phase providing up to 22 daily trains either to Mooresville or to Mount Mourne, an unincorporated area 4.7 miles south of Mooresville. If project construction is authorized by the Metropolitan Transit Commission (MTC), which oversees transit policy for the Charlotte region, CATS anticipates completing project engineering by 2009, starting construction in 2010 and initiating the new commuter rail service by the end of 2011. CATS projects the cost to implement the first phase of service to Mount Mourne at $261 million, escalated to the completion of construction in 2011. Completion of the second phase of the project, which would increase service to 38 daily trains, is planned for 2019.

The southern terminus for the commuter rail line is the proposed Charlotte Gateway Station (CGS), located at Trade and Graham Streets in Charlotte's downtown business center. Planning for CGS has been undertaken jointly by CATS and the North Carolina Department of Transportation (NCDOT), which owns the CGS site and some 20 adjacent acres of property along the NS tracks in downtown Charlotte. Funding for the CGS project will come from the Federal Transit Administration (FTA), CATS and NCDOT, as well as private parties. The project is not formally part of the NCCR and CATS has submitted a separate Environmental Assessment (EA) to the FTA for the CGS project. The facility is a key component of

Charlotte's regional transit program and North Carolina's long-range intercity and high-speed rail service. In addition to NCCR trains, the new station would be served by Amtrak, with trains to Atlanta, Raleigh, and New York; Greyhound intercity buses; and local and regional CATS buses, street car and rapid transit. CGS will be within walking distance of much of the business district in downtown Charlotte, as well as the new Lynx Blue line, with light-rail service south to Pineville and eventually north to the UNC-Charlotte campus.

As detailed below, the NCCR is one of five rapid transit projects planned in the Charlotte area and currently advancing through the environmental impact review and funding processes. One of those corridor projects – The LYNX Blue Line light rail project – opened for service on November 26, 2007. Originally, CATS planned to seek Federal funding for each of these projects through the FTA New Starts program. Projects with Federal funding are required to comply with the National Environmental Policy Act (NEPA), which includes the completion of an environmental impact analysis. In 2002, CATS initiated the environmental impact review process for the NCCR with the goal of submitting the document to the FTA. Subsequently, the MTC determined that the NCCR would not likely meet the strict eligibility criteria for New Starts funding and that CATS should instead seek a Federal loan under the Railroad Rehabilitation & Improvement Financing (RRIF) program, administered by the Federal Railroad Administration (FRA). Use of a RRIF loan also constitutes a major Federal action that triggers a NEPA environmental impact analysis. Accordingly, CATS has completed this EA in compliance with the requirements of NEPA and the FRA.

The EA details the environmental impacts resulting from implementation of the NCCR project, compared to the no-build alternative. It concludes that, with mitigation (primarily to address noise related to train operations), implementation of commuter rail would not create any significant environmental impacts.

S.1 PURPOSE AND NEED FOR ACTION

The NCCR project extends from the proposed CGS in Center City Charlotte north through the towns of Huntersville, Cornelius, and Davidson in Mecklenburg County to Mooresville in Iredell County. Like the Charlotte region in general, the North Mecklenburg towns face two fundamental challenges as they attempt to retain their quality of life and identity in the growing regional economy:

- Rapid population growth is generating low-density residential and automobile-dependent retail development, dispersing the population and marginalizing the historic downtown centers of the towns.
- Growing congestion is overwhelming the capacity of the region's only major north-south highway and forcing commuters onto local two-lane roads never intended to serve as major regional arterials.

Already, low density and automobile-dependent land uses, accompanied by deficient levels of traffic service, define large areas west of NC-115 (Old Statesville Road) and I-77 that were rural in nature just a decade ago. The result has been to lengthen the commute to work, endanger regional air quality and drive the development of strip malls and low-density retail to support the growing population.

In contrast, many areas east of NC-115, bordering the historic town centers, remain largely undeveloped due to lack of water and sewer and the limited road network. These areas are adjacent to the NS "O" line. Recently, with work underway to expand sewer and water lines east of the "O" line, these large green-field areas face accelerating residential development pressure. However, there are no current plans to create a new road network linking these new green-field communities to Center City Charlotte and other employment centers. Moreover, plans for many future local connector streets lack any source of funding. As a result, the region faces the prospect of large-scale residential development lacking a reasonable, high-capacity means for coordinated commutation to Charlotte and other local activity centers.

To help meet these challenges, Charlotte and the four towns have led the effort within the region and at the MTC to implement commuter rail service in the North Corridor, concluding that providing the public with a convenient, reliable, safe and environmentally attractive public transportation alternative will positively shape future land use and stimulate strong mixed-use development around transit areas.

S.1.1 Transportation Issues and Project Goals

The Charlotte region's transportation and land use objectives have been defined over the past decade in several key documents. These objectives have been used to evaluate the relative benefits of various proposed regional transportation alternatives. The 1994 Centers and Corridors called for a transit system that would:

- Sustain economic growth and vitality
- Expand to a regional system
- Concentrate development in Center City and along corridors and at key economic centers
- Combine Rapid Transit with enhancement of the overall transit system

In addition to supporting this vision, the 2025 Integrated Transit/Land-Use Plan sought to ensure the integration of transportation and land use by:

- Linking the land wedges between the rapid transit corridors to the corridors by an extensive feeder bus system so that every part of Charlotte-Mecklenburg has access to transit
- Combining transit solutions with road improvements
- Involving citizens extensively in the system development process

Both the Centers and Corridors and the 2025 Integrated Transit/Land-Use Plan embrace the same conclusion: enhanced accessibility, environmental quality, pedestrian friendliness, and public safety are vital to successful transit systems and to the long-term health of the Charlotte region. The primary benefit of congregating housing, jobs, shops, and other activities along transit corridors is to increase the convenience of transit, and build more livable, less auto-dependent communities.

S.2 Purpose of the EA

In November 2002, following completion of Major Investment Studies, the MTC recommended construction of five rapid-transit corridors leading into Charlotte's downtown employment center, along with a new Center City street car system. In the North Corridor, the MTC recommended start-up of new commuter rail service between Charlotte and Mooresville, supplemented by enhanced express bus service along I-77. The MTC directed CATS to seek Federal funding for the projects through the FTA New Starts program. Federal funding triggers the requirement to undertake a NEPA environmental impact analysis. With the decision to seek a Federal loan for the NCCR project under the RRIF program, CATS has prepared this EA for review and approval by the FRA.

The EA evaluates the social, economic, environmental, and transportation impacts that would result from implementation of this proposed commuter rail service. The EA was developed in accordance with NEPA and with regulations implementing NEPA promulgated by both the FTA and the FRA. In addition, the Rail Division of NCDOT has provided extensive input into NCCR planning and safety activities and has reviewed the EA for consistency and compliance with North Carolina environmental impact review requirements.

The EA includes:

- Analyses and studies necessary to identify the social, economic, environmental, and transportation impacts of implementing commuter rail, as compared to the No-Action and Transportation Systems Management (TSM) alternatives;
- Opportunities to avoid, minimize, and mitigate adverse impacts;
- Estimated project costs;
- Information and analysis sufficient for the MTC to endorse or modify the previously adopted Locally Preferred Alternative (LPA), including decisions on minimum operable segments (MOS), alignment, station locations and footprints (station refinements are based on further studies conducted since the adoption of the System Plan), yard and shop location, at-grade crossing improvements, and implementation phasing.

The No-Action Alternative consists of the existing transportation facilities, plus committed transportation improvements, including projects under construction, projects in the State Transportation Improvement Program (STIP), the Mecklenburg Union Metropolitan Planning Organization's (MUMPOs) Long-Range Transportation Plan (LRTP), and bus service improvements to which area transit providers have made financial commitments. The No-Action Alternative provides a basis for establishing the environmental impacts of the build alternatives. The TSM Alternative is a low capital cost approach for improving existing transit services and facilities in the corridor.

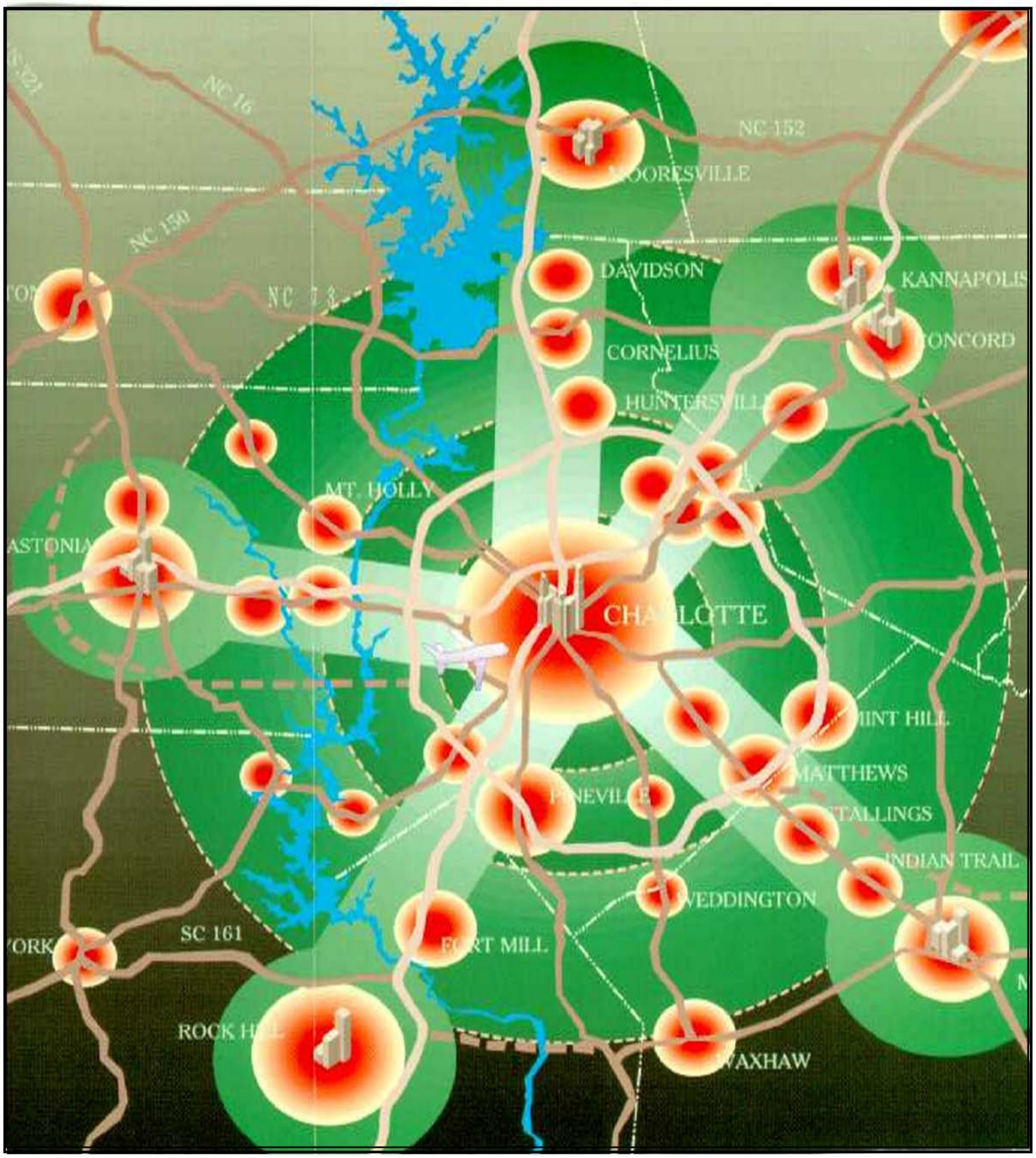


Figure S-1 | Regional Centers and Corridors

S.3 ALTERNATIVES CONSIDERED

S.3.1 No-Action Alternative

The No-Action Alternative provides the underlying foundation for comparing the travel benefits and environmental impacts of the other alternatives. It also is considered an alternative itself. While implementation of the No-Action Alternative has no environmental impacts along the project corridor, it also offers none of the travel or land use benefits of the NCCR project. The No-Action Alternative includes transit services and highway and transit facilities that are likely to exist in 2030. This includes:

- The existing highway network
- Highway improvements that NCDOT has scheduled in the STIP for implementation between 2006 and 2012 as adopted by the North Carolina Board of Transportation (BOT) and MUMPO on July 7, 2005 and September 21, 2005 respectively.
- Highway improvements listed in the MUMPO-adopted financially-constrained LRTP.
- Existing transit routes and schedules currently operated by CATS.
- The South Corridor Light Rail Transit (LRT) line (completed in 2007).
- TSM-level improvements in the other rapid transit corridors.
- Other new bus services to which CATS has committed.
- New bus services to serve areas that will be developed by 2030.
- Routine replacement of existing facilities and equipment at the end of their useful life.

S.3.2 Transportation Systems Management Alternative

The TSM Alternative is a lower capital cost approach for addressing the need for transit improvements in the North Corridor. It assumes the implementation of the highway and transit improvements associated with the No-Action Alternative for the North Corridor, along with expansion of transit service to 2030 to provide for growth in regional population and employment. Bus service improvements associated with the TSM Alternative for the other corridors are assumed plus LRT operations in the South Corridor. Transit improvements under the TSM Alternative include both transit services and transit facilities.

S.3.3 Commuter Rail Build Alternatives

The two Build alternatives analyzed in the EA are similar and operate on the same NS "O" line; the MOS Alternative terminates at Mount Mourne rather than Mooresville as a means of reducing project cost. Both alternatives assume that an existing project to realign the "O" line in Huntersville near Hambright Road is completed prior to construction of the NCCR. As part of this realignment project, approximately 1.2 miles of track has be relocated several hundred feet to the east in order to provide for a commuter rail station at the center of a new transit-oriented development called *Bryton*. Work has commences on the relocation, planned for completion in 2009. The Hambright track relocation also eliminates a sharp curve and seven at-grade crossings.

The two build alternatives are described as follows:

- LPA – This is the original LPA alignment recommendation (modified to reflect the Hambright relocation) with commuter service operating on the existing NS "O" line with the northern terminus at Cascade/NC 150 in Mooresville.

- MOS Alternative - This is the same as Alternative LPA with a northern terminus at Mount Mourne, 4.7 miles south of the LPA alternative terminus at Cascade/NC 150.

On November 15, 2006, the MTC directed CATS to pursue the MOS Alternative, with a goal of extending service to Mooresville (LPA) in the future if funding becomes available. The Build alternatives are illustrated in Figure S-2 located at the end of this chapter.

The LPA includes the CGS and up to 11 commuter rail stations; the MOS includes the CGS and up to nine stations. All proposed stations would have a park-and-ride (PNR) lot that would provide accessible parking for handicapped patrons, a "kiss-and-ride" drop-off area, patron parking, and bus bays to facilitate transfers between the NCCR and the CATS bus system.

S.4 SUMMARY OF ENVIRONMENTAL CONSEQUENCES

This section summarizes the potential environmental consequences of the No-Action Alternative, the TSM Alternative, and the NCCR Build alternatives. Neither the No-Action Alternative nor the TSM Alternative include upgrade of the NS "O" line, construction of stations or operation of trains; they differ primarily in the number of buses and the routes operated. As a result, they generate similar social, economic and environmental impacts as compared to the Build alternatives. Accordingly, the TSM and No-Action alternatives are presented as a single alternative for the assessment of impacts.

The EA evaluates a number of environmental impacts for each alternative as they relate to preserving and protecting the environment within the North Corridor. The following key findings were made:

- Population: An estimated 18,200 (MOS) to 21,200 (LPA) people are projected to reside within 1/2 mile of stations in 2010, rising to 37,000 to 40,500 by 2030.
- Employment: Employment in 2010 within ½ mile of the stations is estimated at 33,200 (MOS) and 35,800 (LPA). By 2030, the projected employment base would rise to 55,600 and 59,300 respectively. In addition, the NCCR would provide employment benefits to the Charlotte Region from its ongoing operations and maintenance activities.
- Residential and Business Displacements: Reinstitution of passenger trains on the "O" line and construction of stations could require the taking of 3-6 single-family dwellings and 2-6 businesses structures. No institutional structures would be displaced.
- Air Quality: The project is not predicted to cause or exacerbate a violation of the CO standard and conforms to the State Implementation Plan (SIP) for air quality conformance and the goals set forth in the Clean Air Act Amendments (CAAA) and the Environmental Protection Agency's (EPA's) Final Conformity Rule.
- Noise & Vibration: If train horns are sounded prior to passing through public at-grade crossings along the rail line, the number of sites within the FTA "severe" category would be 1,105 (MOS) and 1,329 (LPA). However, CATS has committed to purchase train equipment with lower sound decibel emissions and to establish Quiet Zones to eliminate he requirement to sound horns at crossings. These commitments would eliminate all "severe" impacts along the rail corridor. A total of 95 residences would potentially be affected by vibration velocity levels (VdB) of 80 or higher from each train passage.
- Water Resources: No perennial streams or open water bodies would be directly affected by construction of the NCCR. The total length of intermittent streams affected would be 749 linear feet for the LPA and MOS alternatives. No streams

classified as Water Supply (WS) or surface water intakes would be directly affected by any proposed components of the NCCR. No groundwater supply wells, wellhead protection zones, treatment/storage facilities, or groundwater recharge or discharge areas would be directly affected by construction of the NCCR. No 100-year floodplains or regulatory floodways would be directly affected by the proposed NCCR project.

- Cultural, Historic & Archeological: The State Historic Preservation Office (SHPO) found that no properties were determined to have an Adverse Effect, except potential replacement of the railroad bridge spanning NC 115 between Davidson and Cornelius. Indirect impacts could affect 4-7 vulnerable properties and CATS was requested to assist in protecting those properties.
- Hazardous Materials: Some 31 sites at eight of the stations and 12 sites along the rail line were identified as potential sites or sources of hazardous waste and will require additional environmental investigations, such as soil and/or groundwater sampling. Special measures, as appropriate, would be implemented during construction to mitigate adverse impacts.
- Environmental Justice: By providing a reliable and safe public transportation alternative, implementation of commuter rail would enhance mobility options for low-income and minority communities and businesses, provide greater access to regional jobs and non-job opportunities such as educational, shopping and entertainment activities, and generate potential economic development in communities along the project corridor. As with any major transportation project, it is likely that residents within the project area will endure some impacts because of the construction and operation of the NCCR project. These impacts, however, would not be disproportionately high or adverse for minority or low-income populations along the rail line.

Table S-1 presents a summary of the possible environmental impacts identified for the No-Action, the TSM Alternative, and the NCCR Build alternatives.

Table S-1. Summary of Potential Environmental Impacts

Impact Areas	No-Action and TSM Alternatives	Commuter Rail MOS	Commuter Rail LPA
TRAFFIC			
Number of Degraded Intersections (PM) (Level of Service (LOS) E or F)/Total Intersections	16/64	19/64	19/64
LAND USE PLANS AND POLICIES			
Consistency with local plans	No	Yes	Yes
Transit Supportive Development Polices	Zoning Codes in place, but no application of Transit Overlay District Zone would occur in North Corridor	Yes	Yes
DISPLACEMENTS			
Residences	0	3	6
Businesses	0	2	6
COMMUNITY SERVICES			
Disruption of Access	None	None	None
Emergency Service Interruption	None	None	None
ENVIRONMENTAL JUSTICE			
Impacts to Target Populations	No improved mobility and access to jobs under the No-Action Alternative. Increased mobility and access to jobs under the TSM Alternative.	Improved mobility and access to jobs	Improved mobility and access to jobs
POPULATION AND EMPLOYMENT			
2030 Population Served Within ½ mile of Stations	None	37,053	40,492
2030 Employment Served Within ½ mile of Stations	None	55,610	59,263
VISUAL AND AESTHETICS			
New visual elements not in character with corridor	No	No	No
AIR QUALITY			
Conformity with Regional Plan	No	Yes	Yes
Creation of Carbon Monoxide (CO) Hot Spots	No	No	No
Reduction in Vehicle Miles of Travel (VMT)	No	Yes	Yes

Table S-1. Summary of Potential Environmental Impacts (continued)

Impact Areas	No-Action and TSM Alternatives	Commuter Rail MOS	Commuter Rail LPA
NOISE AND VIBRATION			
Noise without Horn (# sites)	None	0 – 16 severe impacts	0 – 16 severe impacts
Noise with Horn (# sites)	None	1,105 – 1,113 severe impacts	1,328 – 1,329 severe impacts
Vibration (# sites)	None	85 impacts	95 impacts
ECOSYSTEMS, FARMLANDS, PROTECTED/ENDANGERED SPECIES			
Endangered Species			
Schweinitz's Sunflower	None	0.07 – 0.08 acres	0.09 – 0.10 acres
Michaux's Sumac	None	0.19 – 0.28 acres	0.21 – 0.30 acres
Smooth Coneflower	None	0.15 – 0.24 acres	0.17 – 0.26 acres
Farmlands	None	4.9 – 6.0 acres	4.9 – 6.0 acres
Terrestrial Plant Communities and Associated Wildlife Habitat Wildlife	None	3.03 – 4.62 acres	3.05 – 4.64 acres
WATER RESOURCES			
Floodplains	None	None	None
Groundwater	None	None	None
Surface Waters (linear feet)	None	749 linear feet	749 linear feet
Wetlands (acres)	None	0.145 acre	0.145 acre
HISTORICAL AND ARCHAEOLOGICAL RESOURCES			
Historic Resources			
Possible Adverse Impact	None	4 – 5 sites	6 – 7 sites
Archaeological Resources	None	None	None
PARKLANDS			
	None	"de minimis" (minimal) affect on Bailey Park	"de minimis" (minimal) affect on Bailey Park
HAZARDOUS MATERIALS			
Soil Impact			
Low Possible Contact	None	9	14
Possible Impacted	None	4 – 5	12 – 13
Likely Impacted	None	9	11
Known Impacted	None	5	5
Water Impact			
Low Possible Contact	None	13	14
Possible Impacted	None	11 – 12	23 – 24
Likely Impacted	None	3	5
Known Impacted	None	0	0
CONSTRUCTION IMPACTS			
	None	Low	Low

The potential positive and negative secondary effects of the NCCR alternative are summarized in Table S-2.

Table S-2. NCCR Secondary Effects

Potential Positive Secondary Effects

- Transportation and Traffic
  - Improved mobility options and accessibility
  - Potential that some drivers would switch to transit
  - Reduced commute times
- Quality of life
  - Reduced urban sprawl by concentrating growth around infrastructure
  - Options to avoid stress of commuting via personal auto
- Economics
  - Increased sales tax revenues
  - Increased property values - increased tax base and revenues
  - Sustainable economic development
  - Increased efficiencies in service delivery due to increased concentration of development
  - Increased employment opportunities
- Environmental Justice
  - Increased mobility for transit-dependent residents
- Neighborhoods
  - Infill and redevelopment opportunities of underutilized properties
  - Improved access to parks, recreation centers, and entertainment venues
- Air Quality
  - Reduced pollution
- Natural Resources
  - Conservation of land and natural resources

Potential Negative Secondary Effects

- Traffic and Transportation
  - Increased traffic from induced development
- Quality of Life
  - Public opposition to dense development patterns near neighborhoods
  - Aesthetics of stations and station area development
- Economics
  - Strain on infrastructure to support station area plans
- Environmental Justice
  - Market demand for housing near transit may reduce affordable housing
  - Redevelopment could displace of low income persons
- Historic Resources
  - Destruction/redevelopment of historic properties
- Natural Resources
  - Loss of habitat for terrestrial natural communities
  - Less than 0.2 acres of impacts to wetlands

S.5 SUMMARY OF TRANSPORTATION IMPACTS

The North Corridor area is facing unprecedented growth. By 2030 --

- Traffic on I-77 is projected to double -- from 87,000 vehicles/day to 170,000 vehicles/day whether or not the highway is widened. The vast majority of trips are by single-occupancy vehicles.

- Local trips within the North Corridor will nearly triple – from 490,500 to 1,241,700.

- Population in Huntersville, Cornelius and Davidson is projected to more than triple

Implementation of commuter rail service will not eliminate or materially reduce regional traffic congestion. However, it will provide residents and travelers with a reliable, environmentally superior, and safe transportation alternative for those living near or with access to the rail line and for businesses and employees near station areas. During the many times each year when the road network is closed due to accidents or other delays, commuter rail service will provide an alternative that can ensure access to home and the work place.

Some 4,600 travelers are projected to daily ride the commuter rail service. The majority of these trips will be during the rush hour and most would otherwise have been made via the personal automobile. In addition, construction of pedestrian-friendly transit-oriented developments around station areas is expected to reduce usage of automobiles for access to public transportation and for local recreation and commercial activities.

Operation of commuter trains across public streets at road-rail at-grade crossings could potentially impact traffic on adjoining parallel arterials, including NC-115, Old Statesville Road and other arterials crossing the NS rail line. Transportation impacts were evaluated the opening year (assumed to be 2011) and future year 2030 based on estimated future traffic volume. The results indicate that intersection LOS, used to quantify the effectiveness of an intersection or a roadway, is expected to deteriorate to levels described as “serious” in both the “No-Action” and the “Build” scenarios scenario in the year 2030. Most impacts will occur on arterials at grade crossing and around station locations.

Grade Crossings:

Currently, there are 109 grade crossings between CGS and Cascades/NC-150 station in Mooresville – 67 public crossings and 42 private crossings. Of these, only 31 currently are protected with gates and flashers. By contrast, implementation of the LPA alternative would facilitate the closure of up to 43 of these crossings. All of the remaining public crossings would be equipped with gates and flashers and designed to qualify under Federal law as Quiet Zones (within which train engineers would not be required to sound horns at crossings). Traffic analysis indicates that these new grade crossings will provide acceptable levels of service and safety to the motoring public.

Stations and Park & Ride Facilities:

The NCCR project would add nine to 11 stations in addition to the CGS. Traffic volumes around stations will increase, particularly during the morning and afternoon rush hour. As a result, levels of services on arterials and intersections in close proximity to these facilities are expected to experience some degradation.

Parking

The construction of the NCCR itself does not reduce existing parking. All proposed stations will have adequate parking required to meet the ridership demand. Construction of the CGS is expected to displace existing parking but because there is adequate parking available in Center City Charlotte, it is not expected to be a critical issue.

S.6 MITIGATION SUMMARY

Mitigation would be required to offset any severe impacts, as detailed in Chapters 3-18 of this EA. These mitigation commitments are summarized in Table S-3 below.

Table S-3. Summary of Mitigation

Impact Areas	**Mitigation Summary**
TRAFFIC	Mitigation required. At-grade crossings will be enhanced through closures, installation of protective gates, road improvements and traffic lights, all as appropriate.
LAND USE PLANS AND POLICIES	No mitigation required. The NCCR project is consistent with local and regional land use plans and policies. Land use mitigation efforts would not be necessary.
DISPLACEMENTS	Mitigation required. The Uniform Relocation Assistance and Real Property Acquisition Policies Act would be followed.
COMMUNITY SERVICES	No mitigation required. Access to community facilities and emergency services would not be disrupted.
ENVIRONMENTAL JUSTICE	No mitigation required. The NCCR project would not result in disproportionately adverse impacts on low-income and minority communities and businesses. Environmental justice mitigation efforts would not be necessary.
POPULATION & EMPLOYMENT	No mitigation required. The NCCR project will increase public accessibility to employment opportunities. Population and employment mitigation efforts would not be necessary.
VISUAL AND AESTHETICS	Mitigation required. CATS would use context sensitive design principles and commit to create station areas conforming to local land use plans and, when applicable, Historic District guidelines. One percent of CATS' construction budget is dedicated to "Art-in-Transit."
AIR QUALITY	No mitigation required. The NCCR project is included in a conforming long-range transportation plan and transportation improvement program. Air quality mitigation efforts would not be necessary.
NOISE AND VIBRATION	
Noise	Mitigation may be required. CATS would implement appropriate sound mitigation as required to eliminate severe impacts. CATS is committed to purchasing train equipment with lower noise emissions and to upgrading all public at-grade crossings to ensure eligibility for Quiet Zone treatment, thereby eliminating the need to sound the train horn as trains approach each crossing. Additional mitigation, if required, could include installation of sound insulation at affected residences, use of continuous-weld rail and ensuring adequate maintenance of train wheels and track. Mitigation options are dependant upon cost effectiveness.
Vibration	Mitigation may be required. No severe impacts identified; FRA recommended mitigation options would be followed if severe vibration is identified.

Table S-3. Summary of Mitigation (continued)

Impact Areas	Mitigation Summary
ECOSYSTEMS, FARMLANDS, PROTECTED/ENDANGERED SPECIES	
Endangered Species	No mitigation required
Farmlands	No mitigation required
Terrestrial Plants and Wildlife	No mitigation required
WATER RESOURCES	
Floodplains	No mitigation required
Groundwater	No mitigation required
Surface Waters	Mitigation Required. Stream mitigation would likely be required by the USACOE and the NCDWQ for 183 linear feet.
Wetlands	No mitigation required
HISTORICAL AND ARCHAEOLOGICAL RESOURCES	Mitigation may be required. The archaeological survey for the NCCR project identified no NRHP eligible sites within the project corridor. There would be no impact to the Elmwood/Pinewood Cemetery in downtown Charlotte. Archaeological resource mitigation efforts would not be necessary. However, in order to address potentially competing interests and to mitigate any adverse effects, CATS will invite identified agencies, organizations, and interested groups to be included as parties to the consultation process with SHPO. .
PARKLANDS	Mitigation required. Park mitigation would include a security fence and landscaping for Bailey Road Park between the existing multi-use trail and the proposed passing siding to the east of the existing railroad tracks. Where feasible, bike lanes may be accommodated during grade crossing upgrades if provisions for bike facilities are called for in locally approved plans and the phasing of the roadway improvements is consistent with the improvements being implemented at the grade crossing.
HAZARDOUS MATERIALS	Mitigation may be required. Phase II investigations would be conducted during final design. Remediation would be undertaken in accordance with local and state regulations.
CONSTRUCTION IMPACTS	Mitigation required. A detailed block-by-block traffic plan will be completed and Best Management Construction techniques will be applied to reduce noise, air and water impacts; historic buildings will be noted on construction plans and designated as “no-go” zones.

S.7 FINANCIAL ANALYSIS AND INVESTMENT IMPACTS

S.7.1 Capital Costs

CATS estimated capital costs based on conceptual engineering plans. The costs for full project implementation to Mooresville are summarized in Table S-4 below. The estimate includes costs associated with the project planning, design, construction, contingencies, management, oversight and start-up costs, as well the capital outlay required to purchase vehicles, provide a VMF, track work, and all other components necessary to construct a commuter rail system. These estimates do not include the CGS project, which is being separately funded.

Table S-4. Capital Cost Estimates by Alternative (2006 dollars, millions)

Alternative	Cost
LPA	**$310**
MOS	**$261**

CATS may phase the implementation of commuter rail as a means of managing costs and matching the level of service with the market as it grows in coming years. This might include first implementing service to Mount Mourne as Phase 1 and then extending the line to Mooresville in a subsequent Phase 2.

S.7.2 Operating and Maintenance Costs

Projected NCCR operating costs, in year 2006 dollars, would be $11.0 million dollars for the LPA and $9.5 million dollars for the MOS Alternative.

S.7.3 Funding and Financing Strategies

The 2025 Transit Corridor System Plan, approved in 2002, called for advancing multiple rapid transit corridors in the Charlotte region and enhancing local and regional bus services. An assumption underlying the 2025 plan was each rapid transit project would be eligible for up to 50% funding from the FTA New Starts program, and that the state and CATS (through the ½-cent transit sales tax approved by voters in Mecklenburg County in 1998) would each contribute 25 percent.

Federal Funding: Since 2002, in the face of growing competition for federal New Starts funding, FTA has significantly tightened the requirements for participation in the program. A key component of the FTA rating system is the cost effectiveness of the proposed system, measured by comparing the amount of cumulative travel-time savings to the annualized capital and operating cost of the project. Based on FTA's latest funding criteria, only those projects providing high-frequency service in highly congested, highly populated metropolitan areas are likely to meet the criteria for participation in New Starts.

Commuter rail projects in smaller cities such as Charlotte typically rate low under the New Starts criteria. This is due largely to the nature of commuter rail, which focuses primarily on rush hour service, with less frequent service during non-peak periods (the cost to expand the rail line to permit full-day high-frequency service would be excessive). In the case of the North Corridor, projected ridership of 4,600 daily trips compares strongly with other commuter rail systems in medium-sized cities. However, while North Corridor trains are projected to carry many work-based trips during the rush hour, off-peak service is planned to be less frequent. As a result, commuter rail service is unlikely to be an alternative for many off-peak local automobile trips (e.g., trips related to local shopping, schools, and other local business and activities) by residents living near the train line. This reduces potential ridership and cumulative travel-times savings (compared to high-frequency light-rail and bus systems) below the FTA eligibility requirements. Accordingly, CATS does not intend to pursue FTA New Starts funding.

Instead, the MTC authorized CATS to apply for a Federal loan under the RRIF program administered by the FTA. RRIF was created by Congress to assist railroads and municipalities pay the costs to upgrade freight and passenger rail lines. Loans can be used to fund track, safety and facility upgrades as well as the acquisition of train equipment. The interest rate on the Federal loans is equal to the rate on the Treasury security of the same term as the loan. The City of Charlotte or County of Mecklenburg, each of which enjoy a AAA bond rating, would be responsible for repaying the loan. Local funding for the debt service could come from incremental tax revenue generated by new development at the North Corridor station areas. On June 28, 2007, CATS submitted the *North Corridor*

Commuter Rail Project Financing Strategy to the MTC for consideration. The document included a detailed financial analysis supporting the proposed use of incremental tax revenue to fund a RRIF loan. On July 25, 2007, the MTC approved a resolution authorizing CATS to advance the *Financing Strategy* and to apply for a RRIF loan to confirm eligibility for the project.

NCDOT Transit Trust Fund: NCDOT provided 25 percent of the funding required to design and to construct the South Corridor LRT Project. State funding was provided under a Full-Funding Grant Agreement and derived from the Highway Trust Fund. It is anticipated that a similar funding approach will be approved by the state for the NCCR project.

CATS: CATS currently plans to pay for 34 percent of the project cost using revenues from the CATS ½ cent sales and use tax dedicated to funding future transit improvements. Voters in Mecklenburg County approved the sales tax in November 1998 and it has been collected since April 1999. By statute, revenues from the sales and use tax can only be applied to expenditures for planning, construction, and operation of a county wide public transportation system.

A final financing plan will be developed and implemented by CATS prior to the start of construction.

S.8 PUBLIC AND AGENCY COORDINATION

A comprehensive public involvement plan was developed to parallel the EA process in order to engage citizens in the project and ensure that the project reflected their input and concerns. This is consistent with the City of Charlotte and CATS policy of proactively seeking public comment on transit-related projects.

The goals of the public involvement plan are to:

- Inform/educate citizens in a factual and objective manner about the transit/land-use plan and its associated opportunities and challenges.
- Proactively seek opinions, perceptions and participation from the North Corridor publics so that the project recommendations may reflect the needs of the community
- Document and incorporate public input into the NCCR EA phase
- Ensure that all public involvement activities identify and address the needs of area minority, low-income and transit dependent populations

Stakeholders across the entire corridor (Charlotte, Huntersville, Cornelius, Davidson, and Mooresville) participated in the activities and outreach leading to this EA. Stakeholders representing corridor residents, neighborhood associations, businesses and other interest groups were specifically targeted and included as part of the public involvement process.

Since January 2004, approximately 400 people have attended six sets of public meetings relating to the North Corridor program. Additionally, approximately 600 citizens from neighborhood associations, social organizations and business groups met with the North Corridor team members during presentations and dialogues. The project mailing list has grown10 percent during this phase.

Specific outreach efforts in the project incorporated a variety of participation techniques, including:

- Corridor study public meetings

- Presentations to neighborhood association on the North Corridor
- Presentations to local clubs, business organizations, and other interest groups
- Information booths at community, town, and business events
- Database and direct mailings to inform and correspond
- A North Transitions newsletter mailed quarterly to over 1700 stakeholders
- A website (www.ridetransit.org) to publicize project information or activities
- Media (print, broadcast, and electronic)

S.9 Next Steps

Key future NCCR project milestones are as follows:

- Complete Phase 1 Engineering: July 2009
- Seek MTC Authorization To Build NCCR: July 2009
- Initiate Phase 1 Construction: September 2009
- Initiate Phase 1 Service: Fall 2011
- Initiate Phase 2 Engineering: 2016
- Initiate Phase 2 Construction: 2017
- Initiate Phase 2 Service: 2019

S.10 Contact Information

This EA was prepared for the Federal Railroad Administration by the Charlotte Area Transit System.

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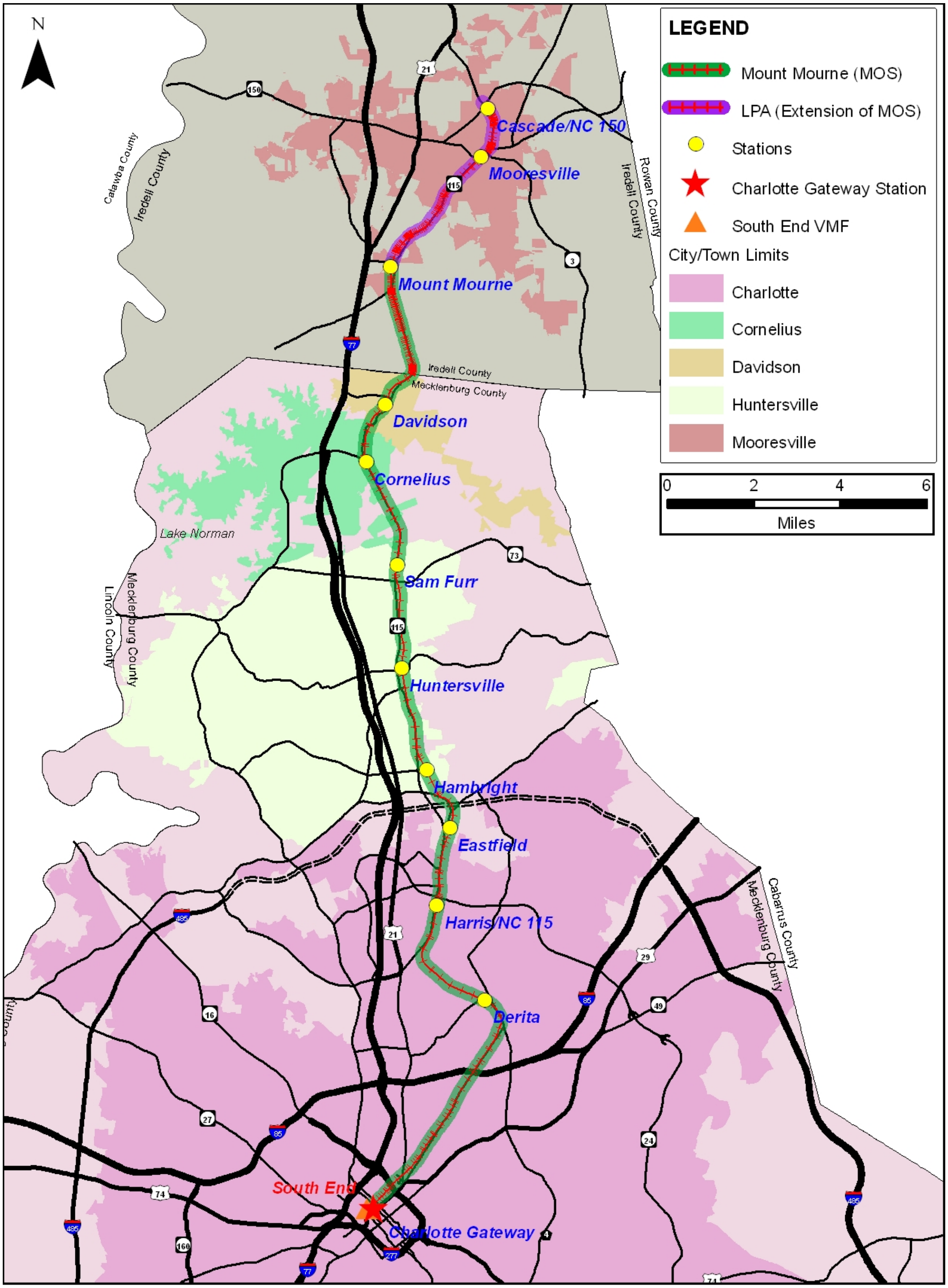


Figure S - 2

NCCR Build Alternatives

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

1.0 PURPOSE AND NEED

The Charlotte Area Transit System (CATS) proposes to implement new commuter rail service connecting Charlotte with four towns to its north as a means of addressing growing congestion of the region's road network and to serve as a catalyst for transit and pedestrian friendly development of large green field areas along the rail line. This Chapter identifies the transportation and land use challenges facing the North Corridor and the ability of existing transportation facilities to address those challenges. It defines the objectives the region is seeking to achieve through the implementation of new commuter rail service.

1.1 Description of Corridor

1.1.1 Project Description

The North Corridor Commuter Rail (NCCR) project consists of improvements to the lightly used Norfolk Southern (NS) "O" line from Charlotte Gateway Station (CGS) in Center City Charlotte (area within the I-277 loop) to Cascades/NC 150 in Mooresville, North Carolina, 30 miles to the north. The "O" line runs though the centers of downtown Huntersville, Cornelius, Davidson and Mooresville. Improvements to the rail line under this project would include replacement of ties and rail, signalization, protection of at-grade crossings, and construction of up to 11 stations north of Center City Charlotte and a vehicle maintenance facility (VMF). CATS is likely to phase in service, starting with 22 daily trains and growing to as many as 38 daily trains When fully implemented, commuter rail service would consist of up to three trains per hour in each direction during the morning and afternoon rush hour period and hourly service during the remainder of the day. Trip time would be approximately 35 minutes between Davidson and Charlotte and 50 minutes from Cascades (Mooresville) to Charlotte. Some 4,600 commuters are projected to ride the trains daily to or from Charlotte. The vast majority of these commuters currently travel by single-occupancy vehicle along I-77 and/or NC 115 (Old Statesville Road) or US 21 (Statesville Road).

The southern terminus for the commuter rail line is the proposed CGS, which is being reviewed under a separate Federal environmental assessment (EA). The CGS is a key component of Charlotte's regional transit program and North Carolina's long-range intercity and high-speed rail service. In addition to North Corridor commuter trains, the new station would be served by Amtrak, with service to Atlanta, Raleigh, and New York; Greyhound intercity buses; new Charlotte Center City Streetcar service; and proposed rapid transit from the Southeast and the West corridors. The facility also would serve as a new Charlotte Area Transit System (CATS) Express and local off-street bus center, relieving congestion at the existing Charlotte Transportation Center. CGS will be within walking distance of much of the business district in downtown Charlotte, as well as the new South and Northeast Corridors Light Rail system. The area immediately around the proposed CGS is currently home to Gateway Village, a Bank of America office complex that includes 1.2 million square feet of office space, the new 5,000-student Johnson & Wales University, Bank of America football stadium, a new downtown park, and other large business and office complexes. A substantial number of downtown residents also live adjacent to the proposed station in the historic Third and Fourth Wards. The area around the proposed station is expected to experience office, residential and retail growth in the next five years.

CATS currently operates rush-hour express bus service from Mooresville, Davidson, Cornelius, and Huntersville to Charlotte. These services have experienced substantial growth over the past five years. However, traffic congestion on the roads leading from the towns to I-77, as well as traffic on I-77 itself, are expected to undermine the competitiveness of this service in the coming years. With implementation of commuter rail service east of I-77 from the center of the towns, CATS express bus service would be re-oriented along and west of I-77, thereby providing commuters on both sides of I-77 with a competitive, reliable rapid transit alternative.

1.1.1.1 Regional Context

The Charlotte region boasts one of the most aggressive economies in the United States. Not only has Charlotte become the second leading economy in the Southeast (after Atlanta), but is the nation's second-largest banking center and headquarters for Bank of America and Wachovia Bank. Five Fortune 100 firms are headquartered in the Charlotte area. Other major activity centers located throughout the area have attracted substantial business growth as well. Recently, Lowe's Corporation relocated its headquarters to a new campus in Mount Mourne, just south of Mooresville and along the "O" line. With some 12,000 new jobs expected by 2020 as a result of this relocation, this once rural area is facing rapid transformation.

Based on recent projections, rapid job growth will continue well into the future, with Mecklenburg County's employment increasing from 530,000 in 2000 to 948,000 by 2030, a 79 percent increase. During the same timeframe, Mecklenburg County's population is projected to grow by 77 percent, an increase of 532,000 residents.

1.1.1.2 Local Context

Figure 1.1-1 shows the boundaries of the North Corridor study area. The project extends from Center City Charlotte north approximately 30 miles through Huntersville, Cornelius, and Davidson in Mecklenburg County to Mooresville in Iredell County. The primary north-south transportation facilities in the study area are I-77, US 21, NC 115, and the NS "O" line.

The portion of the City of Charlotte that is within the study area extends north to Alexanderana Road. This area of the City has experienced dramatic development within the past fifty years. Large tracts of vacant land, however, still exist along the "O" line. These areas are planned for new transit-oriented developments (TODs). Charlotte has adopted a comprehensive TOD zoning district and a Transit Supportive (TS) overlay district (see Section 1.1.3 for further discussion of Charlotte TOD and TS zoning/overlay). North of Charlotte, the study area includes the four towns. Over the past decade, these communities have experienced very robust growth, in part due to the popularity of nearby Lake Norman area and the economics of available green-field areas for large developments.

The study area extends north of Davidson into Iredell County and includes the unincorporated area called Mount Mourne and the Town of Mooresville. Mooresville expects to annex most of the Mount Mourne area within the next several years. Land use trends in this portion of south Iredell County mirror those in the three north Mecklenburg towns: rapid population growth, residential and low-density retail at I-77 interchanges; and strong community interest on preserving and enhancing the quality of the town center.

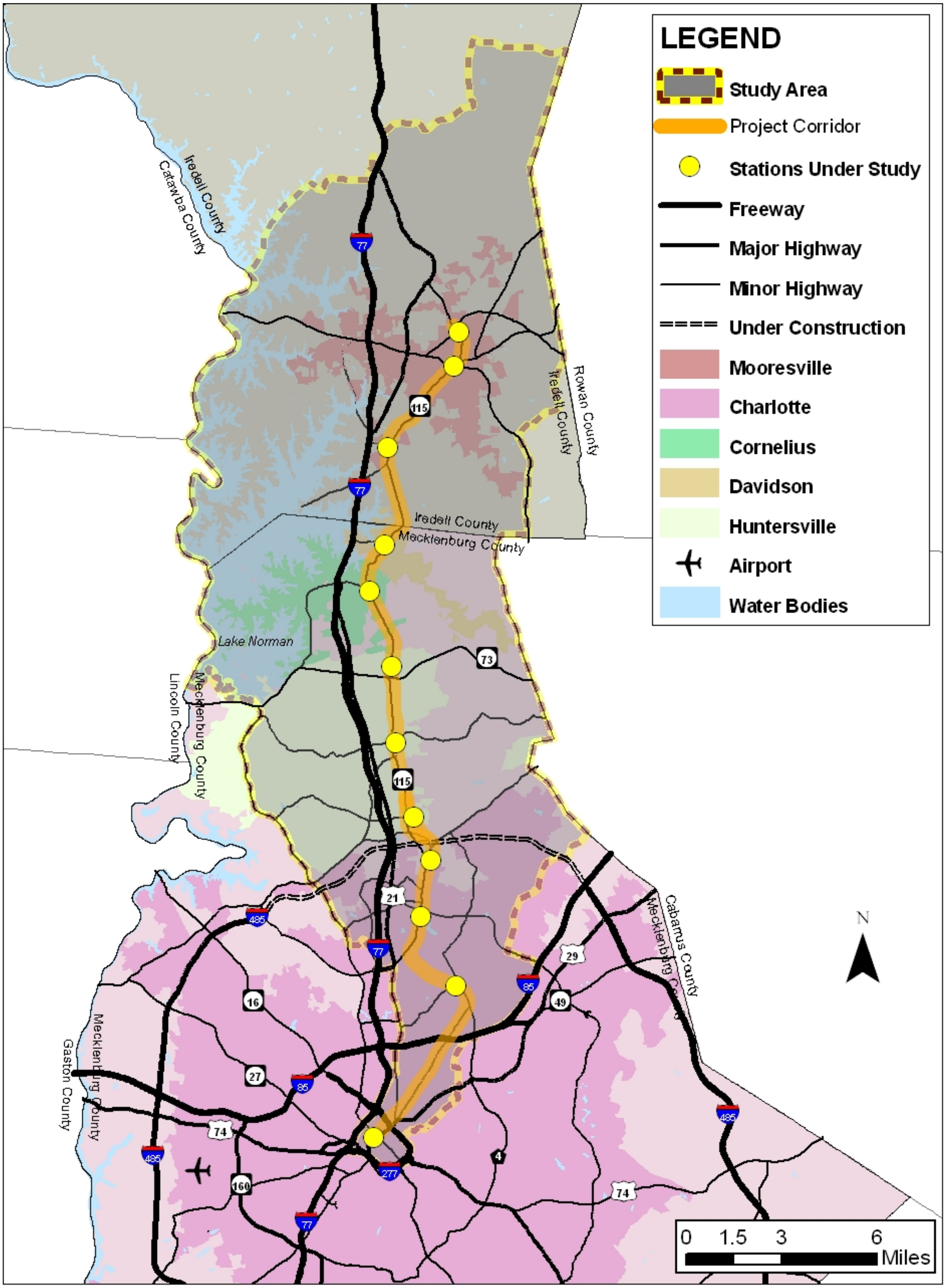


Figure 1.1-1 | NCCR Study Area

1.1.2 Population and Employment

Population and employment in the Charlotte region have grown substantially over the past 20 years, with the highest rate of growth within the North Corridor study area: 145 percent growth in population and 118 percent growth in employment forecasted from 2000 to 2030. The growing population, combined with strong employment in Center City Charlotte, has contributed substantially to increases in travel demand and congestion in the region.

1.1.2.1 Population

According to Census statistics, in 2000, there were 159,900 residents living in the North Corridor study area. Of these, 72 percent (115,000) live in Mecklenburg County and 28 percent (44,900) live in Iredell County. Table 1.1-1 shows the total population and population density in the North Corridor and the projected rate of growth between years 2000 and 2030 based on data from the Mecklenburg-Union Metropolitan Planning Organization (MUMPO).

Table 1.1-1. 2000-2030 Population in North Corridor

Population Characteristics	2000	2030	Increase	% Change
Total Population*	159,900	391,500	231,600	145%
Population Density (per sq mi)	658	1,611	953	145%

*All data rounded to the nearest increment of 100.
Source: MUMPO

Population and employment are largely centered around major activity centers, many of which are located in close proximity to the "O" line. These include office and business centers, residential developments, retail malls, recreation facilities, and industrial facilities. Each is a location that can generate a large number of trips. Regional transportation planners have long focused on these locations as the likely location for future transit station. Along the North Corridor, major activity centers include:

- Center City Charlotte
- WT Harris Boulevard
- Eastfield
- Hambright (future activity center)
- Downtown Huntersville
- Downtown Cornelius
- Downtown Davidson
- Mount Mourne
- Downtown Mooresville

As shown in Table 1.1-2 (population) and Table 1.1-3 (employment), in 2000 these activity centers accounted for 18 percent of the study area's population and 50 percent of the study area's employment. By 2030, with population growth and dispersal across the study area, these activity centers are projected to include 21 percent of the study area's population and 39 percent of the study area's employment. This amounts to an increase of nearly 54,000 residents and over 51,000 employees in activity centers within the study area.

Table 1.1-2. Population within One Mile of Activity Centers

Activity Center	Total Population				Population Density (per Sq Mi)			
	2000	2030	Increase	% Growth 00 - 30	2000	2030	Increase	% Growth 00 - 30
Center City Charlotte	7,842	31,142	23,300	297%	2,496	9,913	7,417	297%
WT Harris Boulevard	3,455	4,561	1,106	32%	1100	1,452	352	32%
Eastfield	1,606	3,798	2,192	136%	511	1,209	698	137%
Hambright	632	6,733	6,101	965%	201	2,143	1,942	966%
Huntersville	4,422	11,954	7,532	170%	1,408	3,805	2,398	170%
Cornelius	3,275	8,207	4,932	151%	1,042	2,612	1,570	151%
Davidson	4,140	7,558	3,418	83%	1,318	2,406	1,088	83%
Mount Mourne	946	4,698	3,752	397%	301	1,495	1,194	397%
Mooresville	6,585	9,094	2,509	38%	2,096	2,895	799	38%

Source: US Census Bureau: 2000 Census; MUMPO, Traffic Analysis Zone (TAZ) Data, November 2004.
Note: Based on one-mile radius from proposed station. TAZ data was distributed to the census block level prior to calculation. If any portion of a block was found to be within the specified radial distance, the share of population within that portion (assuming an even distribution within the block) was included. This can result in a slight over or under estimation of population.

1.1.2.2 Transit Dependent Populations

There are several transit dependent populations in the Charlotte-Mecklenburg region. These include low-income households, the elderly, the disabled, and those persons without an automobile or with limited access to one. The greatest concentration of transit dependent population in the North Corridor include Center City Charlotte, the Derita neighborhood in Charlotte, and the town centers of Huntersville, Cornelius, Davidson and Mooresville. Of the 67,598 population within one mile of the North Corridor, an estimated 14,002 persons – 21 percent of the total population -- have been identified as transit dependent. Of the 63,310 persons within one mile of the NCCR project for whom poverty level is determined (non-group quarters population), 8,793 or 14 percent are considered below the poverty level.

1.1.2.3 Employment Growth

Employment growth in the region and within the North Corridor study area mirrors the growth in population. Table 1.1-4 provides the amount of existing and projected employment around the North Corridor's major activity centers and Table 1.1-3 details employment in the North Corridor study area by employment category. In 2000, MUMPO estimated there were approximately 146,000 jobs in the North Corridor study area. The study area is projected to experience an employment increase of 118 percent by year 2030 to nearly 319,000 jobs. The service sector is expected to have the largest growth, around 169 percent, and become predominant by 2030.

Charlotte's Center City continues to be the employment engine for the region, with growth not only in banking, but in education, retail, entertainment, and government services as well. In 2000, there were over 57,000 jobs in Center City Charlotte. By 2030, this figure is projected to increase by 63 percent to nearly 93,000. Importantly, almost 40 percent of all existing and future employment in Center City Charlotte would be within walking distance of the proposed CGS, terminus of the NCCR service. Moreover, the CGS is also anticipated to be an employment center, with current plans for at least 100,000 square feet of office space within the complex and significant air rights opportunities on adjacent parcels.

Table 1.1-3. Employment within One Mile of Activity Centers

Activity Center	Total Employment				Employment Density (per Sq Mi)			
	2000*	2030*	Increase	% Growth 00 - 30	2000*	2030*	Increase	% Growth 00 - 30
Center City Charlotte	59,578	85,110	25,532	43%	18,964	27,091	8,127	43%
WT Harris Boulevard	5,225	9,039	3,814	73%	1,663	2,877	1,214	73%
Eastfield	2,039	3,940	1,901	93%	649	1,255	606	93%
Hambright	1,122	4,461	3,339	298%	357	1,420	1,063	298%
Huntersville	1,672	4,850	3,178	190%	532	1,544	1,012	190%
Cornelius	1,773	4,919	3,146	177%	564	1,566	1,002	178%
Davidson	3,770	5,489	1,719	46%	1,200	1,747	547	46%
Mount Mourne	395	9,682	9,287	2,351%	126	3,083	2,957	2,351%
Mooresville	2,805	6,172	3,367	120%	893	1,965	1,072	120%

Source: MUMPO, TAZ Data, November 2004.
Note: Based on one mile radius from proposed station. If any portion of a TAZ was found to be within the specified radial distance, the share of employment within that portion (assuming an even distribution within the zone) was included. This can result in a slight over or under estimation of employment.

As rush-hour trip time to downtown Charlotte has worsened with the steady increase in congestion, employment outside the Center City has grown substantially. With the completion of the I-485 beltway north of the Charlotte by 2015, office space development near the Eastfield/NC 115 interchange is expected to increase. Two commuter rail stations are proposed for this area – Eastfield and Hambright. Twin Lakes, located adjacent to the proposed Eastfield station, expects to include a mix of retail, housing, and office on a 110 acre development site. Bryton, a 450-acre development surrounding the Hambright station, is planned to include up to 3,000 homes, one million square feet of retail, and 1.2 million square feet of office/flex space. Mount Mourne, with employment of less than 400 in 2000, expects the relocation of Lowe's Corporation to generate over 12,000 employees by 2020.

Table 1.1-4. 2000-2030 Employment in North Corridor

Employment*	2000	2030	Increase	% Change
Manufacturing/Industrial	48,500	83,800	35,300	73%
Retail	16,600	38,000	21,400	129%
Service	40,900	109,900	69,000	169%
Office/Government	14,500	31,800	17,300	119%
Banking	18,000	41,000	23,000	128%
School	7,500	14,400	6,900	92%
Total Employment	**146,000**	**318,900**	**172,900**	**118%**
Employment Density (per sq mi)	**601**	**1,312**	**711**	**118%**

Source: MUMPO.
*All data rounded off to nearest increment of 1000.

1.1.3 Land Use

Land use in the Corridor is predominantly residential and, in the north, undeveloped farm land with some areas of heavy industrial and commercial activities.

Along Graham Street, just north of Charlotte's downtown area, the corridor extends through an area of heavy industrial and commercial development, interspersed with several small, older residential areas. Along I-77, heavy automobile-oriented development patterns continue to spread at each highway interchange. However, from the Derita area, five miles north of Center City Charlotte, to Mooresville, the remainder of the corridor consists largely of residential communities and developments, historic town centers and large green-field, undeveloped areas to the east. Growing population and employment have greatly accelerated residential development of these areas. Local officials have worked hard to manage that development in order to protect the character of the region, local neighborhoods, and town centers.

In Center City Charlotte, the market for new residential units is expected to remain very strong. Since 2004, ten new residential towers, with more than 2,500 residential units, have been proposed in the Center City area. Four of these already were completed in 2007. Much of the new housing is within a 10-minute walk of the proposed CGS. Current enrollment at the new Johnson & Wales University campus, located adjacent to the proposed CGS, is over 2,000 and expected to reach 5,000 students by 2008. Two-thirds of these students would live within walking distance of the new campus.

Residential development in the four towns also is accelerating, particularly around the downtown areas and east of the "O" line. Of the 95,000 new households projected to be added within the North Corridor study area from 2000 to 2030, approximately 57,000 units -- 60 percent – would be located east of the "O" line. One indicator of this growth is the projected need for new schools in the region. As shown on Table 1.1-5 below, an area currently served by three high schools is expected to have six by the year 2015, along with eight middle and 27 elementary schools.

Table 1.1-5. School Expansion in the Study Area

Station	Elementary	Middle	High	Total
Existing Schools	15	5	3	23
Additional Schools (by 2015)	12	3	3	18
Total	27	8	6	41

Source: Charlotte-Mecklenburg Schools, February 2005.

Building on the public support for implementation of the *2025 Integrated Transit/Land-Use Plan* and the Metropolitan Transit Commission (MTC) Corridor System Plan, Charlotte and the northern towns have implemented a number of important land use and growth management policies that will enhance their abilities to support TOD objectives and ultimately increase the use of transit along the North Corridor for work and other travel.

- Charlotte has adopted a comprehensive TOD zoning district and a TS overlay district. The purpose of the TOD zoning district is to create a compact and high intensity mix of residential, office, retail, institutional, and civic uses in areas with high potential for enhanced transit and pedestrian activity. The development standards require attractive streetscapes, a functional mix of complementary uses, and the provision of facilities that support transit use, bicycling, and walking. These zoning districts are meant to create high density transit supportive development around transit stations, typically the area within one-half mile walking distance from the transit station, which represents a 10-minute walk.

The purpose of TS overlay district is to accommodate the continued existence and minor expansion of existing uses while transitioning to a more compact, high intensity, transit supportive mix of uses that complement adjacent neighborhoods.

- Huntersville has adopted two TOD zoning districts, residential and employment, for areas within one-half mile of rapid transit stations. The residential zone (TOD-R) supports higher density residential communities that include a mix of services within a pedestrian environment. A minimum of 15 dwelling units per acre (du/ac) is established. The employment zone (TOD-E) accommodates office and supporting uses in a pedestrian-friendly setting. Minimum office intensity is established.

- Cornelius has adopted a Transit District-Overlay zone centered on a proposed commuter station in the historic downtown area. The Town's goal is to produce compact areas of higher density, mixed use development within walking distance of the proposed transit station. Within one-quarter mile of transit stations, minimum residential densities are established at 12-16 du/ac and within the one-quarter- to one-half-mile area, the minimum density is set at 8-12 du/ac. The lower end of these ranges is for sites of less than two acres and the higher end is for sites of more than two acres.

- Davidson's Town Center Master Plan, adopted in 1998, anticipated a rapid transit station in the center of downtown. The Plan recommends substantial new development in support of transit with the addition of nearly 300,000 square feet of retail/office space and 400-500 new residential units. In June 2001, the town adopted a planning ordinance that ensures higher density mixed use development that is pedestrian oriented and transit supportive. Work on developing a comprehensive station area plan, as part of the Town Center Master Plan, is expected to be completed in 2006.

- Mooresville is planning to include a TOD overlay zoning district in their next zoning ordinance update. The zoning ordinance would be updated as soon as a funding source is identified. The new requirements would apply to proposed station locations in Mount Mourne, downtown Mooresville and at the proposed North Corridor terminus at Cascades/NC 150.

The dramatic impact of these new policies, major development in proposed stations areas even prior to approval of the rapid transit project, demonstrates the demand for more efficient land uses and alternative transportation choices. Over 20 major residential developments have been built or are under active planning within one-half mile of proposed transit stops along the North Corridor. These are expected to include 12,000 to 14,000 residential units. Most also include major retail and commercial activities. Table 1.1-6 identifies new developments and local plans within one-half mile of proposed transit stations as of 2006.

Table 1.1-6. New Developments/Plans near Proposed Transit Stations

Station	Development	Number of Units	Commercial/Retail Space
Charlotte Gateway	Various	2,500	4.0 million sq ft office 65,000 sq ft retail
Derita	Village Glen	50	
	Nevin Creek	70	
	Avalon	110	
Harris/ NC 115	Griffith	2,800	420,000 sq. ft. office 489,000 sq. ft retail
Eastfield	Twin Lakes	750-1,000	600,000 sq ft office 200,000 sq ft retail
	Eastfield Station	951	50,000 sq ft retail
Hambright	Bryton	3,000	1,200,000 sq ft office 1,000,000 sq ft retail
Huntersville	Vermillion	1,200	64,000 sq ft office, retail, and civic buildings
Sam Furr	Caldwell Station	1,359	108,000 sq ft office 14,000 sq ft retail
Cornelius	Antiquity	759	190,000 sq ft office 95,000 sq ft retail
Davidson	Town Center Master Plan	400-500	300,000 sq ft retail/office
Mount Mourne	Legacy Village	135	300,000 sq ft office/retail
Mooresville	Downtown Mooresville Master Plan	Undefined	Undefined
Cascade/NC 115	Cascade Neighborhood Master Plan	156 or more	Undefined

1.1.4 Travel Demand Patterns

Population growth in the North Corridor and the continued strong employment base in Center City Charlotte have led to a very predictable result: heavy morning and afternoon peak period vehicular traffic coming to and from the Center City along I-77 and the two primary local north-south arterials, NC 115 and US 21.

Demand for travel is a direct result of growth in population and employment in the region, combined with the choice of where to live and where to work. These are key factors that have contributed to the mobility problems north of Charlotte. The availability of the private automobile has made it possible for residents to live in one area and commute to another for work. As suburbanization continues, people are commuting over longer distances to get to work. The increases in the number of person trips and the longer trips have overburdened the region's roadway network. This has resulted in increases in the number of person trips, vehicle miles of travel (VMT), and vehicle hours of travel (VHT). Based on the Metrolina Travel Demand Model, daily VMT in the region will grow by 112 percent, from 58.2 million in 2000 to 123.4 million in 2030. During the same period, VHT is expected to grow by 138 percent from 1.6 million in 2000 to 3.8 million in 2030. The overburdened highways, combined with longer commuting distances, have resulted in a higher increase in VHT, with even greater percentage increases projected for the future.

Demand for travel in the North Corridor study area is estimated using the Metrolina's Regional Travel Demand Model. As shown in Table 1.1-7 below, in 2000, the Charlotte Central Business District (CBD) was the destination for 2.6 percent of total daily originating trips in the North Corridor study area; 54.6 percent of trips remain within the study area, 7.5

percent are destined for the adjacent Northeast Corridor, which includes UNC Charlotte and Research Park, and the remaining 35.3 percent to other corridors and surrounding areas.

Table 1.1-7. 2000 Daily Person Trips

Destination (To)	Trips Originating in	
	North Corridor	Other Areas
Charlotte CBD	12,800	113,600
North Corridor Study Area	268,100	221,100
South Corridor	14,100	270,400
Northeast Corridor	36,800	220,500
Southeast Corridor	16,300	401,200
West Corridor	7,800	83,600
Other Area	134,600	3,776,400
Total	490,500	5,086,800

Source: Metrolina's Travel Demand Model, June 2005; Parsons Brinckerhoff, 2006

As shown in Table 1.1-8 below, the model projects that in 2030, the Charlotte CBD area would be the destination for 27,200 -- 2.2 percent -- of total daily originating trips in the North Corridor study area; 56.7 percent of trips stay within the study area. Daily person trips in the entire Metrolina region, increased by 89 percent between 2000 and 2030. However, in the North Corridor study area, this increase is153 percent, including a 112 percent increase in the number of trips to the Charlotte CBD.

Table 1.1-8. 2030 Daily Person Trips

Destination (To)	Trips Originating in	
	North Corridor	Other Areas
Charlotte CBD	27,200	226,000
North Corridor Study Area	703,800	539,600
South Corridor	24,700	433,400
Northeast Corridor	83,300	413,900
Southeast Corridor	25,600	551,100
West Corridor	17,000	182,100
Other Area	360,100	6,978,500
Total	1,241,700	9,324,600

Source: Metrolina's Travel Demand Model, June 2005; Parsons Brinckerhoff, 2006

The 1990 and 2000 Census data confirms the 2004 and 2030 travel demand trends. Commuters traveling from northern Mecklenburg County to Center City Charlotte increased 186 percent from 1990 to 2000.

1.2 Transportation Facilities and Services in the Corridor

The North Corridor includes several major transportation facilities on which the region depends for local travel and commutation to and from employment centers. These include existing roadways, public transit service provided by CATS, and bicycle and pedestrian facilities. Currently, Amtrak provides intercity passenger rail service to Charlotte, but not to the other towns in the North corridor. There is no other public or private passenger rail service within the North Corridor.

Figure 1.2-1 illustrates the major highways and other transportation services in the corridor.

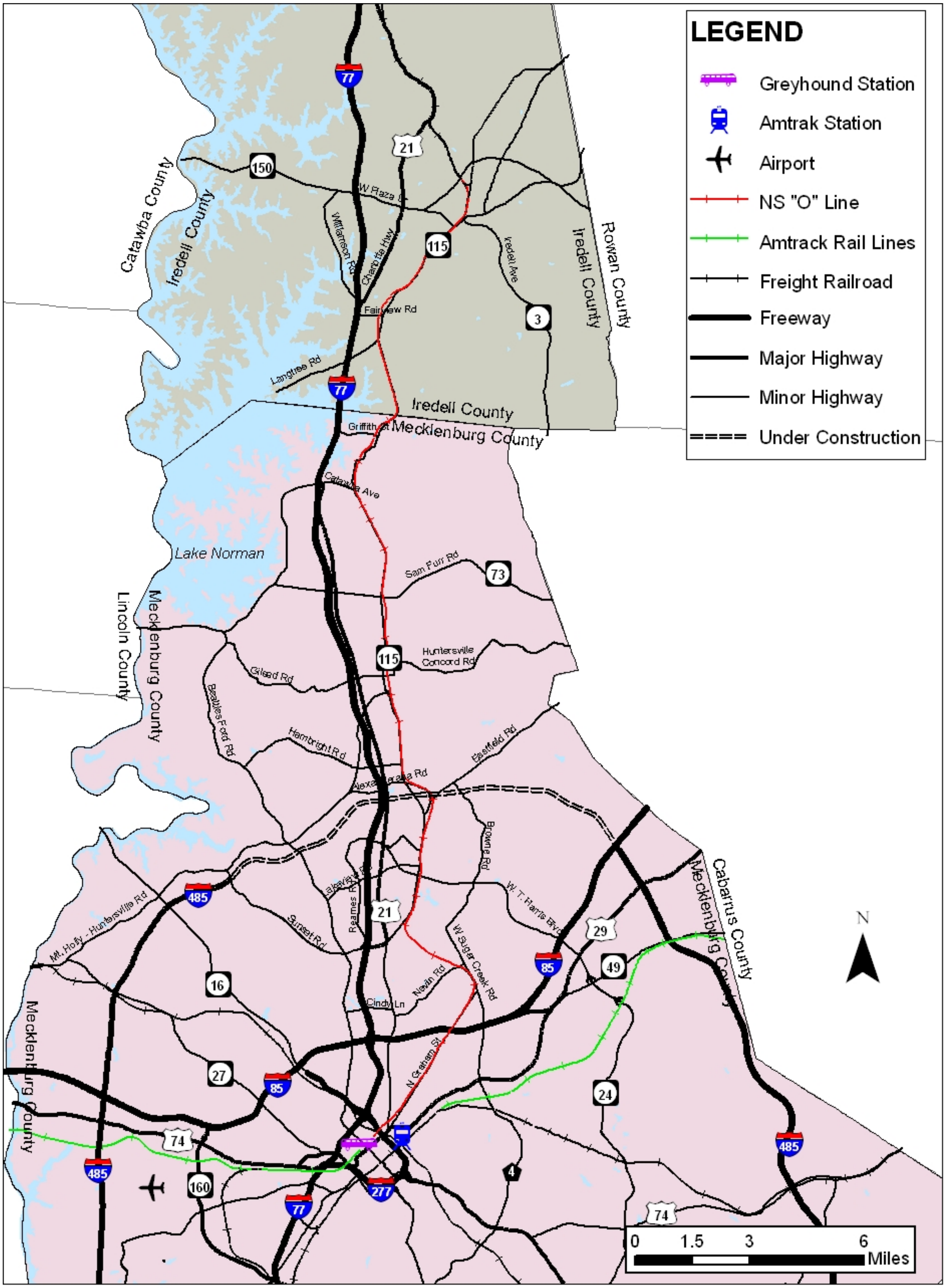


Figure 1.2-1 Highways And Other Transportations Services

1.2.1 Existing Roadway Facilities

1.2.1.1 Major North-South Roadways

Just three north-south roadways serve the North Corridor – I-77, US 21, and NC 115. All are located within a narrow one-two mile wide strip running due north of Charlotte. Only two of these roads (I-77 and US 21) pass directly through Charlotte. Importantly, no other north-south highways connecting North Mecklenburg with downtown Charlotte are planned for at least the next 25 years. The three existing facilities carry the majority of the traffic originating from or departing to the North Corridor and Center City Charlotte. US 21 and NC 115 – two lane roads through much of the North Corridor – reflect the rural, low-density history of the region and are ill-equipped to handle the significant increase in traffic of the past decade. Not only are these roads highly congested with commuters during rush hour, but they must continue to serve local functions. For example, during the morning school "drop-off" – which occurs during the morning rush hour peak -- NC 115 becomes severely congested in a number of locations. Three of Mecklenburg County's fastest growing and most populated public schools (North Mecklenburg High, Alexander Middle, and Blythe Elementary) are located along a 3,300 foot stretch of NC 115 in Huntersville, creating severe congestion at this location. In addition, during periods of major incidents along I-77, NC 115 is used as an alternative to I-77, further exasperating congestion on the road.

The extension of I-485 to NC 115 from the west will be completed in the summer of 2007. I-485 will terminate at a grade separated interchange with NC 115 adding further to north south movements along NC 115 and US 21. The interchange is less than a half-mile south of the North Mecklenburg, Alexander, Blythe public school complex. The I-485 loop east to I-85 is not scheduled for completion until approximately 2012, thus assuring that NC 115 and the school complex would confront the growth of local traffic destined to or arriving from I-485. Given the previously mentioned constrained north south vehicular capacity and the unlikelihood of new capacity, this remains a critical regional issue as development pushes east past NC 115.

Interstate 77: I-77 is the major carrier of north-south traffic through the North Corridor study area. In 2004, Phase I of a North Carolina Department of Transportation (NCDOT) project to widen I-77 from six to eight lanes between I-85 and the future I-485 was completed. An additional northbound lane and High Occupancy Vehicle (HOV) lane between the future I-485 and Gilead Road (Exit 23), and an HOV lane southbound from future I-485 to Brookshire Freeway (I-277) were added in 2005.

From Gilead Road (Exit 23) to the north into Iredell County, I-77 is a four-lane facility, with two lanes in each direction. I-77 is proposed to be widened between I-485 and the future interchange at Langtree Road (now under construction between exits 30 and 33) by 2020.

I-77 carries high volumes of traffic most hours of the day (daily volumes ranging from 76,000 to 160,000 vehicles) and is congested beyond capacity during peak hours. Even with the recently added lanes, I-77 continues to experience high levels of congestion during peak periods (Figure 1.2-2).

Figure 1.2-2	I-77 North Bound, Peak Period HOV and Multi-use Lanes

Statesville Road (US 21): Statesville Road begins just north of Charlotte's Center City and proceeds north. At Sunset Avenue, near the Exit 16 interchange with I-77, it becomes US 21and runs parallel to I-77 through Catawba Avenue in Cornelius. North of Cornelius, US 21 shares use of I-77 for a three-mile section between Catawba Avenue (Exit 28) and Williamson Road/Charlotte Highway (Exit 33). US 21 resumes as a separate facility north of Lake Norman and continues north serving Mooresville and Iredell County. US 21 is a two-lane facility from Sunset Road to Cornelius and is located between one-quarter and one-half mile from I-77. The 2030 Long-Range Transportation Plan (LRTP) for the Mecklenburg-Union urban area includes three separate projects to widen US 21 to four lanes from Sunset Road north to Catawba Avenue in Cornelius. The horizon year for completing these projects is 2020.

Old Statesville Road (NC 115): NC 115 does not provide access to Charlotte's Center City. It begins as Sunset Road west of I-77, crossing the interstate at Exit 16 north of Charlotte. From there it runs parallel to and slightly east of US 21 and I-77, basically following the "O" line through the northern downtowns of Huntersville, Cornelius, Davidson, and Mooresville. Between Huntersville and Mooresville, the road is as close as 25 feet from the "O" line tracks. The road was widened from two to four lanes between Sunset Road and WT Harris Boulevard in 2004. The remaining portion of NC 115, which serves the four northern towns, is a rural two-lane facility. The LRTP for the Mecklenburg-Union urban area includes two widening projects for NC 115 between WT Harris Boulevard and Verhoeff Drive in Huntersville from two to four lanes with a horizon year for completion of 2020. There is a separate project listed in the LRTP for NC 115 between McCord Road and Bailey Road. This project calls for the widening of NC 115 from two to four lanes and has a 2020 horizon year for completion. Both projects face significant land use and environmental challenges in light of existing development along the existing road boundaries and the presence of the "O" line tracks immediately to the east.

Future Roads: The region's major thoroughfare plan includes one additional north-south road – extension of Asbury Chapel Road from the Charlotte/Huntersville border north to Iredell County. The road would be located three to four miles east of the NC 115. No funding has been allocated towards road planning or construction, and current plans do not call for construction before 2030. Importantly, the south end of Asbury Chapel Road would not enter Charlotte's Center City, but rather terminate at Eastfield Road and NC 115, further exasperating north-south traffic congestion.

1.2.1.2 Major East-West Roadways

There are a limited number of roadways running east-west across the North Corridor that provide connectivity to I-77, US 21, and NC 115. Most of these roadways have become heavily congested, adding time to commuter and non-commuter trips. Roadway improvements have provided relief in some areas and plans for other improvements are underway. However, with the rapid population and employment growth in the North Corridor and limited space for expansion, it is anticipated that travel times will continue to increase. Below is a brief summary of each of the major east-west roadways.

Sunset Road (Exit 16): Sunset Road crosses I-77 from the west at Exit 16, six miles north of Charlotte's Center City. Most of the traffic from NC 115 and US 21 use Sunset Road to cross over or access I-77. Heavy congestion occurs in both AM and PM peak periods at this crossing. Sunset Avenue is a 4-lane facility.

WT Harris Boulevard (Exit 18): WT Harris Boulevard provides an east-west connection between I-77 and I-85 and carries large volumes of traffic generated from densely populated areas and businesses located along this major facility. The University Research Park area, with current employment totaling some 20,000, is located along WT Harris Boulevard east of the "O" line. A new retail complex, Northlake Mall, located at WT Harris Boulevard and I-77 opened in mid September, 2005 adding 1.2 million square foot of retail within two miles of the of the proposed Harris/NC 115 station.

Gilead Road (Exit 23): The next exit off I-77 is five miles north of WT Harris Boulevard at Gilead Road. Gilead Road is the main route through downtown Huntersville and becomes Huntersville-Concord Road east of NC 115. Commercial and residential development east and west of I-77 has generated significant growth in traffic along Gilead Road. Because US 21 is less than 500 feet from the I-77 northbound off ramp, traffic attempting to access or exit both roads has become severely congested during the morning and afternoon peak periods.

NC 73/Sam Furr Road (Exit 25): NC 73/Sam Furr Road serves both local and regional traffic and is a major connection from I-77 to I-85. Growing residential development east of the "O" line generates major congestion on Sam Furr Road, particularly at the intersection with NC 115 and between NC 115 and US 21 and I-77. Traffic often backs-up the full mile between I-77 and NC 115. A major regional study is underway to expand NC 73 and the Town of Huntersville is seeking to accelerate expansion of the section between I-77 and NC 115 from two to four or six lanes by 2012. The study calls for eventual expansion of NC 73 to at least four lanes from Lincolnton in the west to Concord in the east.

<u>Catawba Avenue (Exit 28)</u>: Catawba Avenue is the main route through downtown Cornelius from I-77 and currently ends at NC 115 adjacent to the “O” line. Work is currently underway to extend Catawba Avenue across the rail line into a TOD that will include the Cornelius rapid transit station. Cornelius recently completed upgrades to Catawba Road, including installation of speed bumps that slow traffic to just 20 mph. The road is heavily congested during the morning and afternoon peak periods.

<u>Griffith Street (Exit 30)</u>: Griffith Street extends from I-77 to NC 115 at Davidson College in downtown Davidson. The road is less congested than other east-west roads along I-77. However, traffic along NC 115 through Davidson can be severely congested.

<u>Langtree Road (Future Exit 32)</u>: Langtree Road extends from NC 115 west over I-77 to the Lake Norman peninsula. Design work is underway to create a new Langtree Road exit on I-77, which would enhance access to the Lowe’s Corporation headquarters campus.

<u>Fairview Road/Charlotte Highway (Exit 33)</u>: Fairview Road extends 1.5 miles from NC 115 to I-77 (Exit 33) and provides the shortest route from I-77 to a proposed commuter rail station from the north. The road provides access to both the Lake Norman Regional Medical Center and the new Lowe's Corporation headquarters. As a result, traffic to and from I-77 during the morning and afternoon peak periods is growing. Fairview Road connects to NC 115, which is the major commuter route for traffic coming to and from downtown Mooresville.

<u>NC 150/West Plaza Drive (Exit 36)</u>: The last exit in the study area is heavily developed with both commercial and residential activities. This route is very congested during the morning and afternoon peak periods.

1.2.2 Existing Transit Services

1.2.2.1 Regional System Overview

CATS provides public transportation in the Charlotte-Mecklenburg area. The bus network tends to be largely radial, providing service from Charlotte’s Center City to outlying neighborhoods and suburban areas. A number of circumferential routes also exist to offer supporting cross-town connections. CATS currently operates a fleet of over 400 buses and para-transit vehicles which serves an average of 68,000 riders per weekday. Average annual transit ridership in the area increased by 6 percent in fiscal year 2004, and the system is currently transporting 15.8 million passengers per year.

Figure 1.2-3 illustrates the fixed transit services in the corridor. Transit service in the Charlotte region includes 33 local and 19 express routes, 15 neighborhood/town shuttles, and 64 vanpools. Gold Rush shuttle service is provided in Center City Charlotte along three fixed routes. There is also an electric trolley with service from Historic South End to Center City Charlotte. Special Transportation Service (STS) provides door-to-door transit services for individuals with disabilities certified as eligible according to the Americans with Disabilities Act (ADA). The local routes operate between 5:30 a.m. and 1:30 a.m. Monday through Saturday, with 6:30 a.m. to 1:30 a.m. service on Sundays. Express routes provide transportation with limited stops from the suburbs to the Center City area.

The Center City Charlotte Gold Rush service is free. Local route fares are $1.30 and express fares are $1. 75 for routes inside Mecklenburg County and $2.60 for routes that extend outside the county (express plus). Transfers between local bus services are free.

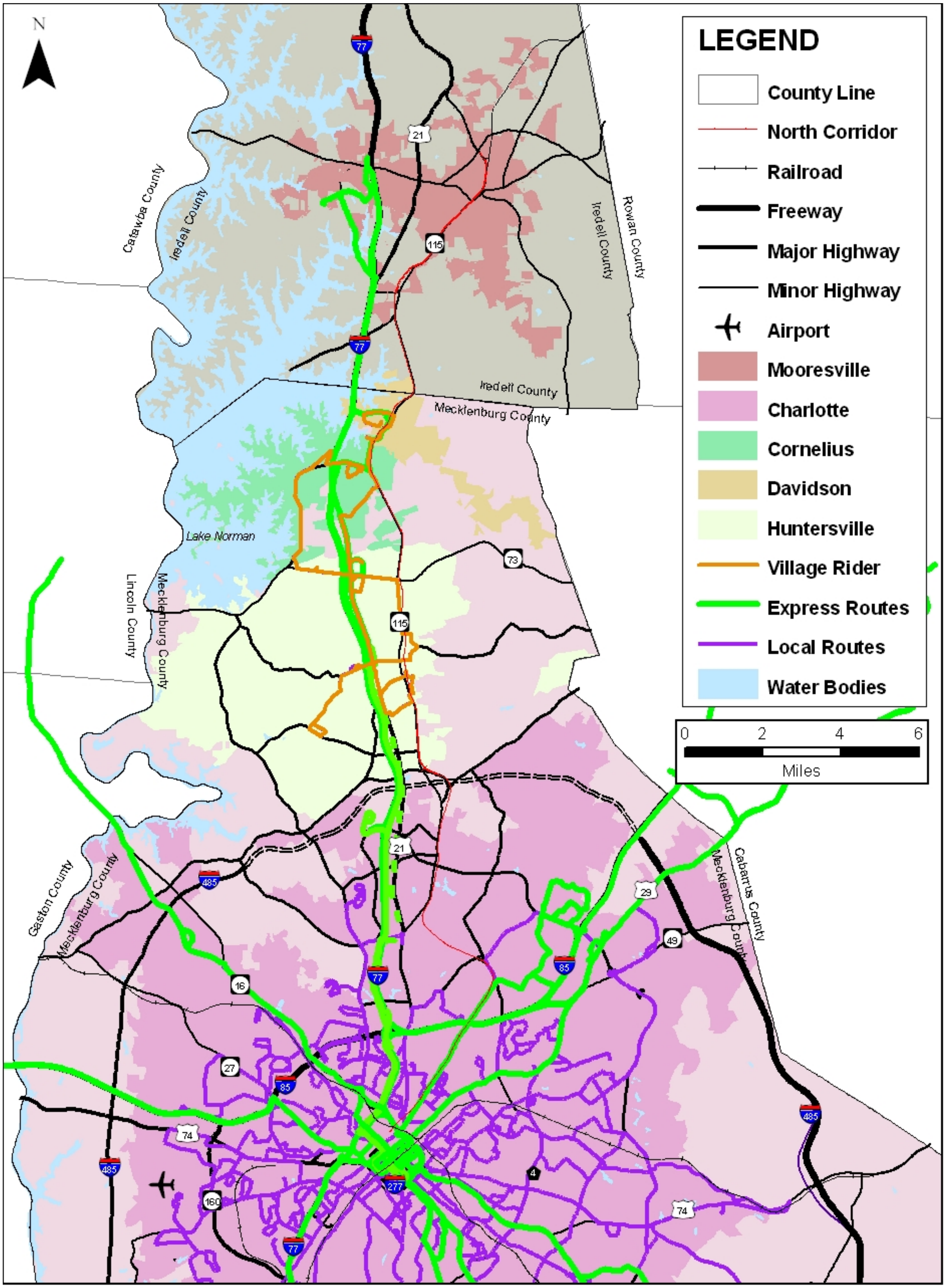


Figure 1.2-3	Existing Bus Transit System

Other transfers range from $0.45 to $2.00 depending on the type of service. Various multiple ride passes are available: local 10-ride/7-day/monthly ($11.00/$13.00/$45200), express 10-ride/monthly ($14.85/$70.00), and express plus 10-ride/monthly ($22.10/$104.00). There is also a monthly pass ($80.00) available for persons qualified for STS.

1.2.2.2 Existing North Corridor Transit Service

The North Corridor study area is currently being provided with both local and express bus service. Routes that currently serve the NCCR ridership market area are described below.

- Two local bus services:
  Route 13 – Nevin Road: Serving Derita Woods, Nevins Center, Statesville Road, Uptown
  Route 22 – Graham Street: Wachovia CIC, Crisis Assistance Ministry, The Hal Marshall Center, Uptown
- Three express bus routes: The Mooresville Express (Route 83X), North Mecklenburg Express (Route 77X), and the new Northlake Express (Route 53X) provide express service for outlying areas in the North Corridor and downtown.
- Village Rider Local town shuttles: The Village Rider routes 96, 97, 98 and 99 are shuttle services that provide neighborhood circulation through the towns of Huntersville, Cornelius, and Davidson. These shuttles can deviate by a quarter of a mile from routes if they receive individual request calls from riders.

Local bus routes in the North Corridor study area operate only within the City of Charlotte; no service available north of WT Harris Boulevard to or between Huntersville, Cornelius, Davidson or Mooresville. The Village Rider provides service to the local communities in North Mecklenburg County, but is not designed to connect with the local bus route system.

The North Mecklenburg Express (77X), Mooresville Express (83X), and Northlake Express (53X) buses are the only public transportation options for those living in the northern towns to reach Center City Charlotte. The 83X buses pick up passengers in downtown Mooresville and travel directly to I-77, distributing passengers at several Center City Charlotte locations. The scheduled travel time ranges from 50 minutes to one hour 10 minutes, depending on the departure time during the peak periods. The 77X buses operate to downtown Charlotte via I-77 from Davidson, Cornelius and Huntersville. The scheduled trip time ranges from 50 minutes to one hour 10 minutes from Davidson. Increases in ridership over the past three years have required CATS to reduce headways from 20 minutes to 10 minutes during the peak morning and afternoon periods. Trips have also been added in the mid-day and evening hours to accommodate off-peak and late evening workers. A third express bus route, the Northlake Express, was added in October 2005. This route starts from the Huntersville Gateway Park and Ride Lot, located at Exit 23 off I-77 in Huntersville and stops at the new Northlake Mall off I-77 Exit 18 in route to Center City Charlotte. There are four trips inbound in the morning and four trips outbound in the afternoon. The Northlake Express operates Monday through Friday. While congestion on I-77 has been reduced for these express buses through use of new HOV/Bus lanes, congestion and trip time are growing on the local roads connecting NC 115 and I-77.

1.2.3 Bicycle and Pedestrian Programs

There are numerous existing and proposed bikeways (both exclusive and non-exclusive) and greenways within the North Corridor. At least one bikeway or greenway would serve almost every transit station under consideration. A majority of bikeways are non-exclusive facilities and are part of the street design. Many of the proposed bikeways are bicycle improvements on existing roads, including simple signs and physical improvements such as wide shoulders or exclusive lanes. There also are several greenways within the corridor. Greenways are off-road trails designed for use by bicycles and pedestrians. There are some proposed trails that are part of the greenway system that cross or have entrances near the rail line.

1.2.4 Railways

The railroad corridor proposed for use by the NCCR project, NS's "O" Line, currently does not operate through freight service. Freight service to a limited number of local customers is provided by a single, daily switch engine move from Charlotte with an occasional freight service from the north (Barber line). Freight service is typically a daily occurrence of one train pulling less than 20 cars.

1.3 Performance of the Transportation System

1.3.1 Highway Performance

The existing highway and road system, while integral and primary to the region's future, is not capable of meeting the future mobility needs and land use goals of the region. As a result, sole reliance on the existing highway and road system would not meet the *Corridor System Plan* principles. This is at the heart of the decision to implement rapid transit in the Charlotte region.

In the case of the North Corridor, the north-south road system relied upon for commutation to and from Charlotte is severely constrained during the morning and afternoon peak periods. No additional north-south connections between the four towns and Charlotte are planned within the 2030 horizon period. Travel demand in the North Corridor has grown substantially in recent years and will continue to increase in the future. Traffic on I-77 is projected to double along most segments along the corridor by 2030. Although recent expansion of I-77 between Charlotte and Huntersville from two to three lanes plus HOV will provide some relief in the near term, studies make clear that the capacity of the transportation system has not kept and cannot in the future keep pace with the rapid projected growth in population, employment, and resulting travel demand.

At best, the result is worsening congestion on I-77, US 21 and NC 115, undermining the quality of life in small neighborhoods and communities devoid of traffic congestion a mere decade prior. At worst, with any incident on I-77 that slows or stops the movement of traffic, there is the potential for transportation paralysis in the region. Congestion will only worsen as the region digests major residential development of the green fields east of the NS "O" line in the coming decade.

1.3.1.1 Conditions Analysis

The Charlotte Department of Transportation (CDOT) provided Average Annual Daily Traffic (AADT) numbers for existing conditions based on historic volume counts taken during 2004. Level of service (LOS) analyses was conducted for both roadway segments and intersections within the study area. Freeway LOS is dependent on a number of factors such as directional traffic split, peak hour factor, traffic mix, observed free flow speeds, and the terrain and driver population. Currently, I-77 in the study area is carrying between 57,000 and 152,000 vehicles per day (see Table 1.3-1). The eight-lane section closer to Center City Charlotte and the recently expanded six-lane section between I-85 and Gilead Road (Exit 23) are already at or over capacity and experiencing high levels of congestion during peak hours. The two-lane section from Gilead Road to Fairview Road (Exit 33) is experiencing severe congestion.

Table 1.3-1. Existing and Future Freeway Critical Peak Hour LOS Analysis Results

	2004			2030		
I-77 Freeway Segment	**AADT**	**Lanes***	**LOS**	**AADT**	**Lanes***	**LOS**
I-277 to I-85	145,000 – 152,000	8	D	221,100 – 232,600	8	F
I-85 to Gilead Rd	76,000 – 96,000	6	D	163,000 – 188,500	6	F
Gilead Rd to Langtree Rd	82,000 – 86,000	4	E	160,600 – 185,800	6	F
Langtree Rd to Fairview Rd	77,000	4	E	177,400	8	E
Fairview Rd to NC 152	57,000	4	C	161,800	8	E

Source: Metrolina's Travel Demand Model, June 2005; Parsons Brinckerhoff, 2006

*Number of lanes does not include HOV lanes. The HOV lanes are assumed to have LOS of A-C under existing and future conditions.

Future conditions analysis indicates that I-77 will have severe levels of congestion by the year 2030. This is despite the expansion of the interstate north of Gilead Road as documented in the MUMPO LRTP. The projected growth in residential and employment in the North Corridor are major contributors to these conditions.

Table 1.3-2 lists the major roadways (arterials) within the study area and their current operating conditions. Arterial capacity varies with roadway characteristics. For example, arterial segments with the same geometry may have different capacities depending on the number of signalized intersections, area type, observed travel speeds, the percentage of heavy vehicles, lane width, or other varying traffic conditions. The table also shows the critical peak hour LOS by comparing the existing AADT volume to the output table derived exclusively for the given arterial. The analysis shows that the entire length of an arterial roadway does not operate at the same LOS. The level of congestion varies within an arterial roadway. Currently, there are some sections of arterial roadways in the North Corridor that exhibit high to severe congestion during the peak period. These sections exhibiting congestion problem are usually located adjacent to major intersections.

The future congestion on the highway network will not be isolated to just the interstate system. Most of the parallel facilities in the North Corridor are projected to double and in some cases triple in traffic volumes over the next 25 years. The LRTP recommends additional lanes where opportunities for capacity expansion exist. US 21 and NC 115 are planned as 4-lane facilities for nearly their entire length. But several segments will still reach LOS E and F by the year 2030.

Table 1.3-2. Existing and Future Arterial Critical Peak Hour LOS Analysis Results

	2004			2030		
Roadway Segment	**AADT**	**Lanes**	**LOS**	**AADT**	**Lanes**	**LOS**
STATESVILLE AVENUE/ROAD						
N. Graham St to Starita Rd	17,000 – 28,000	4	B – C	42,500 – 53,200	4	F
Starita Rd to Sunset Rd	14,000	2	C	33,000	4	D
STATESVILLE ROAD (US 21)						
Sunset Rd to WT Harris Blvd	9,000 – 14,000	2	C	26,400 – 28,100	4	C
WT Harris Blvd to Mt. Holly - Huntersville Rd	12,000 – 15,000	2	C – D	37,100 – 42,300	4	F
Mt. Holly - Huntersville Rd to Sam Furr Rd	13,000 – 16,000	2	C – E	40,000 – 57,200	4	F
Sam Furr Rd to Cawtaba Ave	10,000 – 15,000	2	C	19,900 – 30,000	4	C
CHARLOTTE HWY (US 21)						
McLelland Ave to Fairview Rd	13,000 – 14,000	2	C	16,700 – 17,800	2	D – E
OLD STATESVILLE ROAD (NC 115)						
Gibbon Rd to WT Harris Blvd	12,000	4	C	40,400	2	F
WT Harris Blvd to I-485	14,000 – 15,000	2	D	34,300 – 39,400	4	E – F
I-485 to Hambright Rd	9,500 – 11,000	2	C	39,800 – 42,900	4	F
Hambright Rd to Mt. Holly - Huntersville Rd	9,400	2	C	17,950	4	C
Mt. Holly - Huntersville Rd to Stumptown Rd	10,000 – 13,000	2	C	17,100 – 18,800	2	C
Stumptown Rd to Catawba Ave	10,000 – 14,000	2	C – D	14,900 – 22,300	4	C
GRAHAM STREET						
I-277 to Statesville Ave	20,000	4	C	69,700	4	F
Statesville Ave to Norris Ave	14,000	4	B	32,200	4	F
Norris Ave to I-85	15,000 – 26,000	4	B – D	32,200 – 53,200	4	F
I-85 to Sugar Creek Rd	19,000	4	B	52,000	4	F

Source: Metrolina's Travel Demand Model, June 2005; Parsons Brinckerhoff, 2006

1.3.1.2 Major Problems and Deficiencies

Traffic congestion at many of the intersections and roadways is already high or severe. With the near doubling of population and employment projected over the next 25 years, this congestion will greatly worsen.

Table 1.3-3 below lists the number of crashes and severity over the 2002-2004 period for the main north-south roadways in the North Corridor. Table 1.3-4 provides a comparison of crash statistics at the county and State level. These accidents that often force a major slow down or shut down of traffic in the study area. When such events occur on I-77, highway traffic seeks alternatives, which are limited to US 21 and NC 115. The result is to quickly shut those roads down as well, essentially paralyzing the mobility of the region, often for hours on end.

Table 1.3-3. 2002-2004 Crash Summary in the Study Area

Route	From	To	Fatal Crashes	Injury Crashes	Property Damage Only Crashes	Total
I-77	Trade St (Exit 10)	Charlotte Hwy (Exit 42)	14	855	2,065	2,934
US 21	Sunset Rd (Exit 16)	Catawba Ave (Exit 28)	1	188	384	573
US 21	I-77 (Exit 33)	I-77 (Exit 42)	0	129	178	307
NC 115	US 21 (Sunset Rd)	US 21 in Iredell Co	5	294	483	782
Total			20	1,466	3,110	4,596

Source: NCDOT Traffic Engineering Accident Analysis System, 2002-2004 select data.

Note: US 21 follows I-77 from Catawba Ave (Exit 28) to Charlotte Hwy (Exit 33)

The region and the State are attempting to address these capacity and mobility issues by programming various highway and intersection improvements in their long range plans, including the potential widening of portions of US 21 and NC 115. These improvements and the future year traffic analysis are discussed in Chapter 4 of this report. However, while implementation of these improvements is critical, it nonetheless remains clear that these improvements alone cannot keep pace with the growing population and congestion.

Table 1.3-4. 2002-2004 Crash Summary: County and State

Jurisdiction	Classification	Fatal Crashes	Injury Crashes	Property Damage Only Crashes	Total
Iredell Co	Interstate	17	731	1,612	2,360
	US Highway	13	537	534	1,084
Mecklenburg Co	Interstate	35	3,526	7,485	11,046
	US Highway	19	1,354	2,304	3,677
North Carolina	Interstate	338	16,226	34,439	51,003
	US Highway	920	43,024	61,114	69,170

Table 1.3-5 summarizes the performance of the highway system as measured by the Corridor System Plan Principles as adopted by the MTC in 2002.

Table 1.3-5. Performance of the Highway System

Principle	Achieves Principle	Deficiencies
Mobility	No	Increasing congestion on highway and local roads; lengthening of peak period congestion; no plans for expansion of capacity east of NC 115;
Land Use	No	Growing sprawl and highway interchanges; does not support TOD; supports low density residential development in green-filed areas; fails to strengthen town centers and neighborhoods
Environment	No	Lack of public transportation alternatives encourages single-occupancy commutation; undermines efforts to reduce automobile-generated air pollution
Financial	No	Fails to leverage funding from the Mecklenburg County transit sales tax; fails to encourage cost-effective public transprotation alternatives to more roads and highways
System Integration	No	The highway/road system in the North Corridor provides few options for direct access to Charlotte's Center Ctiy, forcing commuters to use congested I-77; provides no efficiencies or inducements for connectivity with local transit or regional transportation

Source: Corridor System Plan, September 2002

1.3.2 Transit Performance

The success of the 83X and 77X Express buses demonstrates the market for public transportation in the North Corridor.

Table 1.3-6 below summaries the performance of CATS bus transit service in the North Corridor. In 2005, in the face of rising gasoline prices, ridership on 77X and 83X grew 22 percent and 46 percent respectively. Recent improvements to I-77, including the additional of HOV lanes for one-third of the trip, have reduced Express bus travel times, which range from 50 minutes to one hour and 10 minutes.

Table 1.3-6. Transit Performance, Existing North Corridor Bus Routes

Route Number and Name	Hours/Days of Service	Frequency	Annual Ridership	FY 2004 – 05 Growth
13 – Nevin Road (Local)	5 am – 1 am, M-F 5 am – 7 pm, Sat. 7 am – 8 pm, Sun.	30 – 75 min, M-F 30 – 40 min, Sat 40 min, Sun.	207,573	16%
22 – Graham Street (Local)	5 am – 2 am, M-F 6 am – 2 am, Sat. 6 am – 2 am, Sun.	35 – 45 min, M-F 45 – 50 min, Sat Hourly, Sun.	270,963	8%
96 – Village Rider Davidson (Local Shuttle)	6 am – 8 pm, M-F 9 am – 8 pm, Sat. 9 am – 6 pm, Sun.	Hourly, 7 days/week	14,854	-21%[1]
97 – Village Rider Cornelius (Local Shuttle)	6 am – 8 pm, M-F 9 am – 8 pm, Sat. 9 am – 6 pm, Sun.	Hourly, 7 days/week	25,854	-6%[1]
98 – Village Rider McCoy Road (Local Shuttle)	6 am – 8 pm, M-F 9 am – 8 pm, Sat. 9 am – 6 pm, Sun.	Hourly, 7 days/week	26,185	-4%[1]
99 – Village Rider Huntersville (Local Shuttle)	6 am – 8 pm, M-F 9 am – 8 pm, Sat. 9 am – 6 pm, Sun.	Hourly, 7 days/week	21,391	-15%[1]
53X – Northlake Mall Express (New)	6 am – 7 pm, M-F No Service, Sat. & Sun	30 min., M-F Peak Service Only No Service, Sat. & Sun.	NA	NA
77X – North Mecklenburg Express	5 am – 11 pm, M-F 7 am – 6 pm, Sat. No Service, Sun.	10 – 50 min., M-F 30 – 60 min, Sat No Service, Sun.	164,020	22%
83X – Mooresville Express	5 am – 8 am, M-F 4 pm – 7 pm, M-F No Service, Sat./Sun.	20 – 30 min.	36,713	46%

Source: CATS

[1] FY 2005 – 2006 ridership decline appears to have stabilized. Meetings with town planners, residents, and merchants in Spring 2006 will review the Village Rider service frequencies, stops, fares and hours of service.

Reliance on current or expanded Express bus service to achieve the *Corridor System Plan* principles will not be successful. Growing traffic on local roads used by the Express buses to access stops and on I-77 in those areas without HOV lanes will increasingly undermine trip time and reliability, especially at rush hour when time-competitiveness is so critical to marketability of public transportation. As shown on Table 1.3-7, the average speed for local and Express buses already is slow and these speeds are likely to be further reduced in coming years.

Table 1.3-7. 2006 North Corridor Peak Period Service, Speed, and Headways

Service Route	Peak Buses and Shuttles	Average Speed	Peak Period Headways
Local Service – Routes 13, 21, 22, 96, 98 & 99	17	13.5 mph	6 minutes
Express Service – Routes 53X, 77X & 83X	20	25 mph	8 minutes

Source: CATS

Perhaps more importantly, the experience to date with CATS Express bus service across the region is that such service does not positively impact land use and cannot be relied upon to support TOD densities. While providing an important transportation alternative to North Corridor citizens, Express and local bus service alone has not and is unlikely to enhance development of dense, mixed-use neighborhoods and town centers.

Table 1.3-8 summarizes performance of the transit system as measured by the *Corridor System Plan* principles.

Table 1.3-8. Performance of the Transit System

Principle	Achieves Prnciple	Deficiencies
Mobility	Partial	Growing congestion on NC 115 and east-west roads connecting to I-77, as well as I-77 congestion, will undermine marketability of Express buses; few local transportation options for transit-dependent populations north of Charlotte
Land Use	No	Express bus service in the North Corridor does not justify TOD densities or discourage low density residential and commercial development.
Environment	Partial	While providing an important public transportation alternative and reduces air pollution, current bus options do not discourage low density residential and commercial development or foster TOD
Financial	Partial	Current transit on the North Corridor fails to fully leverage capital funding from the Mecklenburg County transit sales tax available for rapid transit construction
System Integration	Partial	Express buses provide connectivity to Center City transit and regional transportation; the lack of local bus services north of Charlotte and between the four towns undermines integration of the transit system and limits public transportation

Source: Corridor System Plan, September 2002

1.3.3 Potential Transit Markets

1.3.3.1 Commuters

As indicated in Table 1.3-9 below, a large portion of these trips are work-related and define a large portion of the potential market for commuter rail service in the North Corridor.

Table 1.3-9. 2000-2030 Work-Related Daily Person Trips

Destination (To)	Originating in North Corridor	
	2000	2030
Charlotte CBD	5,100	9,800
North Corridor Study Area	34,800	98,500
South Corridor	5,000	8,500
Northeast Corridor	6,400	16,000
Southeast Corridor	3,900	7,300
West Corridor	2,300	5,100
Other Area	28,800	77,300
Total	86,300	222,500

Source: Metrolina's Travel Demand Model, June 2005; Parsons Brinckerhoff, 2006

- Of these 86,300 work-related daily trips, 46 percent (39,900 trips) are trips originating and ending in the North Corridor or the Charlotte CBD. This represents the group of commuters that would be most likely to use NCCR service.
- In addition to those living in the vicinity of a transit station, some commuters living north of the transit line are likely to exit I-77 at Mount Mourne or Davidson in order to commute the rest of the way to Charlotte by train.
- CATS plans on implementing a feeder bus network to bring commuters at large developments and activity centers to and from transit stations. This will include taking commuters from stations to employment centers, such as the University Research Park, as well as residents to and from stations.
- Some residents living along the rail line are employed at locations north of Charlotte, such as the Lowe's Corporation headquarters in Mount Mourne. The number of reverse commuters is expected to grow substantially as employment and other activities increase in the four towns and Northern Mecklenburg and Iredell Counties. When fully implemented, NCCR service is planned to operate in both directions during the morning and evening rush hour periods, enabling it to provide reverse-commute service to this growing employment base.
- Commuter rail service is planned to operate from early morning to evening, including, when fully implemented, non-peak hour times. As a result, the service will provide convenient access for discretionary travel to and from Charlotte, the four towns, other activity centers and special events, such as Carolina Panther football games.

1.3.3.2 Transit Dependent

CATS serves the transit-dependent population through provision of regularly scheduled bus service and on-demand Special Transit Service vehicles for passengers with limited mobility. However, the large geographic breadth of Mecklenburg County and the dispersed nature of many transit trips make meeting this objective challenging. As noted, there is no local CATS bus service north of WT Harris Boulevard that serves and connects Huntersville, Cornelius, or Davidson. Additionally, there is no service that connects these towns with Mooresville.

Implementation of regularly scheduled commuter rail service between the towns along the North Corridor and to and from Charlotte would enhance the public transportation options for this transit-dependent population.

1.4 Transportation Problems and Needs

1.4.1 Project Purpose

The existing regional transportation system is ill-prepared to meet the rapidly growing employment, population and travel demand forecast for the next two decades. Moreover, the transportation system is undermining the region's land use vision of transit-oriented developments, strong downtowns, and sustainable neighborhoods. In the absence of new public transportation alternatives, the region is likely to see continued low-density, automobile-dependent residential development, which will further congest an overburdened road network.

To address this potential future, the MTC has recommended the start-up of new commuter rail service between Charlotte and Mooresville, and operation of enhanced bus service on I-77. Competitive, reliable, and safe commuter rail service along an existing rail corridor will provide commuters an alternative to attempting to access the congested highway and road network into Charlotte. Moreover, the concentration of people and activities at proposed rail stations can justify and make marketable dense, mixed-use TODs. Such developments will enhance land use and transit usage in the center of the towns and other TODs along the rail line. This vision is at the heart of the MTC's regional Corridor System Plan.

1.4.2 Summary of Problems and Needs

The existing highway and transit system in the North Corridor has played a major role in defining the region, both positively and negatively. Despite growing congestion on I-77, highway access has provided mobility for the region and fed population growth in the North Corridor. Express buses during the morning and afternoon peak periods provide an important transportation alternative for commuters. The recent addition of HOV lanes on I-77 supports regional air quality objectives and has improved Express bus travel time.

Nonetheless, as detailed above, the existing transportation system has seriously undermined regional land use objectives by encouraging residential sprawl and low-density commercial activities at highway interchanges. This has drawn businesses and residents away from historic downtown areas, marginalized communities, and stretched the ability of local governments to support a widely dispersed population.

To achieve the land use vision enunciated by community leaders over the past decade, the transportation system of the future must be able to address several major needs.

Transit-Oriented Development: Charlotte and the four towns are seeking to fundamentally change the nature of development around their town centers and future rapid transit stations. By congregating housing, jobs, retail shops, and other activities within pedestrian-friendly, accessible areas along transit corridors, Charlotte and the towns hope to increase the convenience of transit, and build more livable, less auto-dependent communities. Thus, strong public transit and positive land-use development are mutually dependent. Transit will help to foster mixed-use, dense development; pedestrian-friendly TOD will enhance the attractiveness of public transit.

Transportation Alternatives: In the next decade, residential development in the North Corridor area will focus largely on the large green-field areas east of NC 115 and the "O" line. Already, thousands of new residential units are under construction or planned along the rail line and the area to the east is poised for large-scale development. Providing access for these residents to the employment centers in Charlotte's downtown, the four towns, and the region will be critical. No new north-south roads are planned within the next 25 years that can connect these new communities to downtown Charlotte. As a result, in the absence of new public transportation alternatives, commuters will be forced to access NC 115, US 21 and I-77 for commutation to and from Charlotte. These roads cannot handle this influx of vehicles.

Rapid transit alternatives would be critical to the development of livable communities east of the "O" line and to preventing paralysis on the existing roadway network. A commuter rail line carrying 3,000 rush-hour passengers in each direction would be equivalent to an additional lane on I-77.

System Connectivity: The region's public transit system largely is focused on bringing riders to and from Center City Charlotte. Given the geographic breadth of Mecklenburg County and the dispersed nature of many trips, CATS is not able to meet many travelers' desire to take public transit to other locations within the County. Moreover, connectivity to intercity rail (Amtrak), intercity bus (Greyhound) and the Charlotte-Douglas International Airport often requires one or more bus transfers. These shortcomings undermine system connectivity and encourage further reliance on the private automobile.

The region's future public transportation system should provide convenient, reliable connectivity to other transportation modes and activity centers. Implementation of the five rapid transit corridors and construction of the new CGS would help to address this issue. At CGS, commuters from the North Corridor will be able to access rapid transit corridors in the south, southeast, northeast, and west, as well as across town using the proposed Center City Street Car. CGS also will serve as the Charlotte station for Amtrak, with service to Atlanta and Birmingham in the south and Raleigh, Richmond, Washington and New York in the north. Greyhound regional service also will available at the new station. Service on the west corridor will access the Charlotte Douglas International Airport.

Improved Air Quality: Traffic congestion and low density residential and commercial development are prime ingredients for poor air quality, and the Charlotte region is no exception. Historically, Mecklenburg County has exceeded the federal standard for ozone levels. Future non-compliance could result in the loss of federal funding and undermine the region's health and quality of life.

The region has attained moderate maintenance air quality status, based on assumptions about future travel demand, population, and employment. These assumptions include increased use of public transportation in the region – in particular, construction of the five rapid transit corridors, including commuter rail in the North Corridor.

1.4.3 Goals and Objectives

For over a decade, regional planners and elected officials have grown increasingly concerned about the ability of current transportation facilities to accommodate and sustain economic and population growth. Indeed, as is evidenced on any given day, traffic congestion during the morning and afternoon peak period on I-77, NC 115 and US 21 is severe; yet construction of new homes and communities within the North Corridor continues at a very rapid pace. These concerns have led officials to focus on a strategy aimed at developing rapid transit alternatives that could provide reliable and safe public transportation to Charlotte's Center City while preserving and enhancing town centers and neighborhoods.

This two-pronged focus – transportation alternatives and managed land use – was defined through the publication of *Centers and Corridors* vision and the *2025 Integrated Transit/Land-Use Plan for Charlotte-Mecklenburg*. The *Centers and Corridors* vision called for a transit system that would:

- Sustain economic growth and vitality
- Expand to a regional system
- Concentrate development in Center City and along corridors and at key economic centers
- Combine Rapid Transit with enhancement of the overall transit system

In addition to supporting these *Centers and Corridors* goals, the *2025 Integrated Transit/Land-Use Plan* established the following goals:

- Link the land wedges between the rapid transit corridors to the corridors by an extensive feeder bus system so that every part of Charlotte-Mecklenburg has access to transit
- Combine transit solutions with road improvements
- Involve citizens extensively in the system development process

Both the *Centers and Corridors* and the *2025 Integrated Transit/Land-Use Plan* embrace the same conclusion: enhanced accessibility, environmental quality, pedestrian friendliness, and public safety are vital to successful transit systems and to the long-term health of the Charlotte region. The primary benefit of congregating housing, jobs, shops, and other activities along transit corridors is to increase the convenience of transit, and build more livable, less auto-dependent communities.

1.4.4 Evaluation Criteria

In October 2001, the MTC incorporated these goals and objectives into a set of principles by which to define transit and land use objectives and evaluate proposed approaches to achieving those objectives. The Corridor System Plan Principles are as follows:

Mobility

Mobility has several components. One is ridership; both in terms of how many people will ride new services and how many new transit trips are attracted away from automobiles. Reducing automobile use minimizes congestion, air pollution, and energy consumption. Mobility includes serving a variety of travel markets, such as work trips or off-peak travel. Mobility also involves improving access to selected areas, providing savings in travel times, and improving service reliability.

Land Use

Along with mobility, the transit system must support and be supported by the region's land use vision. Making Charlotte-Mecklenburg's future transit system successful will require making land use decisions that encourage residents to use transit as an alternative for their daily travel. TODs around transit stations will sustain economic growth and vitality within close proximity to the stations, while contributing to the enrichment of Center City Charlotte and key activity centers.

Air Quality

Promoting Charlotte-Mecklenburg's air quality goals will minimize disruptions to communities, natural areas, and cultural resources. This principle also involves not creating undue adverse effects on communities that receive little of the transit program's benefits.

Financial

The level of investment in capital costs to build the improvements and ongoing operating and maintenance expenses should be balanced by the capacity of local sales tax revenue and federal, state, private, and other potential revenue sources. Because many of the federal and state revenue sources are grants, and appropriations could be limited, the ability of certain improvements to attract federal and state grants and opportunities to leverage CATS investment with other projects is an important consideration.

System Integration

Each corridor is part of a larger system. An alignment and transit technology solution for a given corridor should be balanced against its ability to operate as part of an overall system, including considerations of passenger distribution with Center City Charlotte, provision of through service between corridors of the region, and balanced use of system capacity.

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

2.0 ALTERNATIVES CONSIDERED

In 2002, CATS completed a Major Investment Study (MIS), which analyzed numerous bus and rail alternatives for addressing the growing congestion and land use challenges in the North Corridor. Following completion of the MIS, the MTC selected commuter rail as the Locally Preferred Alternative (LPA) and directed CATS to advance analysis of commuter rail through the environmental impact review process.

In this EA, two commuter rail alternatives are considered, the only difference being the location for the northern terminus of the line. These alternatives are compared to two no-build alternatives in order to quantify the environmental impacts of implementing commuter rail service.

This chapter describes the alternatives and the process used to select them. Section 2.1 summarizes the analysis undertaken in the MIS for rapid transit in the North Corridor and the selection of commuter rail as the LPA. Sections 2.2 describe the No-Action, the Transportation Systems Management (TSM), and the two Build alternatives along the NCCR alignment relating to the terminus, stations and at-grade crossings. Section 2.3 describes the capital and operating costs of the alternatives. Section 2.4 describes the fare policy that is proposed for this transit service.

2.1 Selection of the North Corridor Commuter Rail Alternative

The MTC directed CATS to undertake the MIS in 2000 in order to determine the need for and the type of transit improvements that could best meet the North Corridor's transportation and land use objectives. The following sections describe the alternatives considered, evaluation measures, and recommendations in the MIS.

2.1.1 Definition of North Corridor Alternatives

The MIS focused on seven rapid transit alternatives (five build alternatives, one baseline alternative and one no-action alternative). The No-Action and Baseline Alternatives were combined into a single Baseline Alternative (N-1). The five "build" alternatives included commuter rail (two variations), Bus Rapid Transit (BRT), and a combination of commuter rail and BRT. These build alternatives provided connectivity between the northern towns and Charlotte; minimized environmental and land use impacts by using existing highway and/or railroad rights-of-way; generated important land-use benefits and served transit-dependent populations. In addition, each of the alternatives appeared to be constructible with minimal adverse cultural, social, environmental or economic impacts.

The alternatives are described below.

<u>Alternative N-1: Baseline Alternative</u>

The 2025 Baseline Alternative included expanded bus service on the existing CATS bus network. The Baseline provided an increased number of transit hubs, additional express services, and general increases in the frequency of local and express service to keep pace with passenger demand.

The baseline network included 18 trunk bus routes serving Center City Charlotte (area within the I-277 loop), four circumferential routes linking major passenger generators, 20 local routes providing local service only and 12 express routes. Of these, two express routes served North Mecklenburg County and Mooresville. In addition, the alternative assumed completion and operation of light-rail service in Charlotte's South Corridor between Center City Charlotte and Pineville. CATS' bus fleet of 281 vehicles would increase to 562 buses plus 15 light-rail transit vehicles in 2025.

The assumed operating speeds for the bus services, including stops, range from 8 mph in Center City Charlotte to 20 mph in the outer suburbs. For freeway bus operations, the assumed speeds range from 25 mph to 50 mph.

<u>Alternative N-3: Commuter Rail (11 Stations)</u>

In this alternative, the express bus routes in the baseline alternative were supplemented by conventional diesel-powered, locomotive-hauled commuter rail technology along the Norfolk Southern (NS) right-of-way between Mooresville and the proposed Charlotte multimodal station. Commuter trains would serve 11 stations, operating every 20 minutes during peak periods and every 60 minutes in the midday. Trains would not run in the evening. The average operating speed, including station stops, would be 39 miles per hour. Typical in-vehicle travel time between Davidson and Charlotte would be 32 minutes.

The MIS includes one alignment alternative near downtown Charlotte. Rather than follow the "O" line track between the multimodal station and a point three miles north of that station at Atando Avenue, the trains would use the NS mainline tracks to the NS Atando Yard, where they would follow a "wye" track connection to the "O" line at milepost 3.0. This variation would enable commuter trains to avoid a predominantly minority residential neighborhood, called Greenville, located near the tracks in downtown Charlotte. However, this routing of commuter rail service would have added ten minutes to the schedule and would have been inherently unreliable, as commuter trains would face significant train dispatching conflicts along the NS main line track and within the Atando yard. The NS has since stated its opposition to any consideration of this routing.

<u>Alternative N-4: DMU Rail (17 Stations)</u>

This alternative was similar to Alternative N-3 except that trains would use as-yet undeveloped Diesel Multiple Unit (DMU) rail technology, capable of high acceleration similar to that of electric multiple-unit trains and electric light-rail vehicles. Based on projected performance, it was believed that this equipment would allow the number of stations served to increase from 11 to 17 without degrading schedule performance**.** Despite the use of the higher performance DMU technology and representations to the contrary, the increased number of stations would have reduced the average operating speed to 35 miles per hour, increasing the in-vehicle travel time between Davidson and the Charlotte multimodal station to 38 minutes.

Since completion of the MIS, there has not been any progress in developing a DMU with the performance characteristics of an electric multiple-unit train or electric light-rail vehicle. As a result, the trip time and ridership projected for this alternative ultimately could not have been achieved.

<u>Alternative N-5: BRT on I-77 and Commuter Rail</u>

This Charlotte-Mooresville alternative combined DMU rail service in Alternative N-4 with BRT service in the I-77 corridor to serve 22 stations outside of Center City Charlotte**.**

BRT vehicles would follow North Graham Street in mixed traffic from the multimodal station to an exclusive at-grade bus-way on Statesville Avenue. From there the bus-way alignment would follow LaSalle Street to enter the I-77 corridor. Between LaSalle Street and Sunset Road, there would be an exclusive bus-way on the west side of I-77. North of Sunset Road, the bus-way would operate on shoulder bus lanes on I-77 all the way to Lake Norman. The

BRT buses would then operate in the I-77 general-purpose lanes across Lake Norman to Fairview Road in Iredell County. From Fairview Road to Mooresville, the BRT buses would operate in mixed traffic on NC 115.

The BRT vehicles would make all stops along the route and be scheduled every five minutes during peak periods, every 10 minutes in the midday and every 15 minutes in the evening. The average operating speed, including station stops, would be 30 miles per hour. Typical in-vehicle travel time between Davidson and Charlotte would be 35 minutes.

Supplementing the BRT service would be three express bus routes using conventional bus equipment and serving the area west of I-77. These express bus services would follow the same routes as in the Baseline Alternative N-1, except they would use the bus-way once they entered the I-77 corridor. The in-vehicle express bus travel time from Davidson to the Charlotte multimodal station would be 28 minutes.

Alternative N-6: BRT on I-77

In this alternative, BRT service described in Alternative N-5 would operate without commuter rail service**.** Additional express bus routes would replace the commuter rail service to serve the area on the east side of I-77.

Alternative N-7: DMU plus Bus on HOV Lanes on I-77

This alternative is similar to Alternative 5, with the exception that BRT vehicles would operate in median High Occupancy Vehicle (HOV) lanes along I-77 rather than along an exclusive bus-way. The use of the median HOV lanes, to be constructed by North Carolina Department of Transportation (NCDOT) as part of the planned widening of I-77, would reduce the additional cost of establishing BRT service in the North Corridor.

Under this Alternative, BRT vehicles would use I-77 HOV lanes between I-277 in Center City Charlotte to Fairview Road in Mount Mourne. Five BRT stations would be provided, four of which would be off-line stations accessed by a T-ramp. The T-ramp would avoid the additional time and distance required by a bus having to weave in and out of the HOV lanes across three freeway lanes to serve the stations. The provision of direct service BRT stations within the freeway median was not recommended as they would require construction in the freeway median over a considerable distance north and south of each station to accommodate a minimum of two additional bus only lanes, the platforms and the barriers to separate the HOV lane traffic from the buses serving the stations.

2.1.2 Evaluation of North Corridor Alternatives

The MTC approved evaluation criteria to assess and select an LPA at the corridor level. Table 2.1-1 provides the MIS alternatives compared using the evaluation criteria.

The evaluation found that while BRT would serve a potentially higher number of existing households and employment within the station areas, due in large part to the greater number of stations and the existing dense residential development along highway interchanges, rail better supported the region's land-use policies and objectives:

- Rail-based options more strongly encourage transit oriented development (TOD) near proposed stations, including the historic downtown centers. Thus, rail better supported the implementation of adopted land use regulations and policies of Charlotte, Huntersville, Cornelius, and Davidson. Rail also better served the future development potential east of I-77 and along the "O" line.

- The quality of potential TOD sites along the rail line is generally higher than at existing highway interchanges. Much of the development along I-77 is automobile-oriented, “suburban” residential and commercial development. In contrast, much of the land around the “O” line currently is undeveloped.
- There are a number of existing and planned land use developments along the rail line that not only support transit service, but also focus on it. Future land use patterns along major portions of I-77 support interstate-related development such as strip retail centers. Therefore, the rail alignments score higher than the BRT alignment for this measure.

Table 2.1-1. Summary of Differentiating Evaluation Measures

MEASURES	N-1: Future Baseline	N-3: Commuter rail (11 Station option)	N-4: DMU Rail (17 Station option)	N-5: BRT on I-77 (11 Station Commuter rail)	N-6: BRT on I-77	N-7: HOV on I-77 and 17 station DMU
Land Use						
Existing corridor & station area land use patterns	N/A	Low-Med	Medium	High	Med-High	Med-High
Existing corridor & station area development character	N/A	Med-High	High	Medium	Low-Med	High
Potential TOD sites	N/A	Medium	Med-High	Medium	Low-Med	Med-High
Existing land use policies & tools for station area & corridor	N/A	High	High	Med-High	Low-Med	Med-High
Future corridor & station area land use patterns	N/A	Low	Low-Med	High	Med-High	Medium
Enhance Center City & core area growth	N/A	Low-Med	Med-High	High	Medium	Low-Med
Mobility/Operations						
Total Daily Guideway Boardings	3,100	8,000-10,000	9,000-11,000	20,000-22,000	18,000-20,000	16,000-18,000
New Daily Transit Trips	N/A	9,730	10,530	15,130	12,830	11,330
Daily Travel time savings (hours)	N/A	1,300	1,600	2,200	2,200	1,500
Transit dependent access (within 0.5 mi.)	N/A	383	1,659	3,990	3,612	1,762
Service reliability	Low-Med	High	Med-High	High	Med-High	Med-High
Connections to activity centers, special event & cultural sites	Medium	Medium	High	Medium	Medium	High

Table 2.1-1. Summary of Differentiating Evaluation Measures (Continued)

MEASURES	N-1: Future Baseline	N-3: Commuter rail (11 Station option)	N-4: DMU Rail (17 Station option)	N-5: BRT on I-77 (11 Station Commuter rail)	N-6: BRT on I-77	N-7: HOV on I-77 and 17 station DMU
Environment						
Displacements (Right-Of-Way takes)	Low	Low-Med	Medium	High	Medium	Medium
Potential for noise impacts	Low	Low-Med	Low	Low-Med	Low	Low
Local traffic effects	N/A	Low	Low-Med	Low	Low	Low-Med
Cultural or natural resources affected	Low	Low-Med	Low-Med	Low-Med	Low	Low-Med
Properties with access affected	Low	Med-High	Med-High	High	Low	Med-High
Water resources affected	None	None	None	None	None	None
Financial						
Capital costs	N/A	$230 M	$251 M	$427 M	$179 M	$307 M
Incremental cost per new transit trip	N/A	$13.16	$12.42	$12.88	$7.61	$12.99
Operating & maintenance costs	$15.2M	$19.1M	$17.2M	$19.1M	$13.5M	$17.9M
System Development						
Synergy with other corridors (through-service and connections)	Low	Medium	Medium	Med-High	Med-High	Med-High
Operating efficiency	Low	Medium	Medium	Med-High	High	Med-High
Balance use of system capacity	Low	High	High	High	High	High

Source: North Corridor MIS, September 2002
N/A: Not Applicable

2.1.3 Corridor System Plan

Upon completion of a MIS for each of the proposed corridors, the MTC developed the Transit Corridor System Plan to coordinate and integrate the corridor work. The Transit Corridor System Plan added evaluation criteria to ensure overall system optimization and to determine which alternative would have the best chance at a phased implementation. The Plan:

- Identifies the alignment and technology recommendations -- the Locally Preferred Alternative -- in each of the corridors,
- Develops the strategy for promoting connectivity among the five corridors
- Links the corridors to and integrates the existing Charlotte Transportation Center (CTC) and proposed multimodal station,
- Recommends an implementation plan that describes the proposed schedule and financing strategy.

The Transit Corridor System Plan was completed in November 2002. Figure 2.1-1 illustrates the planning process used to set transportation goals and establish evaluation criteria for the transit system.

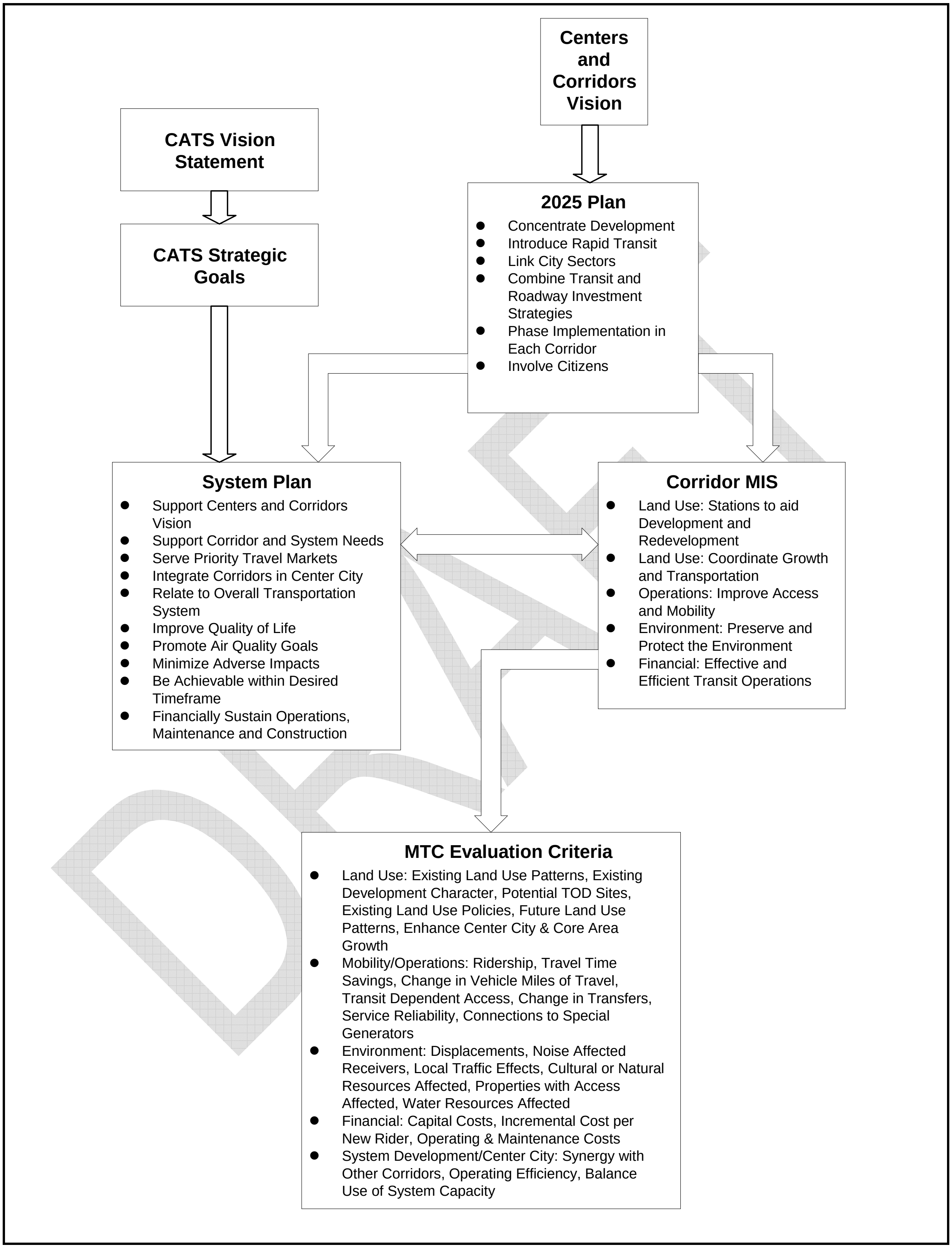


Figure 2.1-1. Process for Developing CATS Goals and Criteria

Source: Corridor System Plan, November 2002

2.1.4 Recommendation of CATS & Adoption of the LPA

On November 25, 2002, the MTC formally adopted the LPA for each corridor. The North Corridor recommendation was to implement commuter rail service on the NS "O" line and to enhance bus service utilizing conventional buses operating on the I-77 HOV lane being constructed by NCDOT. The MTC directed CATS to further study the commuter rail option and progress the alternative through the environmental review process.

Iredell County and Town of Mooresville officials and staff participated in the MIS work and in the Transit Corridor System Plan recommendations. Both the County and the Town also participated in the funding of the North Corridor MIS. Both have subsequently assisted in funding the costs associated with the environmental review process.

2.2 Definition of Alternatives

2.2.1 Future No-Action Alternative

The No-Action Alternative includes transit services and highway and transit facilities that are likely to exist in 2030. This includes:

- The existing highway network
- Highway improvements that NCDOT has scheduled in the State Transportation Improvement Program (STIP) for implementation between 2006 and 2012 as adopted by the North Carolina Board of Transportation (BOT) and the Mecklenburg-Union Metropolitan Planning Organization (MUMPO) on July 7, 2005 and September 21, 2005 respectively.
- Highway improvements listed in the MUMPO-adopted financially-constrained Long Range Transportation Plan (LRTP).
- Existing transit routes and schedules currently operated by CATS.
- The South Corridor Light Rail Transit (LRT) line (completed in 2007).
- TSM-level improvements in the other rapid transit corridors.
- Other new bus services to which CATS has committed.
- New bus services to serve areas that will be developed by 2030.
- Routine replacement of existing facilities and equipment at the end of their useful life.

The No-Action Alternative provides the underlying foundation for comparing the travel benefits and environmental impacts of the other alternatives. It also is an alternative itself. While it has no environmental impacts resulting from implementation of the build alternatives, it also offers none of their travel or land use benefits.

2.2.1.1 Highway Improvements

The No-Action Alternative highway system is the same under the TSM and NCCR alternatives. The 2030 highway system includes the existing roadway network plus those projects that are listed in the LRTP. These projects are listed in Table 2.2-1 and illustrated in Figure 2.2-1. The projects primarily provide for an increase in capacity, such as new roadway construction, widening projects, and major interchanges.

Table 2.2-1. NCCR Study Area Highway Improvements

Horizon Year/Project	From	To	Existing Lanes	Improvement Type
2010-Mecklenburg				
Cindy Ln. Ext.	Statesville Rd.	Nevin Rd.	n/a	New (2)
City Blvd.	US 29 (N. Tryon St.)	I-85	n/a	New (4)
WT Harris Blvd.	I-77	I-485	2	Widen (4-6)
I-485	Oakdale Rd.	NC 115 (Old Statesville Rd.)	n/a	New Freeway (6)
I-77	I-485	Gilead Rd.	4	Widen (1) NB Lane
Mallard Creek Rd.	Sugar Creek Rd.	WT Harris Blvd.	2	Widen & Reloc. (4)
Nevin Rd.	Sugar Creek Rd.	Mallard Creek Rd.	n/a	New (2)
US 29/NC 49 (Graham St.)	I-277 (Brookshire Frwy.)	Dalton Ave.	4	Widen (6)
W. Catawba Ave.	Torrence Chapel Rd.	Jetton Road	2	Widen (5)
2020-Mecklenburg				
Alexanderana Rd.	Mt. Holly-Huntersville Rd.	Eastfield Rd.	2	New/Widen (4)
Church St. Ext.	Eastfield Rd.	Mayes Rd.	n/a	New/Improve (2)
City Blvd.	Neal Rd.	Mallard Creek Rd. Ext.	n/a	New (4)
City Blvd. Ext.	US 29 (N. Tryon St.)	I-85	n/a	New (4)
Fred D. Alexander Blvd.	NC 16 (Brookshire Blvd.)	Sunset Rd.	n/a	New (4)
Hambright Rd.	Mt. Holly-Huntersville Rd.	NC 115 (Old Statesville Rd.)	2	Widen (4)
I-485	NC 115 (Old Statesville Rd.)	I-85	n/a	New Freeway (8)
I-77 HOV Project	I-277 (Belk Frwy.)	I-85	6, 8	HOV Lanes
I-77 Widening (North)	I-485	Langtree Rd.	4	Widen (6) & HOV
Mallard Creek Rd.	Prosperity Church Rd.	I-485	2	Widen (4)
NC 115 (Old Statesville Rd.)	McCord Rd.	Bailey Rd.	2	Widen (4)
NC 115 (Old Statesville Rd.)	WT Harris Blvd.	Verhoeff Dr.	2	Widen (4)
NC 73 (Sam Furr Rd.)	Northcross Dr.	Davidson-Concord Rd.	2, 4	Widen (4-6)
Prosperity Ridge Rd.	South of Panthersville Dr.	Prosperity Church Rd.	n/a	New (2)
Prosperity Ridge Rd. (northern leg)	Prosperity Church Rd.	Eastfield Rd.	2	Widen (4)
Ridge Rd.	Eastfield Rd.	Beard Rd.	0, 2	New/Widen (4)
Thirty Sixth St.	Atando Ave.	N. Tryon St.	n/a	New (2)
Statesville Rd.	Starita Rd.	Keith Dr.	2	Widen (4)
US 21 (Statesville Rd.)	Sunset Rd.	Catawba Ave.	2	Widen (4)
Westmoreland Rd.	US 21 (Statesville Rd.)	Washam-Potts Rd.	2	Widen (4)
Zion Ave. Ext./Improve	Mayes Rd.	South Main St. (Davidson)	2	New/Widen (2)

Table 2.2-1. NCCR Study Area Highway Improvements (Continued)

Horizon Year/Project	From	To	Existing Lanes	Improvement Type
2030-Mecklenburg				
Bailey Rd. Ext.	Northcross Dr.	US 21 (Statesville Rd.)	n/a	New (2)
Bailey Rd.	NC 115 (Old Statesville Rd.)	Davidson-Concord Rd.	2	New/Widen (2)
Brevard St.	Eleventh St.	Seventh St.	2	Widen (3)
Caldwell St.	I-277 (Belk Frwy.)	E. 4th St.	4	Improve (4)
Church St.	Stonewall St.	I-277 WB Ramp	3	Widen (4)
Davidson Eastside Connector	Davidson-Concord Rd.	NC 115 (Old Statesville Rd.)	n/a	New (2)
Eastfield Rd.	Alexanderana Rd.	Cabarrus County Line	2	Widen (4)
Gilead Rd.	McCoy Rd.	Boren St.	2	Widen (4)
Gilead Rd.	US 21 (Statesville Rd.)	NC 115 (Old Statesville Rd.)	2	Widen (4)
Hambright Rd.	McCoy Rd.	Mt. Holly-Huntersville Rd.	2	Improve (2)
Hambright Rd. Ext.	NC 115 (Old Statesville Rd.)	Eastfield Rd.	n/a	New (4)
WT Harris Blvd.	Reames Rd.	Mt Holly-Huntersville Rd.	2	Widen (4-6)
Hucks Rd. Ext.	Prosperity Church Rd.	US 21 (Statesville Rd.)	0, 2	New/Widen (4)
Hugh Torance Pkwy. Ext.	Wynfield Creek Pkwy.	Beatties Ford Rd.	n/a	New (2)
Huntersville-Concord Rd.	NC 115 (Old Statesville Rd.)	Trails End Ext.	2	Improve (2)
Johnston-Oehler Rd.	Prosperity Ridge Rd.	Mallard Creek Rd.	2	Improve (2)
Mt. Holly-Huntersville Rd.	US 21 (Statesville Rd.)	Alexanderana Rd.	2	Improve/Widen (2-4)
NC 73 West	Catawba River	Northcross Dr.	2, 4	Widen (4-6)
NC 73 East	Davidson-Concord Rd.	Cabarrus County Line	2	Widen (4)
Nevin Rd.	Sugar Creek Rd.	Gibbon Rd.	2	Improve (2)
Nevin Road Ext.	Black Walnut Ln.	IBM Dr.	n/a	New (2)
Northcross Dr.	Bailey Rd. Ext.	W. Catawba Ave.	n/a	New (2-3)
Odell School Rd.	I-485	Cabarrus County Line	2	Widen (6)
Prosperity Church Rd.	I-485	Prosperity Ridge Rd.	2	New/Widen (2)
Stumptown Rd.	Hugh Torance Pkwy.	Ramah Church Rd.	0, 2	New/Widen (2)
US 29/NC 49 (N. Tryon St.)	US 29/NC 49 (Dalton Ave.)	32nd St.	4	Widen (5)
Vance Rd. Ext.	Mt. Holly-Huntersville Rd.	NC 73	n/a	New (4)
Verhoeff Dr. West	Mt. Holly-Huntersville Rd.	NC 115 (Old Statesville Rd.)	0, 2	New/Improve (2)
W. Catawba Ave.	Jetton Rd.	NC 73 (Sam Furr Rd.)	2	Widen (4)
Washam-Potts Rd.	Westmoreland Rd.	NC 115 (Old Statesville Rd.)	2	Widen (4)
Westmoreland Rd.	W. Catawba Ave.	US 21 (Statesville Rd.)	2	Widen (4)

Table 2.2-1. NCCR Study Area Highway Improvements (Continued)

Horizon Year/Project	From	To	Existing Lanes	Improvement Type
2010-Iredell (None)				
2020-Iredell				
I-77	Langtree Rd.	North of Exit 36	4	Widen (8)
I-77	North of Exit 36	North of Exit 42	4	Widen (8)
2030-Iredell				
NC 150	I-77	Catawba County Line	2	Widen (4)
Connector	Langtree Road	Fairview Road	n/a	New (2)
US 21	NC 115	I-77	2	Widen (4)
NC 152	East of Mooresville	Rowan County Line	2	Widen (4)

Source: MUMPO LRTP, September 2005; Lake Norman Rural Planning Organization LRTP, February 2005

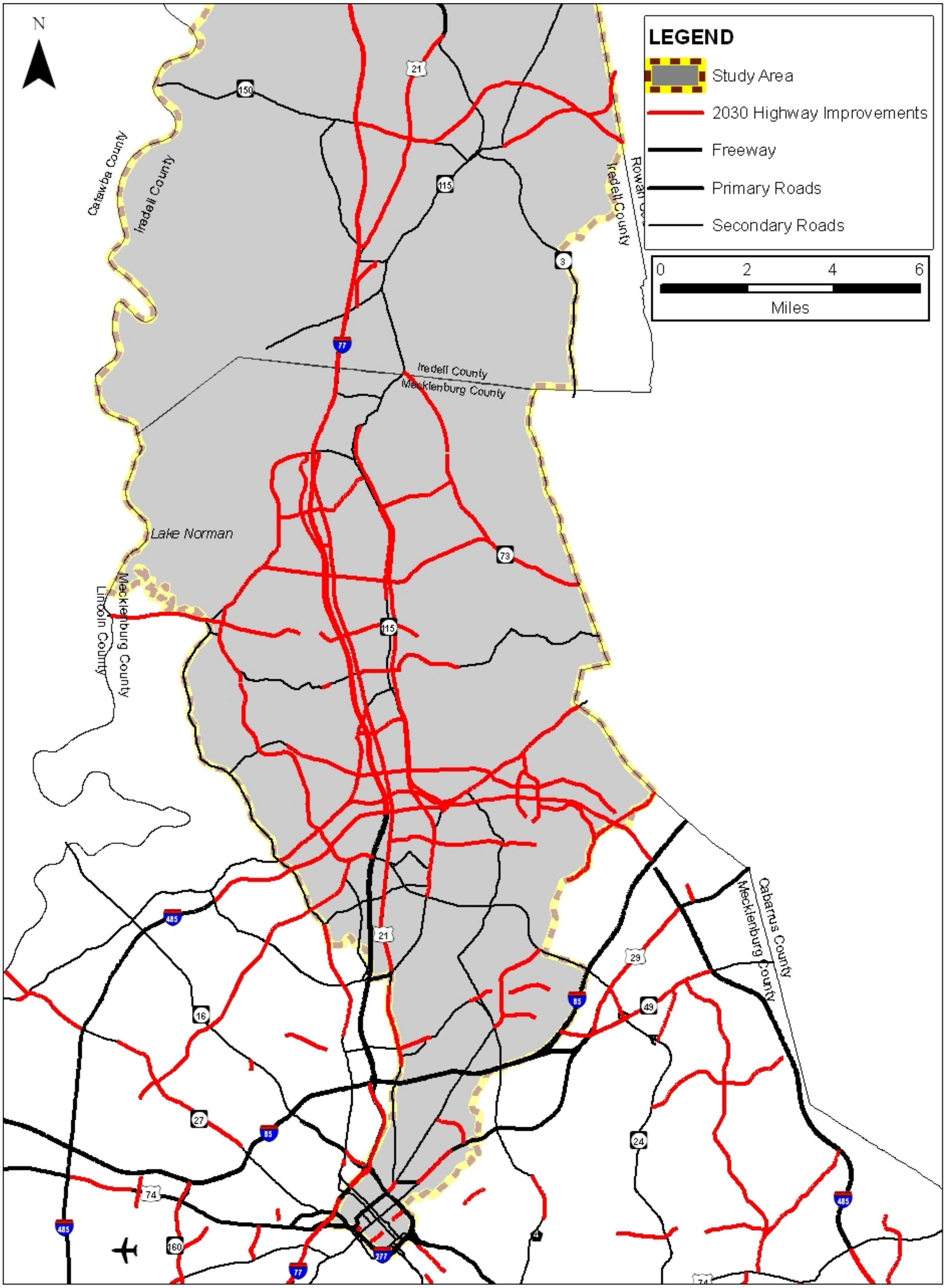


Figure 2.2-1 2030 Highway Improvements

2.2.1.2 Bus Transit Improvements with the No-Action Alternative

The transit component of the No-Action Alternative includes both bus transit service expansion and transit facilities. The No-Action Alternative transit services include operation of the new South Corridor light rail system (Lynx Blue Line and TSM-level bus services in the other corridors of the 2025 Transit Corridor System Plan.

Table 2.2-2 lists these proposed transit services with average weekday vehicle hours of travel (VHT), average weekday vehicle miles of travel (VMT), and frequency and type of service. Figure 2.2-2a-c shows the bus routes and park-and-ride (PNR) lots included in the No-Action Alternative for the North Corridor.

Table 2.2-2. Bus Service for No-Action Alternative in North Corridor

Routes	VHT	VMT	Peak Frequency	Midday Frequency	Night Frequency	Type
7 – Beatties Ford	130	1,969	10	15	30	Local
13 – Nevin Road	41	476	30	45	45	Local
21 – Double Oaks	32	328	15	30	60	Local
22 – Graham	60	811	30	30	40	Local
26 – Oaklawn	38	401	20	30	45	Local
53X – Northlake Mall	23	513	15	---	---	Express
77X – North Mecklenburg	63	1,486	10	60	60	Express
81X – Wachovia CIC	*13*	*336*	*60*	*60*	*---*	*Express*
83X – Mooresville	*16*	*472*	*30*	*---*	*---*	*Express*
89 – Northlake-UNCC	***40***	***647***	***30***	***60***	***---***	***Local***
92 – Gilead Road	***14***	***250***	***25***	***60***	***---***	***Local***
96 – Davidson	*23*	*387*	*25*	*60*	*60*	*Local*
97 – Cornelius	21	354	25	60	60	Local
98 – McCoy	*37*	*581*	*25*	*60*	*60*	*Local*
99 – Huntersville	21	359	25	60	60	Local
143 – Northlake-Derita	***55***	***838***	***30***	***60***	***60***	***Local***
202 – Washington Lincoln Heights	15	200	30	30	30	Local
250 – Hambright-Gilead	***46***	***853***	***25***	***60***	***60***	***Local***
351 – Harris-Sugar Creek	***30***	***435***	***30***	***60***	***60***	***Local***
451 – Northlake-Harris	***18***	***326***	***25***	***60***	***60***	***Local***
461 – Highland Creek	***39***	***577***	***30***	***60***	***60***	***Local***
462 – Ridge Road	***40***	***697***	***30***	***60***	***30***	***Local***
All Routes	***815***	***13,296***				

Source: Metrolina 2030 Regional Transit Plan
Bold, italicized routes are additions to the existing bus services for the North Corridor. Italicized routes are bus services in the existing network that have been re-routed under the No-Action Alternative.

<u>Route 7. Beatties Ford</u>
This route will operate the same as the existing route between Northlake Mall/Sunset Road and the CTC. The bus will primarily run on (future) Fred Alexander Boulevard, Beatties Ford Road, and Trade Street. The bus will run at 10-minute frequency during AM peak and PM peak, 15-minute frequency during mid-day time periods, and run every 30-minute during the night period. This bus will visit the CTC, Beatties Ford Transit Center (TC), and Northlake Mall PNR-TC.

<u>Route 13. Nevins</u>
This route will run the same as the existing route between Woodstone/Cedarhurst and CTC along Nevin Road and Statesville Avenue. This bus will run at 30-minute headway during peak periods (AM and PM), and every 45-minute during mid-day and night time periods. This bus will visit the CTC.

Route 21. Double Oaks
This bus will run the same as the existing route between Double Oaks/Newland Road and CTC running along Statesville Avenue, Dalton Avenue, and Tryon Street. This bus will run at 15-minute frequency during AM and PM peak periods, 30 minutes during mid-day and 60 minutes during night time period. This bus will visit the CTC.

Route 22. Graham
This route the same as the existing route beginning at Prosperity Church Road/Mallard Creek Road intersection and ending at the CTC. This bus runs along Mallard Creek Road, Sugar Creek Road, North Graham Street, Dalton Avenue, and Tryon Street. The inbound bus serves Pine Bellefonte Street and the outbound bus serves Thirtieth Street. The bus operates at 30-minute AM peak, mid-day and PM peak headways and 40-minute night headway. The bus visits CTC and Mallard Creek PNR-TC.

Route 26. Oaklawn
This route will operate the same as the existing route at 20-minute frequency during peak periods (AM and PM), every 30-minute during the mid-day and every 45-minutes night between Trentwood/Pinestream and College/Trade Street running along Newland Road, Oaklawn Avenue, and Graham Street. This bus will visit the CTC.

Route 53. Northlake Mall Express
This bus will run the same as the existing route between the Huntersville Gateway PNR and the intersection of 3rd/4th and McDowell Streets in Center City Charlotte. The inbound AM and outbound PM peak bus will run on I-77 and travel on Trade Street and 3rd Street (AM) or 4th Street (PM) to/from McDowell Street. The outbound AM and PM reverse peak bus will run on I-77, Sunset Road, US 21, and WT Harris Boulevard with stops at Twin Lakes Business Park and Northlake Mall. The AM bus will operate at 30-minute frequency during AM peak period and the PM bus operates at 30 minute headway during the PM peak. This bus will visit the Huntersville Gateway PNR-TC, Northlake Mall PNR-TC, and the CTC.

Route 77. North Mecklenburg Express
This bus will run the same as the existing route. The inbound North Mecklenburg Express route will run from the Davidson South Main PNR to the CTC and will operate at 10-minute frequency during morning peak period, every 20-minute during PM peak period and 60-minute frequency during mid-day and night period. The outbound express route from CTC to the Davidson South Main PNR will operate at 20-minute frequency during morning peak period, every 10-minute during PM peak period and 60-minute frequency during mid-day and night period. The route will follow mainly NC 115 between Davidson and Cornelius, US 21 between Cornelius and the Huntersville, and the I-77 HOV lanes between the Huntersville and Center City Charlotte. This bus will visit the Davidson South Main PNR, Cornelius Town Hall PNR, Huntersville-Northcross PNR, North County Library TC, Huntersville Gateway PNR-TC, and the CTC.

Route 81. Wachovia CIC Express
This bus will run differently than the existing route at the north end. This express route operates at 60-minute frequency during peak periods (AM and PM) and mid-day time period and runs between CTC and Sugarcreek Road/Nevin Road intersection. The bus operates on Nevin Road extension, I-85, I-77 and uses N Trade Street to get to and from the CTC. While portions of this route are within the NCCR study area, it predominantly serves the Northeast Corridor. The bus visits the CTC.

Route 83. Mooresville Express
This bus will run differently than the existing route at the north end. The Mooresville express route will operate at 30-minute frequency during peak periods (AM and PM) and every 60-minute during mid-day period between West Plaza Drive/Talbert Road and CTC. The route will serve Williamson Road and run along I-77. This bus will visit the Williamson Chapel PNR and the CTC.

Route 89. North-Lake UNCC
This new route operates at 30-minute frequency during the Peak periods (AM and PM) and 60-minute headway during mid-day between WT Harris Boulevard/US 29 North interchange and Northlake Mall. The bus runs along WT Harris Boulevard, JW Clay Boulevard, US 29 North, Mallard Creek, Prosperity Ridge Road, Eastfield Road, Alexanderana Road, and Northlake Boulevard. The bus visits University Place PNR-TC and Northlake Mall PNR-TC.

Route 92. Gilead Road
The new Gilead Road feeder bus will start from the intersection of Bud Henderson Road and Beatties Ford Road and end at NC 115 using Gilead Road. This bus will run at 30 minutes peak, off-peak and evening headways. This bus will visit the Huntersville Gateway PNR-TC.

Route 96. Davidson
This bus will run differently than the existing route. This route will operate at 30-minute frequency during peak-periods (AM and PM), and mid-day, and every 60-minute during night time between Davidson Concord/Pine Road intersection and end at Catawba Avenue, running along NC 115 and looping around Westmoreland Road. This bus will visit the Davidson South Main PNR.

Route 97. Cornelius
This route will operate the same as the existing route at 30-minute frequency during peak-periods (AM and PM), mid-day, and every 60-minute during night between Catawba Avenue/NC 115 and Sam Furr Road/US 21 running along Catawba Avenue and Sam Furr Road. This bus will visit the Cornelius Town Hall PNR, Huntersville-Northcross PNR, and North County Library TC.

Route 98. McCoy
This bus will run differently than the existing route, operating at 30-minute frequency during peak-periods (AM and PM), mid-day, and every 60-minute during night between Northlake Mall and US 21/Sam Furr Road and run along WT Harris Boulevard, (future) Vance Road, Kerns Road, McCoy Road, Gilead Road, and US 21. This bus will visit the North County Library TC, Huntersville Gateway PNR-TC, and Northlake Mall PNR-TC.

Route 99. Huntersville
This route will operate the same as the existing route at 30-minute frequency during peak-periods (AM and PM), mid-day, and every 60-minute during night between US 21/Mt Holly-Huntersville Road and Sam Furr Road/US 21 and run along Gilead Road and NC 115. This bus will visit the North County Library TC and Huntersville Gateway PNR-TC.

Route 143. Northlake-Derita
This new route operates at 30-minute frequency during the entire day and runs between WT Harris Boulevard/University Executive Center and Northlake Mall. The bus runs along mainly WT Harris Boulevard, JW Clay Boulevard, Research Drive, Mallard Creek Road, Nevin Road, Sugar Creek Road, and Statesville Road. The bus visits University Place PNR-TC, Mallard Creek PNR-TC, and Northlake Mall PNR-TC.

Route 202. Washington Lincoln Heights
This route will operate the same as the existing route at 30-minute frequency all-day between Beatties Ford Road/Hoskins Road and Beatties Ford Road/Russell Avenue. The route will serve Beatties Ford Road, Lasalle Street, Jennings Street, and Oaklawn Avenue. This bus will visit the Beatties Ford TC.

Route 250. Hambright-Gilead
This new route will operate at 30-minute frequency during peak periods (AM and PM), mid-day, and every 60-minute during night between Gilead Road/NC 115 and Hambright Road/NC 115. The route will follow Gilead Road, Statesville Road, Ranson Road, Beatties Ford Road, and Hambright Road. This bus will visit the Huntersville Gateway PNR-TC.

Route 351. Harris-Sugar Creek
This new route operates at 15-minute peak headways (AM and PM) and 60-minute mid-day and night time headways. This bus runs from the WT Harris Boulevard/US 29 North interchange and Sugar Creek Road/N Tryon Street intersection. The bus runs mainly along WT Harris Boulevard, JW Clay Boulevard, Nevin Road, and Sugar Creek Road. This bus visits the University Place PNR-TC.

Route 451. Northlake-Harris
This new route will operate between Hambright Road/NC 115 intersection and will end at the intersection of NC 115/Reames Road. This bus will run along the Hambright Road, Mt Holly-Huntersville Road, Fred Alexander Boulevard extension, and Reames Road. The bus will operate at 30-minute headways at peak periods (AM and PM), at 60 minute headways at mid-day and night period. This bus will visit the Northlake Mall PNR-TC.

Route 461. Highland Creek
This new route will operate between WT Harris Boulevard/Odell School Road intersection in Iredell County and will end at Northlake Mall. This bus will run along the WT Harris Boulevard, Eastfield Road, NC 115, Hucks Road extension, Statesville Avenue, and Reames Road. The bus will operate at 30-minute headways the entire day. This bus will visit the Northlake Mall PNR-TC.

Route 462. Ridge Road
This new route operates at 30-minute peak headways the entire day and runs from the Mallard Creek Road/US 29 North interchange to Fred Alexander extension/WT Harris Boulevard interchange. The bus runs along US 29, Salome Church Road, Ridge Road, Hambright Road, Mt Holly-Huntersville Road, Northlake Boulevard, and Fred Alexander extension. This bus visits the Northlake Mall PNR-TC.

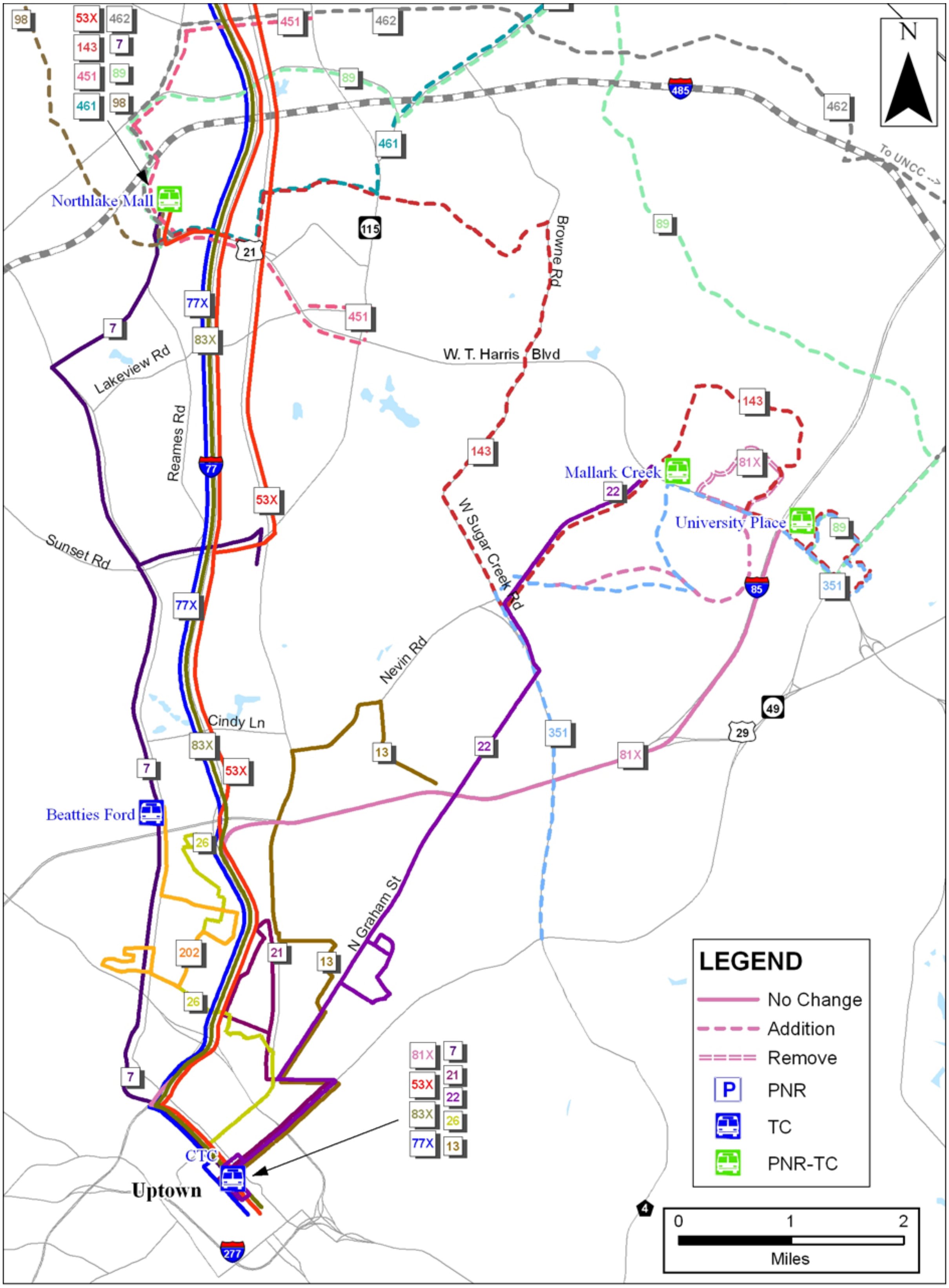


Figure 2.2-2a	No-Action Alternative

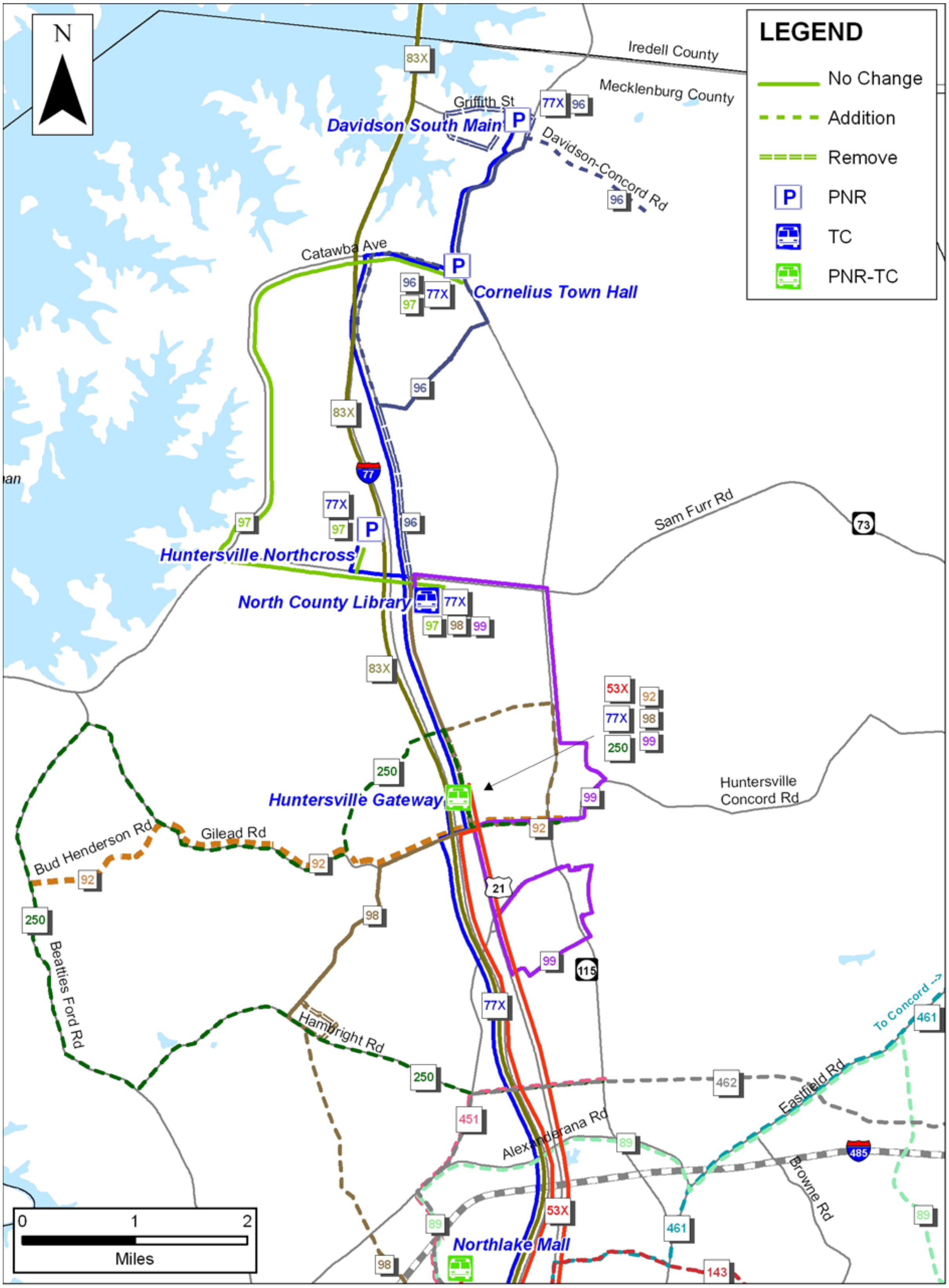


Figure 2.2-2b

No-Action Alternative

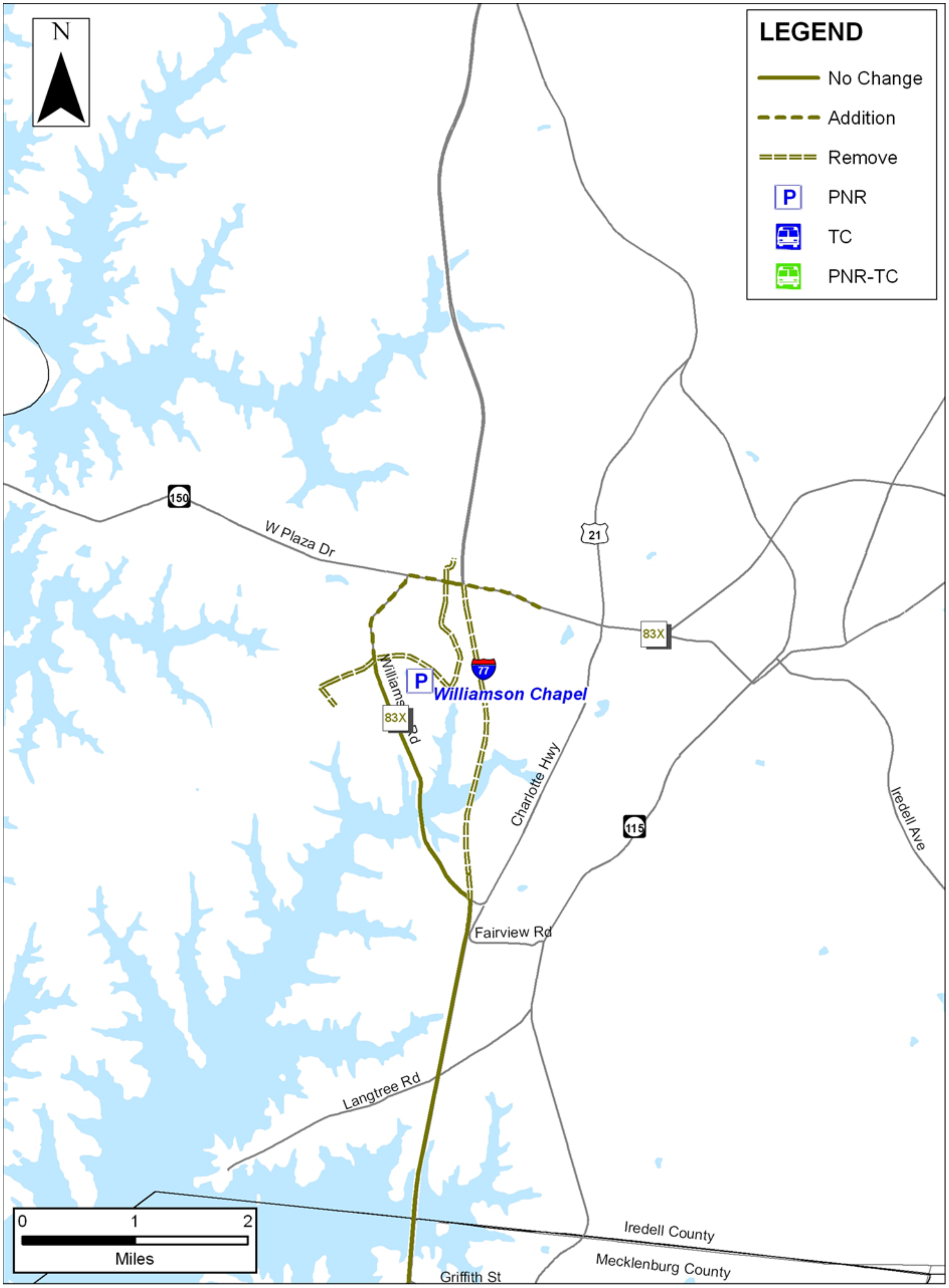


Figure 2.2-2c	No-Action Alternative

2.2.2 TSM Alternative

The TSM Alternative is a lower capital cost approach for addressing the need for transit improvements in the North Corridor. It assumes the implementation of the highway and transit improvements associated with the No-Action Alternative for the North Corridor, along with expansion of transit service to 2030 to provide for growth in regional population and employment. Bus service improvements associated with the TSM Alternative for the other corridors are assumed plus LRT operations in the South Corridor. The TSM Alternative provides the baseline for evaluating the cost-effectiveness of the Build alternatives. Transit improvements under the TSM Alternative include both transit services and transit facilities. The TSM Alternative proposes the improvements listed in Table 2.2-3 and shown in Figure 2.2-3 a-c.

2.2.2.1 Bus Transit Improvements with the TSM Alternative

Routes that are additions to the bus services included in No-Action Alternative for the North Corridor and routes that are bus services in the No-Action network that have been re-routed under the TSM Alternative are described below. All other routes remain the same as described in the No-Action Alternative.

Table 2.2-3. Bus Service for TSM Alternative in North Corridor

Routes	VMT	VHT	Peak Frequency	Midday Frequency	Night Frequency	Type
7 – Beatties Ford	*65*	*1,137*	*30*	*30*	*30*	*Local*
13 – Nevin Road	41	476	30	30	45	Local
21 – Double Oak	32	328	15	15	30	Local
22 – Graham Street	60	811	30	30	30	Local
26 – Oaklawn	40	419	20	20	30	Local
53X – Northlake Mall	*22*	*545*	*15*	*15*	*0*	*Express*
77X – North Mecklenburg	*65*	*1,499*	*20*	*10*	*60*	*Express*
81X – Wachovia CIC	13	341	60	60	60	Express
83X – Mooresville	*40*	*1,025*	*60*	*25*	*60*	*Express*
89 – Northlake-UNCC	40	647	30	60	0	Local
92 – Gilead Road	14	250	25	25	60	Local
96 – Davidson	23	387	25	25	60	Local
97 – Cornelius	21	354	25	25	60	Local
98 – McCoy	37	581	25	25	60	Local
99 – Huntersville	21	359	25	25	60	Local
143 – Northlake-Derita	55	838	30	60	60	Local
202 – Washington Lincoln Heights	15	200	30	30	30	Local
250 – Hambright-Gilead	46	853	25	25	60	Local
351 – Harris-Sugar Creek	30	435	30	30	60	Local
451 – Harris-Northlake	18	326	25	25	60	Local
461 – Highland Creek	39	577	30	30	60	Local
462 – Ridge Road	40	697	30	60	30	Local
606 – North Corridor Skip-Stop	***40***	***622***	***60***	***25***	***60***	***Express***
All Routes	***817***	***13,703***				

Source: Metrolina 2030 Regional Transit Plan
Bold, italicized routes are additions to the bus services included in No-Action Alternative for the North Corridor. Italicized routes are bus services in the No-Action network that have been re-routed under the TSM Alternative.

Route 7. Beaford Sunset
This route will operate between Northlake Mall/Sunset Road and the Beatties Ford TC near I-85/Beatties Ford Road and discontinue service from the CTC to the Beatties Ford TC. The bus will primarily run on (future) Fred Alexander Boulevard and Beatties Ford Road with additional service along Sunset Road. The Fred Alexander Boulevard and Beatties Ford Road route will operate at 30-minute headways the entire day. Another bus running between Statesville Avenue and I-85/Beatties Ford Road along Beatties Ford Road and Sunset Road will operate at 10-minute headways the entire day. This bus will visit the Beatties Ford TC and Northlake Mall PNR-TC.

Route 53. Northlake Mall Express
This bus will run between the Huntersville Gateway PNR and the intersection of 3^{rd}/4^{th} and McDowell Streets in Center City Charlotte. The inbound AM and outbound PM peak bus will run on I-77 with a diversion to Northlake Mall and travel on Trade Street and 3^{rd} Street (AM) or 4^{th} Street (PM) to/from McDowell Street. Outbound AM and PM reverse peak bus will discontinue service along US 21. The AM bus will operate at 30-minute frequency during AM peak period and the PM bus operates at 30 minute headway during the PM peak. This bus will visit the Huntersville Gateway PNR-TC, Northlake Mall PNR-TC, and the CTC.

Route 77. North Mecklenburg Express
The North Mecklenburg Express route will follow the same route as described in the No-Action Alternative but will serve PNR facilities in Davidson and Cornelius at the parking locations as described for the proposed commuter rail stations. This bus will also visit the Huntersville-Northcross PNR, North County Library TC, Huntersville Gateway PNR-TC, and the CTC.

Route 83. Mooresville Express
The Mooresville express route will operate at 30-minute frequency during peak periods (AM and PM) and every 60-minute during mid-day period between McLelland Avenue/South Broad Street and CTC. The route will serve NC 150, Williamson Road, Fairview Road, NC 115 and then run on I-77 and include stops at PNR facilities in Mooresville and Mount Mourne at the parking locations as described for the proposed commuter rail stations. This bus will also visit Williamson Chapel PNR, and the CTC.

Route 606. North Corridor Skip-Stop Service
This new route will operate between CTC and Gilead Road/US 21 North Intersection and will run along Trade Street, Graham Street, Sugar Creek Road, Nevin Road, Gibbon Road, NC 115, and Gilead Road. The bus will operate at 20 minute AM and PM peak headways and 30 minute mid-day headways. The route will serve PNR facilities in Huntersville, Hambright, Harris/NC 115, Eastfield, and Derita at the parking locations as described for the proposed commuter rail stations. This bus will also visit the Huntersville Gateway PNR-TC and CTC. This bus operates only in the Baseline Alternative.

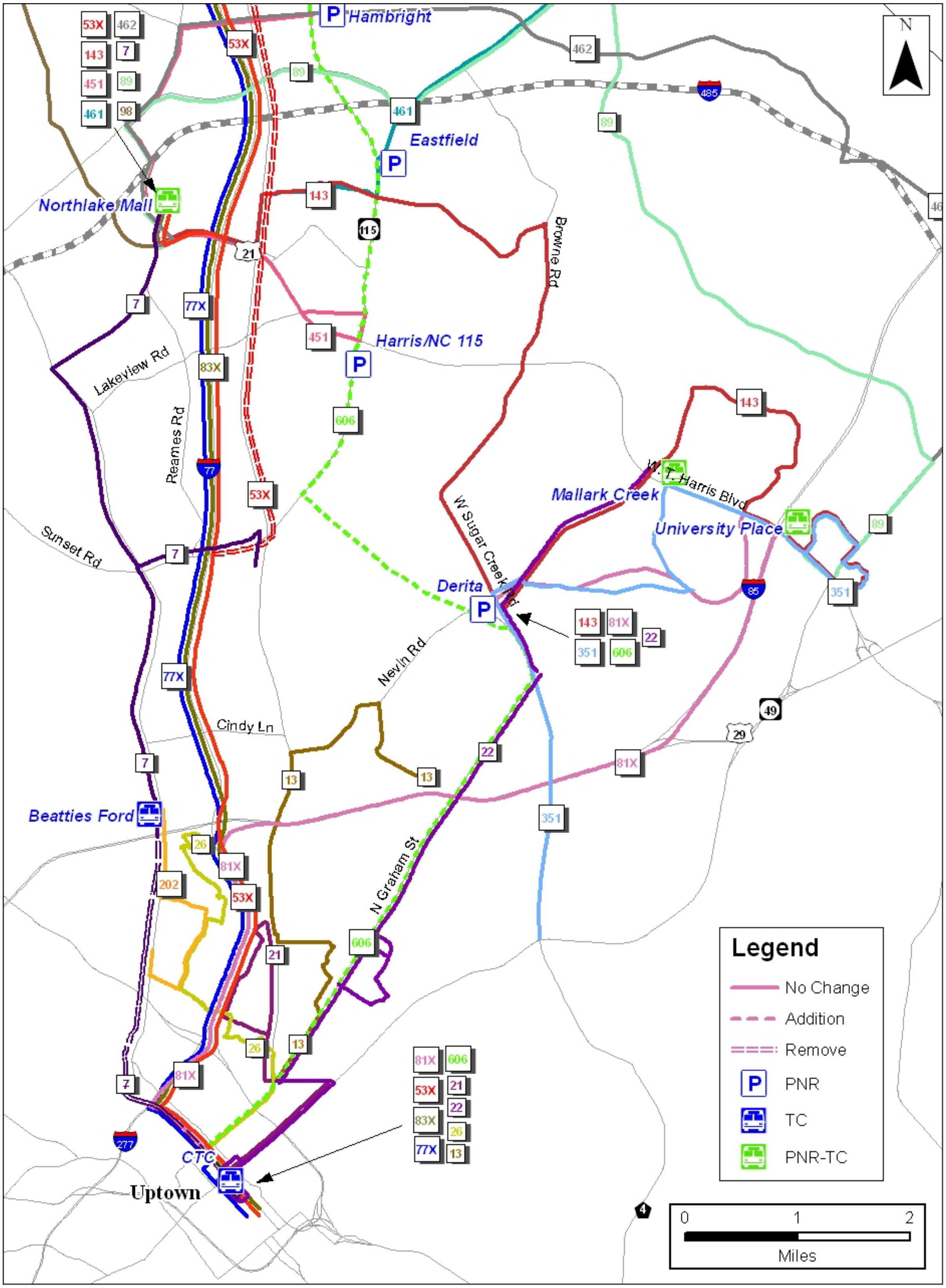


Figure 2.2-3a	TSM Alternative

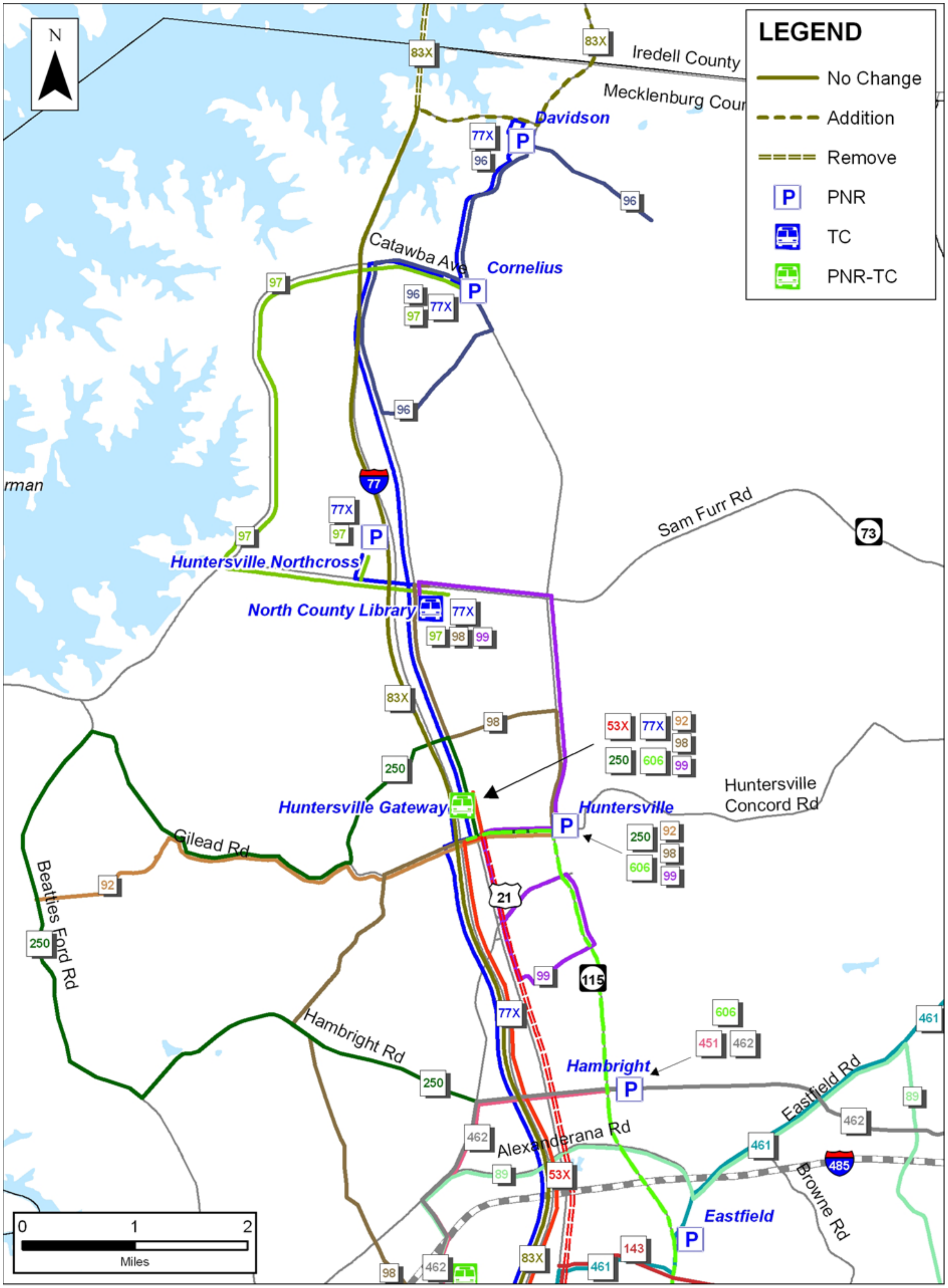


Figure 2.2-3b TSM Alternative

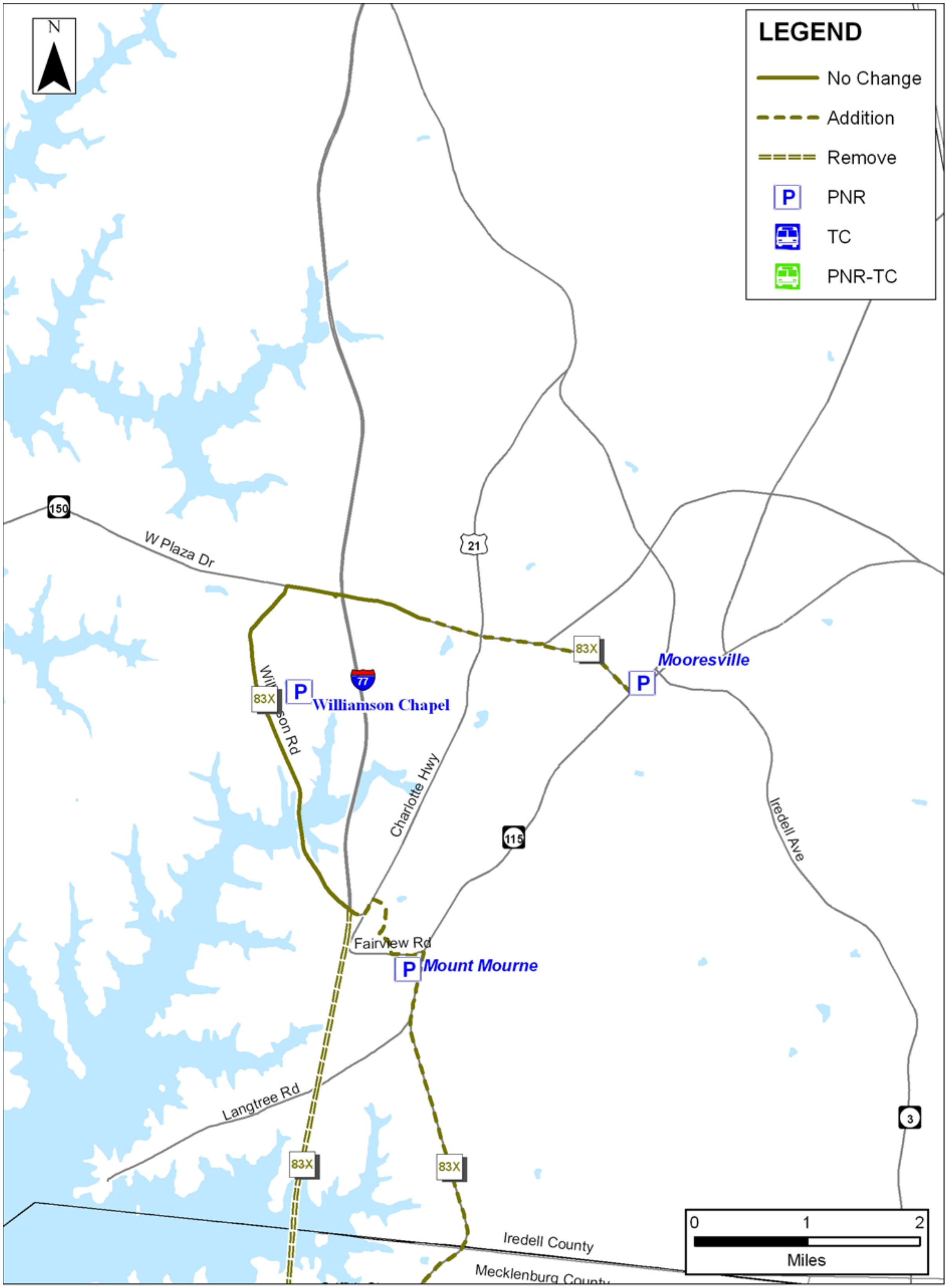


Figure 2.2-3c	TSM Alternative

2.2.2.2 Bus Park-and-Ride Capacity for No-Action and TSM Alternatives

PNR lot capacities for bus service under No-Action and TSM alternatives are provided in Table 2.2-4 and Table 2.2-5. The two existing parking facilities in Huntersville are owned by CATS while the other lots are provided through negations with other entities. The No-Action Alternative assumes that the existing PNR lots will continue to be used or equivalent sized parking facilities will be provided in the vicinity of the existing lots.

Parking capacity for the TSM Alternative assumes a skip stop express bus service with routes and stops that closely follow the proposed commuter rail build alternative. The 83X will serve the Mooresville and Mount Mourne station sites. The 77X will serve the Davidson and Cornelius station sites and replace the existing PNR lots. A new Route 606 will stop at PNR lots at the proposed Huntersville, Hambright, Harris/NC 115, Eastfield, and Derita station sites. The proposed Sam Furr and Cascade/NC 150 station locations will not be used as PNR sites for the TSM Alternative.

Table 2.2-4. No-Action PNR Lot Capacity and Routes Served

Description	Bus Routes Service	Parking Spaces	Status
Northlake Mall	7, 89, 98, 143, 451, 461, 462, 53X	200	Existing
Huntersville – Gateway	92, 98, 99, 250, 53X, 77X	209	Existing
Huntersville – Northcross	97, 77X	320	Existing
Cornelius Town Hall	96, 97, 77X	75	Existing
Davidson – South Main	96, 77X	50	Existing
Williamson Chapel	83X	150	Existing

Source: CATS

Table 2.2-5. TSM PNR Lot Capacity and Routes Served

Description	Bus Routes Service	Parking Spaces	Status
Northlake Mall	7, 89, 98, 143, 451, 461, 462, 53X	200	Existing
Huntersville – Gateway	92, 98, 99, 250, 606, 53X, 77X	209	Existing
Huntersville – Northcross	92, 77X	320	Existing
Williamson Chapel	83X	150	Existing
Derita	22, 143, 351, 606, 81X	75	Proposed
Harris/ NC 115	451, 606	300	Proposed
Eastfield	461, 606	250	Proposed
Hambright	451, 462, 606	200	Proposed
Huntersville	92, 98, 99, 250, 606	150	Proposed
Cornelius	96, 97, 77X	125	Proposed
Davidson	96, 77X	125	Proposed
Mount Mourne	83X	300/450	Proposed
Mooresville	83X	100	Proposed

Source: CATS

2.2.3 North Corridor Commuter Rail Build Alternatives

The EA carries forward the LPA and evaluates a 30-mile commuter rail corridor, operating on the existing NS "O" line, between Charlotte and Mooresville as illustrated below in Figure 2.2-4. The proposed Charlotte Gateway Station (CGS) serves as the Charlotte terminus. Eleven stations would be constructed to the north, including a terminus at Cascade/NC 150, just north of downtown Mooresville. Alternative locations for a vehicle maintenance facility (VMF) include Iredell County close to Mount Mourne and an abandoned NS industrial siding immediately south of the CGS.

CATS has proposed two build alternatives, which are identical except for the northern terminus. The first alternative consists of a Minimum Operable Segment (MOS), ending at Mount Mourne, 4.7 miles south of the terminus for the LPA alternative, which terminates at the Cascades station. Terminating the service at Mount Mourne would reduce the cost of the project. Service could then be extended to Cascades in a future phase of the project.

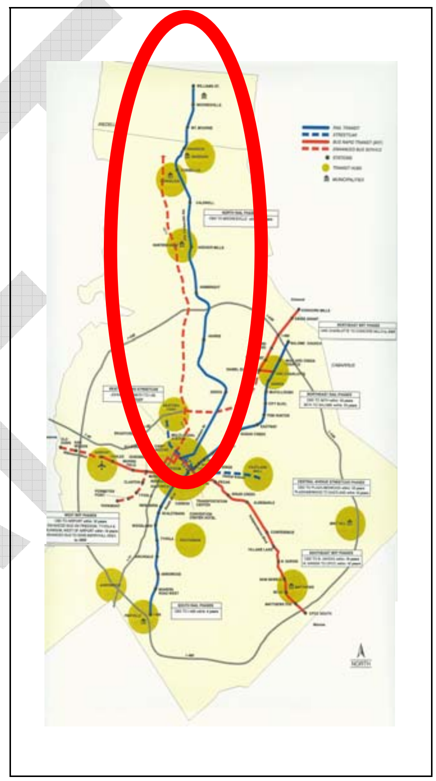


Figure 2.2-4.
Locally Preferred Alternative

The two build alternatives assume that a 1.2 mile segment of the NS "O" line located near Hambright Road in Huntersville has been realigned several hundred feet to the east through the center of a new transit-oriented development called "Bryton." Realignment of the track will enhance safety by eliminating a number of at-grade crossings, reduce the curvature of the track, and help to enhance the land use objectives of the Town of Huntersville. The realignment of the track is currently underway.

In addition, CATS is considering implementing new commuter rail service in two project phases in order to better manage project cost and size the service to the maturing market near the stations. Phase 1 would consist of up to 22 daily trains, focused primarily on the rush hour commute; Phase 2 would offer expanded service during rush hour and during off-peak hours and could include extension of service to Mooresville if the MOS alternative is implemented first.

The LPA and other alternatives each include a similar feeder bus system serving the rail stations and a system of local and express bus routes providing transit services to and from Charlotte for those in the North Corridor not served by the rail system. Figure 2.2-5 illustrates the general location of the stations, the VMF alternatives, and alternative termini.

2.2.3.1 North Corridor Commuter Rail Line

Commuter rail service would operate on the NS "O" line. The line was incorporated as the Atlantic, Tennessee & Ohio Railroad, with initial service between Charlotte and Statesville, NC beginning in 1860. Three years later, the track was disassembled to provide rail for the Confederate Army, and then rebuilt in 1871. In 1894, the line was bought by the Southern Railway and rebuilt to a standard 4-foot 8 ½ inch track gauge. Through various reorganizations and mergers, the "O" line today is owned and operated by NS.

NS operates one daily round-trip local freight train on the line, serving 6-10 shippers between the NS Atando Yard in Charlotte (milepost 3.0) and Foamex Corp. in Cornelius (milepost 19.0). Freight service ranges from daily shipments to a metals reprocessing plant to less-than-monthly carloads to several lumber yards. This train generally does not operate north of Cornelius, but occasionally travels to the Mooresville passing track in order for the locomotive to change ends of the train for the return to Charlotte. The "O" line splits in downtown Mooresville, with one branch, called the NS "L" line, heading northeast to Barber, NC. The other branch follows a discontinued rail alignment that originally provided service to Statesville. NS operates one daily train south from Barber to Mooresville. Generally, the train does not operate south of Mooresville. There is minimal freight tonnage on the line

The line passes through the historic downtown areas of Charlotte, Huntersville, Cornelius, Davidson and Mooresville. Given the light use of the line, many homes and businesses have been built within close proximity to the rail line in the four towns and in Charlotte. Larger portions of the land to the east of the "O" line remain undeveloped, but planning is progressing rapidly for numerous large residential and mixed-use developments in these areas.

The "O" line operates as a single-track, non-signalized (dark) railroad. It includes several short industrial and passing sidings. The line is maintained to a marginal Federal Rail Administration (FRA) Track Class 2 standard, permitting a maximum speed limit for freight trains of 35 mph, with a maximum speed of 25 mph through at-grade crossings. The rail used on the line dates back to the 1920s; ties are replaced as required, with most dating back to the 1970s or earlier.

Operation of marketable commuter rail service on this line will require a number of improvements. These include:

- Upgrade of the rail line – including replacement of ties and rail with new wood ties and 132-pound or heavier continuous welded rail – to FRA Class 4 standards, permitting passenger train speeds up to 79 mph.
- Addition of a modern signal system to permit trains to safely operate in either direction at maximum authorized speeds. Signalization is required to operate two-way "reverse" rush-hour service.
- Construction of passing sidings to allow trains to pass in opposite directions. The locations for these sidings have been determined using a Train Performance Calculator and string-line operation plans, which identify the locations for train meets based on the proposed train schedule. Schedules are manipulated through a series of computer simulations to locate sidings at sites with the fewest environmental or operational concerns.
- Closure or upgrade of existing public and private railroad/road crossings and provision of new crossings to enhance access to stations. CATS and NCDOT have jointly undertaken a Traffic Separation Study (TSS) to identify those crossings that should be closed and design the necessary improvements to protect remaining crossings, such as installation of gates and flashing lights. In addition, because of the proximity of residential areas to the rail line, CATS intends to design at-grade crossing improvements to qualify for new "Quiet Zone" standards, enabling trains to pass through crossings without the requirement to sound the train whistle.
- Construction of up to 11 commuter rail stations including platforms, a station building with waiting room, parking, and passenger drop-off.

- Construction of a VMF to provide daily turn-around servicing of the train equipment, mandated inspections, and light repair and maintenance.

The south end of the “O” line starts at a point 7/10ths of one mile north of the CGS at the Archer Daniels Midland (ADM) flour mill, where three rail lines converge:

- The north-south, three-track NS Atlanta-Greensboro mainline
- The east-west, single-track CSX line between Bostic and Monroe
- The Charlotte-Mooresville “O” line

NCCR trains will be stored on two tail tracks extending from the CGS approximately 1000’ to the south as well as on a storage track located at or near the northern terminus. Between CGS, which will include two NCCR station tracks, and the “O” line, NCCR trains will operate on the western-most NS mainline track (NS Track 2) and continue north to the ADM flour mill. NS Track 2 will then diverge north and become the “O” line, cross over the CSX track and continue north to Mooresville. The connections between the “O” line and the NS mainline tracks and the CSX-“O” line crossing diamond were removed in the 1960s. In addition, to provide the NCCR trains with exclusive use of NS Track 2, a new NS track (NS Track 3) will be added to the east and the NS main line will “shift” over one track.

There are three options for crossing over the CSX track:

- <u>Restoration of the at-grade crossing diamond:</u> This would be the least expensive and most easily implemented approach. However, because the crossing is at-grade and CSX operates some 6-8 daily freight trains on this track, restoration of the diamond could present reliability concerns for commuter rail service. If this option is pursued, CATS will require agreements with both the NS, which controls access over the diamond, and CSX regarding priority and scheduling of trains at this intersection.
- <u>Grade separation of the CSX and NS Mainline</u>: NCDOT, in cooperation with the FRA and CATS, is undertaking the engineering and environmental analyses to support a grade separation of the CSX line and the NS main line tracks at ADM, and other railroad infrastructure improvements along the NS main line in Charlotte necessary to relocate Amtrak service to the CGS and to provide tracks and a platform for the NCCR service. Under the plan, the CSX line would be placed in a trough under the “O” line and the NS mainline tracks. If this plan is progressed, the “O” line track also would pass at grade above the CSX trough.
- <u>Grade separation of CSX and the “O” line</u>: In the event the CSX/NS grade separation is not progressed, CATS could place the “O” line in a trough under the at-grade CSX line to eliminate any potential rail congestion at this location. This option will be reviewed in the NCDOT rail infrastructure program analysis.

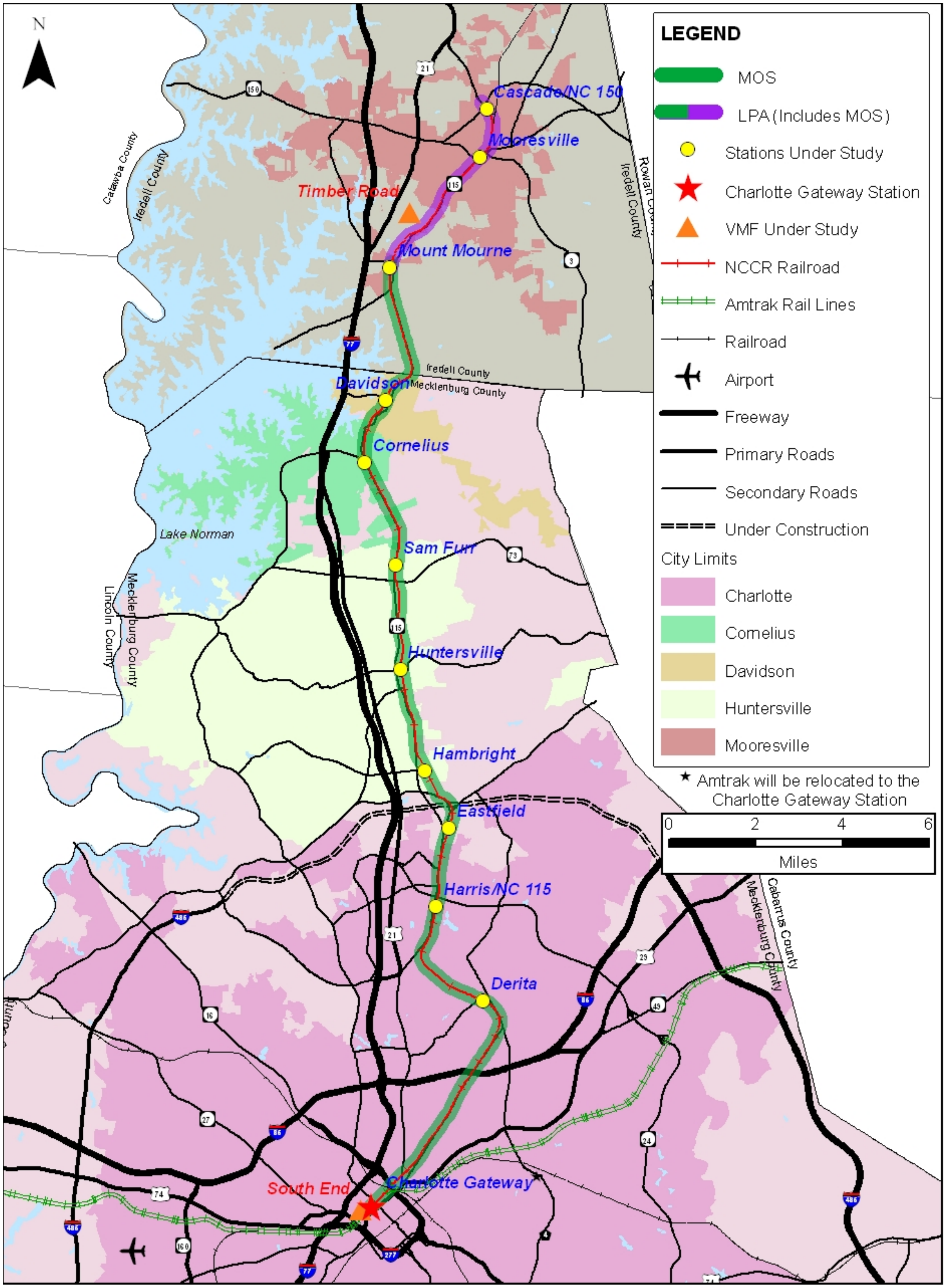


Figure 2.2-5	Basic Features of NCCR Build Alternatives

2.2.3.2 Terminal Station Options

<u>Southern Terminus</u>: The southern terminus for commuter rail service will be at the future CGS (Figure 2.2-6), located at West Trade Street. This location formerly housed the Southern Railway passenger depot and is currently the site of the Greyhound bus terminal. The CGS project is expected to be funded in part with federal appropriations through the FTA. Accordingly, a separate federal EA under NEPA is underway for the CGS. The CGS EA includes a Base Build Alternative, which represents the minimum investment at the CGS site to provide platforms to facilitate NCCR service. The Full Build Alternative would add retail, office and future air rights development, integrated to provide scale, functional connectivity with the public transportation facilities, and a critical mass of activities and markets to support a dynamic, vibrant urban setting.

The CGS Full Build Alternative will be served by Amtrak, which will relocate from its current North Tryon Street facility. Amtrak currently operates three daily round-trip trains through Charlotte: the Crescent, with service between New Orleans, Atlanta and New York; the Carolinian, serving Charlotte, Raleigh, Washington and New York; and the Piedmont, providing daily service between Charlotte and Raleigh. Future plans call for up to eight daily round-trip trains between Charlotte and Raleigh. NCDOT is separately undertaking the analysis associated with the rail infrastructure to relocate Amtrak to CGS and grade-separate the rail lines at ADM.

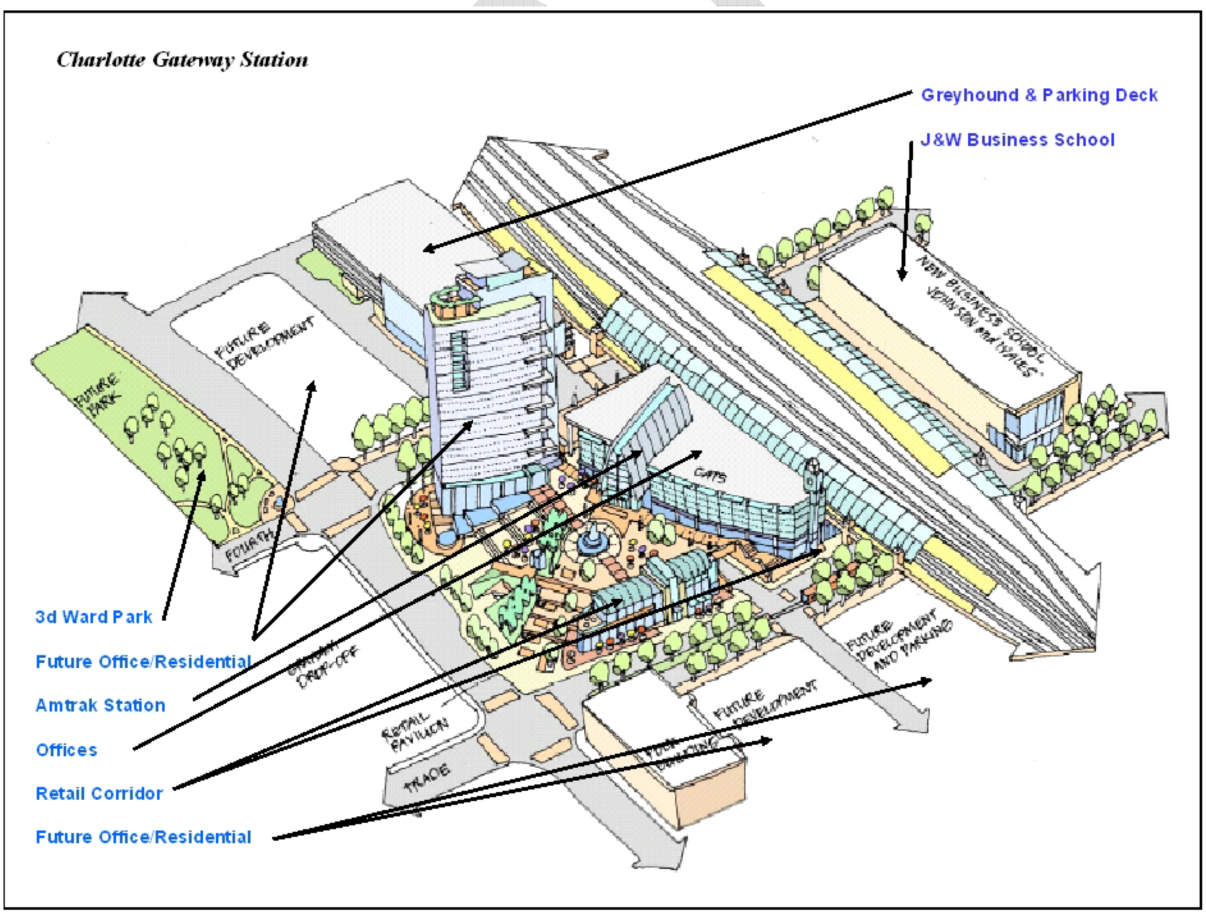


Figure 2.2-6	Charlotte Gateway Station

Greyhound will relocate its terminal to a new building in the adjacent block, which will be part of the CGS complex. Greyhound operates as many as 100 daily buses through Charlotte with up to 2000 daily passengers.

The CGS Full Build Alternative also will include a new CATS off-street bus center, served by local and express buses. The CGS will also serve as a primary stop for the proposed Center City Street Car system and will function as the terminal station for the rapid transit service on the West and Southeast Corridors. The complex will include retail and office space. The design for the complex will focus on creating an exceptional environment for passengers, pedestrians, bicyclists, and the local neighborhood.

Under the CGS Full Build or Base Build Alternative, NCCR trains will use a new platform to be added west of the existing NS mainline tracks and served by two exclusive NCCR station tracks. These two tracks will join NS Track 2, the western-most NS track, some 400 feet north of the station. NS Track 2 will be used exclusively for commuter rail service and will connect to the "O" line at ADM.

Northern Terminus: Cascade/NC 150, one mile north of downtown Mooresville, is the northern terminus for the LPA. The location, at the intersection of NC-115 and NC-150, provides access to I-77, located approximately two miles away, and borders an undeveloped parcel of property that is planned for a TOD. A Cascade/NC 150 terminus enables NCCR trains to serve downtown Mooresville and provides a PNR capability that cannot be provided within downtown Mooresville.

At the current time, Iredell County, in which Mooresville is located, lacks a dedicated local funding source to support their share of the engineering and construction of the NCCR line. As a result, an alternative terminus has been identified 4.7 miles south of Cascade/NC 150 at the planned Mount Mourne station. This location, 25 miles north of the CGS and 3 miles within Iredell County, is an unincorporated area within Mooresville's general jurisdiction.

Mooresville is continuing its efforts to secure funding for service to Mount Mourne and Mooresville. In the event such funding is not secured, NCCR service would be required to terminate at the planned Davidson station, located within Mecklenburg County.

Provision for a terminus at Mount Mourne creates an appropriate and logical alternative for consideration as a Minimum Operable Segment (MOS). The new Lowe's Corporation headquarters, expected to support in excess of 12,000 corporate and supplier jobs, is immediately adjacent to the proposed station location. Several new housing developments already are under construction and others are planned immediately around the proposed station. Mount Mourne is less than one mile east of an I-77 interchange and a second, even closer, interchange at Langtree Road is currently under construction. The Lowe's Corporation headquarters and other businesses adjacent to the Mount Mourne station are expected to generate a significant and important "reverse" commute by employees living in Mecklenburg County.

A MOS is defined as a start-up segment that must:

- Be capable of sustaining operations when complete;
- Include logical termini connecting two or more origins and destinations;
- Include access to a VMF;
- Be able to be designed, constructed, and operated independent of the balance of the line and still facilitate the turning back of trains; and

- Be able to accommodate, at least on an interim basis, a logical interface with the bus system.

The Mount Mourne MOS meets each of these criterions and would generate sufficient ridership to address the North Corridor's transportation and land use objectives.

2.2.3.3 Evaluation of Terminus and Build Alignment Alternatives

Two Build alternatives will be analyzed to evaluate the impact of terminus and alignment impacts:

- <u>Alternative LPA</u>. – Mooresville Terminus

    This is the original LPA alignment recommendation with commuter service operating over the existing NS "O" line alignment with the northern terminus at Cascade/NC 150.

- <u>Alternative MOS</u>. – Mount Mourne Terminus

    This is the same as Alternative LPA with a northern terminus at Mount Mourne, 4.7 miles south of the LPA alternative terminus at Cascade/NC 150.

The basic features of each alternative are summarized in Table 2.2-6.

Table 2.2-6. Basic Features of the NCCR Build Alternatives

Features	LPA	MOS
Number of Tracks	Single Track	Single Track
Passing Sidings	Four one-mile long sidings will be added. Existing freight sidings are being retained.	Three one-mile long sidings will be added, as well as a double track station at Mount Mourne. Existing freight sidings are being retained.
Line Capacity	Freight service will operate in available windows between commuter trains or at night	Same
Stations	Up to 12 stations, including the two termini.	Up to 10 stations, including the two termini. Downtown Mooresville would not be served.
At-Grade Crossings	108 road/rail crossings would be upgraded, closed and/or consolidated to enhance safety (includes 8 new crossings). Remaining public crossings would be protected by up to four gates.	99 road/rail crossings would be upgraded, closed and/or consolidated to enhance safety (includes 8 new crossings). Remaining public crossings would be protected by up to four gates. Crossings from Fairview Road north to Mooresville would not be upgraded as service will not extend to downtown Mooresville.
ADM CSX Crossing	Diamond or grade separated	Same
Peak Period Train Frequencies	20-35 minutes	Same

Table 2.2-6. Basic Features of the NCCR Build Alternatives (continued)

Features	LPA	MOS
Off-Peak Period Train Frequencies	60 minutes	Same
Impacts on Existing Operations	Current one daily local freight train, and any additional future service, will operate in non-commuter train windows or at night. Freight and intercity passenger trains on the NS mainline will not be impacted.	Same.
CGS Terminus	Dedicated NCCR platforms and two station tracks and a dedicated track on the NS mainline to the "O" line.	Same
Future NCCR Rail Capacity Expansion	Additional frequencies can be added to the proposed schedule, and the right-of-way is being designed to accommodate a second track.	Same

<u>Alternative LPA – Mooresville Terminus</u>

Under the LPA Alternative, four one-mile passing sidings would be built as follows:

1. From I-85 to Maple Street just south of the Derita station
2. From Everett Keith Road to just south of Damson Road
3. From just north of the Sam Furr station to Bailey Road
4. From Langtree Road to just north of Fairview Road

A total of 12 stations, including the two termini, would be served. The total length of Alternative LPA is 29.9 miles.

<u>Alternative MOS – Mount Mourne Terminus</u>

Under the MOS Alternative, NCCR trains would operate on the existing NS tracks to Fairview Road, 4.7 miles south of the LPA (Casacdes/NC-150) terminus. This alternative would include passing sidings similar to the LPA alternative; however, the Mount Mourne siding would instead terminate at the Mount Mourne station as two station tracks. The siding length and design would be very similar for both options. The total length of Alternative MOS is 25.1 miles. A total of ten stations, including the two termini, would be served.

2.2.3.4 Station Alternatives

<u>Station Selection Process</u>

The MIS identified nine general locations along the North Corridor for commuter rail stations, along with the termini at Cascade/NC 150 in Mooresville and the CGS (multimodal station) in Charlotte. In adopting commuter rail as the LPA, however, the MTC did not select specific station sites. In the interim between the completion of the MIS and this EA, the four Towns each have adopted local area plans that include station locations for the future commuter rail system. Some of these locations have been incorporated into approved development plans and zoning.

CATS, the Charlotte-Mecklenburg Planning Commission and the four Towns have completed a *North Corridor Station Location Refinement Report* (2005) to identify the type, size, and location of commuter rail stations along the North Corridor. This study incorporates the area plans developed by the Towns and also analyzes options for the Charlotte stations and for the Hambright alternative. From the recommendations in the *North Corridor Station Location Refinement Report*, drawings of conceptual site designs for each station were developed. The *North Corridor Station Location Refinement Report* recommendations and guidelines are summarized below.

Station locations for the NCCR are intended to serve three primary functions:

- Help to recreate and redefine the historic downtown area of the Towns or other neighborhoods through which the commuter trains will operate. This includes: the Derita neighborhood in Charlotte and the downtown areas of Huntersville, Cornelius, Davidson and Mooresville.
- Provide parking sufficient to meet demand and access to bus and feeder routes, particularly at larger PNR locations at key intersections with close highway access. This is applicable to locations at WT Harris Boulevard, Eastfield Road, Sam Furr Road (NC 73), Mount Mourne, and Williams Street.
- Support and focus strong land use development, particularly TOD projects. This is particularly important for the Hambright realignment, as well as TOD projects at Eastfield, Cornelius, and Williams Street.

Within these three broad focuses, specific station site selection included the following considerations:

- The explicit area planning recommendations of Mooresville, Cornelius, Davidson, and Huntersville.
- Specific potential development or redevelopment opportunities. These included TOD projects under detailed planning or construction at Eastfield, Hambright, Huntersville, Cornelius, and Mount Mourne.
- The location of specific single users with large ridership potential, such as the Lowe's Corporation office campus in Mount Mourne.
- Ability of rapid transit to redevelop and energize older neighborhoods near the transit line, such as Derita.

In addition, it is important that station locations be as visible and as accessible to pedestrians as possible and free, to the extent possible, of any fatal engineering or environmental flaws.

Station Characteristics & Locations

Each station will include the following:

- A 350-foot long, 12-foot wide passenger platform parallel to the tracks. Platforms will be approximately 5'1" from the center line of tracks. Platform height will be set either at approximately 25" to provide level boarding of standard bi-level passenger coaches, or at eight inches above top-of-rail, with one short "mini-high" platform set at 25" high to provide level boarding for passengers with disabilities.

- A station building providing a waiting room and potential joint retail or other commercial use;
- Parking, generally in landscaped surface lots;
- An overhead canopy covering a portion of each platform to provide protection for the elements;
- Compliance with all American with Disabilities Act (ADA) requirements regarding access, parking, facilities and boarding;
- Bicycle racks (or other appropriate bicycle storage facilities);
- Provisions for buses;
- Ticket vending machines;
- Significant security protection, including the use of security cameras, emergency phone access, and lighting;
- Public address systems; and
- Landscaping.

Using the above criteria, 11 station sites have been selected, in addition to the CGS. Proposed sites were presented to the public in early 2005 and separate presentations were made to the Town Board of Commissioners for Huntersville, Cornelius, Davidson and Mooresville, as well as the Charlotte City Council. On April 27, 2005, the MTC, on which the mayors for Charlotte, Huntersville, Cornelius and Davidson sit, approved selection of the proposed station sites for further review in the NEPA process.

A brief description of each site plan follows. Conceptual site plans showing the layout of station facilities, including parking, platform location and access points, parking and drop-off areas, bus loading and layover areas are illustrate for each station. These plans were used to assess potential environmental impacts and estimate the capital costs for the alternatives. These plans are conceptual in nature and not intended to reflect architectural design. They will be subject to further review and development as the project, and adjacent transit-oriented development continue to advance.

It should be noted that the stations, with the exception of Hambright and Mount Mourne (in the MOS (Mount Mourne terminus) Alternative), are sited along single-track sections of the "O" line. Gate-protected at-grade road crossings will provide access for pedestrians and cars to the other side of the tracks. In the case of the Hambright and Mount Mourne alternatives, the stations are sited on double-track sections of the railroad, with passenger platforms on both sides of the tracks. Access across the tracks is detailed in the specific station drawings.

1. DERITA

   The Derita station is located on a triangular parcel on the southwest quadrant of the intersection of Sugar Creek and Nevin Roads (Figure 2.2-7). The existing railroad track is on the west edge of property. Derita Baptist Church is adjacent to the station area. The potential to share a joint surface parking facility with the Church is currently under discussion. A cell tower is located on the site and either will be relocated or sectioned off. A small commercial building located on the western corner of the triangle on Nevin Road would require relocation. The property lends itself well for joint use development, both in the station building and on Church-owned property along Nevin and Sugar Creek

Roads. This station provides the easiest and closest access to the University Research Park area and feeder bus service to this large employment center would be provided.

In the event that an agreement with the Derita Baptist church for joint use of its property cannot be reached, the Derita station would be relocated to the opposite side on Nevin Road to the west. This site also lends itself well to a station and provides good pedestrian and vehicular access for Derita.

2. HARRIS/ NC 115

This station (Figure 2.2-8) is located on the west side of the tracks on an undeveloped property owned by CATS. The site borders NC 115 to the west and WT Harris Boulevard, a major east-west thoroughfare, to the north. Both roads experience congestion during the entire day, with a significant increase in congestion occurring during rush hour and at the intersection of NC 115 and WT Harris Boulevard. A large residential development and transit village, called "Griffith Lakes," is planned east of the tracks. The tracks are elevated at this site and it may be possible to provide future access under the rail line to connect the station on the west side with development on the east side of the tracks.

3. EASTFIELD

This station (Figure 2.2-9) is located west of the tracks between Hucks Road and Eastfield Road. The site, currently undeveloped, will serve as the nexus between the Twin Lakes office and retail development to the west and a large residential development to the east. In addition, Eastfield Road provides a direct connection to Charlotte's largest residential community, Highland Creek, with some 4,500 residential units. Given the proximity of Highland Creek and the residential and commercial/office development surrounding the station, a large number of PNR commuters is expected.

4. HAMBRIGHT

The initial Hambright station was located west of the tracks adjacent and parallel to North Mecklenburg High School, Alexander J. McKnitt Middle School and Blythe Elementary School. The NS tracks at this location are to be relocated several hundred feet to the east and centered in the new 450-acre "Bryton" transit-oriented development encompassing 2,000 residential units and up to 2.1 million square feet of office, commercial and retail space. The station is located within walking distance of the schools and the retail and residential areas of Bryton.

5. HUNTERSVILLE

Consistent with the adopted area plan for Huntersville, this station (Figure 2.2-11) would be located immediately north of Gilead Road on an undeveloped site within the historic town center. This site was the location of the former Huntersville passenger station and would be incorporated as part of the Farmer's Market improvements. The platform would be located between Main Street and the existing tracks. The tracks will be relocated approximately 15 feet to the east in order to provide sufficient space to expand Main Street and provide passenger drop off and bus services. The MIS identifies the Anchor Mill site, 1000' north of Gilead Road, as a possible station site due to the potential, at the time, for redevelopment of the old mill site. Since then, Huntersville has recommended that the station return to its original historic location and be integrated with other Town activities (e.g., the Farmers' Market).

6. SAM FURR

This station (Figure 2.2-12) is located north of Sam Furr Road (NC 73) and east of the existing railroad tracks and NC 115. The parcel is undeveloped. A station near this site was included as part of the joint Cornelius-Huntersville-Caldwell area plan. That plan locates the station approximately 1,000’ further to the north across NC 115 from the current entrance to the Caldwell Station residential development. However, Huntersville and Cornelius planners have since concluded that the station would attract larger ridership and its TOD potential would be greater if the station is located closer to and provided better visibility from Sam Furr Road. This site, near a future entrance to Caldwell Station, has significant PNR potential, particularly for commuters living east of the railroad and traveling along NC 73 to access NC 115 and I-77. Sam Furr Road may eventually be expanded in this area to six lanes, necessitating the grade separation of NC 73 and the railroad tracks.

7. CORNELIUS

This station (Figure 2.2-13) is located on the east side of the existing railroad between a proposed extension of Catawba Street and the existing Hickory Street within the town of Cornelius. The station would be incorporated into a TOD project, already approved by the Town and under construction, called Antiquity. According to the Town’s Subdivision Map revised June 29, 2004 and the outcome of the Cornelius Town Center charette process, the Cornelius Town Center and Antiquity TOD will include 151 single family residential units and 800 multi-family residential units. Approximately 136,400 square feet of commercial and office space is included and 26,000 square feet of retail space will be provided. The site is at the center of historic Cornelius and the location of the former Cornelius passenger train station.

8. DAVIDSON

A new station would be built south of Depot Street (Figure 2.2-14). Parking would be located at several existing and new sites surrounding the station, including a new site at Watson and Depot Streets, within one block of the proposed commuter rail platform.

9. MOUNT MOURNE

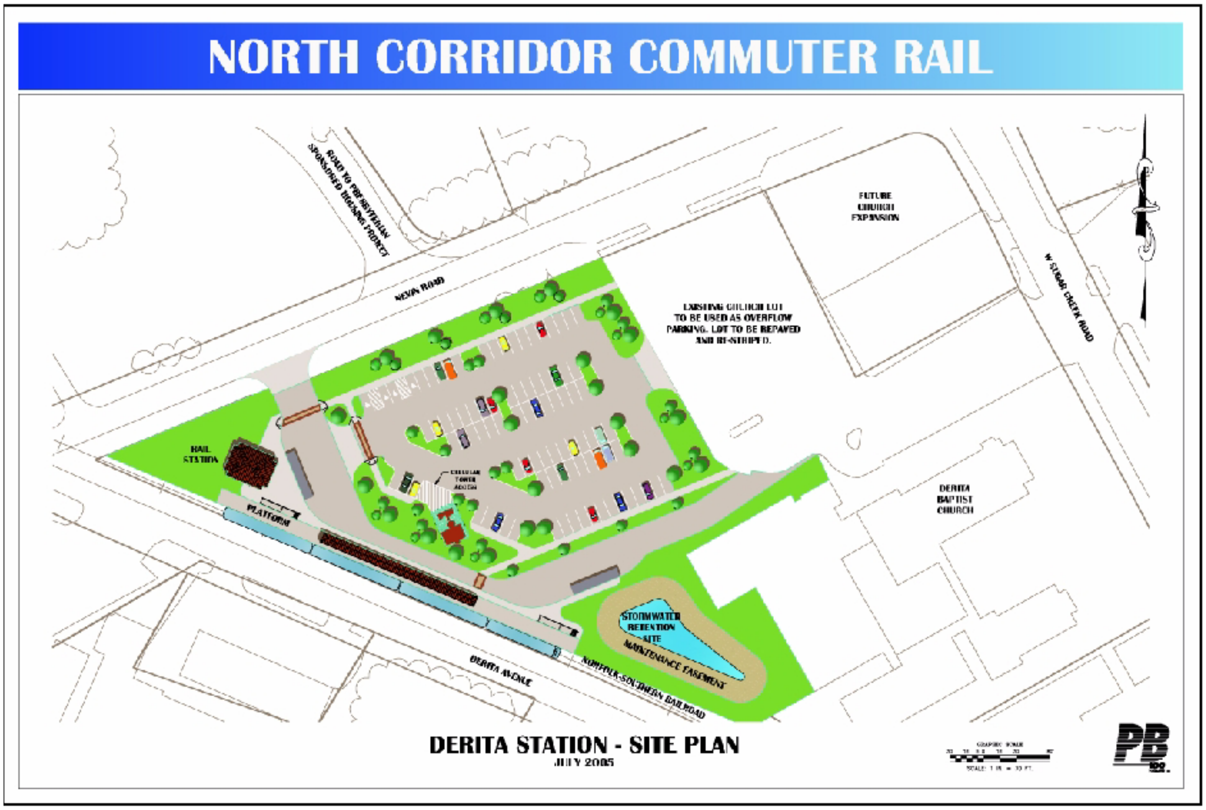
The station (Figure 2.2-15) would be built east of the tracks and incorporated into the proposed Legacy Village TOD, which is planned to include 458,000 SF of mixed residential, office, and retail, including 131 town homes. Lowe’s Corporation headquarters, with as many as 12,000 employees planned by 2020, is less than 1000’ to the southwest. Lake Norman Regional Medical Center, with more than 900 employees, is located ¼ mile to the northwest. Several new residential communities are under construction immediately around the station to support Lowe’s employment. Station 115 just north of the station site for example, is anticipated to have over 200 town homes when completed. Parking would be located east of the tracks. Discussions are underway for construction of a joint surface or decked parking facility with the Fairview United Methodist Church, which owns five acres of undeveloped property immediately east of the tracks. Some parking could also be located with the TOD to the west. Shuttle service could be provided to the Lowe’s Corporation headquarters, as well as to downtown Mooresville in the event Mount Mourne is the terminus for commuter rail service.

10. MOORESVILLE

The former Mooresville passenger rail station, located at the center of historic Mooresville and parallel to North Broad Street between Moore and Center Streets, would be restored. The area is very urbanized. The platform would be located on the west side of the tracks on property that is currently undeveloped (Figure 2.2-16). Drop off would be on Main Street, with parking across Main Street at a former Ford dealership.

11. CASCADE/NC 150

    The station (Figure 2.2-17) would be located west of the tracks and immediately south of NC 150, and would replace a number of commercial buildings along NC 115. Mooresville's local area plan for this location calls for a large TOD on largely undeveloped land to the east of the tracks. A number of TOD proposals are under active consideration by Mooresville. The site is located 1.5 miles from I-77 and could serve as a PNR facility for areas north of Mooresville.



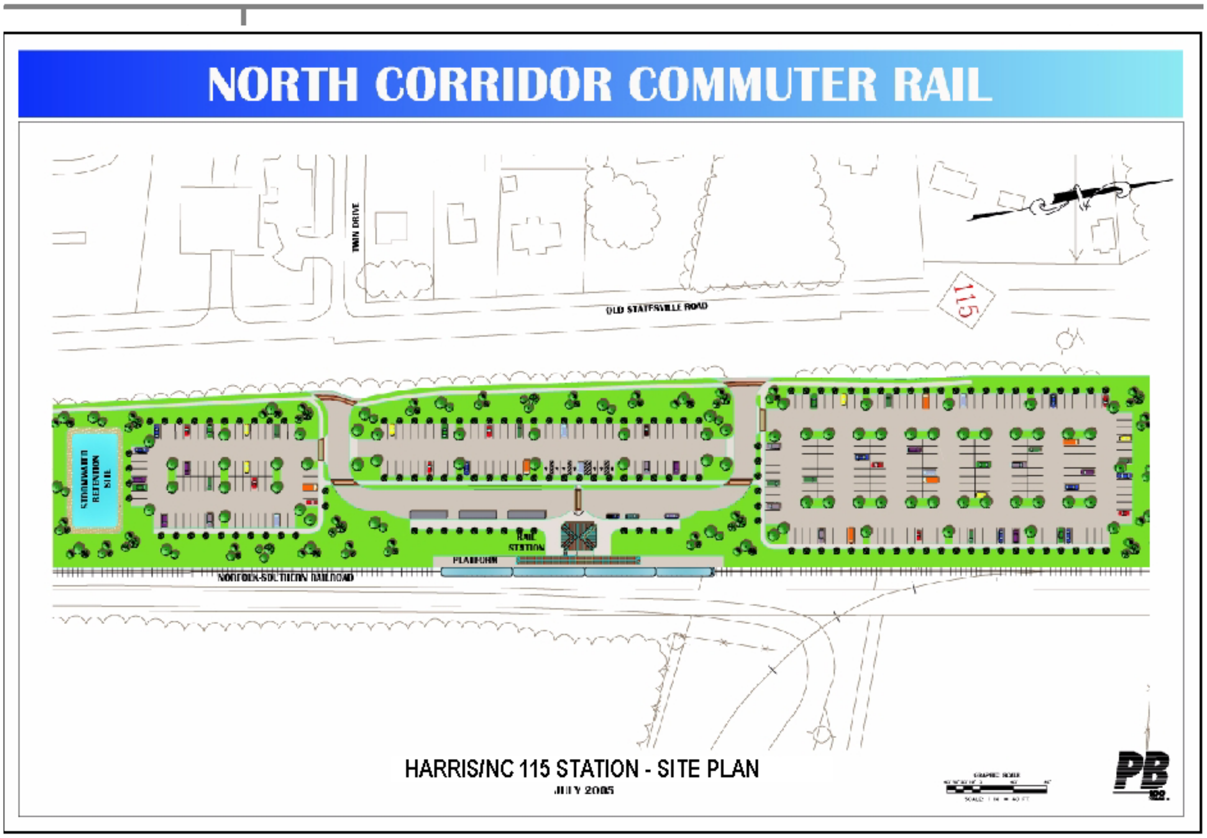


Figure 2.2-8	Harris/ NC 115 Station

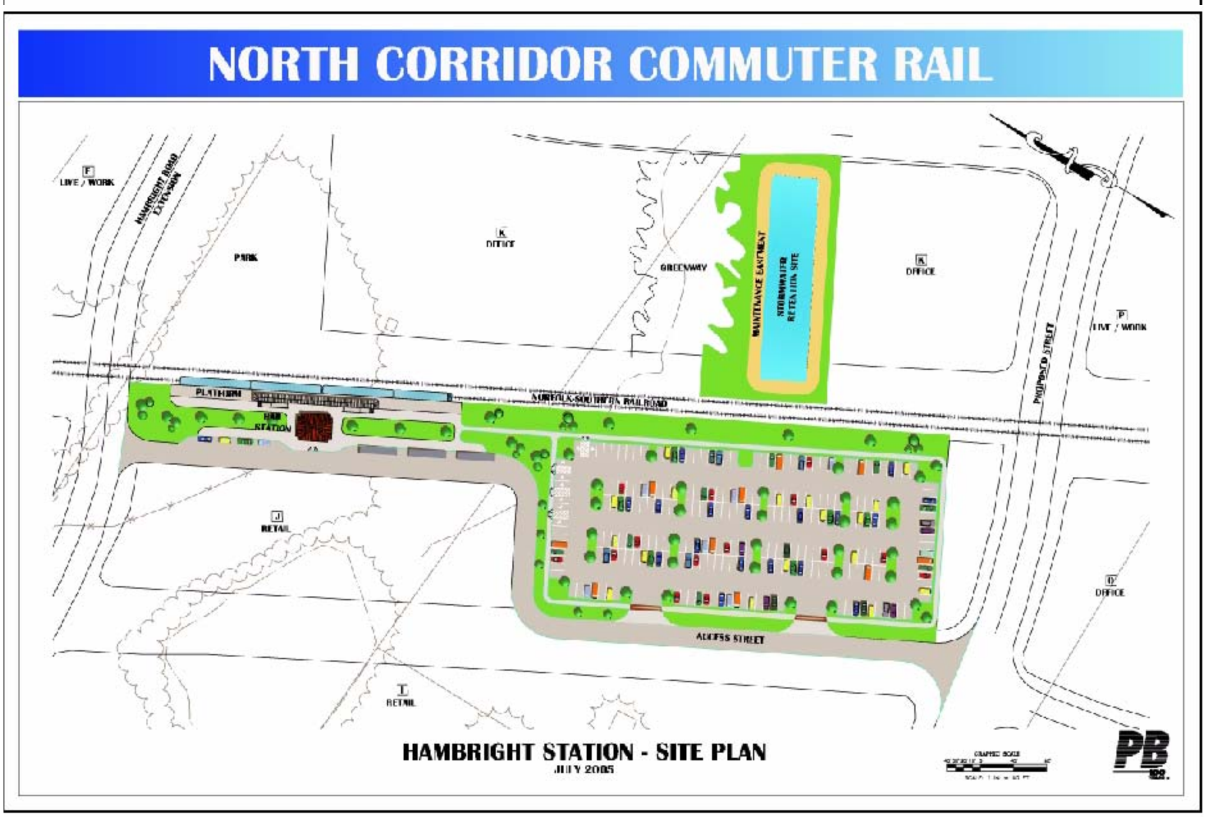
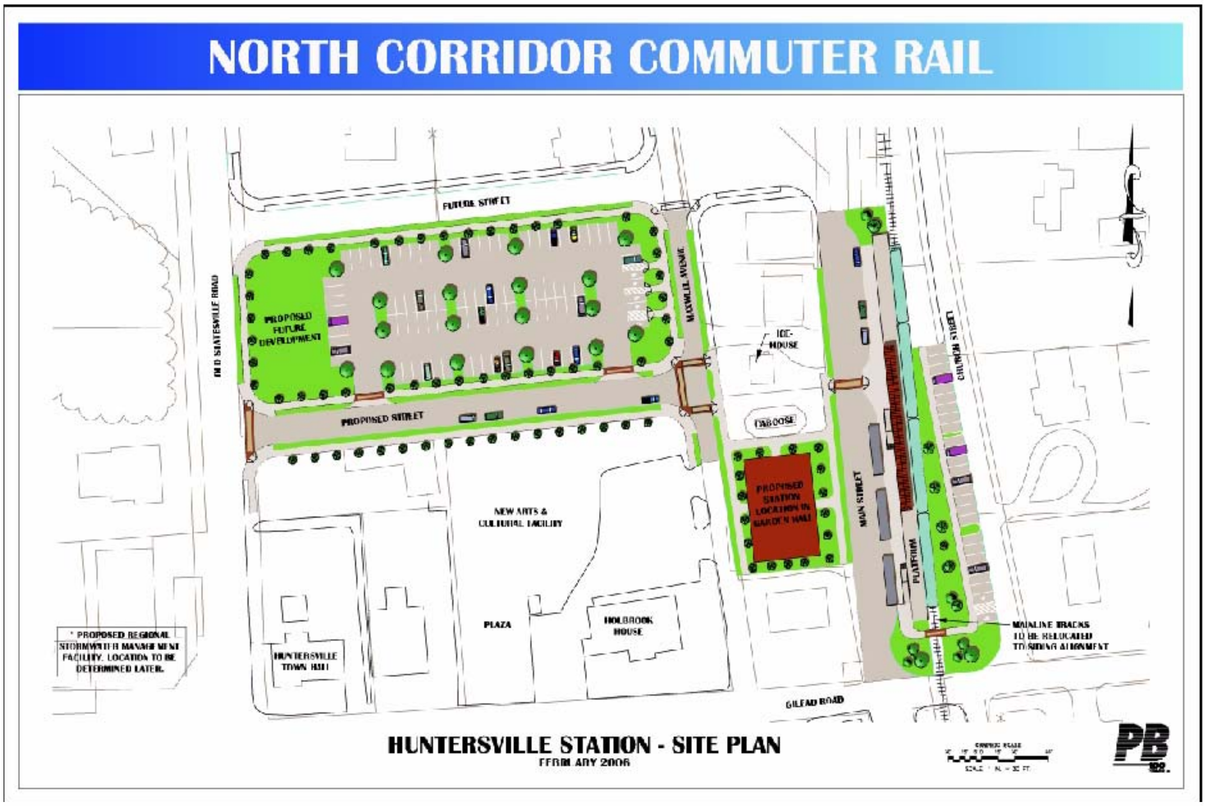


Figure 2.2-10 Hambright Station



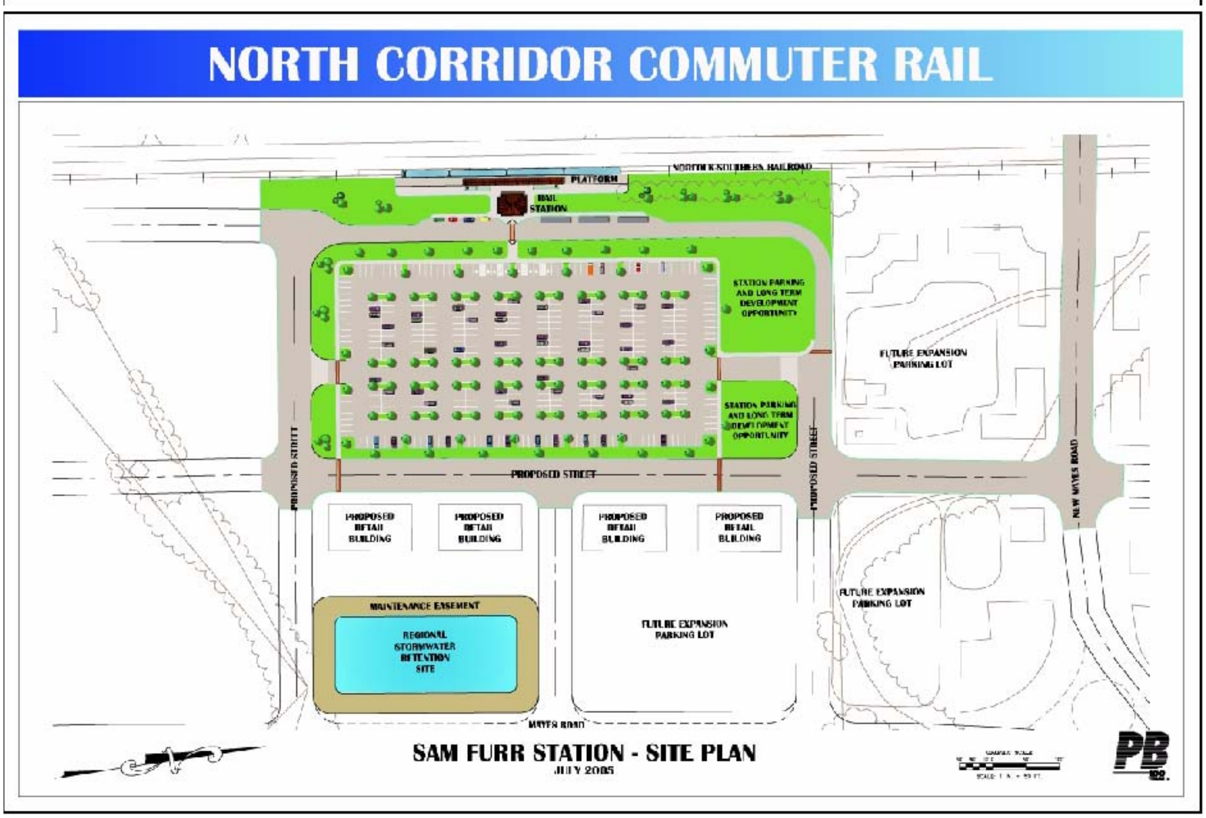
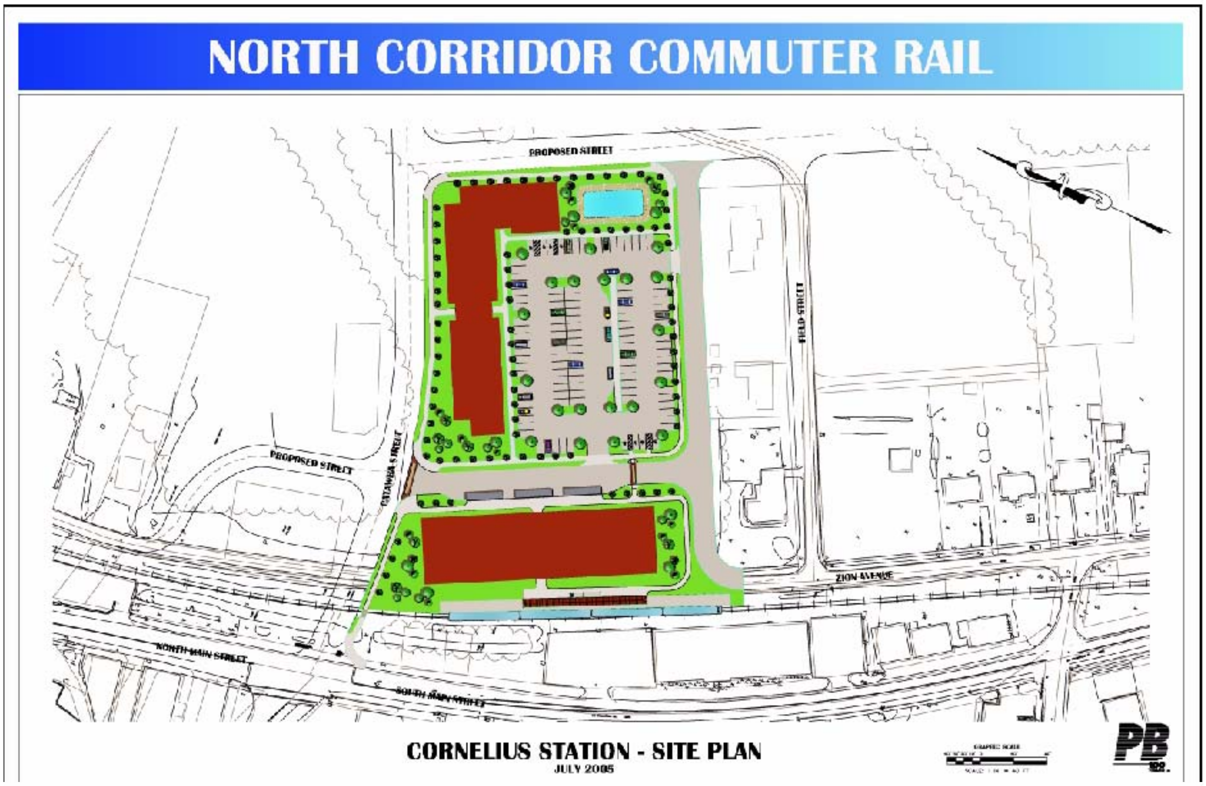


Figure 2.2-12	Sam Furr Station



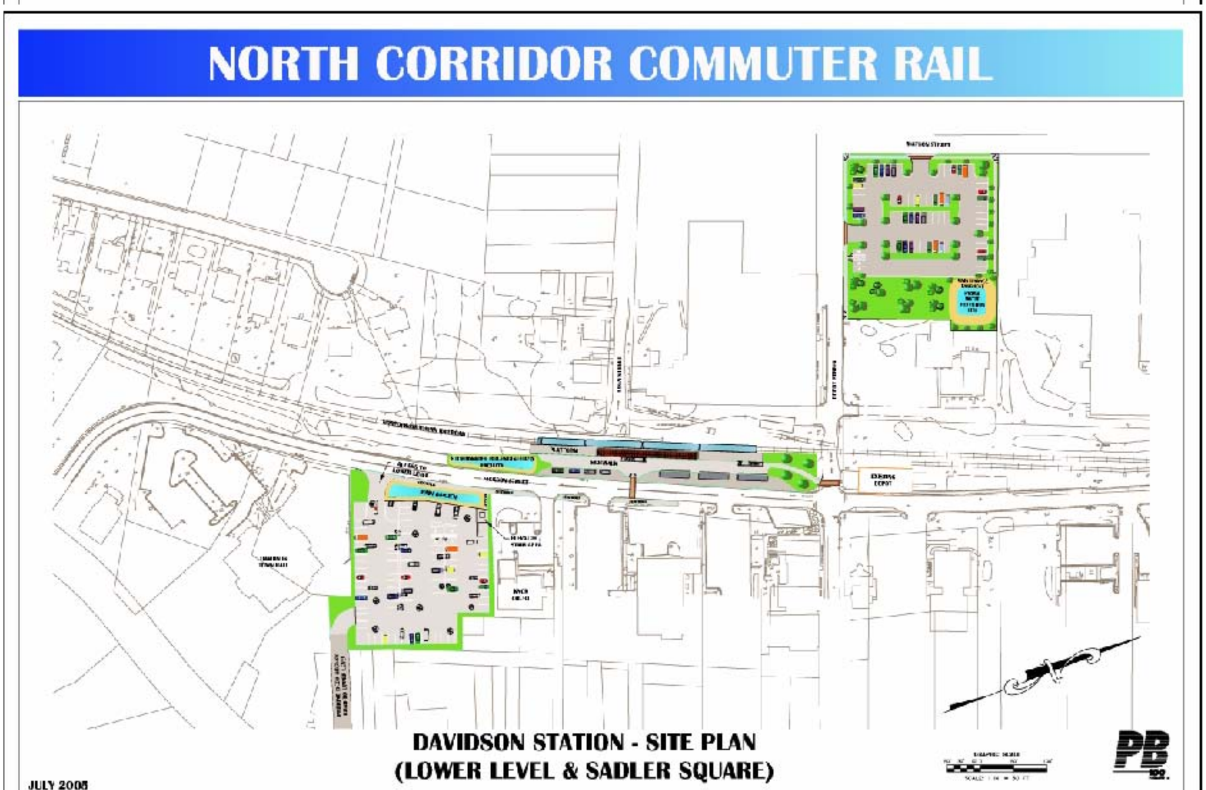
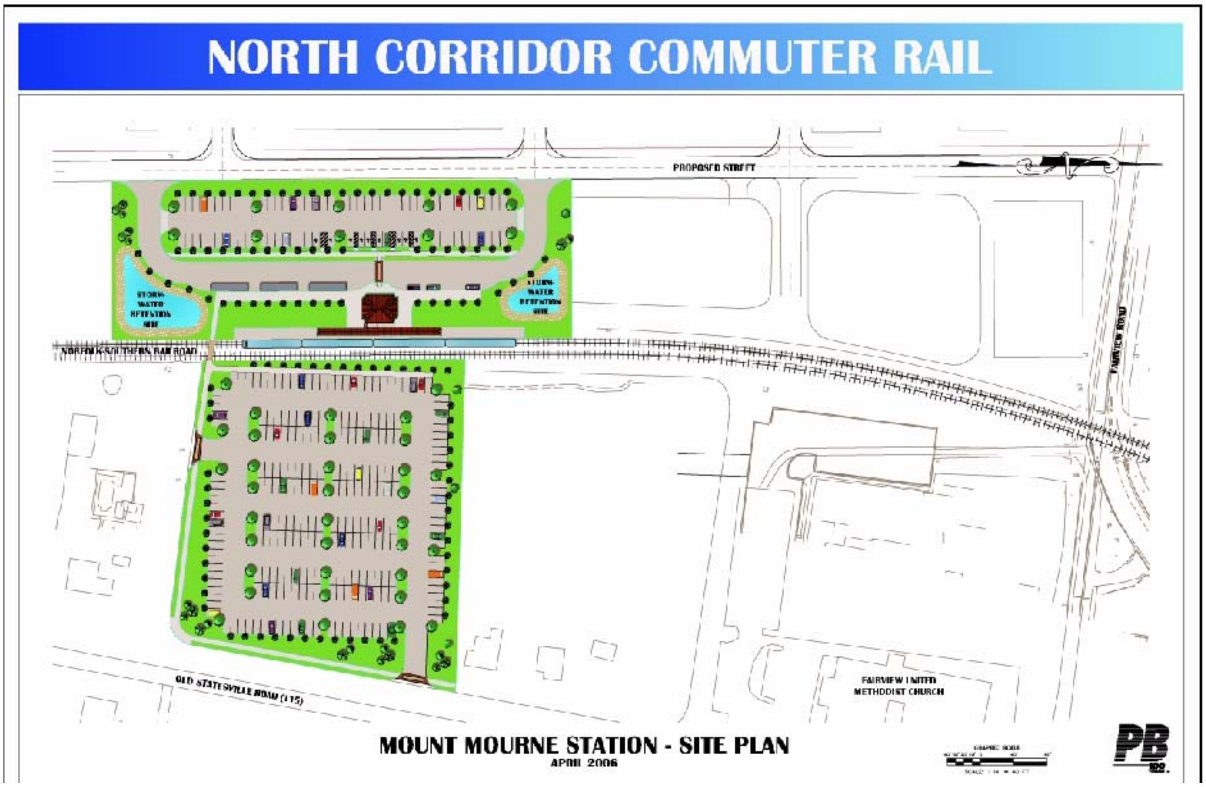


Figure 2.2-16 | Davidson Station



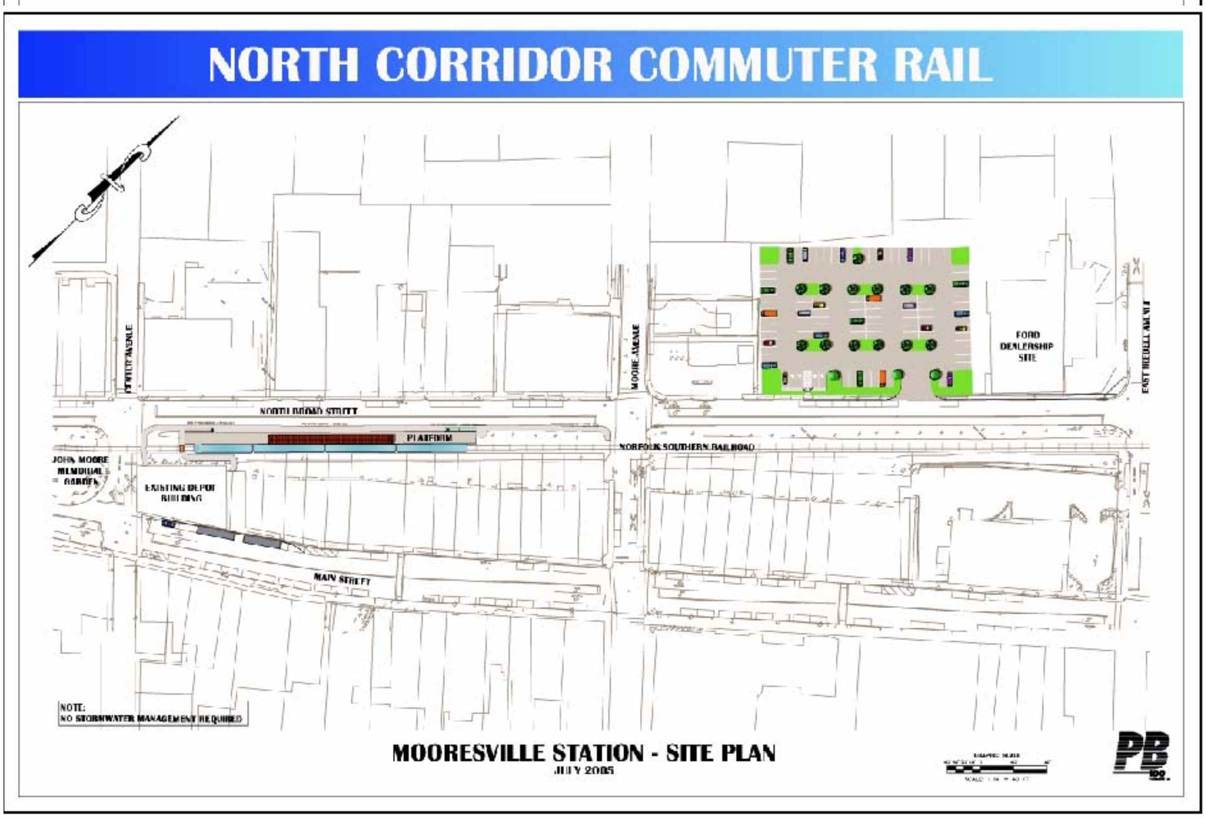


Figure 2.2-16	Mooresville Station

Figure 2.2-17 | Cascade/NC 150 Station

Table 2.2-7 summarizes several key attributes for each of these stations:

Table 2.2-7. Summary of Station Characteristics

Station	Station Location	Included in Local Area Plan	TOD Potential	Feeder Bus Capable	Parking Spaces
Charlotte Gateway	West Trade Street	Yes	Strong	Yes	450[1]
Derita	Nevin Road	No	Low	Yes	75
Harris/NC 115	WT Harris Boulevard	No	Strong	Yes	300
Eastfield	Eastfield Road	Yes	Strong	Yes	250
Hambright	Hambright Road	Yes	Strong	Yes	200
Huntersville	Gilead Road	Yes	Moderate	Yes	125
Sam Furr	Sam Furr Road	Yes	Strong	Yes	250
Cornelius	Catawba Road	Yes	Strong	Yes	125
Davidson	Depot Street	Yes	Low	Yes	125
Mount Mourne[2]	Fairview Road	Yes	Strong	Yes	300/450
Mooresville	W Center Avenue	Yes	Low	Yes	100
Cascade/NC 150	NC 150	Yes	Moderate	No	200

[1] Parking deck at the CGS Full Build Alternative serves all functions including NCCR.
[2] Mount Mourne station parking would expand to 450 spaces if the MOS alternative is selected.

2.2.3.5 VMF Alternatives

A service and inspection facility and train storage area will be required to support NCCR operations. The facility and storage area will be used to clean, inspect, store and provide light repairs to the locomotives and passenger coaches used for NCCR service. Heavier repairs – wheel truing, overhauls and damage repairs – would be performed off site. The facility will support the following activities:

- Storage of the equipment fleet;
- A "pit" to provide access to the underside of the equipment and side platforms for performing: FRA-mandated brake and safety inspections, interior and exterior cleaning, maintenance and light repairs, wheel replacement, and component change out;
- Train equipment washer;
- Support facilities for inventory, facility mechanical and electrical equipment, administration (crew sign-up and train orders) and records offices, employee welfare functions: conference/training room, and vending equipment;
- Fueling and sanding for locomotives;
- Parking and circulation for employees and visitors;
- Oil-water collection and separation; and
- Circulation tracks and leads as required.

Figure 2.2-18 and Figure 2.2-19 shows two proposed VMF site layouts, one at Timber Road in Iredell County near the northern terminus of the service and one located just south of the southern terminus at the CGS.

Timber Road VMF Alternative

A VMF located near the northern terminus, where rush hour trains begin and end each day, would permit cleaning and maintenance activities during night-time hours. Interior cleaning services – vacuuming floors and removal of trash – would be done during the day at the CGS. Three factors were considered essential to finding site alternatives in the north:

1. Close proximity to the northern terminus of the NCCR service;
2. Sufficient property for efficient design of the facility -- approximately 15-20 generally flat acres; and
3. Ability to serve both the LPA and the MOS.

Two north end sites were identified that respond to these criteria. One is a large tract of undeveloped property west of the rail line opposite Timber Road, approximately 1.5 miles north of the Mount Mourne station and 3.3 miles south of the Cascade/NC 150 station. The facility would be placed perpendicular to the "O" Line and parallel a major electric and pipeline utility easement. To access this site, 1.5 miles of track north of the Mount Mourne station would be upgraded, including possible improvements at four at-grade crossings. A residential development and golf course is located 1,000 feet to the north of the site. The second site is approximately two miles south of Mount Mourne near the Mecklenburg County/Iredell County border at Bridges Farm Road. This facility would be placed parallel to the existing rail line on undeveloped property.

The Timber Road site is zoned for industrial activities. The Bridges Farm Road site is zoned residential and faces significant potential land use objections from the property owners, due to rapidly changing land use plans for these areas resulting from development of the Lowe's Corporation headquarters and new residential and commercial development. The Bridges Farm Road site is the subject of a new area planning study by both Mooresville and Davidson, as well as speculation by developers. A joint area planning effort will define the future uses of property surrounding Bridges Farm Road.

From an operational perspective, the Timber Road site has the advantage of being closer to the end of the commuter rail line, thus affording shorter deadhead travel from the last station (either Mount Mourne or Williams Street). Additionally, the Timber Road site is configured to run parallel to an existing overhead electric transmission line. The existing electric transmission towers and proposed VMF sites and trackage represent a very compatible land use corridor. The Timber Road site was identified in the earlier alternatives analysis presented in the MIS.

The Bridges Farm Road site contains a two-story antebellum period farmhouse which is eligible for the National Register of Historic Places (NRHP) under Criterion C for architecture. The NRHP boundaries recommended for this site include the structure and approximately 50 acres of adjacent field and woodlands. The boundaries include all of the property east to the proposed commuter rail right-of-way (ROW) and north to the ROW of Bridges Farm Road. This condition may preclude construction of a VMF site south of Bridges Farm Road.

Given the operational advantages of the Timber Road site and the cultural resource complications of the Bridges Farm Road site, it was determined that the Bridges Farm Road site would not be advanced further at this stage of the environmental review process.

South End VMF Alternative

A third alternative is to provide a VMF at the southern terminus of the commuter service. This would facilitate daytime servicing of trains. Sufficient property is available immediately south of the CGS for construction of a two-track facility on property CATS already is required to acquire from the NS for its NCCR platform tracks. Trains would be inspected, maintained, repaired and washed at the facility. Trains would be stored during the day at the CGS platforms and at night at a storage track located at or near the Cascade/NC 150 or Mount Mourne stations. Interior cleaning of the trains would take place at the platforms. The site is constrained, which could limit its equipment storage capacity. Design of the facility would have to be consistent with the residential and institutional nature of the adjacent land uses.

VMF Analysis

A VMF either at the northern terminus or southern terminus would be acceptable. A facility in the north would include sufficient property to accommodate long-term increases in fleet size. A facility in the south would minimize property acquisition and more efficiently utilizes platforms for storage; however, a significant increase in fleet size in the future likely would require additional off-site storage capacity.

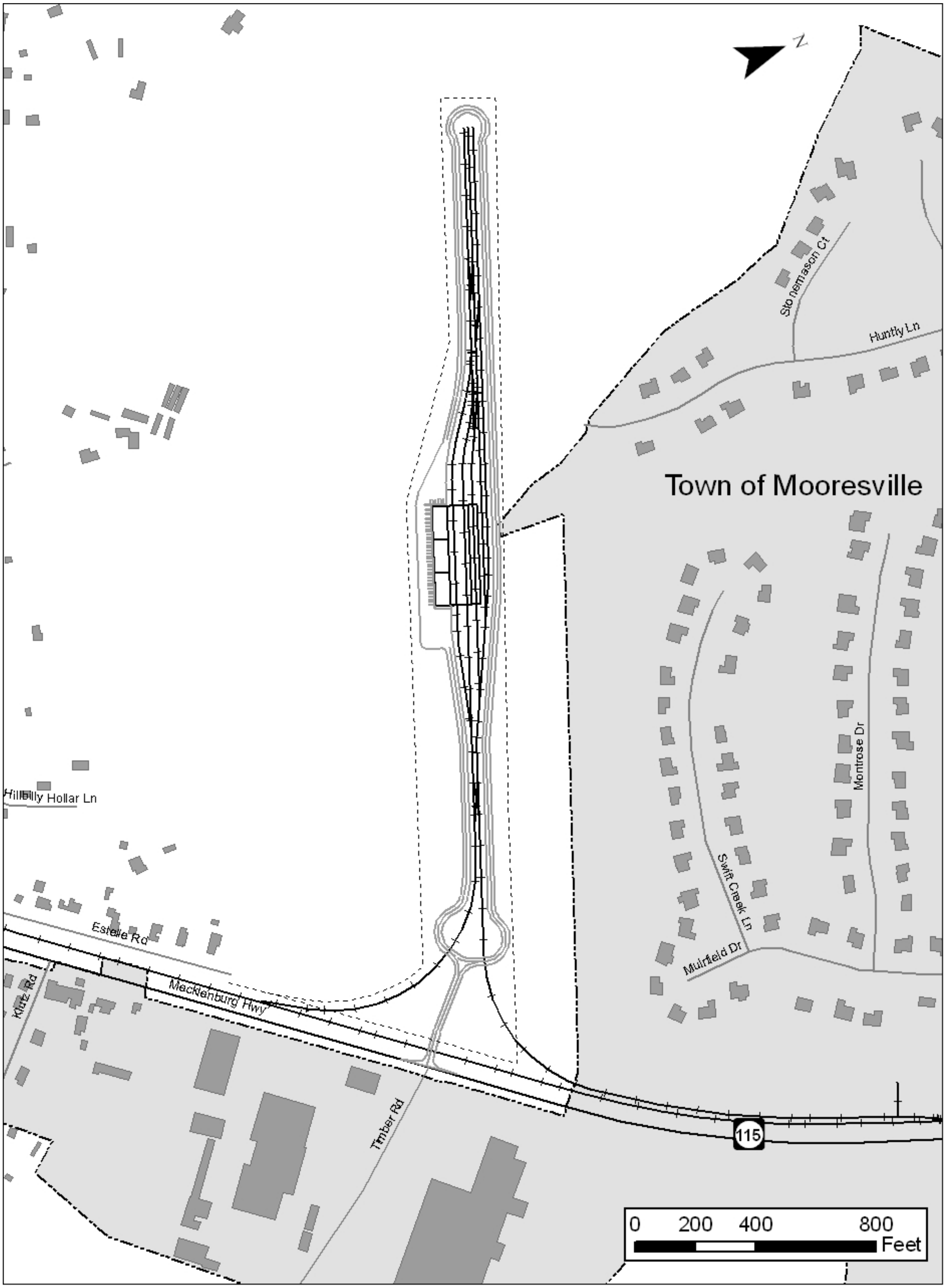


Figure 2.2-18 | Timber Road VMF

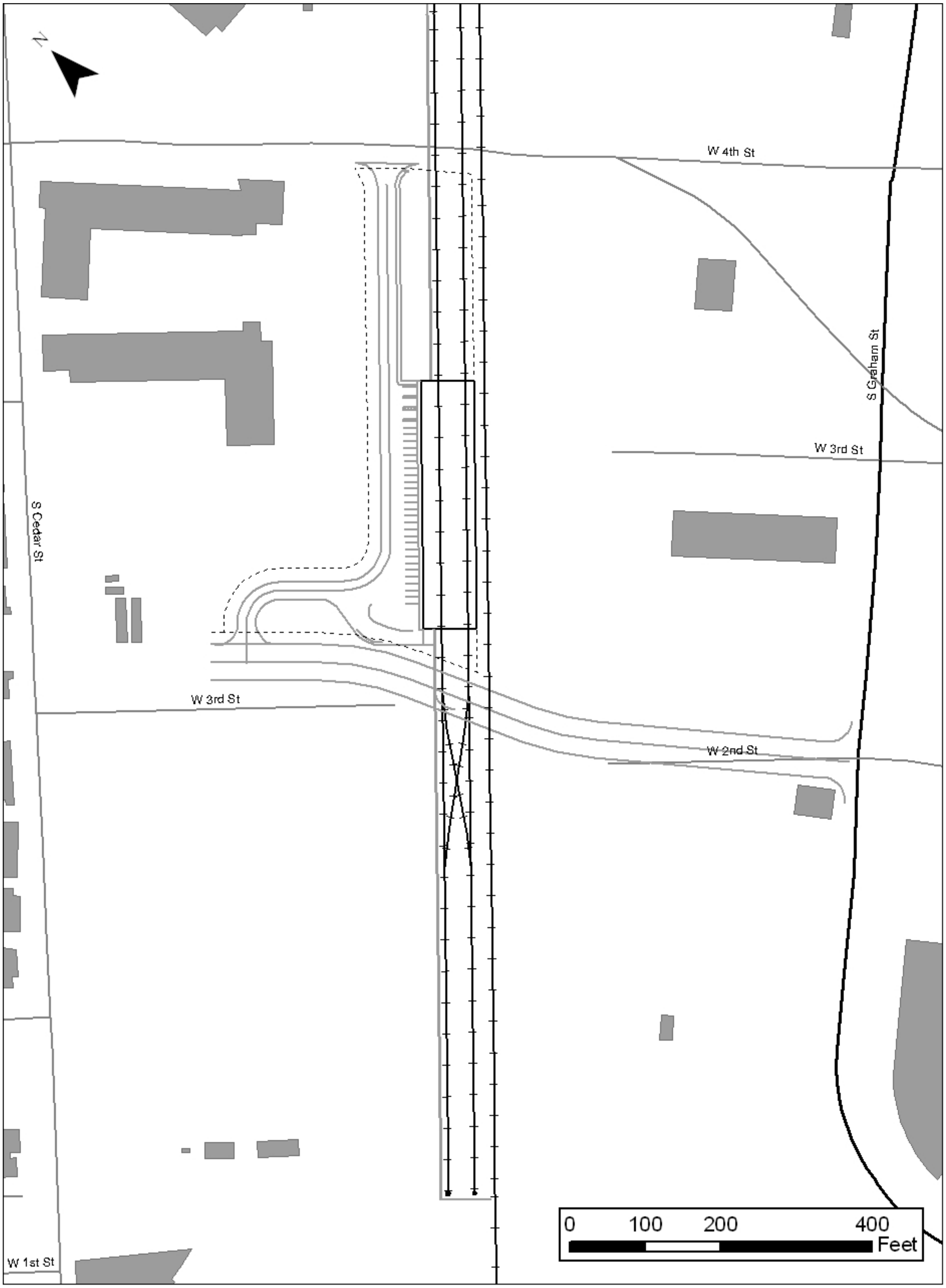


Figure 2.2-19 South End VMF

2.2.3.6 Grade Crossings and Separations

One of the major challenges to implementation of commuter rail service on the North Corridor is the need to upgrade, close or provide new grade crossings for 109 public and private at-grade crossings along the “O” line between Charlotte and Mooresville. This equates to over three crossings per mile of track. Only 31 of these crossings are protected today with gates and flashers.

In 2004, NCDOT and CATS completed the TSS, which recommended crossings that should be closed and options for improving the protection at remaining crossings. The TSS recommended:

- Closure of 19 public crossings
- Closure of 26 private crossings by connecting them to new or existing streets
- Addition of six new crossings to facilitate closure of other crossings or based on plans for new regional roads.

The City of Charlotte and the four Towns reviewed the recommendations of the TSS. Each municipality formally adopted resolutions committing their “best efforts” to implement the recommendations.

Since completion of the TSS, CATS has continued to study crossing safety and the feasibility of implementing TSS recommendations. In addition, identification of the potential station sites has necessitated revisions to local road plans and the need, at some locations, for additional crossings.

Table 2.2-8 identifies existing and proposed at-grade crossings on the North Corridor and compares the recommendations provided in the TSS with current recommendations. The milepost (MP) beginning reference point is located at the proposed CGS. The Average Daily Traffic (ADT) volumes are based on 2001 estimates.

Table 2.2-8. Grade Crossing Characteristics

Crossings	MP	TSS Recommendation	Current Recommendation	2005 ADT
Charlotte				
Spratt St	1.30	Close/Roadway Improvements	Same	972
Statesville Ave	1.40	Install Median Separator	Same + 2 Gates & Flashers	11,200
Woodward Ave	2.00	Install Gates & Flashers/ Demolish Bridge & Fill	4 Quad Gates & Flashers, No Bridge Demo	3,941
Moretz Ave	2.30	Install Gates & Flashers	4 Quad Gates & Flashers	4,627
Norris Ave	2.50	Install Gates & Flashers	4 Quad Gates & Flashers	4,282
Private (Blythe Ind.)	2.70	Clear Sight Distance	Close/Alt. Access Available	<200
Private (Closed Plant)	2.71	Close/Alt. Access Available	Close	<200
Atando Ave	2.95	Install Gates & Flashers	4 Quad Gates & Flashers (Possibly 6 Gates)	4,600
Toal St	3.20	Close	Same	1,765
Private (NC Equip Co.)	3.30	Add Cross Bucks/Stop Signs	2 Long Gates & Flashers	<200
Starita Rd	3.51	No Improvements	4 Quad Gates & Flashers	4,300

Table 2.2-8. Grade Crossing Characteristics (continued)

Crossings	MP	TSS Recommendation	Current Recommendation	2005 ADT
Charlotte (continued)				
Cottonwood St	3.80	Add Gates	4 Quad Gates & Flashers	5,202
I-85 Service Rd (S)	4.00	Close	3 Gates/Flashers, 4 Q Equiv	4,141
I-85 Service Rd (N)	4.10	Add Gates	3 Gates/Flashers, 4 Q Equiv	3,043
Oneida Rd	4.47	No Improvements	4 Quad Gates & Flashers	2,512
Allan Rd	4.67	No Improvements	4 Quad Gates & Flashers	1,697
Racine Ave	4.99	Install Gates & Flashers	Close/Connect to Bonded Warehouse	518
Private (Bonded Warehouse)	5.11	Clear Sight Obstructions	4 Quad Gates & Flashers	<200
Private (Residential)	5.29	Install Stop Signs	Close	<200
Maple St	5.52	Close	Same	3,038
Gibbon Rd	5.68	Roadway Improvements/New Gates & Flashers/Signal	Same + 4 Quad Gates & Flashers	14,948
Nevin Rd	6.00	Add Gates	Add 2 Gates to Existing 2 Gates – 4 Quad Equivalent	7,245
Private (Residential)	6.40	Close/Construct New Driveway	Same	<200
Christenbury Rd	7.01	Install Gates & Flashers	4 Quad Gates & Flashers, Undercut, Roadway Work	2,364
Private (Farm Access)	7.18	Install Cross Bucks/Stop Signs	Close - Connect to Adjacent Development	<200
Future Crossing (Henderson Cir)	8.00	*Not in TSS*	4 Quad Gates & Flashers	<200
Oak Dr	8.06	Close/Connect to Henderson Cir	Close - Connect to Adjacent Development	<200
Pete Brown Rd	8.28	Close/Connect to Henderson Rd	4 Quad Gates & Flashers	<200
Henderson Rd	8.45	Install Gates & Flashers / Roadway Improvements	Close and connected to Pet Brown Road	330
David Cox Rd	9.45	Add Gates/Traffic Signal	Add 2 Gates to Existing 2 Gates – 4 Quad Equivalent	4,364
Bob Beatty Rd (S)	9.80	Close	Same	<200
Future Crossing (Reames Rd)	9.90	*Not in TSS*	New Public Crossing – 4 Quad Gates & Flashers	<200
Bob Beatty Rd (N)	10.20	Install Gates & Flashers	Close	<200
Hucks Rd	10.46	Install Gates & Flashers / Roadway Improvements	4 Quad Gates & Flashers	2,700
Private (Farm Access)	10.82	Install Cross Bucks/Stop Signs	Close	<200
Private (Farm Access)	11.05	Install Cross Bucks/Stop Signs	Same	<200
Eastfield Rd	11.25	Install Gates & Flashers / Roadway Improvements	4 Quad Gates & Flashers	17,145
Huntersville				
Everett Keith Rd	11.65	Install Gates & Flashers	To be relocated; 4 Quad Gates & Flashers	497
Private (Residential)	12.45	Close/Connect to Hambright Rd	Same	<200
Private (Future Hambright)	12.56	Install Future Crossing	New grade separated crossing	<200
Private (Residential)	12.71	Close/Connect to Hambright Rd	Same	<200

Table 2.2-8. Grade Crossing Characteristics (continued)

Crossings	MP	TSS Recommendation	Current Recommendation	2005 ADT
Huntersville (continued)				
Private (Farm Access)	12.87	Close/Connect to Hambright Rd	Same	<200
Private (Residential)	12.93	Close/Connect to Damson Rd	Same	<200
Private (Power Substation)	13.02	Close/Connect to Damson Rd	Same	<200
Private (Future Damson Rd)	13.10	Install New Public Crossing	4 Quad Gates & Flashers + New Roadway	<200
Private (Residential)	13.28	Close/Connect to Damson Rd	Same	<200
Verhoeff Rd (Future Crossing)	13.73	*Not in TSS*	New Grade Separated Crossing	<200
Church St. (S)	13.77	Close	Same	<200
Holbrooks Rd	14.04	Add Long Gate Arm	4 Quad Gates & Flashers	1,727
Dellwood Rd	14.47	Close	4 Quad Gates & Flashers	641
Gibson Park Rd	14.62	Install Gates & Flashers	Close	651
Huntersville-Concord Rd	14.90	Install Gates	4 Quad Gates & Flashers + Road Improvements	5,577
Church St. (N)	15.37	Install Gates & Flashers	Close/Connect to 4th St	288
4th St	15.42	Close/Connect to Church St	4 Quad Gates & Flashers	1,002
Ramah Church Rd	15.59	Install Gates & Flashers	4 Quad Gates & Flashers	3,709
Private (Residential)	15.94	Connect to Stumptown Rd	Same	<200
Stumptown Rd Ext.	16.00	Install Future Crossing	4 Quad Gates & Flashers + New Roadway	<200
Private (Residential)	16.04	Connect to Stumptown Rd	Same	<200
Private (Residential)	16.12	Connect to Stumptown Rd	Same	<200
Private (Residential)	16.19	Connect to Stumptown Rd	Same	<200
Private (Residential)	16.29	Connect to Stumptown Rd	Same	<200
McCord Rd	16.59	Replace Flashers/Add Gates	4 Quad Gates & Flashers	4,984
NC 73/Sam Furr Rd	17.00	Add Gates/Median Separator/ Roadway Improvements	4 Quad Gates & Flashers	16,852
Private (Residential)	17.12	Connect to Sam Furr Rd	Close	<200
Private (Residential)	17.27	Connect to Sam Furr Rd	Close	<200
New Public Crossing	17.50	Install New Crossing/Roadway Improvements	4 Quad Gates & Flashers + Road Improvements	<200
Caldwell Station Rd	17.65	Close/Connect to New Crossing at MP 17.50	Same	<200
Mayes Rd	17.91	Close/Connect to New Crossing	Undercut, 4-Quad Gates and Flashers	1,511
Cornelius				
Private (Residential)	18.22	Connect to Bailey Rd	Close/Connect to Private Road (MP 18.29)	<200
Private (Residential)	18.29	Connect to Bailey Rd	2 Gates & Flashers	<200
Bailey Rd	18.76	Install Gates & Flashers/ Roadway Improvements	Same, 6 Gates & Flashers, Traffic Signal, 4 Q Equiv	1,000
Private (Residential)	18.80	Connect to Bailey Rd	Close/Connect to Private Road (MP 18.83)	<200
Private (Residential)	18.83	Connect to Bailey Rd	Crossbucks & Stop Signs	<200

Table 2.2-8. Grade Crossing Characteristics (continued)

Crossings	MP	TSS Recommendation	Current Recommendation	2005 ADT
Cornelius (continued)				
Private (Residential)	19.01	Connect to Bailey Rd	Close/Connect to Private Road (MP 18.83)	<200
Private (Residential)	19.27	Connect to Zion St	Same	<200
Smith Rd	19.62	Install Gates & Flashers/ Roadway Improvements	Close	1,007
Hickory (Zion S) St	19.84	Close	4 Quad Gates & Flashers	674
Prop Catawba Ave Ext.	19.90	Install New Public Crossing	Same + 4 Quad Gates & Flashers	<200
Zion St (N)	20.03	Replace w/ New Catawba St Crossing	Close	287
Private (Residential)	20.45	Install Cross Bucks/Stop Signs	Same	<200
Davidson				
Catawba Ave	21.15	Install Gates & Flashers	4 Quad Gates & Flashers	3,459
Depot St	21.48	Install Gates & Flashers	4 Quad Gates & Flashers	960
Griffith St	21.61	No Improvements	4 Quad Gates & Flashers	7,900
Delburg St	21.71	Close	Close + Pedestrian Access	<200
Beatty Rd	22.23	Install Gates & Flashers	4 Quad Gates & Flashers + Traffic Signal	2,851
Iredell County				
Private (Industrial Access)	22.56	No Improvements	Crossbucks & Stop Signs	<200
Private (Residential)	23.02	Install Cross Bucks/Stop Sign	Same	<200
Bridges Farm Rd	23.18	Install Gates & Flashers/ Roadway Improvements	4 Quad Gates & Flashers	<200
Private (Farm Access)	23.41	Install Cross Bucks/Stop Sign	Same	<200
Private (Farm Access)	23.78	No Improvements	Crossbucks & Stop Signs	<200
Private (Residential)	24.02	Install Cross Bucks/Stop Sign	Same	<200
Langtree Rd	24.63	Relocate Crossing/Raise NC 115	NCDOT Road Relocation 4 Quad Gates and Flashers + Traffic Signal	3,200
Private/Quality Ln	24.68	Install Cross Bucks/Stop Sign	4 Quad Gates & Flashers	<200
Private/Campus Dr	24.70	Install Stop Signs	4 Quad Gates & Flashers	<200
Fairview Rd	25.07	Install Gates & Flashers/ Roadway Improvements	4 Quad Gates & Flashers	2,817
Crossrail Rd	25.37	Install Gates & Flashers	4 Quad Gates & Flashers	581
Waterlynn Dr	25.70	No Improvements	4 Quad Gates & Flashers	6,182
Private (Residential)	26.02	Connect to Foursquare Rd	Same	<200
Private (Residential)	26.09	Connect to Foursquare Rd	Same	<200
Foursquare Rd	26.31	Install Gates & Flashers	4 Quad Gates & Flashers	338
Private (Farm Access)	26.62	No Improvements	Crossbucks & Stop Signs	<200
Mills Ave	27.62	Close	Same	1,429

Table 2.2-8. Grade Crossing Characteristics (continued)

Crossings	MP	TSS Recommendation	Current Recommendation	2005 ADT
Mooresville				
Doster Ave (Norman)	27.27	Close	Same	4,929
Brawley Ave	27.45	Replace Flashers/Add Gates	Same, 4 Quad Gates & Flashers	4,749
Wilson Ave	27.83	Replace Flashers/Add Gates	TSS Adopted [1] 4 Q Equiv	7,783
Catawba Ave	27.97	Close	Same	1,860
McLelland Ave	28.16	Replace Flashers/Add Gates	TSS Adopted [1] 4 Q Equiv	6,991
Center St	28.26	Replace Flashers/Add Gates	Same, 4 Q Equiv	6,780
Moore Ave	28.37	Replace Flashers/Add Gates	Same, 4 Q Equiv	1,590
Iredell St	28.49	No Improvements	Same	9,078
Oak St	28.75	No Improvements	TSS Adopted [1] 4 Q Equiv	1,631
Walnut St	28.89	Close	Same	126
Patterson St	28.98	Install Gates & Flashers	TSS Adopted [1] 4 Q Equiv	1,127
Statesville Ave	29.20	Replace Flashers/Add Gates	4 Quad Gates & Flashers	8,005
Williams St	29.40	*Not in TSS*	4 Quad Gates & Flashers	1,700

1. TSS recommendation has been adopted with 4 quad gates & flashers constructed at the referenced location.
Source: Metrolina's Travel Demand Model, June 2005; Parsons Brinckerhoff, 2006

All remaining public crossings will be upgraded to include the following:

- Gates: Crossings will be engineered to include either four gates (quad gates) to block traffic in all directions, or two-gates to block the approach lanes. At locations with just two gates a median divider may be added to prevent motorists from going around the gates. The decision to include median barriers will be based on site-specific conditions in both directions.
- Flashers and bells: All public crossings will have flashing lights and bells. Flashing red lights will indicate the approach of a commuter rail train approximately 30 seconds prior to its arrival.
- Traffic lights: Traffic lights will be added or upgraded where required due to lack of adequate distance between the rail crossing and an intersection with a parallel road. At intersections with inadequate car storage queuing, the traffic light sequence will be pre-empted upon the approach of a train to provide a green light to cars on or near the railroad tracks.

Remaining private crossings will be upgraded on an individual basis as appropriate. Improvements may include installation of warning signs, gates and flashes, wayside horns and/or improved crossing surfaces.

The only at-grade crossing currently under consideration for grade separation as part of the NCCR project is Sam Furr Road (NC 73), which crosses the rail line 150 feet away from the intersection with Old Statesville Road (NC 115). Projections for this crossing indicate heavy growth in traffic volumes in the coming years. NCDOT and Huntersville are studying expansion of Sam Furr Road at this location from two lanes to as many as six lanes. A decision regarding grade separation of the rail line will depend in large part on the timing and maturity of plans for the road expansion.

Prior federal and state laws required locomotive engineers to sound the train horn four times (two long blasts followed by one short blast and another long blast) as the train approached a public at-grade crossing. Recently, the FRA modified this requirement to permit municipalities to qualify segments of track as a Quiet Zone. In a Quiet Zone, train engineers no longer are required to sound the train horn. To meet the requirements for a Quiet Zone, crossing protection must be upgraded to specific standards to maximize safety at crossings within the Quiet Zone.

The design of all public crossings on the North Corridor will include the upgrades required to qualify for a Quiet Zone. The decision to seek Quiet Zone status for segments of the route will be determined at a later date, based on possible noise mitigation required as a result of the EA review, the desire of municipalities and the public for such treatment, and approval of NCDOT and the FRA.

2.2.3.7 Rail Equipment

The LPA called for use of conventional commuter rail equipment on the North Corridor. This includes FRA compliant passenger locomotives and coaches. The trailing coach would be a cab control car to permit "push-pull operations." A cab control car includes controls that enable an engineer to operate the train from the last car rather than from the locomotive. In this way, the train operates in one direction with the locomotive in the lead and in the other direction with the cab car in the lead, thereby avoiding the need to turn the train around at the end of each run.

Coaches can be either single level (one level of seating with 70-80 seats) or bi-level (two levels of seating with 125-200 available seats). Bi-level coaches provide both maintenance and labor cost efficiencies, but require a higher vertical clearance along the rail line. Because there are no clearance constraints along the North Corridor that would dictate use of shorter, single coaches, the more efficient bi-level cars are preferred. In addition, the floor height of a bi-level car is 25" above the top of rail, compared to 54" for a single level coach. The lower floor height would enable the construction of significantly less-costly 25"-high passenger platforms at stations to provide level boarding.

High-acceleration DMU technology was considered for the North Corridor during the MIS for alternatives, as it would provide marketable travel times to as many as 17 stations. However, the enhanced acceleration and other performance benefits of DMUs were premised on technology that has yet to be successfully developed in a non-electric power unit. As a result, only existing DMU trains, which generate performance generally equivalent to diesel-powered locomotive hauled trains, will be considered for the proposed build alternatives.

Figure 2.2-20 illustrates a conventional locomotive and bi-level train set.

Figure 2.2-20 Conventional Locomotive

2.2.3.8 Operational Characteristics

Separate operating plans were developed for the two rail alternatives. The alternatives are compared below.

<u>Rail Service</u>

NCCR service would share the NS “O” line with existing freight service, which would operate during night-time hours when commuter trains are not operating. The need to provide sufficient time for freight operations limits the amount of time available each day for commuter trains. NCCR service would operate five days a week from approximately 6:00 a.m. to 7:30 p.m. Schedules could be modified to accommodate special events and weekend activities. As identified in Table 2.2-9, both rail alternatives provide headways of 25-40 minutes during peak hours and 60 minutes during off-peak hours.

The operating plans assume use of trainsets consisting of a locomotive and three coaches throughout the day. The number of such trainsets will depend on the location for the northern terminus. The MOS Alternative to Mount Mourne would require five peak-hour train sets. The LPA Alternative to Cascade/NC 150 would require six peak hour train sets. One less trainset would be required for both alternatives if CATS initiates service with just 22 daily trains.

Table 2.2-9. NCCR Operating Plans

Day of Week	Time Period		Headway (minutes)
Weekday	AM Peak	6:00am – 8:30am	20-30
	Midday	8:30am – 4:15pm	60
	PM Peak	4:00pm – 6:30pm	20-30
	Evening	6:30pm – 7:30pm	60
Weekend	None	NA	NA

Passing sidings will be used at locations where trains heading in opposite directions meet. Trains operating in the primary direction of the rush hour traffic (south in the morning and north in the evening) would be provided priority and allowed to remain on the main line. Trains in the opposite direction would be directed to the passing siding. As a result, trip time for trains taking the sidings will be 5-8 minutes longer than trains operating in the direction of the rush. Table 2.2-10 lists the location of the required sidings.

Table 2.2-10. North Corridor Passing Sidings

No.	Station	S. End Milepost	N. End Milepost
1	Derita Siding	4.2	5.5
2	Hambright Siding	11.6	13.6
3	Caldwell Siding	17.7	18.7
4	Mount Mourne Siding	23.5	24.76

In the MOS (Mount Mourne) alternative, the Mount Mourne siding would terminate as two station tracks. In the LPA alternative, the siding would be extended just north of the Mount Mourne station.

The station dwell time for the trains would depend on the ridership for each station, as well as size and numbers of doors per train. For planning purposes, dwell time was assumed to last 45 seconds.

On the basis of the Train Performance Calculator (TPC) computer simulations, using the passing siding, station location, dwell time, and track data discussed above, NCCR trains would generate trip times as provided in Table 2.2-11. These trip times do not include 5-7% of additional time included in schedules as "pad" to enhance reliability of the schedule.

Fare collection would be on the proof-of-payment or "honor" system, as is increasingly done with commuter and light rail systems throughout the country. Riders would either use a pre-purchased weekly or monthly pass or purchase a ticket at one of the fare vending machines at each station. The conductor, however, would not collect tickets. Instead, railroad personnel would periodically and randomly request to inspect tickets or passes onboard trains to ensure that passengers have paid the appropriate fare.

Table 2.2-11. AM Peak Travel Times

Station	Southbound, Peak Direction Estimated Time to CGS[1] (minutes:seconds)	Northbound, Reverse Peak Direction Estimated Time from CGS[1] (minutes:seconds)
Cascade/NC 150	45:30	51:30
Mooresville	41:00	47:00
Mount Mourne	35:00	41:00
Davidson	30:30	36:30
Cornelius	28:00	34:00
Sam Furr	23:30	29:30
Huntersville	20:00	26:00[2]
Hambright	16:30	16:30
Eastfield	15:00	15:00
Harris/ NC 115	11:30	11:30
Derita	7:00	7:00
Charlotte Gateway	0:00	0:00

1. Includes 45 seconds of dwell time at each station. Dwell time is the time the train is stopped at each station.
2. Estimated additional 6 minutes dwell in passing siding at Hambright for north bound trains.

Intermodal Coordination

As detailed below, regional bus service along the North Corridor will be restructured to enhance access to and from NCCR trains and to ensure that areas not served by the trains would continue to have strong public transportation options. Local, express and shuttle bus services will be scheduled to meet trains in the morning and afternoon peak periods, and to provide service during the remainder of the day.

At the CGS, passengers will be able to transfer to other rapid transit modes, Center City Street Car, Amtrak and Greyhound. The design of the station will focus on providing convenient, easy connections between modes.

CATS is also committed to coordinating its fare structure and transfer policy with the other transit modes to create a seamless transportation system for passengers and encourage the use of public transportation. A seamless transportation system is one in which passengers must use several modes of transportation, but the transfer between them is as smooth, convenient and efficient as possible. Passengers will be able to transfer conveniently from trolley, light-rail, bus, and commuter rail under one fare structure and transfer system.

Security at Stations and on Trains

The safety and security of CATS passengers is of utmost importance and concern and many steps and systems will be implemented system wide to maximize the safety of passengers. While the proposed NCCR security program has not been developed, it is expected to include a variety of features, including:

- Extensive use of transit and local police at stations and aboard trains;

- Security cameras at all stations and, where appropriate, along the right-of-way; and
- Emergency call boxes at stations, along platforms, and along the right-of-way.

In addition, CATS will rely on the latest FTA and FRA analyses and recommendations regarding safety and security at transit and rail stations and facilities. In November 2004, the FTA released a report entitled Transit Security Design Characteristics. The recommendations included in such analyses will be relied on in designing transit stations and systems.

2.2.3.9 Feeder Bus Network

The NCCR system will be supported by an integrated feeder bus network consisting of local, regional, and express services and some station-focused shuttle services, as shown on Table 2.2-12. Table 2.2-13 identifies the routes that are planned to serve each of the NCCR stations along the corridor in 2025. The table also reflects several changes in CATS routes that are scheduled to occur after the NCCR project opens. If the LPA Alternative to Cascade/NC 150 is implemented, minor route changes will be made to capitalize on the additional NCCR stations. Implementation of the bus services will depend on the adequacy of funding.

Table 2.2-12. Bus Service for Build Alternative in North Corridor

Routes	VMT	VHT	Peak Frequency	Midday Frequency	Night Frequency	Type
7 – Beatties Ford	65	1137	30	30	30	Local
13 – Nevin Road	41	476	30	45	45	Local
21 – Double Oak	32	328	15	30	60	Local
22 – Graham Street	*63*	*846*	*30*	*30*	*40*	*Local*
26 – Oaklawn	*40*	*419*	*20*	*30*	*45*	*Local*
53X – Northlake Mall	*23*	*514*	*15*	*0*	*0*	*Express*
77X – North Mecklenburg	*41*	*1079*	*10*	*60*	*60*	*Express*
81 – Wachovia CIC	*13*	*341*	*60*	*60*	*0*	*Local*
83 – Mooresville	*24*	*372*	*25*	*60*	*0*	*Local*
89 – Northlake-UNCC	46	713	30	60	0	Local
92 – Gilead Road	15	263	25	60	0	Local
96 – Davidson	23	390	25	60	60	Local
97 – Cornelius	*28*	*484*	*25*	*60*	*60*	*Local*
98 – McCoy	*45*	*716*	*25*	*60*	*60*	*Local*
99 – Huntersville	*29*	*495*	*25*	*60*	*60*	*Local*
143 – Northlake-Derita	59	877	30	60	60	Local
202 – Washington Lincoln Heights	15	200	30	30	30	Local
250 – Hambright-Gilead	47	861	25	60	60	Local
351 – Harris-Sugar Creek	31	447	30	60	60	Local
451 – Harris-Northlake	19	336	25	60	60	Local
461 – Highland Creek	40	584	30	60	60	Local
462 – Ridge Road	40	697	30	60	60	Local
All Routes	**779**	**12,575**				

Source: Metrolina 2030 Regional Transit Plan
No additions to the bus services included in the TSM Alternative are introduced in the Build Alternative for the North Corridor. Italicized routes are bus services in the TSM network that have been re-routed under the Build Alternative.

Table 2.2-13. 2030 Feeder Bus Service at NCCR Stations

Station	Routes	Terminate at Station
Derita	22 – Graham Street	Through
	81 – Wachovia CIC	Yes
	143 – Northlake-Derita	Through
	351 – Harris-Sugar Creek	Through
Harris/ NC 115	451 –Harris-Northlake	Yes
Eastfield	461 – Highland Creek	Through
Hambright	89 – Northlake-UNCC	Yes
	250 – Hambright-Gilead	Yes
	451 –Harris-Northlake	Yes
	462 – Ridge Road	Through
Huntersville	92 – Gilead Road	Through
	250 – Hambright-Gilead	Yes
Sam Furr	97 – Cornelius	Yes
	98 – McCoy	Yes
	99 – Huntersville	Through
Cornelius	96 – Davidson	Through
	97 – Cornelius	Yes
Davidson	96 – Davidson	Through
Mount Mourne	83 – Mooresville	Yes
Mooresville	83 – Mooresville	Yes
Cascade/ NC 150	No feeder bus routes will serve this station	NA

Regional bus service would be restructured to support NCCR ridership and extend the market reach for commuter rail service. Bus service will be designed to provide both general scheduled service to commuter rail stations, and dynamic service intended to meet trains as they arrive or depart specific stations.

A total of up to 14 feeder bus routes would be used for operation of peak period service along the NCCR system, assuming the adequacy of funding. This bus system effectively connects potential commuter rail riders with a public transportation means for accessing nearby stations, as well as providing commuters with access to key employment centers such as the University Research Park.

The proposed system also enhances public transportation for those too far from the NCCR to use it – primarily those residents living west of I-77. Express bus service is restructured to provide frequent service to downtown Charlotte using the I-77 HOV lanes, as recommended in the LPA selected by the MTC in 2002. Figure 2.2-21a-c depicts the regional bus route system with the NCCR alternatives.

Peak frequency is 25 minutes (intended to match the NCCR schedule frequency) except for selected routes which also serve LRT stations and are scheduled at 15-minute frequency (based on Metrolina 2030 Build Alternative Transit Service table). Off-peak frequency is the more frequent of 60 minutes or the frequency in current public timetables for existing routes.

Routes that are additions to the bus services included in TSM Alternative for the North Corridor and routes that are bus services in the TSM network that have been re-routed under the Build Alternative are described below. All other routes remain the same as described in the TSM Alternative.

Route 22. Graham

This bus operates the same as described in the No-Action and TSM alternatives except that it will also visit the Derita station in the Build Alternatives.

Route 26. Oaklawn
This bus operates the same as described in the No-Action and TSM alternatives except that it will also visit the Charlotte Gateway Center in the Build Alternatives.

Route 53. Northlake Mall Express
This bus operates the same as described in the No-Action Alternative except that it will also visit the Charlotte Gateway Center in the Build Alternatives.

Route 77. North Mecklenburg Express
The inbound express route will run from the Sam Furr Road/I-77 interchange to the CTC and will no longer serve Davidson or Cornelius. The bus will operate at 10-minute frequency during morning peak period, every 20-minute during PM peak period and 60-minute frequency during mid-day and night period. The outbound express route will operate at 20-minute frequency during morning peak period, every 10-minute during PM peak period and 60-minute frequency during mid-day and night period. This bus visits the CTC, Charlotte Gateway Center, Huntersville Gateway PNR-TC, North County Library TC, and Huntersville-Northcross PNR-TC.

Route 81. Wachovia CIC
This route will not serve as an express bus to Charlotte in the Build Alternative. This express route operates at 60-minute frequency during the Peak periods (AM and PM) and mid-day time period and runs between Sugarcreek Road/ Nevin Road intersection and US29 North/ McCullough Drive interchange. The bus operates on Nevin Road extension, Harris Blvd and McCullough Drive. The bus visits the Derita station and University Place PNR-TC.

Route 83. Mooresville
This route will not serve as an express bus to Charlotte in the Build Alternative. The Mooresville bus route will operate at 30-minute frequency during peak periods (AM and PM) and every 60-minute during mid-day period between Mooresville station and Mount Mourne station and will run along NC150, Williamson Road and Fairview Road. This bus will visit the Mooresville and Mount Mourne stations. This route will operate the same in the LPA and MOS Build alternatives, however, the Mooresville station parking site will serve as a PNR only since no train service will be provided.

Route 97. Cornelius
This bus operates the same as described in the No-Action and TSM alternatives except that it will also visit the Sam Furr station in the Build Alternatives.

Route 98. McCoy
This route operates at 30-minute frequency during peak-periods (AM and PM), mid-day, and every 60-minute during night between Fred Alexander Boulevard/WT Harris Boulevard and the Sam Furr station and runs along Kerns, McCoy, NC115, US 21 and Gilead Road. This bus visits the North County Library TC, Huntersville Gateway PNR-TC, and Northlake Mall PNR-TC. The route also serves the Huntersville and Sam Furr stations.

Route 99. Huntersville
This bus operates the same as described in the No-Action and TSM alternatives except that it will also visit the Sam Furr station in the Build Alternatives.

Other Bus Routes
The remaining bus routes that are not part of the feeder bus network in the North Corridor will operate the same as described in the TSM Alternative. Routes that will not change from the TSM Alternative include: Route 7, Route 13, Route 21, Route 26, and Route 89, Route 202.

2.2.3.10 Bus Facility Improvements

The North Corridor alternatives include all of the bus facility improvements of the TSM Alternative (see Section 2.2.2), except for the facilities that would be replaced by rail stations. These stations will include off-street and/or on-street bus access to the platform. In addition, the CGS will include a new CATS bus center, supplementing the current CTC.

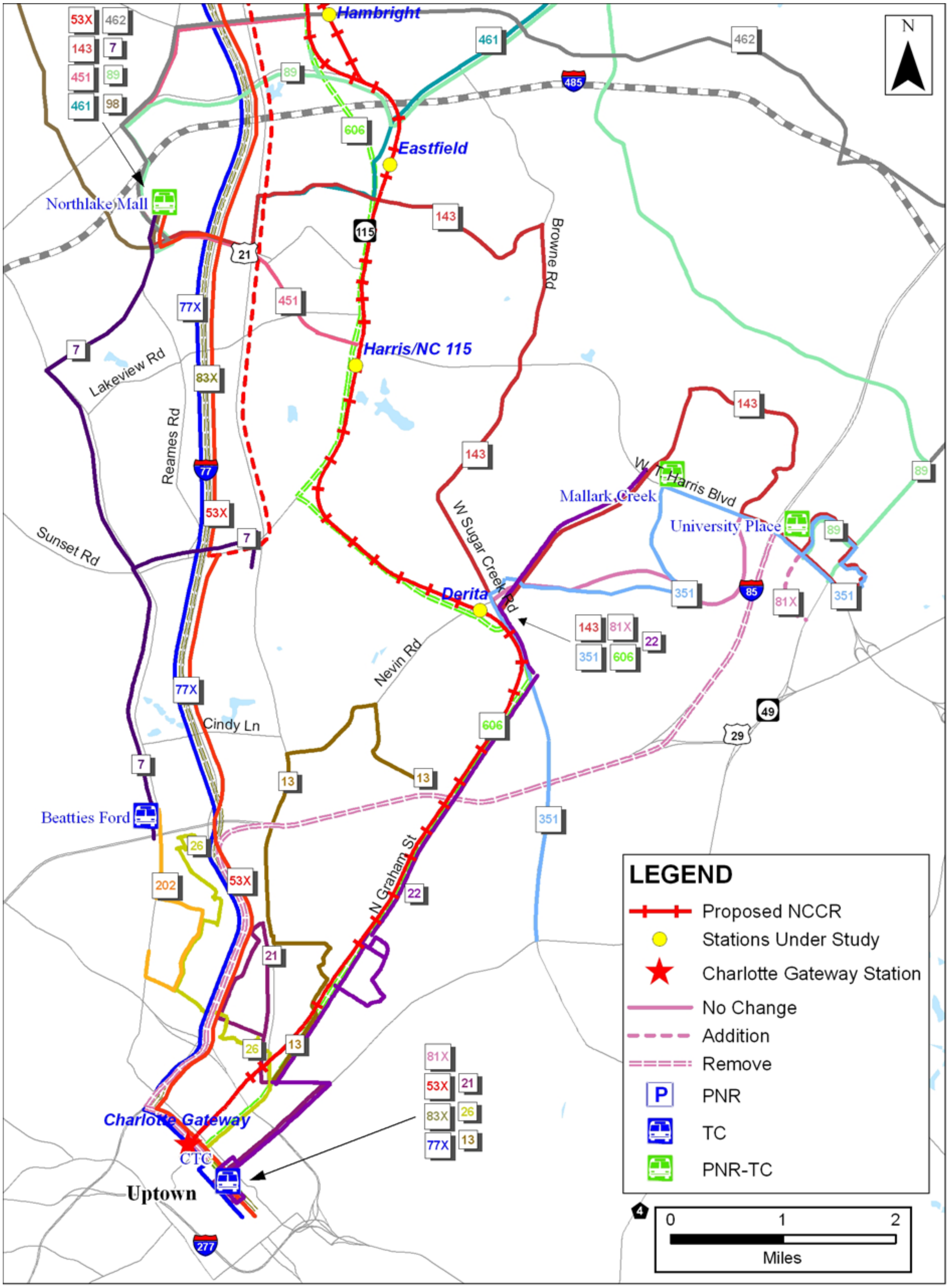


Figure 2.2-21a | Build Alternative

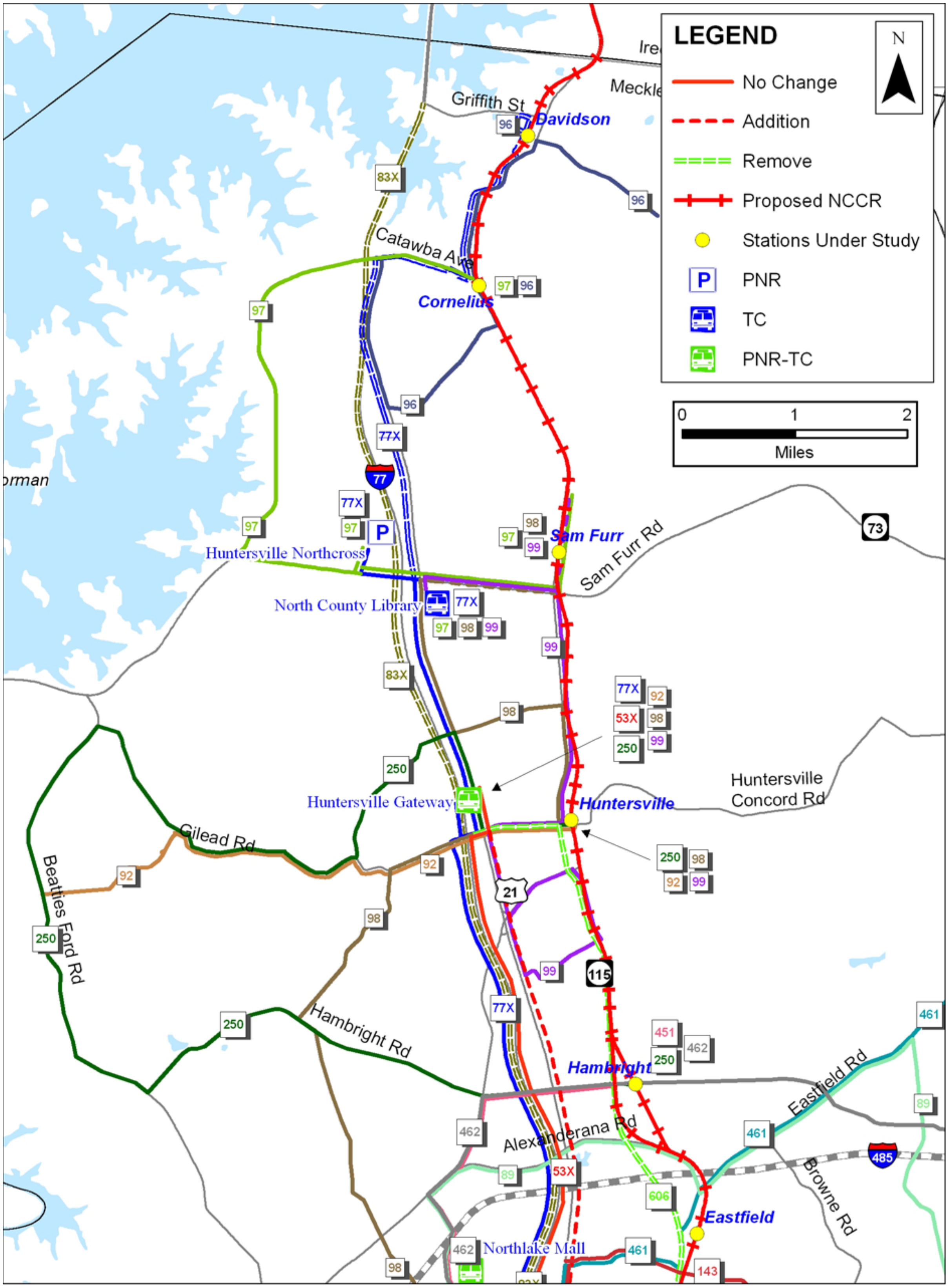


Figure 2.2-21b	Build Alternative

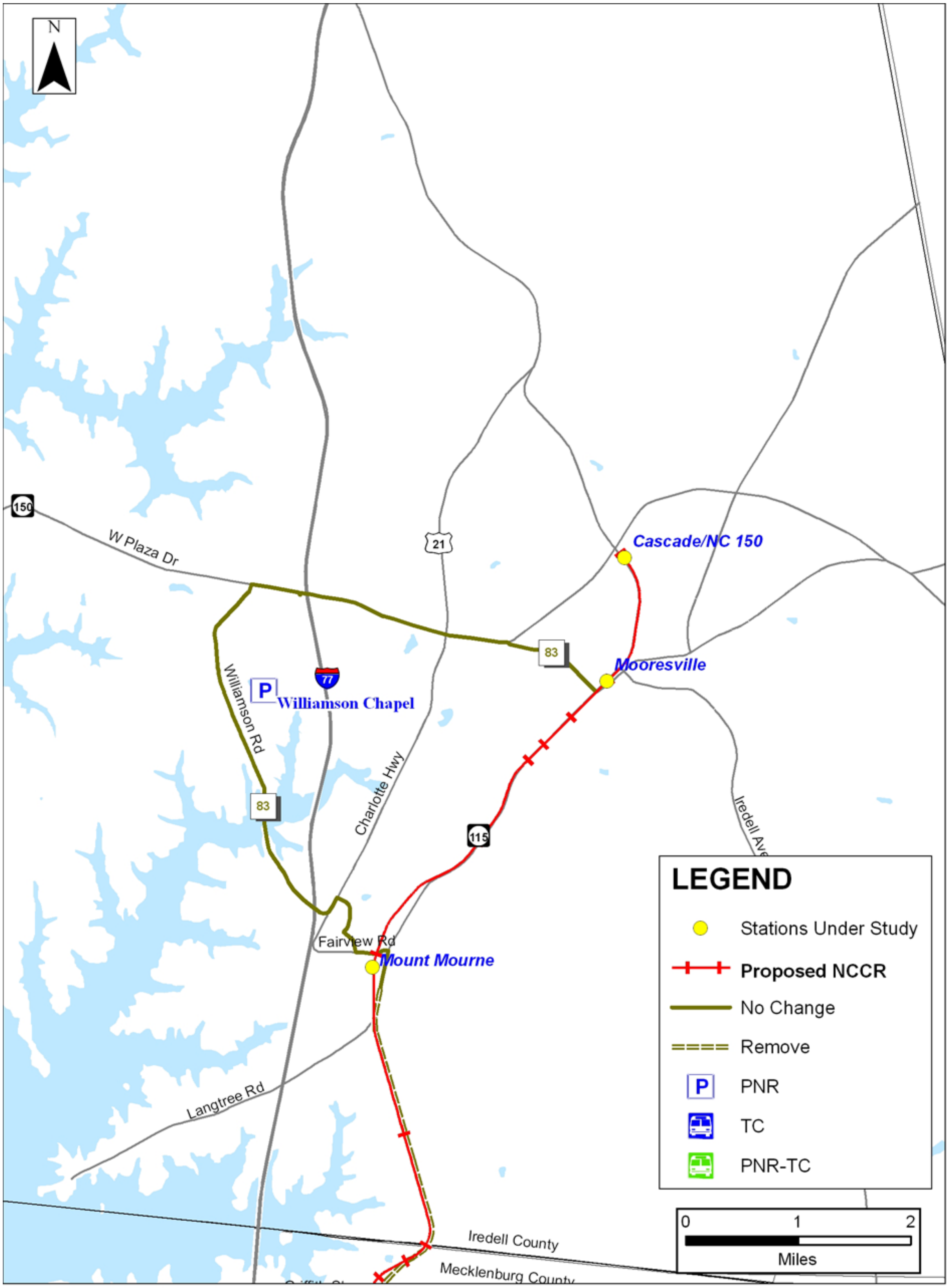


Figure 2.2-21c | Build Alternative

2.3 Cost

This section presents the capital costs and operating and maintenance costs for the No-Action, TSM, and NCCR Alternatives. The methodology used to estimate the capital costs is discussed first, followed by the results of the capital cost estimates.

2.3.1 Capital Costs

The total capital costs (in 2006 dollars) for each alternative evaluated are presented in Table 2.3.1 These estimates do not include the cost for constructing CGS, which is being funded as a separate project in part with federal appropriations through the FTA and is discussed in a separate federal EA.

Specific cost unit items were developed using typical transit and rail construction standards. Quantities of materials were then generated by taking measurements off of the drawings. This work included computer generated cut-and-fill quantities, mapping review of existing utility locations (and the need to move them), quantification of street reconstruction by square yard, etc. Various sources, including experience on other rail projects, were used to develop unit costs for each item defined above. The level of detail in the cost estimating is considered appropriate for a 10 percent conceptual design. Contingencies ranging from 25-40 percent were added to construction costs to take into account uncertainties related to current design unknowns. Environmental impact mitigation was considered when setting the contingencies. Signal costs at crossings include modifications to the existing railroad signal system. Costs, design, and project management were included as a percentage of construction costs. Because the railroad owning the right-of-way, the NS, will be responsible for the majority of track, signal and crossing design work, the design percentage was set at 6 percent and the project management percentage was set at 5 percent, both somewhat below the industry average.

The MOS (Mount Mourne) alternative would be less costly to build than the LPA alternative. The MOS alternative eliminates the need to acquire, build and/or upgrade four miles of track, 14 at-grade crossings, and two stations. In addition, one fewer train set is required for service to Mount Mourne.

Table 2.3-1. Capital Cost Estimates by Alternative (2006 dollars)

Project Components	LPA	MOS
Length (Mile):	29.9	25.1
Number of Stations:	12	10
Number of Revenue Vehicles:	27	23
Guideway & Track Elements	$68	$57
Stations, Stops, Terminals, Intermodal	$18	$15
Support Facilities: Yards, Shops, Admin. Bldgs	$12	$12
Sitework & Special Conditions	$16	$14
Systems	$46	$38
Construction Subtotal	**$160**	**$136**
Row, Land, Existing Improvements	$21	$18
Vehicles	$57	$49
Professional Services	$25	$21
Unallocated Contingency	$24	$20
Total Estimated Capital Cost	**$286**	**$243**

2.3.2 Operating and Maintenance Costs

Annual operating and maintenance (O&M) cost estimates were prepared for each alternative based on the NCCR operating plans and cost models. The costs are expressed in 2006 dollars and include labor and materials relating to track, train and station operations and maintenance, dispatching and VMF operation. Annual NCCR costs associated with the MOS option total $9.5 million. Annual NCCR costs associated with the LPA option total $10.4 million.

2.4 Fare Policy

2.4.1 Fare Structure

Table 2.3-1 depicts the existing bus fares for different categories of users. CATS also offers multiple-ride ticket books and monthly passes at a discounted cost. Transfers are free between the same services (i.e., local to local) with an extra charge for transferring from a local or community shuttle to a premium route (Express or Express Plus).

Table 2.3-1. 2007 CATS Fare Structure

Passenger Category	Local	Express	Express Plus	Community Shuttle
Adult	$1.30	$1.75	$2.60	$0.60
Senior Citizens & Disabled	$0.65	$0.85	$1.30	$0.60
Children (46 inches and under)	Free	Free	Free	Free
Students	$0.65	$1.75	$2.60	$0.60

Currently a structured policy for fares on the commuter rail component of CATS' rapid transit network has not been formally adopted by the governing body, the MTC. CATS management has suggested commuter rail service would be priced similar to express bus or express plus bus service. In the development of the Metrolina travel demand model commuter rail fares assumed the express plus fare structure. There have been no rate or fare studies to date comparing a zonal fare structure vs. a single fare system. The nine mile South Corridor light rail system, opened in 2007, has adopted a rate structure which will mimic the local bus fare.

2.4.2 Collection System

A ticket vending machine (TVM) will be provided at each station with passes good across the CATS system based on fare and potential additional fare for higher priced routes. Transaction detail accounting and collection of receipts would be controlled through a centralized location where funds would be validated against a computerized system linked to the TVM network.

2.4.3 Enforcement

Enforcement along the South Corridor light rail system is currently based on an honor system. This is essentially, proof of payment without validators. While not formally endorsed by CATS or adopted as policy by the MTC it is likely that a similar procedure will be implemented for the NCCR.

2.4.4 Fare Box Recovery Ratio

The fare box recovery ratio measures the capacity of the fare to recover the operating expenses of the system. MTC policy sets a fare box recovery ratio target of 15% or greater.

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

3.0 AFFECTED ENVIRONMENT AND CONSEQUENCES

3.1 Population, Employment, Land Use, and Government Finance

This section presents the current and forecast population and employment figures for the North Corridor study area, areas within 1/2 mile of proposed North Corridor Commuter Rail (NCCR) line, and areas within 1/4 and 1/2 mile of proposed NCCR stations. The population concentrations of various social groups, including low-income households, ethnic and cultural minorities, elderly, and the transit dependent in the project area, are also discussed.

Existing land uses within 300 feet of the NCCR line are presented. Comprehensive plans for the municipalities and counties that the project enters also are presented. Specific site and small area planning in areas near proposed NCCR stations are discussed. There is a discussion of farmlands in the study area as well as a discussion of recent tax revenues and rates in jurisdictions that the NCCR enters.

3.1.1 Legal and Regulatory Framework

This section addresses the provisions of the National Environmental Policy Act (NEPA) in accordance with federal environmental law, US Department of Transportation (USDOT) technical guidance related to environmental documentation and specific regulations related to general environmental conditions as well as specific resource protection and preservation measures. In certain cases, state environmental codes are addressed. The following laws, regulations, executive orders and related policy guidance direct much of the foregoing documentation:

- National Environmental Policy Act (NEPA), 1969
- Uniform Relocation Assistance and Real Property Acquisition Policies Act, 1970
- Council on Environmental Quality (CEQ) Regulations for Implementing NEPA (40 Code of Federal Regulations [CFR] 1500-1508),
- Federal Highway Administration's (FHWA) Environmental Impact and Related Procedures (23 CFR 771)
- 23 United States Code (U.S.C.) 109(h) and 23 U.S.C. 138 (Section 4(f) of the DOT Act)
- The reporting requirements of 23 U.S.C. 128

3.1.2 Methodology

3.1.2.1 Population

Census 2000 data were acquired for jurisdictions in the study area. The future population projections are based on the traffic analysis zone (TAZ) data from the Mecklenburg Union Metropolitan Planning Organization (MUMPO).

3.1.2.2 Employment

Data from MUMPO were acquired to determine employment statistics. The future employment projections are based on the TAZ data.

3.1.2.3 Land Use

Land use information was compiled from digital data from the Charlotte-Mecklenburg County Department of Planning, Iredell County Department of Planning, Town of Mooresville Department of Planning, interviews with members of various local government agencies, comprehensive plans, small area plans, internet web sites of local governments (including on-line geographic information systems), and various internet web searches. Existing land use determinations were made from geographic information system (GIS) analysis of tax assessors' data for each parcel within the study area. Data analysis included a review of existing zoning and building type for each parcel within the study area. For parcels with multiple building types, data was generalized through analysis of aerial imagery and limited site visits.

3.1.3 Existing Conditions and Resources

3.1.3.1 Population

Population is presented at the regional level, near NCCR stations, and by social groups, including low-income households, ethnic and cultural minorities, elderly, and the transit dependent in the project area.

<u>Regional</u>

As part of Charlotte-Mecklenburg region, the communities in the study area have experienced intense growth over the last three decades. In 2000, there were 68,214 people living within one mile of the NCCR line (see Table 3.1-1). By 2030, that number is expected to grow by 139 percent. A substantial portion of the study area's growth over the next two decades is likely to occur along the project corridor. The areas along the NCCR project in Huntersville and Cornelius are expected to grow by 200 to 300 percent. The Charlotte and South Iredell areas within one mile of the NCCR are expected to grow by more than 120 percent, while the Davidson area is anticipated to grow by nearly 90 percent within one mile of the NCCR.Table 3.1-2 presents growth for Charlotte, Huntersville, Cornelius, Davidson, Mooresville, and Mecklenburg and Iredell counties since 1980. Projections for the Charlotte-Mecklenburg region show that this growth will likely continue well into the century. Mecklenburg and Iredell counties are both anticipated to experience increases in growth by approximately 80 percent between 2000 and 2030.

Table 3.1-1. Current and Forecast Population within One Mile of the NCCR

Jurisdiction	2000	2010	2020	2030	Forecast Percent Growth 2000 - 2030
Charlotte[1]	36,899	52,439	67,475	82,340	123%
Huntersville[1]	9,294	15,986	23,851	30,811	232%
Cornelius[1]	3,817	6,875	11,008	14,749	286%
Davidson[1]	4,335	5,600	6,838	8,087	87%
South Iredell County[2]	13,869	17,795	22,015	27,360	97%
Entire Corridor	**68,214**	**98,695**	**131,187**	**163,347**	**139%**

Source: US Bureau of the Census: 2000 Census; MUMPO, TAZ Data, November 2004.

Note: TAZ data was distributed to the census block level prior to calculation. If any portion of a block was found to be within the specified distance, the share of population within that portion (assuming an even distribution within the block) was included. This can result in a slight over or under estimation of population.

1 Based on Charlotte-Mecklenburg Planning Commission definition of sphere of influence, which includes portions of Mecklenburg County outside the corporate limits.

2 Includes the Town of Mooresville.

Table 3.1-2. Regional Population Trends and Projections

Jurisdiction	1980	1990	2000	2010	2020	2030	'80 – '00 Percent Change	'00 – '30 Percent Change
Charlotte	314,447	395,934	540,828	612,510	689,830	759,536	72%	40%
Huntersville	1,294	3,014	24,960	39,757	57,778	73,106	1,829%	193%
Cornelius	1,460	2,581	11,969	15,000	18,562	21,575	720%	80%
Davidson	3,241	4,046	7,139	9,192	11,373	13,455	120%	88%
Mooresville	8,575	9,317	18,823	23,023	27,834	33,649	120%	79%
Mecklenburg County	404,270	511,433	695,454	867,451	1,059,519	1,227,928	72%	77%
Iredell County	82,538	92,931	122,660	155,695	189,625	225,452	49%	84%
Study Area	---	---	159,912	232,909	313,718	391,452	---	145%
Proximity to NCCR	---	---	68,214	98,695	131,187	163,347	---	139%

Sources: US Bureau of the Census: 1980, 1990, 2000; North Carolina State Data Center: Iredell County 2010, 2020, 2030; MUMPO, TAZ Data, November 2004: Mecklenburg County 2010, 2020, 2030; MUMPO, TAZ Data, November 2004: Study Area and Project Area 2000, 2010, 2020, 2030; Parsons Brinckerhoff GIS analysis using MUMPO, TAZ Data, November 2004: Local Jurisdiction 2010, 2020, 2030.

Population Near NCCR Station Alternatives

Within walking distance of many of the NCCR station alternatives, the population is expected to grow substantially, as indicated in Table 3.1-3. Between 2000 and 2030, the population within 1/4 mile for eight of the 12 station sites is anticipated to increase by more than 100 percent. Seven of those sites are likely to increase the population within 1/2 mile by more than 100 percent.

Six proposed station sites will have more than 500 people within 1/4 mile by 2030. Five of these site alternatives will have more than 1,000 people. The population in the area within

1/4 mile of the Charlotte Gateway Station (CGS) is expected to be more than 3,000 by 2030. Most station sites have mixed-use development plans that include a major residential component. All but two of the proposed sites will have over 1,000 people within 1/2 mile of the station sites by 2030.

Table 3.1-3. Population Distribution Around Proposed Stations

Station	1/4 Mile				1/2 Mile			
	2000*	2010*	2030*	% Growth 2000 - 2030	2000*	2010*	2030*	% Growth 2000 - 2030
Charlotte Gateway	398	1,456	3,387	751%	2,368	6,629	13,565	473%
Derita	433	623	958	121%	1,687	2,156	2,939	74%
Harris/ NC 115	161	217	315	96%	591	717	928	57%
Eastfield	46	100	185	302%	161	346	630	291%
Hambright	11	237	1,725	15582%	45	892	3,920	8611%
Huntersville	306	371	2,045	568%	1,165	1,561	3,917	236%
Sam Furr	120	214	409	241%	505	923	2,046	305%
Cornelius	177	256	1,563	783%	981	1,278	3,071	213%
Davidson	936	1,133	1,649	76%	2,658	3,273	4,668	76%
Mount Mourne	31	77	263	748%	203	472	1,369	574%
Mooresville	202	217	244	21%	1,428	1,534	1,742	22%
Cascade/ NC 150	310	335	405	31%	1,291	1,398	1,697	31%

Source: MUMPO, TAZ Data, November 2004.

Note: TAZ data was distributed to the census block level prior to calculation. If any portion of a block was found to be within the specified distance, the share of population within that portion (assuming an even distribution within the block) was included. This can result in a slight over or under estimation of population.

<u>Social Groups</u>

Social groups include: low-income households, ethnic and cultural minorities (referred to as minorities elsewhere in the document), elderly, and the transit dependent. Low-income and minority areas near the project are discussed in Sections 3.15 (Environmental Justice).

The elderly are defined as those persons age 65 and over. The transit dependent are defined as those who are dependent upon transit for making trips because they either do not have an available automobile or they do not drive.

Figure 3.1-1 shows concentrations of elderly within the study area. The areas showing the highest concentrations of elderly are those near Center City Charlotte (area within the I-277 loop) and in the Town of Mooresville. There are also concentrations of elderly in the area between the proposed Hambright and Huntersville stations. All areas with concentrations of elderly within the study area are in close proximity to at least one proposed station.

Figure 3.1-2 shows concentrations of transit dependent population within the study area. The greatest concentration of transit dependent populations is found in and around Center City Charlotte. Areas that have large concentrations of transit dependent populations in the study area are generally found in close proximity to the proposed NCCR rail line. In addition to Center City Charlotte, the primary locations of transit dependent populations are Derita and the town centers of Davidson and Mooresville. The Town of Davidson shows a higher percentage of transit dependent population compared to the other northern communities due to the large student body on campus at Davidson College.

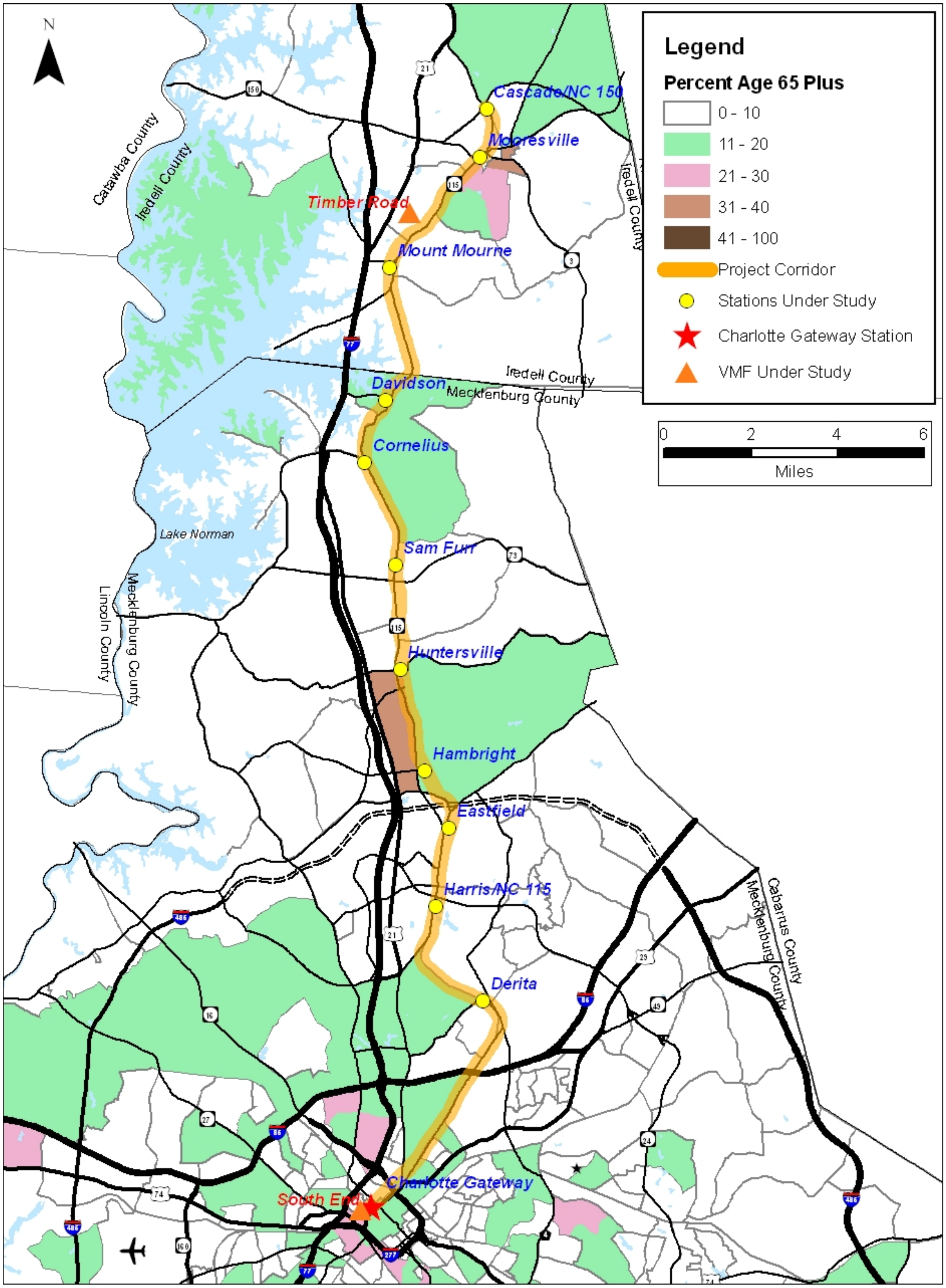


Figure 3.1-1	Percent Population Age 65 and Over

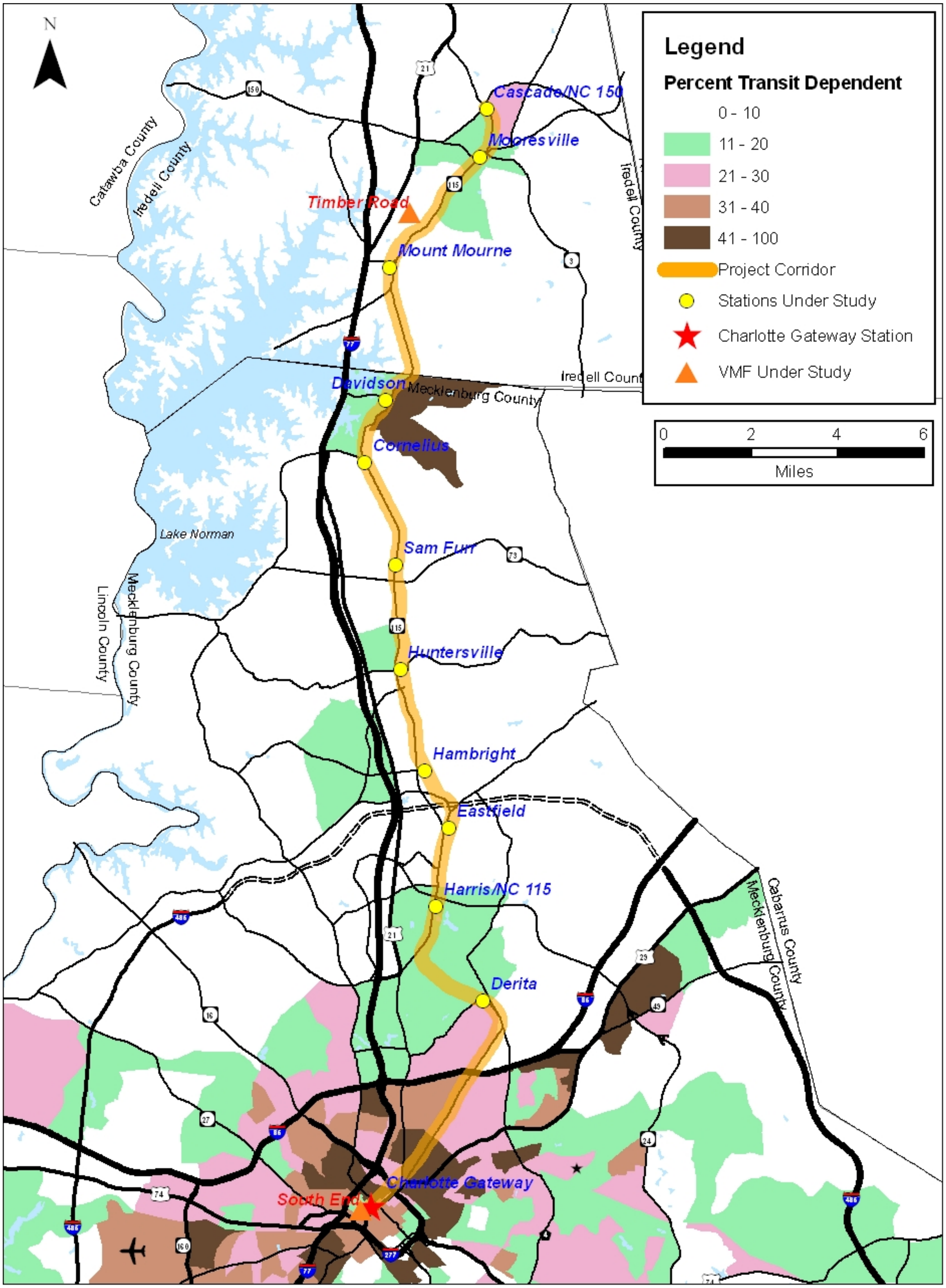


Figure 3.1-2 Percent Population Transit Dependent

3.1.3.2 Employment

Based on census data, there were more than 109,000 jobs within one mile of the NCCR in 2000 (Table 3.1-4). Eighty-five percent of that employment was in Charlotte. The share of employment, for the remaining jurisdictions, range from three to five percent. Each municipality is expected to continue to see increased employment through 2030 in the study area.

Employment within one mile of the NCCR is expected to reach more than 131,000 by 2010 and over 212,000 by 2030. The proportion of the employment near the NCCR will shift between the municipalities. By 2030, Charlotte's share of the employment near the NCCR will be reduced to 75 percent, while Huntersville and South Iredell County will rise to 7 and 14 percent respectively. The employment levels in Huntersville and Cornelius will increase by more than 200 percent in each municipality. Employment in South Iredell County is expected to grow by 350 percent.

Table 3.1-4. Current and Forecast Employment within One Mile of the NCCR

Jurisdiction	2000	2010	2020	2030	Forecast Percent Growth 2000 - 2030
Charlotte[1]	92,880	105,278	129,715	158,828	71%
Huntersville[1]	4,380	5,499	10,371	14,308	227%
Cornelius[1]	2,751	3,461	6,868	8,548	211%
Davidson[1]	3,618	3,888	4,698	5,061	40%
South Iredell County[2]	5,589	13,114	21,379	25,266	352%
Entire Corridor	**109,218**	**131,240**	**173,031**	**212,011**	**94%**

Source: MUMPO, TAZ Data, November 2004.

Note: If any portion of a TAZ was found to be within one mile of the corridor, the share of population within that portion (assuming an even distribution within the zone) was included. This can result in an over or under estimation of population.

1 Based on Charlotte-Mecklenburg Planning Commission definition of sphere of influence, which includes portions of Mecklenburg County outside the corporate limits.

2 Includes the Town of Mooresville.

The employment distribution around the proposed stations is shown in Table 3.1-5. In 2030, eight of the 12 proposed station sites are projected to have employment of more than 500 within 1/4 mile. Two of those sites (CGS and Mount Mourne) are projected to have over 1,000 employees within 1/4 mile. All proposed station sites are projected to have 1,000 or more employees within 1/2 mile by 2030. All sites are projected to have employment increase between 2000 and 2030. Eight of these sites are projected to increase by more than 100 percent.

The station that will serve the most employment is the CGS in Center City Charlotte. In 2000, the employment within 1/2 mile of the CGS was nearly 23,000. By 2030, this figure will reach nearly 37,000. While there is notable employment growth projected to occur throughout the North Corridor, Center City Charlotte will continue to be the regional hub for employment activities.

Table 3.1-5. Employment Distribution Around Proposed Stations

Station	1/4 Mile				1/2 Mile			
	2000*	2010*	2030*	% Growth 2000 - 2030	2000*	2010*	2030*	% Growth 2000 - 2030
Charlotte Gateway	2,393	2,676	5,301	121.5%	22,862	25,110	36,973	61.7%
Derita	219	482	907	314.2%	449	773	1,398	211.4%
Harris/ NC 115	389	469	761	95.6%	1,527	1,807	2,797	83.2%
Eastfield	145	156	265	82.8%	493	541	997	102.2%
Hambright	0	13	796	NA	160	211	1,985	1,140.6%
Huntersville	211	227	875	314.7%	608	673	2,451	303.1%
Sam Furr	83	112	238	186.7%	312	420	1,099	252.2%
Cornelius	119	141	584	390.8%	451	542	2,109	367.6%
North Davidson	269	284	354	31.6%	1364	1,435	1,756	28.7%
Mount Mourne	36	490	1,156	3,111.1%	134	1,718	4,045	2,918.7%
Mooresville	337	475	611	81.3%	1,040	1,516	2,004	92.7%
Cascade/ NC 150	163	245	388	138.0%	694	1,041	1,649	137.6%

Source: MUMPO, TAZ Data, November 2004.
Note: If any portion of a TAZ was found to be within the specified radial distance, the share of employment within that portion (assuming an even distribution within the zone) was included. This can result in an over or under estimation of employment.

Employment distribution by industry is shown in Table 3.1-6. In 2000, MUMPO estimated there were about 146,000 jobs in the North Corridor. The study area is projected to experience an enormous amount of growth in employment with an increase of 118 percent by year 2030 to more than 172,000 jobs. The service sector is expected to have the largest growth, around 169 percent, and the employment breakdown is expected to shift to predominantly service employment by 2030.

Table 3.1-6. Current and Projected Employment by Sector in the North Corridor

Employment*	2000	2030	Increase	% Change
Manufacturing/Industrial	48,500	83,800	35,300	73%
Retail	16,600	38,000	21,400	129%
Service	40,900	109,900	69,000	169%
Office/Government	14,500	31,800	17,300	119%
Banking	18,000	41,000	23,000	128%
School	7,500	14,400	6,900	92%
Total Employment	**146,000**	**318,900**	**172,900**	**118%**
Employment Density (per sq mi)	**601**	**1,312**	**711**	

Source: MUMPO
*All data rounded off to nearest increment of 1000.

3.1.3.3 Existing Land Use

Existing land uses within one mile of the NCCR corridor are shown on Figure 3.1-3a-c. Acreages of each land use is listed in Table 3.1-7. The corridor includes a diverse array of land uses, building mass and densities. Building heights in Center City Charlotte vary from a few stories to the sixty-story Bank of America Corporate Center. Moving north, the corridor exhibits mostly residential and commercial uses. Inner-ring suburban areas, such as Derita and Eastfield, have mostly single-family residences.

The towns of Cornelius and Huntersville have the majority of its developed land located along the three north-south road thoroughfares: Old Statesville Road (NC 115), Statesville Road (US 21) and I-77. All three thoroughfares run parallel to each other and are approximately a mile apart. East of these thoroughfares, land use becomes increasingly rural.

Davidson is smaller in area than Huntersville and Cornelius. Land use in Davidson is indicative of a small college town: institutional, enough commercial to support the institution, and residential. Within the NCCR corridor, light industrial uses are evident just north of Davidson north of Beatty Street.

South Iredell County, which includes the Mount Mourne community and the Town of Mooresville, is undergoing rapid change. Within the NCCR corridor, southern Iredell County is developing into a suburb of Charlotte. The Mount Mourne area is the new location for Lowe's Home Improvement headquarters and for the Lake Norman Regional Medical Center. Mooresville, known as "Race City USA" is home to 50 NASCAR race teams, the NASCAR Technical Institute, and scores of NASCAR suppliers, vendors, machine shops, and technical support facilities. Due to this growth, southern Iredell County's formerly rural landscape has converted or is under conversion to industrial, commercial (office and retail), and residential uses.

Land uses (see Figure 3.1-3a-c) were categorized as follows:

- Residential: single and multi -family residential
- Commercial: includes "business" and "central business" districts
- Industrial: includes industrial and manufacturing districts.
- Institutional: includes government services, hospitals, elder-care facilities, places of worship, and schools.
- Mixed-use: includes areas designated in zoning codes as "mixed-use" or for areas known to have more than one land use.
- Office: includes "offices" and corporate locations.
- Rural-agricultural: includes rural, agricultural, or rural–residential areas. Such areas are usually farmlands or forested lands that have a provision to be developed as low-density (less than five dwelling units per acre) residential areas. This category only exists in Iredell County.
- Utility: land dedicated for utility purposes, including overhead power transmission lines.
- Vacant land: includes undeveloped or vacant land. Areas with no parcel or zoning data associated with them are considered vacant. Areas having insufficient information to place into any other categories described previously would also be considered vacant.

Land use data (and analysis of land use data) is derived from jurisdictional zoning codes and guidelines for Charlotte/Mecklenburg/Iredell and each of the four towns within the study area. Zoning categories were consolidated into the previous categories for consistency. As zoning data is not necessarily an accurate representation of land use, zoning was verified by comparing parcel data to aerial photographs. Acreages of land used in the following sections (including Table 3.1-7) only refer to the acreage of land within 300 feet of the rail line, not within the entire jurisdiction.

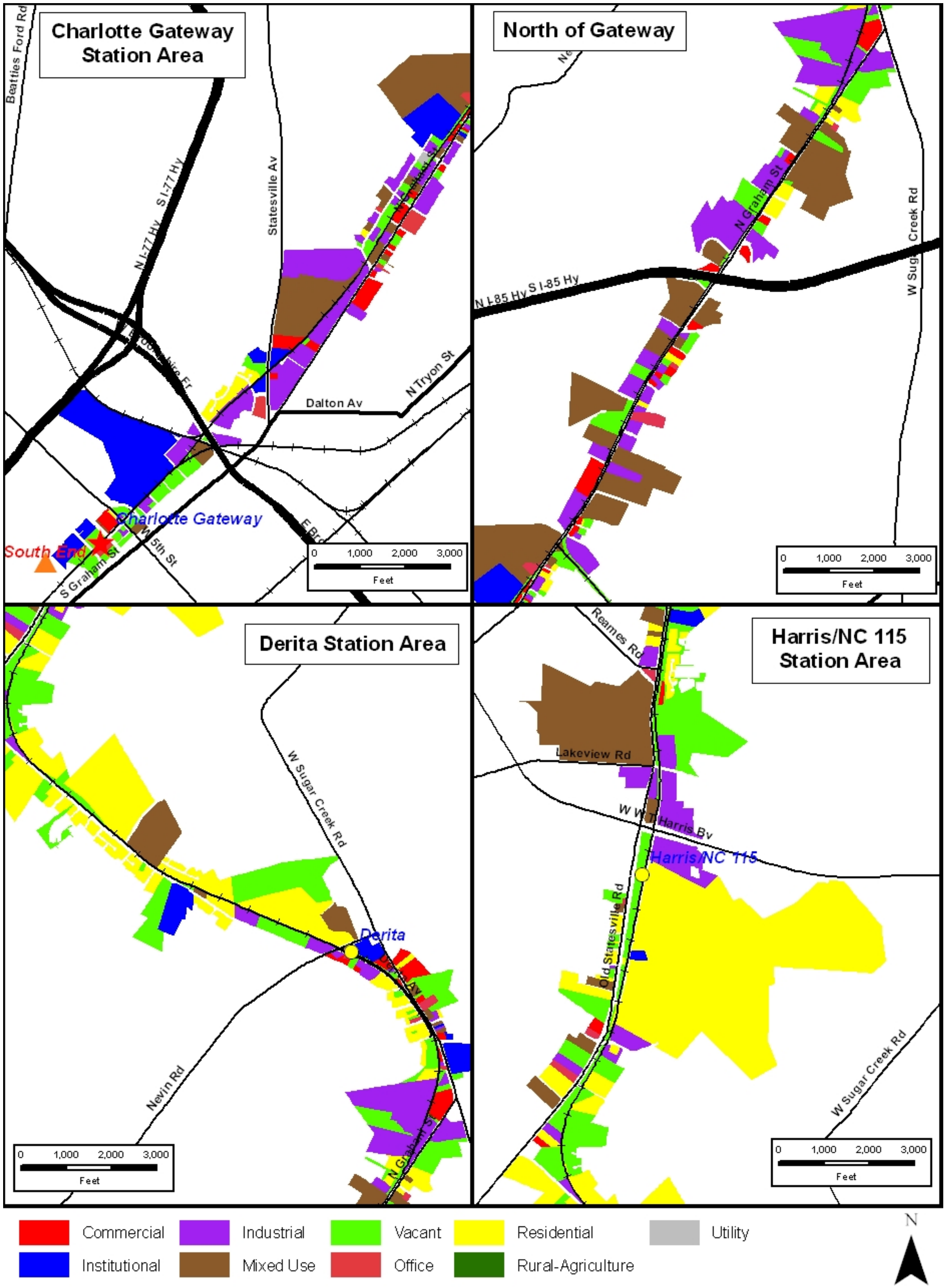


Figure 3.1-3a General Land Use

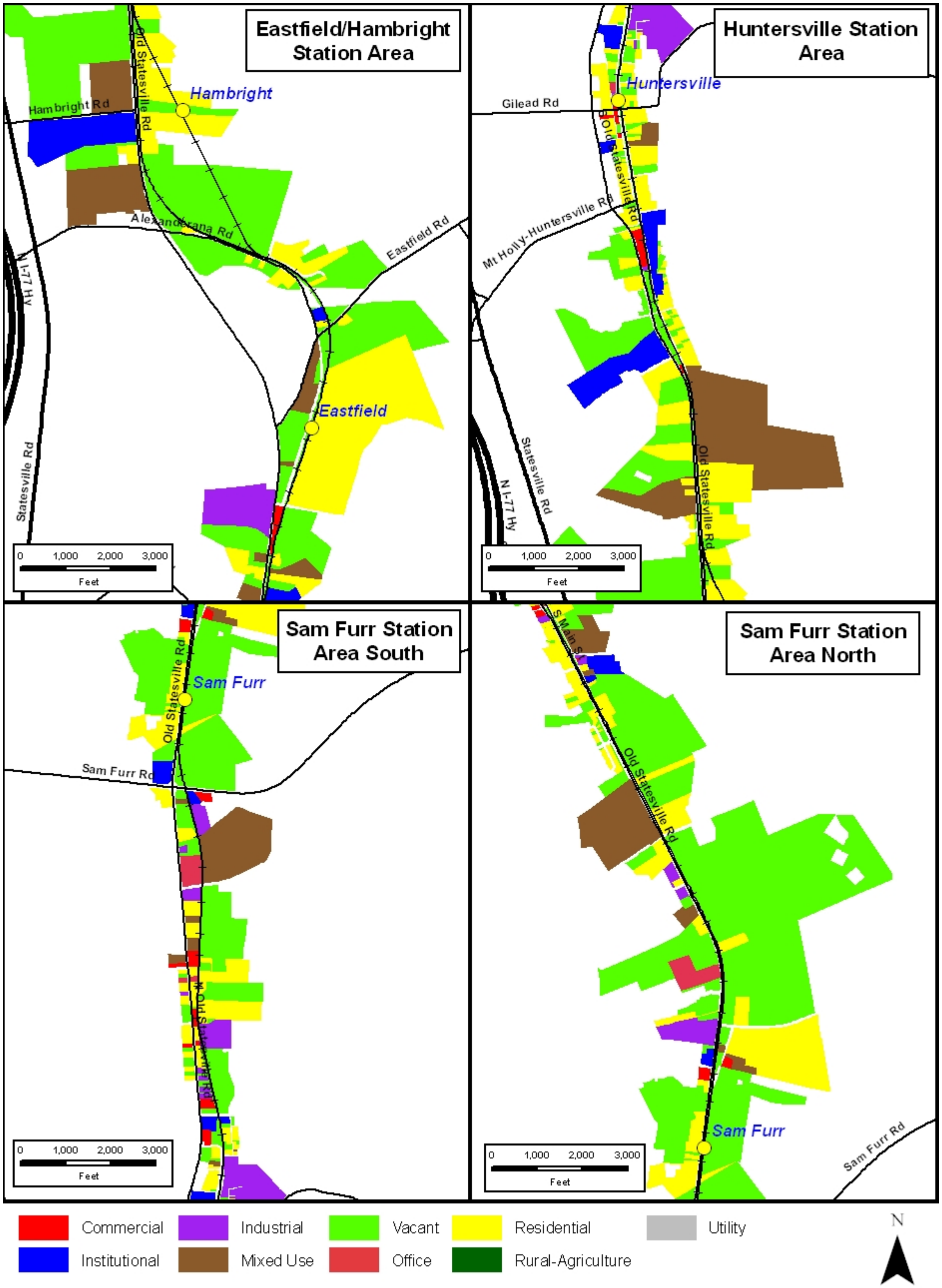


Figure 3.1-3b	General Land Use

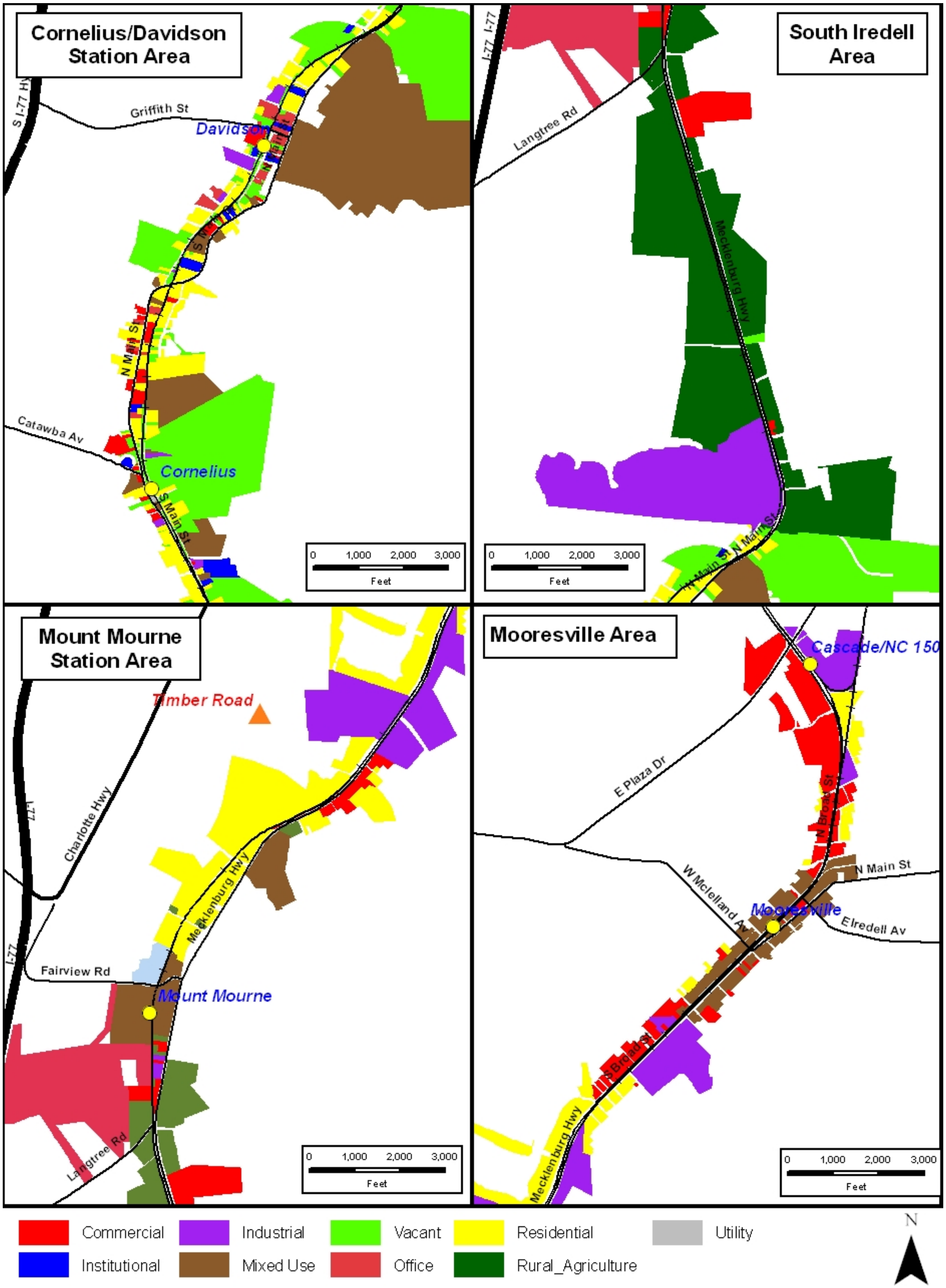


Figure 3-.1-3c General Land Use

Table 3.1-7. Land Use Acreage by Jurisdiction

Land Use	Charlotte	Mecklenburg County	Huntersville	Cornelius	Davidson	Iredell County	Mooresville
Residential	628.81	257.83	287.09	69.5	55.94	157.56	95.03
Commercial	62.86	0	17	15.53	7.02	36.51	120.97
Industrial	319.28	45.78	51.49	6.64	186.29	61.91	125.99
Institutional	144.88	3.71	100.72	7.84	0	0	0
Mixed-Use	424.33	61.09	278.74	51.48	258.22	42.53	86.86
Office	24.14	11.32	9.02	3.14	13.63		139.56
Rural-Ag	0	0	0	0	0.39	435.03	2.43
Utility	1.27	0	0	0.79	0	0	0
Vacant	363.69	758.43	533.75	258.84	0	0	0
Totals	**1969.26**	**1138.16**	**1277.81**	**413.76**	**521.49**	**733.54**	**570.84**

Source: Mecklenburg and Iredell County 2005 GIS; Parsons Brinckerhoff

3.1.3.4 Comprehensive Plans, Land Use and Transit Oriented Development

Comprehensive plans for each of the municipalities and counties that would be affected by the NCCR are discussed in this section. The status of station area and vehicle maintenance area planning efforts is presented as well.

<u>Charlotte: Center City Charlotte</u>

The *Center City 2010 Master Plan (2000)* describes the current state of Center City Charlotte as well as the City's vision and implementation strategy. The *Master Plan* opens with a common planning analysis known as SWOT, stating the area's strengths, weaknesses ("challenges" as used in the *Master Plan*), opportunities, and threats. Results of this analysis are as follows:

– Strengths: Downtown corporate presence and involvement; reemerging residential communities; community interest in promoting Center City Charlotte; the area's regional focus.

– Challenges: Lack of financing opportunities to spur development; tendency to use suburban patters for urban development; need for "workforce" housing downtown.

– Opportunities: Strong commercial and residential markets; public investments in Center City Charlotte (transit, parks).

– Threats: Proposed additional CSX and Norfolk Southern (NS) rail lines and trains; common goals for large-scale development.

As stated in the *Master Plan,* the goal is to "create a livable and memorable Center City Charlotte of distinct neighborhoods connected by unique infrastructure". The City envisions a downtown with a mix of land uses and buildings of varying height and architecture. The *Master Plan* encourages neighborhood districts with pedestrian-oriented services, destination retail, and basic retail (e.g. grocery and drug stores). An academic presence and historic areas would are also be highlighted. An expanded park system is proposed. The system would include linear parks, parks built along side new development, tree-lined "green streets," and a large regional park. Transit, streets, and parking are incorporated into the *Master Plan*, mentioning the need to reduce dependence on the automobile and to create pedestrian-friendly streets.

Guidelines for areas immediately surrounding (within ½ mile) transit stations are presented in "Transit Station Area Principles" (2001), a supplement to the *Master Plan.* This document outlines specific land use procedures, way to encourage multi-modal transit connections, and community design.

The City of Charlotte has adopted a comprehensive Transit Oriented Development (TOD) zoning district and a Transit Supportive (TS) overlay district. The purpose of this zoning district is to create a compact and high intensity mix of residential, office, retail, institutional, and civic uses in areas with high potential for enhanced transit and pedestrian activity. The development standards require attractive streetscapes, a functional mix of complementary uses, and the provision of facilities that support transit use, bicycling, and walking. These zoning districts are meant to create high density transit supportive development around transit stations, typically the area within one-half (1/2) mile walking distance from the transit station, which represents a 10-minute walk.

Charlotte: Northern Charlotte

The Charlotte-Mecklenburg County *2015 Plan* outlines the goals for seven issues: Land Use and Design, Neighborhoods, Parks, Recreation, and Open Space; Transportation, Regionalism, Education, and Economic Development. A summary of the goals follows.

Neighborhoods within Charlotte are directed to be pedestrian-oriented. Infill development is encouraged. Housing throughout Mecklenburg County is to be balanced and to have quality design. Charlotte's *Plan* calls for reinvestment into its 900-plus neighborhoods with public and private resources.

The Land Use, Transportation, and to a certain extent Neighborhoods sections are interconnected. Land use is encouraged to support the growth of an urban core and the transit line connecting that core to the suburban areas. Neighborhoods should be compatible with pedestrian, bike, and transit uses. Although transit is the first of goals within the Transportation category, the emphasis is on improving the bus system with other transit modes briefly mentioned. Roads, bicycling, pedestrian, and aviation modes are also mentioned. One objective of the 2015 plan is to "protect and acquire existing rail corridors as they become available for future fixed guideway transit and complete a major investment study for transitways in Charlotte-Mecklenburg, including consideration of busways, light rail, and high occupancy vehicle (HOV) lanes."

Huntersville

The Town of Huntersville is divided by I-77 and the NS railway). The densest development is located between I-77 and the railway. The Town is 12 miles north of Charlotte, and it had a mostly agricultural and textile economy until the late1980s when Charlotte started its rapid growth. Huntersville became a convenient suburban location for Charlotte commuters, and it experienced a population explosion in the 1990s. An 825 percent increase in population during this period promoted the local government to implement a land use plan that would create a distinction between "town" and "country." This was an effort to curb what the Town refers to as "suburban sprawl" as explained in the Town's methodology:

> The irony of most suburban development is that it often promises "life in the country" but typically delivers a finished product that, when combined with other suburban development, eliminates the "country" characteristics that drew new residents and businesses in the first place ("Planning Philosophy," Town of Huntersville).

The Town placed a one-year development moratorium to update the development code. The new code has principles to preserve the rural areas while accommodating new growth and the NCCR line.

- The Town must be proactive in its approach to guiding this development in a sustainable and efficient manner.
- Each new development proposal must be viewed in a larger context
- The Town will make use of traditional town planning principles
- Discouraging cul-de-sacs in favor of through-streets with “careful and conscientious design.” Traffic calming measures are an example of this design.
- The concentration of higher-density development where existing highways and future rail lines are located.
- Creation of “transit-supportive” communities
- The Town should be a distinct and beautiful community that demands the highest level of design, amenities, preservation, and enhancement of community distinctiveness.

The Town’s zoning code enforces these principles. There are nine districts: three residential, one transitional (rural areas converting to residential), three commercial, two urban, and one special purpose district. The zones bear a likeness to vertical bands across the Town when looking at a land use map. The easternmost and westernmost areas are mostly zoned rural, which can also include residences. Moving toward the center, the next band on either side are the transitional zones, followed by residential zones, commercial zones, and a residential zone in the middle.

The commercial zones are located mostly along I-77, although there are some commercial zones along Statesville Road (NC 115) and the NS railway. Office, Vehicle Sales, and auto-oriented commercial are located along I-77 while office and special purpose uses are long Statesville Road. The area between I-77 and Statesville Road is zoned neighborhood residential, which specifically encourages infill development. The town center is located in an area surrounding the intersection of Gilead Road and Statesville Road. The town center will serve as an anchor to the community and will support higher-density mixed-use development for the future train station. The neighborhood center is a smaller scale version of the town center, and serves as a mixed-use node to residential areas. Neighborhood centers are scattered throughout the Town, located mostly at intersections.

The Town of Huntersville has adopted two TOD zoning districts – residential and employment – for areas within one-half mile of rapid transit stations. The residential zone supports higher density residential communities that include a mix of services within a pedestrian environment. A minimum of 15 dwelling units per acre is established. The employment zone accommodates office and supporting uses in a pedestrian-friendly setting.

<u>Cornelius</u>

The Town of Cornelius is located north of Huntersville. The area is bordered on the west by Lake Norman and the east by Cabarrus County. Similar to Huntersville, I-77 divides the Town. Cornelius, like most of suburban Charlotte, has experience pressures dealing with suburban growth.

The *Cornelius Land Use Plan* (July 24, 2002) discourages low density development and instead, the Town places emphasis on the neighborhood. The western edge is designated as single family housing. Moving east, there is mixed-use, mixed-use residential, and a special rural transportation corridor. West of I-77, West Catawba Avenue, the main east-west road, is designated as a mixed-use corridor, an area planned for pedestrian-oriented streetscaping and retail shopping. There is a highway commercial zone for I-77, then more mixed-use and residential areas between I-77 and Old Statesville Road. The transit center is a mixed-use center extending a ¼-mile radius from the proposed Cornelius station (near the corner of Catawba Avenue and Old Statesville Road). The transit center is surrounded by Medium Density/Mixed Use Residential Land Uses. The proposed Sam Furr station is just outside the Town, but portions of the Town are within a ¼-mile radius of the Sam Furr station. Those sections are designated either medium density or transit oriented district. The eastern edge is devoted to rural land uses.

The Town of Cornelius has adopted a Transit District-Overlay zone centered on a proposed commuter station in the historic downtown area. The Town's goal is to produce compact areas of higher density, mixed use development within walking distance of the proposed transit station. Within one-quarter mile of transit stations, minimum residential densities are established at 12-16 dwelling units per acre and within the one-quarter- to one-half-mile area, the minimum density is set at 8-12 dwelling units per acre.

<u>Davidson</u>

The Town of Davidson adopted its *Planning Ordinance* in 2001 and amended it in 2003. Among its list of general planning principles, the preservation of Davidson as a small and unique town are the first such principles mentioned. The remaining principles stress managed growth, diversity, balance, and design:

- Growth must be sustainable.
    - Much of the new growth must be in walkable, mixed use communities.
    - Old neighborhoods must be interconnected via new streets and greenways, and new neighborhoods must connect to adjacent neighborhoods and undeveloped property.
- The Town must preserve substantial amounts of open space.
- The Town must re-establish its historic diversity of people.
- Development must proceed no faster than the Town can provide public facilities.
- In Davidson, there is a reliance on a unique combination of private property rights and the health of the community as a whole.
- Architecture and planning can either enhance or deteriorate the quality of life.
    - Design is more important than density.
    - Town streets are a critical element of a successful town (Town of Davidson).

The Town of Davidson is divided into seven planning areas which are defined by "geographical areas relating to the historical and topographical patterns of growth in the community." The outlying area to the western side of the Town is named Lakeshore, which is primarily comprised of single-family residences. The Rural planning area allows clustered residential areas to preserve open space and accommodate agricultural uses. The Town Village area is intended to be the center of the Town with mixed-use development with the highest densities in the Town. This is the location of Davidson's future NCCR station, and pedestrian access, street connectivity, and transit-oriented development is encouraged for this "commercial, civic, cultural, and transportation hub." The Village Infill planning area are existing residential neighborhoods that surround the Town Village planning area. Residential Infill development compatible to the Town Village is encouraged in this planning area. Street connectivity and urban open space is required. The College Campus planning area contains the Davidson College campus and the commercial and residential area surrounding it. The guidelines for this planning area regulate sections that are or will be converted to non-academic uses at a future date. For example, drive-through establishments are not allowed, warehouses and wholesale stores must be 500 feet away from residential areas, and metal buildings on the Davidson campus must be screened from public street view-sheds. The goal is to ensure a "compact, pedestrian-oriented environment." The remaining two planning areas, Special Use and Conditional, are in several locations within the Town.

Davidson's Town Center Master Plan recommends substantial new development in support of transit with the addition of nearly 300,000 square feet of retail/office space and new residential units. In June 2001, the Town adopted a planning ordinance that ensures higher density mixed use development that is pedestrian oriented and transit supportive.

Southern Iredell County

Iredell County, which includes the Town of Mooresville and a portion of the Town of Davidson, lies at the northern end of the study area. Unincorporated areas fall under the jurisdiction of the *Iredell County 1997 Land Use Plan*. South Iredell is a planning area subject to the supplemental *South Iredell Small Area Plan* (2004) to address planning issues that surfaced due to the NCCR transit line and the new Lowe's Home Improvement corporate offices. Mooresville has its own comprehensive plan, as does the Town of Davidson. Although the majority of Davidson is within Mecklenburg County, a portion of the Town crosses the county border. A description of the local comprehensive plans follows.

The objective of the *Iredell County 1997 Land Use Plan* is "to present a projected land use scheme" which can be used as a guide for future planning decisions within the unincorporated portions of the county. The Plan has four main land use categories:

- Residential and Agricultural
- Commercial
- Industrial
- Transitional

The majority of the county within the study area is zoned residential and agricultural (Iredell County, 1997). The *South Iredell Small Area Plan* covers a portion of the NCCR study area, including the Mount Mourne area, the Iredell County portion of Davidson, and two fragments of Mooresville. The relocation of Lowe's Home Improvement headquarters to Mooresville and the proposed NCCR line were the impetus to a new small area plan just for southern Iredell County. To accommodate the changes taking place, the western areas within the South Iredell planning area are now recommended for mixed-use and office spaces. There would be multi-story compact space as well as campus style development. The eastern section will be maintained as a residential area, but will incorporate a "neighborhood node." There are provisions to acquire land for public use (e.g. parks and schools) (Iredell County, 2004).

Mooresville

The Mooresville area includes many fragmented land parcels, the Mount Mourne area being the largest. Mount Mourne is to follow basic principles of traditional urban design, where street grids, a town center, smaller neighborhood centers, and varying height limits create an environment where pedestrian and transit use is encouraged. According to its planning code, the Mount Mourne Village Center is to be a "mixed use, pedestrian-scaled, transit-oriented village, and neighborhood center." In this plan, only two zones allow large-scale development: the hospital district and the planned campus development. These zones accommodate the Lake Norman Regional Health Center and the Lowe's Home Improvement headquarters, respectively.

Although the Mount Mourne planning and design guidelines are specific to one part of Mooresville, it does specify that its principles "shall be considered for all new neighborhood construction" (Town of Mooresville).

Finally, the Town of Mooresville is planning to include a TOD overlay zoning district in their next zoning ordinance update. The zoning ordinance will be updated as soon as a funding source is identified. The new requirements will apply to the three proposed stations in its jurisdiction.

Status of Planning for Proposed Stations and Maintenance Areas

Charlotte Area Transit System (CATS) and the Charlotte-Mecklenburg Planning Commission commissioned a consultant team to produce the *Station Location Refinement Report* (2005). In this report, station locations identified in the Major Investment Study (MIS) are identified and, if warranted, modified. The Station Location Refinement Process contained in the *Station Location Refinement Report* is divided into three parts: a MIS Station Location Analysis; a Station Site Selection Analysis; and a Station Area Statistical Baseline Analysis.

The station area guidelines provided in the report are intended to assist the public and private sectors in maximizing new development opportunities resulting from metropolitan Charlotte's investment in rail service. Planning for transit-supportive development is primarily focused on the area that is within a reasonable walking distance of the transit station. The following describes the planning that has occurred or is underway in each of the areas around potential station and vehicle maintenance facility (VMF) locations. Most of the station areas have development plans. Huntersville, Cornelius, Davidson, and south Iredell County (Mount Mourne) have specific language in their respective land use plans addressing development around the transit stations. Those that do not have specific development plans have been identified in applicable general comprehensive plans as appropriate for development in a transit-friendly manner.

In addition to the *Station Location Refinement Report*, an *Intermediate Stations Design Criteria* (2005) document was prepared by the consultant on behalf of CATS. The report outlines the criteria for parking, storm water, utilities, architecture, and lighting.

3.1.3.5 Prime and Unique Farmland

The US Department of Agriculture (USDA), Natural Resources Conservation Service (NRCS) (formerly Soil Conservation Service) has identified three general categories of valuable farmland soils: Prime, Unique, and Statewide or Locally Important. Prime farmland soils are soil mapping-units or series that are best suited for producing food, forage, fiber, or oilseed crops. Such soils have properties that are favorable for production of sustained high yields with minimal inputs of energy or resources. Unique soils have a special set of properties that are unique to producing certain high-value crops. Statewide or locally important soils are those that do not meet all of the requirements of Prime but are valuable when managed according to modern farming methods.

Prime farmland does not include land already in or committed to urban development or water storage. Prime farmland "already in" urban development includes all land that is designated for commercial, industrial, or residential use that is not intended at the same time to protect farmland in:

- A zoning code or ordinance adopted by the state or unit of local government, or
- A comprehensive land use plan that has been either adopted or reviewed in its entirety by the unit of local government in whose jurisdiction it is operative within ten years preceding the implementation of the project.

Within Mecklenburg County, GIS data was used to identify the presence of prime and unique farmland within the project right-of-way (ROW) and proposed stations and VMF. The data showed limited prime and unique farmland in the project vicinity. Since GIS data was not available in Iredell County, a meeting was held with the County's USDA NRCS to discuss resource that could be used for an analysis. Data collected from this meeting was interpreted in GIS to determine the quantities of prime farmland and farmland of statewide importance associated with the proposed stations and VMF. The results showed the existence of prime farmland and farmland of statewide importance in the vicinity of the proposed Mount Mourne station and Timber Road VMF.

3.1.3.6 Government Finance

The 2005 property tax rates and tax revenues for each taxing jurisdiction in the study area are listed in Table 3.1-8 and Table 3.1-9. The total property tax revenue for the five municipalities and two counties was $1,207,283,664 in 2005. This includes revenues from fire and special tax districts.

Table 3.1-8. Study Area Tax Rates

Taxing Jurisdiction	2005 Tax Rate (per each $100 in value)
Mecklenburg Co Unincorporated Areas	$1.01
Charlotte	$1.26
Charlotte District 1	$1.27
Charlotte District 2	$1.29
Huntersville	$1.12
Cornelius	$1.10
Davidson District	$1.32
Davidson - Mecklenburg County	$1.18
Davidson - Iredell County	$0.78
Mount Mourne Fire	$0.47
Mooresville Extraterritorial Jurisdiction	$0.93
Mount Mourne Fire - Mooresville School District	$0.61
Mooresville	$1.06
Mooresville Downtown	$1.22

Source: 2005-2006 Property Taxes, Office of the Tax Collector, Mecklenburg County, NC; Iredell County, NC, 2005-2006, Budget Highlights

Table 3.1-9. Study Area Tax Revenues

Taxing Jurisdiction	2005 Tax Revenue
Charlotte	$415,562,025
Huntersville	$10,435,000
Cornelius	$8,095,000
Davidson	$3,575,611
Mecklenburg County	$696,555,751
Mooresville	$13,534,137
Iredell County	$59,526,140
Total	**$1,207,283,664**

Source: 2005-2006 Property Taxes, Office of the Tax Collector, Mecklenburg County, NC; Iredell County, NC, 2005-2006, Budget Highlights

3.1.4 Impacts and Benefits

The impacts and benefits of the NCCR project on population and employment were evaluated from a transit service and transit accessibility perspective. The larger the potential population and employment base served by the project, the greater the potential benefit to the region. Alternative station locations would potentially serve different population and employment levels. The No-Action Alternative would offer some additional on-street bus transit service to the corridor's population and employment centers, but not access to the higher speed fixed guideway service offered by NCCR.

The projected population that could be served by NCCR stations would range from 4,700 to 5,200 within 1/4 mile of the stations in the opening year; this projection would increase to 12,500 to 13,100 in 2030. An estimated 18,200 to 21,200 people are projected to reside within 1/2 mile of stations in 2010, rising to 37,100 to 40,500 by 2030. Service to low-income and minority populations are addressed in Section 3.15, (Environmental Justice).

The opening year (2010) projected employment base within 1/4 mile of NCCR stations would range from 5,100 for the Minimum Operable Segments (MOS) from Center City Charlotte to Mount Mourne, to 5,800 for the Locally Preferred Alternative (LPA) from Center City Charlotte to Cascade/ NC 150 in Mooresville. Within a 1/2 mile radius of each station, this projection would increase to 33,200 to 35,800 respectively. By 2030, the projected employment base would rise to 11,200 for the MOS and 12,200 for the LPA within 1/4 mile, and 55,600 for the MOS and 59,300 for the LPA within 1/2 mile of the stations. In addition, the NCCR would provide employment benefits to the Charlotte Region from its ongoing operations and maintenance activities.

All of the station sites are compatible with existing land use plans and future development plans.

3.1.4.1 Population

<u>Population Served</u>

Table 3.1-10 shows the projected population within 1/4 and 1/2 mile of the proposed stations for both the proposed project opening year and 2030. These distances are generally the limits of how far transit patrons are willing to walk, either from their homes, or to their places of employment. Estimates for the opening year and the design year of 2030 were considered. The stations used for this analysis represent the preferred sites selected from the *North Corridor Station Location Refinement Report* (2005). Alternative station locations discussed in this report represent only minor shifts from the preferred sites selected. The change in the amount of population served would be minimal if one of the alternative sites were selected. The No-Action Alternative would offer some additional on-street bus transit service to the corridor's population.

Building the NCCR project between Center City Charlotte and Mount Mourne would offer service to an approximate projected population of 4,700 people in the opening year to 12,500 in 2030 within 1/4 mile of the proposed stations. Within 1/2 mile of the stations, the project would serve a projected population of 18,200 people in the opening year increasing to 37,100 in 2030. Extending the line to Cascade/ NC 150 in Mooresville would increase the population area served within 1/2 mile by about 16 percent in the opening year and nine percent by 2030.

Table 3.1-10. Projected Population Served by NCCR

Alternative	Projected Population			
	Within 1/4 mile		Within 1/2 mile	
	Opening Year	2030	Opening Year	2030
Center City Charlotte to Mooresville (LPA)	5,236	13,148	21,179	40,492
Center City Charlotte to Mount Mourne (MOS)	4,684	12,499	18,247	37,053
– Net Difference from LPA	552	649	2,932	3,439
– Percent Difference from LPA	12%	5%	16%	9%

Source: MUMPO, TAZ Data, November 2004.

Note: TAZ data was distributed to the census block level prior to calculation. If any portion of a block was found to be within the specified distance, the share of population within that portion (assuming an even distribution within the block) was included. This can result in a slight over or under estimation of population.

Groups with a Special Interest in Transit

Certain population groups tend to be more transit dependent; these include those who do not have an automobile available for their use and the elderly, whose range of transportation choices is typically more limited. Increasing access to transit would improve the transportation options for these populations. Table 3.1-11 identifies the total elderly (age 65 and over) population within 1/4 and 1/2 mile of the stations in the opening year and 2030 for selected combinations of station alternatives. Table 3.1-12 indicates the total elderly population within 1/4 and 1/2 mile of each station alternative in the opening year and 2030. Service to low-income communities is discussed in the Secondary and Cumulative Impacts section of Chapter 3.

Table 3.1-11. Projected Elderly Population Served by NCCR

Alternative	Projected Elderly Population[1]				Percent Elderly			
	1/4 mile		1/2 mile		1/4 mile		1/2 mile	
	Opening Year	2030	Opening Year	2030	Opening Year	2030	Opening Year	2030
Center City Charlotte to Mooresville (LPA)	339	1,225	1,825	3,977	6%	6%	8%	8%
Center City Charlotte to Mount Mourne (MOS)	280	1,156	1,491	3,590	6%	6%	8%	8%

Source: US Bureau of the Census; MUMPO, TAZ Data, November 2004.

Note: TAZ data was distributed to the census block level prior to calculation. If any portion of a block was found to be within the specified distance, the share of population within that portion (assuming an even distribution within the block) was included. This can result in a slight over or under estimation of population.

1 Elderly (Age 65 and older) population was calculated based upon 2000 Census block data. It was assumed that the elderly percentage at the block level would be constant for the forecast years.

Table 3.1-12. Projected Elderly Population Around Proposed Stations

Stations	2004 Elderly within 1/4 mile (percent of population)	2010 Projected Opening Elderly Population within 1/4 mile	2030 Projected Elderly Population within 1/4 mile	Elderly within 1/2 mile (percent of population)	Projected Opening Year Elderly Population within 1/2 mile	2030 Projected Elderly Population within 1/2 mile
Charlotte Gateway	1%	16	28	9%	428	773
Derita	4%	35	65	6%	142	220
Harris/ NC 115	7%	14	18	7%	53	71
Eastfield	11%	8	13	9%	24	38
Hambright	0	20	80	10%	100	200
Huntersville	12%	46	252	11%	164	461
Sam Furr	5%	17	41	4%	68	195
Cornelius	6%	17	166	8%	107	318
North Davidson	4%	49	101	6%	210	362
Mount Mourne	29%	26	90	19%	114	383
Mooresville	18%	38	42	15%	230	254
Cascade/ NC 150	6%	21	27	7%	104	133

Source: US Bureau of the Census; MUMPO, TAZ Data, November 2004.
Note: TAZ data was distributed to the census block level prior to calculation. If any portion of a block was found to be within the specified distance, the share of population within that portion (assuming an even distribution within the block) was included. This can result in a slight over or under estimation of population. Elderly (Age 65 and older) population was calculated based upon 2000 Census block data. It was assumed that the elderly percentage at the block level would be constant for the forecast years.

Within both 1/4 and 1/2 mile of the stations, in both the opening year and 2030, there is little difference in the percent of the population that is elderly (6 to 8 percent). Within one mile of the NCCR line, approximately 10 percent of the population is elderly. As expected, the stations that have the most population within 1/4 mile (Huntersville, Cornelius, Davidson) have the highest projected elderly population. The exception is the CGS, which has a much younger population base within a few blocks of the proposed site. Most stations are projected to have 200 or more elderly within 1/2 mile. The CGS at this distance is projected to have over 700 persons over the age of 65 living in the area.

Table 3.1-13 identifies the total projected transit-dependent population (those of driving age who do not have an automobile available for their use and persons age 12 to 15) by alternative. The estimated transit-dependent population within 1/4 and 1/2 mile of each station alternative in the opening year and 2030 is shown in Table 3.1-14. Based upon a ½ mile radius, extending the rail terminus to NC 115 would increase the opening year transit-dependent population served by about 12 percent over a Mount Mourne terminus.

The CGS and Davidson stations are projected to have the largest number of transit-depend population. The lack of vehicles available for those living in Center City Charlotte may be a matter of choice or due to limited income. The high number of transit-dependent population in Davidson, based mainly on the on-campus student body at Davidson College, will also benefit from having access to the proposed station.

Table 3.1-13. Projected Transit Dependent Population Served by NCCR

Alternative	Projected Transit Dependent Population[1]				Projected Percent Transit Dependent			
	1/4 mile		1/2 mile		1/4 mile		1/2 mile	
	Opening Year	2030	Opening Year	2030	Opening Year (%)	2030 (%)	Opening Year (%)	2030 (%)
Center City Charlotte to Mooresville (LPA)	1,244	2,423	2,819	8,169	24%	24%	22%	22%
Center City Charlotte to Mount Mourne (MOS)	1,145	2,310	2,344	7,588	25%	25%	23%	23%

Source: US Bureau of the Census; MUMPO, TAZ Data, November 2004.
Note: TAZ data was distributed to the census block level prior to calculation. If any portion of a block was found to be within the specified distance, the share of population within that portion (assuming an even distribution within the block) was included. This can result in a slight over or under estimation of population.
1 Transit dependent population was calculated based upon 2000 Census block group data. It was assumed that the transit dependent percentage at the block group level would be constant for the forecast years.

Table 3.1-14. Projected Transit Dependent Population Around Proposed Stations

Stations	Transit Dependent within 1/4 mile (percent of population)	Projected Opening Year Transit Dependent Population within 1/4 mile	2030 Projected Transit Dependent Population within 1/4 mile	Transit Dependent within 1/2 mile (percent of population)	Projected Opening Year Transit Dependent Population within 1/2 mile	2030 Projected Transit Dependent Population within 1/2 mile
Charlotte Gateway	28%	436	1,071	29%	1,991	4,224
Derita	19%	111	165	16%	333	442
Harris/ NC 115	13%	29	42	13%	96	125
Eastfield	2%	3	8	4%	14	25
Hambright	0%	13	90	7%	52	235
Huntersville	8%	28	158	9%	129	316
Sam Furr	9%	18	31	9%	79	161
Cornelius	10%	21	86	9%	119	217
North Davidson	42%	482	650	39%	1,316	1,782
Mount Mourne	3%	4	9	5%	26	61
Mooresville	18%	41	47	17%	260	291
Cascade/ NC 150	18%	58	66	18%	247	290

Source: US Bureau of the Census; MUMPO, TAZ Data, November 2004.
Note: TAZ data was distributed to the census block level prior to calculation. If any portion of a block was found to be within the specified distance, the share of population within that portion (assuming an even distribution within the block) was included. This can result in a slight over or under estimation of population. Transit dependent population was calculated based upon 2000 Census block group data. It was assumed that the transit dependent percentage at the block group level would be constant for the forecast years.

3.1.4.2 Employment

Employment Served

Table 3.1-15 identifies the total projected employment within 1/4 and 1/2 miles of the stations in the opening year and 2030. A NCCR project between Charlotte and Mount Mourne would offer service to approximately 5,000 projected employees in the opening year to increasing 11,200 in 2030 within 1/4 mile of the stations. Within 1/2 mile of the stations, the project would offer service to approximately 33,200 projected employees in the opening year increasing to 55,600 in 2030. Extending the project to Cascade/ NC 150 in Mooresville would increase the projected employment potentially served by approximately 12,200 within 1/4 mile and 59,300 within 1/2 mile in 2030. The No-Action Alternative would offer some additional on-street bus transit service to the corridor's employment centers, but not access to the high-speed exclusive guideway service offered by the NCCR.

Table 3.1-15. Projected Employment Served by NCCR

Alternatives	Projected Employment			
	1/4 mile		1/2 mile	
	Opening Year	2030	Opening Year	2030
Center City Charlotte to Mooresville (LPA)	5,770	12,236	35,787	59,263
Center City Charlotte to Mount Mourne (MOS)	5,050	11,237	33,230	55,610
– Net Difference from LPA	720	999	2,557	3,653
– Percent Difference from LPA	14%	9%	8%	7%

Source: MUMPO, TAZ Data, November 2004.
Note: If any portion of a TAZ was found to be within the specified radius of the corridor, its entire employment was included. This may result in an overestimation of employment.

Table 3.1-5 provides the projected employment within ¼ and ½ mile of the proposed stations. Although Center City Charlotte will be the main draw for commuter and non-commuter trips, major growth in employment activity is projected for all of the stations. The station area plans adopted by the Towns include a mix of retail and office space as part of the concept design.

3.1.4.3 Compatibility with Land Use Plans

The land use plans for the North Corridor jurisdictions are considered compatible with the NCCR build alternatives for one or more of the following reasons:

- The land use plans contain policies which support and encourage a NCCR transit system and/or a commuter rail station development.
- The land use plans support an increased transit system and/or alternate modes of transportation to the automobile.
- The land use plans support or encourage compact neighborhood development.

Vehicle Maintenance Facilities

Of the two maintenance facility alternatives, the South End facility (located near the CGS) would be compatible with the previous uses at this site. .Sanborne insurance maps illustrate a rail yard has existed at this location since 1885. The site is currently owned by NS. The Timber Road maintenance facility, located just south of the Mooresville Golf Course and the residential subdivision of Muirfield in Iredell County contains some elements inconsistent with current and future land use plans.

<u>Intermediate Stations</u>

The location of the Derita station offers development opportunity as the station is in close proximity to redevelopment parcels. During neighborhood meetings to review the station area plan for Derita, community leaders expressed interest in joint development of the Derita station to include a US Postal Service kiosk and other private/public uses.

At the proposed Harris/ NC 115 station area, a large parcel of land to the southeast of the station parking area is now planned for a major transit-oriented development call Griffith Lakes.

The Eastfield station location supports the Gandy Eastfield Station transit-oriented development, now under construction, as well as transit-oriented development at the adjacent Twin Lakes property. The Charlotte-Mecklenburg Planning Commission is completing a new are plan for the Eastfield station. The plan identifies in excess of $1 billion in new residential and commercial development within ½ mile of the commuter rail station.

The Hambright station will be the center piece for the new Bryton development, which will consist of over 2000 new residences and some 2.1 million in commercial space. The *Hambright Transit Realignment Evaluation* (2005) report justifies the rail line realignment and the Bryton development proposal.

The Huntersville station has been incorporated into the Huntersville Master Plan. The area surrounding the station is zoned "Town Center" which is coded to accommodate high density (two- and three-story buildings) development (Town of Huntersville). The station will be integrated into the Town's new museum (Discovery Place for Kids), a farmer's market and the re-alignment of Statesville Road and Main Street.

The Sam Furr station is compatible and within ¼ mile of both the *Caldwell Station Development Plan* and the *Cornelius East Vision Plan (North Corridor Station Location Refinement Report*).

The Cornelius station has been incorporated into the *Cornelius Land Use Plan.* The thoroughfares in this vicinity of the station, North Main Street and Catawba Avenue, will undergo design changes to make them tree-lined mixed-use corridors. Neighborhoods near the station will have traditional design, with "curb, planting strips, and sidewalks." New and infill development will contribute to the town center's density. The Antiquity Village (currently under construction) will incorporate the Cornelius station into a mixed use complex and will include an adjacent 950 households and 280,000 SF of office and retail space.

Joint development and parking opportunities are possible at the proposed Davidson station, as it would have access to Sadler Square commercial site and allow long term redevelopment opportunities. Transit oriented developments recently approved adjacent to the Davidson station include 900 households and 4,000 new jobs in the immediate Davidson area.

The Mount Mourne station would be located southwest of the Fairview Methodist Church and due west of an area slated for the church's expansion. The Mount Mourne station supports the adjacent Lowes corporate center, currently home to approximately 3,000 employees and proposed to accommodate 12,000 employees. The Fairview Methodist church as well as Lowes present a joint parking opportunity with the proposed station. The joint parking area would be in addition to the proposed parking area located within the adjacent proposed transit oriented development site between Lowe's Road and the station. In this proposed development, commercial and office uses would be located to the north along Fairview Road while residential uses would be located in the south. The existing Lake Norman Regional Medical Center and proposed Legacy Village as well as the proposed Fairview road office development combine to bring an additional 1,000 employees, 135 households as well as 445,000 SF of office and retail space to the Mount Mourne station area.

The Mooresville station will fit in the historical context of the city, as the station will make use of the historic depot building. The location, within the Mooresville Historic District, is compatible with local land use plans with several potential shared parking and joint development opportunities.

The Cascade/ NC 150 station would support the *Cascade Neighborhood Plan*. In addition, the station location is integrated with the Cascade Neighborhood Plan, as this is assumed location of the station in the *Plan.*

3.1.4.4 Prime and Unique Farmland Impacts

The NCCR project would mainly use existing railroad right-of-way for most of the rail line and, therefore, new track work would not impact nearby farmlands classified as prime, unique, or statewide or locally important. The only land outside the existing railroad right-of-way that would be acquired for the NCCR project would be at stations and the selected VMF location. Most of the areas proposed for stations and the VMF facility in Mecklenburg County are designated for urban use. The total of prime farmland impacted by areas outside of the right-of-way (such as proposed frontage roads and station areas) is between five and six acres, depending on alternative.

In Iredell County, the Mount Mourne station and the Timber Road VMF would require the use of prime farmland and farmland of statewide importance for development. The 5.6 acres associated with the proposed Mount Mourne station includes 4.1 acres of prime farmland and farmland of statewide importance. The Timber Road VMF would require the use of 23.2 acres of prime farmland and farmland of statewide importance.

Documentation of prime and unique farmlands is provided in the Appendix on the NRCS – CPA – 106 form. The impacts described have been reviewed by the USDA NRCS.

3.1.4.5 Government Finance Impacts

The NCCR project would require the purchase of private land for its stations and VMF. The use of this private land by the NCCR project would result in the loss of potential tax revenue for the study area. The estimated loss of potential tax revenue does not include the CGS. The government finance impact of the CGS project is discussed in a separate federal Environmental Assessment (EA).

The number of acres lost, the tax value of that land, and the tax base lost by each alternative are listed in Table 3.1-16. The MOS would result in a smaller tax base loss than the LPA since the MOS is shorter in length and have two less stations.

The total tax revenue lost annually by the NCCR system would range between $24,832 and $48,944 (including the VMF), resulting in a net loss for all of the taxing jurisdictions between 0.001 percent and 0.122 percent. A breakdown of the percentage of tax revenue lost by jurisdiction is presented in Table 3.1-17

However, some $5.2 billion in new station area development is projected by 2019, generating over $60 million in new property tax revenues. Station area development is detailed in the *North Corridor Commuter Rail Project Financing Strategy*, submitted by CATS to the MTC in June 2007.

Table 3.1-16. Government Finance Impacts by Alternative

	LPA			MOS		
Station Name	Acreage Taken	Value	Annual Tax Revenue Lost	Acreage Taken	Value	Annual Tax Revenue Lost
Derita	3.0	$242,598	$805	3.0	$242,598	$805
Harris/ NC 115	6.5	$1,359,105	$0	6.5	$1,359,105	$0
Eastfield	6.0	$223,959	$2,270	6.0	$223,959	$2,270
Hambright	5.3	$14,326	$160	5.3	$14,326	$160
Huntersville	3.1	$551,828	$5,605	3.1	$551,828	$5,605
Sam Furr	12.1	$44,145	$492	12.1	$44,145	$492
Cornelius	3.5	$54,122	$594	3.5	$54,122	$594
Davidson	3.4	$277,000	$3,476	3.4	$277,000	$3,476
Mount Mourne	5.6	$575,006	$917	5.6	$575,006	$917
Mooresville	1.5	$257,030	$3,136	NA	NA	NA
Cascade/ NC 150	6.8	$1,175,994	$12,465	NA	NA	NA
Station Totals	**56.8**	**$4,775,113**	**$29,920**	**48.5**	**$3,342,089**	**$14,319**
Frontage Roads/Crossings	30.5	$602,492	$6,434	26.1	$529,512	$6,119
Alignment Shifts/Sidings	29.8	$758,546	$7,763	29.2	$720,133	$7,406
VMF						
Timber Road	33.3	$826,180	$4,827	33.3	$826,180	$4,827
South End	3.9	$248,934	$612	3.9	$248,934	$612
Totals						
With Timber Rd VMF	**150.4**	**$6,962,331**	**$48,944**	**137.1**	**$5,417,914**	**$32,671**
With South End VMF	**121.0**	**$6,385,085**	**$44,729**	**107.7**	**$4,840,668**	**$28,456**

Table 3.1-17. Tax Revenue Lost by Taxing Jurisdiction

With Timber Road VMF		**LPA**		**MOS**	
Jurisdiction	Revenue	Tax Loss	Percent	Tax Loss	Percent
City of Charlotte	$415,562,025	$7,180	0.002%	$7,180	0.002%
Town of Huntersville	$10,435,000	$8,862	0.085%	$8,862	0.085%
Town of Cornelius	$8,095,000	$1,256	0.016%	$1,256	0.016%
Town of Davidson	$3,575,611	$3,545	0.099%	$3,545	0.099%
Mecklenburg County	$696,555,751	$5,418	0.001%	$5,418	0.001%
Town of Mooresville	$13,534,137	$16,451	0.122%	$458	0.003%
Iredell County	$59,526,140	$6,232	0.010%	$5,952	0.010%
Total	**$1,207,283,664**	**$48,944**	**0.004%**	**$32,671**	**0.003%**
With South End VMF		**LPA**		**MOS**	
Jurisdiction	Revenue	Tax Loss	Percent	Tax Loss	Percent
City of Charlotte	$415,562,025	$7,792	0.002%	$7,792	0.002%
Town of Huntersville	$10,435,000	$8,862	0.085%	$8,862	0.085%
Town of Cornelius	$8,095,000	$1,256	0.016%	$1,256	0.016%
Town of Davidson	$3,575,611	$3,545	0.099%	$3,545	0.099%
Mecklenburg County	$696,555,751	$5,418	0.001%	$5,418	0.001%
Town of Mooresville	$13,534,137	$16,451	0.122%	$458	0.003%
Iredell County	$59,526,140	$1,405	0.002%	$1,125	0.002%
Total	**$1,207,283,664**	**$28,456**	**0.002%**	**$44,729**	**0.004%**

3.1.5 Mitigation

Mitigation measures are taken when there are pertinent negative impacts. The NCCR build alternatives including stations and the South End VMF are compatible with existing and future master plans, land use designations and zoning ordinances. Impacts experienced as a result of the NCCR are anticipated and have been incorporated into the comprehensive planning process. Each jurisdiction has a transit-oriented development plan, overlay zone, or related land use management tool to encourage high-density (or higher-density) development around proposed transit stations.

Additionally, each station has a plan as described in the CATS-Charlotte-Mecklenburg Planning Commission document North Corridor Station Location Refinement Report (2005). The impacts resulting from the NCCR and the transit-oriented development are considered a benefit. Land use mitigation efforts would not be necessary.

The prime soils and unique farmland takings do not exceed the federal threshold and do not require mitigation.

The loss of approximately $25,000 to $49,000 of property tax revenues to the localities will be more than mitigated by the private investment of billions of redevelopment dollars into the higher land uses which will translate into materially higher tax rates and tax volume for the local jurisdictions.

3.1.6 Literature Citied

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US Bureau of the Census: 2000 Census; MUMPO, TAZ Data, November 2004.

US Department of Transportation, Federal Highway Administration, *Environmental Impact and Related Procedures (23 CFR 771*).

3.2 Displacements

This section addresses residential and business relocations associated with the NCCR alternatives.

3.2.1 Legal and Regulatory Framework

This section addresses the provisions of NEPA in accordance with federal environmental law, USDOT technical guidance related to environmental documentation and specific regulations related to general environmental conditions as well as specific resource protection and preservation measures. In certain cases, state environmental codes are addressed. The following laws, regulations, executive orders and related policy guidance direct much of the foregoing documentation:

- NEPA, 1969
- Uniform Relocation Assistance and Real Property Acquisition Policies Act, 1970
- CEQ *Regulations for Implementing NEPA (40 CFR 1500-1508),*
- FHWA's *Environmental Impact and Related Procedures (23 CFR 771*)
- 23 U.S.C. 109(h) and 23 U.S.C. 138 (Section 4(f) of the DOT Act)
- The reporting requirements of 23 U.S.C. 128

3.2.2 Methodology

The evaluation of displacements required for the proposed improvements, including:

- Determination of numbers of residences, businesses, and non-profit organizations to be relocated.
- Estimate of the residential relocations by owner and tenant, potential for minorities, low income households, large households, and the elderly, and value of dwellings.
- Identify business relocations by type, estimated number of employees, and square footage.
- Determine availability of replacement housing and business sites through consultation with local real estate agents, newspaper listings, and other sources which may be available.
- Provide analysis of relocation needs versus replacement housing/business availability. Identify environmental justice issues, if any, associated with the required relocations.
- Prepare discussion of relocations issues, including appropriate references to Federal Uniform Relocation Assistance and Real Property Acquisition Policies Act of 1970, the North Carolina Relocation Assistance Act, and any other appropriate relocations policies.

3.2.3 Existing Conditions and Resources

There are approximately 250 residential and 250 non-residential structures within 50 feet of the NCCR centerline. Most of these structures are set back away from the rail line and do not interfere with the normal maintenance and operation of the existing rail line. Structures that abut the rail line (less than 50 feet from centerline) are mostly non-residential. Some of these non-residential structures currently use the rail line for freight operations or utilized the rail line in the past.

Throughout most of the corridor, there is a roadway parallel to the rail line, which restricts the amount of development directly adjacent to the rail on one side or the other. In some communities, such as Huntersville and Mooresville, there are parallel roadways on both sides of the rail line, which serves as a buffer between the rail and nearby structures.

3.2.4 Environmental Impacts and Benefits

As shown in Table 3.2-1, the NCCR system would displace from three to seven residential units and two to six businesses. This does not include one business displacement associated with the CGS. Displacements under the CGS project are discussed in a separate federal EA. No institutional structures will be displaced. Some potential disturbances to businesses would result primarily because of loss of parking and other ancillary facilities where sidings are proposed or alteration of access due to proposed rail crossing closures. These impacts are described in Section 3.3 “Neighborhoods”. The No-Action Alternative would displace no homes, businesses, or institutions.

Table 3.2-1. NCCR System Residential and Business Displacements

Alternative	Single Family Dwelling	Duplexes	Businesses	Institutional Structures
LPA	6	0	6	0
MOS	3	0	2	0
South End VMF	0	0	0	0
Timber Road VMF	1	0	0	0

Source: Mecklenburg and Iredell County 2005 GIS; Parsons Brinckerhoff

Note: No dwellings, businesses, or institutions would be displaced with the No-Action Alternative

3.2.4.1 Residential Displacements

Table 3.2-3, lists the residential units potentially displaced by the NCCR project. All units are assumed to be owner occupied.

Table 3.2-2. Residential Units Potentially Displaced by the NCCR

Type	Location	Impacted by	Affected By
Single-Family	2235 W Sugar Creek Rd	All Build Alternatives	Rail Crossing Closure
Single-Family	104 Old Statesville Rd	All Build Alternatives	Huntersville Station
Single-Family	1464 Mecklenburg Hwy	All Build Alternatives	Mount Mourne Station
Single-Family	1176 Mecklenburg Hwy	LPA	Frontage Road
Single-Family	721 Plaza Ln	LPA	Cascade/NC 150 Station
Single-Family	819 Plaza Ln	LPA	Cascade/NC 150 Station
Single-Family	1046 Mecklenburg Hwy	Timber Rd VMF	VMF

Source: Mecklenburg and Iredell County 2005 GIS; Parsons Brinckerhoff

A single family dwelling unit located at 2235 W Sugar Creek Road will be displaced due to the proposed closure of a private crossing. The crossing is located on a curve section of the rail line with limited sight distance to detect approaching trains. An alternative access to the property was deemed unfeasible. Block data from the 2000 Census suggests that this dwelling is occupied by a non-minority family. The home is located in an area that has a less than five percent poverty population. The assessed value of the dwelling is $27,500. The total assess value of the 2.2 acre property with structures is $73,600.

The parking area for the proposed Huntersville station will require the displacement of one single family dwelling unit located at 104 Old Statesville Road. This dwelling is located in a census block that is nine percent minority based on the 2000 Census. The home is located in an area that has a 12 percent poverty population. The assessed value of the dwelling is $2,000. The total assess value of the 1.4 acre property with structures is $219,000. Displacement of this home may be avoided if Huntersville develops alternative plans for station parking.

The parking area for the proposed Mount Mourne station will require the displacement of one single family dwelling unit located at 1464 Mecklenburg Highway. The home is located in an area that is six percent minority and has a poverty population of five percent. The assessed value of the dwelling is $89,680. The total assess value of the 6.6 acre property with structures is $688,920. The proposed station layout does not require the entire parcel but does cover the portion that includes the dwelling.

A proposed frontage road, which will eliminate the need for two private crossings, will displace one single family dwelling located at 1176 Mecklenburg Highway. Block data from the 2000 Census suggests that this dwelling is occupied by a non-minority family. The home is located in an area that has a poverty population of seven percent. The assessed value of the dwelling is $19,000. The total assess value of the 2.3 acre property with structures is $68,100.

There are two single family dwelling units located on Plaza Lane that will be displaced due to the proposed Cascade/NC 150 station parking. Block data from the 2000 Census suggests that these dwellings are occupied by non-minority families. The homes are located in an area that has a poverty population of 12 percent. The assessed value of the dwelling at 721 Plaza Lane is $26,560 and the total assessed value of the 0.2 acre property with structures is $41,270. The assessed value of the dwelling at 819 Plaza Lane is $31,910 and the total assessed value of the 1 acre property with structures is $90,350.

The proposed VMF near Timber Road would displace one residential unit. The home is located in an area that is 13 percent minority and has a poverty population of seven percent. The assessed value of the dwelling is $44,950. The total assess value of the 6.4 acre property is $87,270. The proposed VMF layout does not require the entire parcel but does cover the portion that includes the dwelling.

3.2.4.2 Business and Institutional Displacements

As listed in Table 3.2-3, six businesses would be displaced by the NCCR project. Four would be associated with construction of the Cascades/NC-150 station in the LPA Alternative.

Table 3.2-3. Business and Institutional Uses Potentially Displaced by the NCCR

Type	Square Footage	No. of Employees Full Time/Part Time	Impacted by	Affected By
Atlantic Steel Supply Company	4,800	3/2	All Build Alts.	Derita Station
Carquest Auto Parts	3,900	7/3	All Build Alts.	Huntersville Station
Clarke's Total Fitness	6,600	5/5	LPA	Cascade Station
Mooresville Glass and Mirror	15,400	18/20	LPA	Cascade Station
Brown and Walker Heating and Ventilation Specialist	6,000	15/5	LPA	Cascade/NC 150 Station
Focus Support Services	1,500	Not Available	LPA	Cascade/NC 150 Station

Source: Mecklenburg and Iredell County 2005 GIS; Parsons Brinckerhoff

None of the relocated businesses are minority owned. One owner considers himself to be low income. One other business has one full time minority employee, one part time minority employee and three non-minority low income employees. A second business has three non-minority low income employees. One business perceives their customer base as being about 50 percent low income. All of the potential business displacements would consider relocation and remain in the same business.

The proposed Derita station will displace one business, Atlantic Steel Supply Company, located at 5600 Nevin Road. The assessed value of the structure is $52,200. The total assessed value of the property and structures is $64,100.

The proposed Huntersville station will displace the Carquest Auto Parts located at 102 Old Statesville Road. The assessed value of the structure is $108,000. The total assessed value of the property and structures is $232,700. Similar to the residence also impacted by the current plan for parking in Huntersville, this displacement may be avoided if Huntersville develops alternative station parking plans.

The proposed Cascade/ NC-150 station will displace four businesses. The Clarke's Total Fitness, located at 829 Plaza Lane, has an assessed structure value of $260,820 and the total assessed value of the property and structures is $408,180. Mooresville Glass and Mirror is located at 837 Plaza Lane has an assessed structure value of $291,550 and the total assessed value of the property and structures is $374,980. Brown and Walker Heating and Ventilation Specialist is located at 843 Plaza Lane has an assessed structure value of $22,050 and the total assessed value of the property and structures is $106,080. Focus Support Services is located at 857 Plaza Lane has an assessed structure value of $66,440 and the total assessed value of the property and structures is $142,490.

In addition to those displaced businesses, other businesses may be affected in some manner. A limited number of warehousing and trucking operations have encroached onto the railroad right-of-way with some aspect of their business; therefore, reclaiming the right-of-way for the NCCR would result in an impact to these businesses. Some at-grade crossings will be closed permanently in preparation for the new service. Those that remain open will be upgraded. For businesses who may lose existing access across the tracks, frontage roads would be provided and extended to the nearest public road crossing or a new crossing would be built to allow access.

3.2.4.3 Relocation Needs Versus Replacement Housing/Business Availability

Housing Availability. An analysis of housing availability was conducted for the areas where the displacements would occur. The analysis area for single family housing consisted of the northeast portion of Mecklenburg County (north of I-85 and east of I-77) and the Mooresville area. The areas where households in owner-occupied homes would be displaced have comparable dwellings of similar value available (Carolina Multiple Listing Services, February 23, 2006). Although it is assumed that no rental households will occur, an analysis was conducted to determine the availability of rental property based on a range of rental rates. Data for rental property was available for northeast Mecklenburg County and all of Iredell County. The value of all the dwellings available is summarized in Table 3.2-4.

Business Availability. Through CATS' interviews with business owners, all expressed that they do not feel they would be forced out of business by being displaced by the NCCR. Most owners felt available business property would prove to be satisfactory. Three business owners felt adjacency was important in relocating their business. Relocation agreements for businesses in the railroad right-of-way would take into account encroachment agreements the businesses may have with the railroads.

Table 3.2-4. NCCR Relocation Summary

Estimated Maximum Displaced		Number of Displaced Dwellings			
		By Value of Owner-Occupied Homes ($000)		By Monthly Rental Rate	
Dwellings	7	$0-50	1	$0-500	0
Vacant Dwelling	0	$50-100	2	$500-1000	0
Households	7	$100-150	2	$1000-1500	0
Businesses	6	$150-200	0	$1500-2000	0
Institutional	0	$200 up	2	$2000 up	0
Other	0	Total	7	Total	0
Number of Households Displaced in Areas with High Concentrations of:		**Number of Decent, Safe, and Sanitary Dwellings Available**			
		By Value of Owner-Occupied Homes ($000)		**By Monthly Rental Rate**	
Elderly	0	$0-50	30	$0-500	9
Minority	0	$50-100	175	$500-1000	76
Low-Income	0	$100-150	485	$1000-1500	80
		$150-200	513	$1500-2000	11
		$200 up	1,028	$2000 up	4
		Total	2,231	Total	180

Source: Information gathered from the Carolina Multiple Listing Services February 23, 2006

3.2.5 Displacement Mitigation

3.2.5.1 Relocation Program

The relocation program for the NCCR project would be conducted in accordance with the Federal Uniform Relocation Assistance and Real Property Acquisitions Act of 1970 (Public Law 91-646), and North Carolina Relocation Assistance Act (GS-133-5 through 133-17). The program would be designed to assist displaced persons in relocating to a replacement site in which to live or do business. The Act establishes comprehensive procedures for acquiring real property and relocating persons or businesses displaced by federally assisted projects. Congress enacted the Federal law to ensure that any person or business affected by projects such as the NCCR system is treated fairly and consistently.

CATS would develop and adopt a Relocation Assistance Plan, addressing all local, state and federal requirements, including related procedures and guidelines to be followed by its staff and right-of-way agent. Given the overall assessment of the types and number of likely cases of relocation, the plan would provide for studies of the availability of equivalent accommodations, definitions of eligibility for assistance, procedures for dealing with relocations, payment methods, procedures for processing claims and typical schedule event times to effect relocations. This program would provide relocation moving payments to cover actual moving expenses and replacement housing payments or rent supplements where an owner or tenant would have to purchase or rent property at a higher cost or lose a favorable financing arrangement. Relocation payments would not be considered as income under the Internal Revenue Code or for determining eligibility or the extent of eligibility of any person for assistance under the Social Security Act or any other federal law.

Last resort housing would be a part of the relocation program used when comparable replacement housing is not available, or when it is unavailable within the financial means of those displaced, and the replacement payment exceeds the federal/state legal limitation. The purpose of the program would be to allow broad latitudes in methods of implementation by CATS so that decent, safe, and sanitary replacement housing could be provided. This program would not be necessary for this project, because there appears to be adequate opportunities for relocation within the area.

3.3 Neighborhoods

This section describes the neighborhoods and communities within one mile of the NCCR line. It also describes the community services that are within 300 feet of the NCCR line. A description is given of fire districts, emergency medical service (EMS) districts, and school service areas that either have service areas that cross the railroad corridor or are within approximately 300 feet of the rail line.

3.3.1 Legal and Regulatory Framework

This section addresses the provisions of NEPA in accordance with federal environmental law, USDOT technical guidance related to environmental documentation and specific regulations related to general environmental conditions as well as specific resource protection and preservation measures. In certain cases, state environmental codes are addressed. The following laws, regulations, executive orders and related policy guidance direct much of the foregoing documentation:

- NEPA, 1969
- Uniform Relocation Assistance and Real Property Acquisition Policies Act, 1970
- CEQ *Regulations for Implementing NEPA (40 CFR 1500-1508),*
- FHWA's *Environmental Impact and Related Procedures (23 CFR 771*)
- 23 U.S.C. 109(h) and 23 U.S.C. 138 (Section 4(f) of the DOT Act)
- The reporting requirements of 23 U.S.C. 128

According to the USDOT document *Guidance for Preparing and Processing Environmental and Section 4(F) Documents* an EA should discuss social impacts "for each alternative commensurate with the level of impacts and to the extent they are distinguishable." These impacts include "Changes in the neighborhoods or community cohesion for the various social groups as a result of the proposed action," regardless if they have beneficial or adverse effects. Examples of these effects are: the bisection of neighborhoods, the isolation of a portion of a neighborhood or an ethnic group, new development, the changing of property values, or the separation of residents from community facilities (FHWA, 1987).

3.3.2 Methodology

Neighborhood boundaries were identified with published map sources, existing tax parcel maps and with coordination from local jurisdictions. For purposes of this analysis, a neighborhood is an area that either:

- is listed as a subdivision on an Alexandria Drafting Company (ADC) map or GIS database provided by a local jurisdiction; or
- is a cluster of homes having similar attributes.

A community, which may contain one or more neighborhoods, is defined as either:

- the area within one quarter-mile of a purposed NCCR station;
- a Neighborhood Statistical Area within the City of Charlotte, as defined by the Charlotte-Mecklenburg Department of Neighborhood Development;

- an incorporated town (in this case, Huntersville, Cornelius, Davidson, and Mooresville); or
- a cluster of "neighborhoods" within Iredell County as defined by Geographic Information System data provided by Iredell County government.

3.3.3 Existing Conditions and Resources

3.3.3.1 Communities and Neighborhoods

This section describes existing conditions for neighborhoods and communities within 300 feet of the NCCR line. General neighborhood areas are shown on Figure 3.3-1a-c. Table 3.3-1 correlates the locations of the neighborhoods, communities, and station areas for the NCCR line.

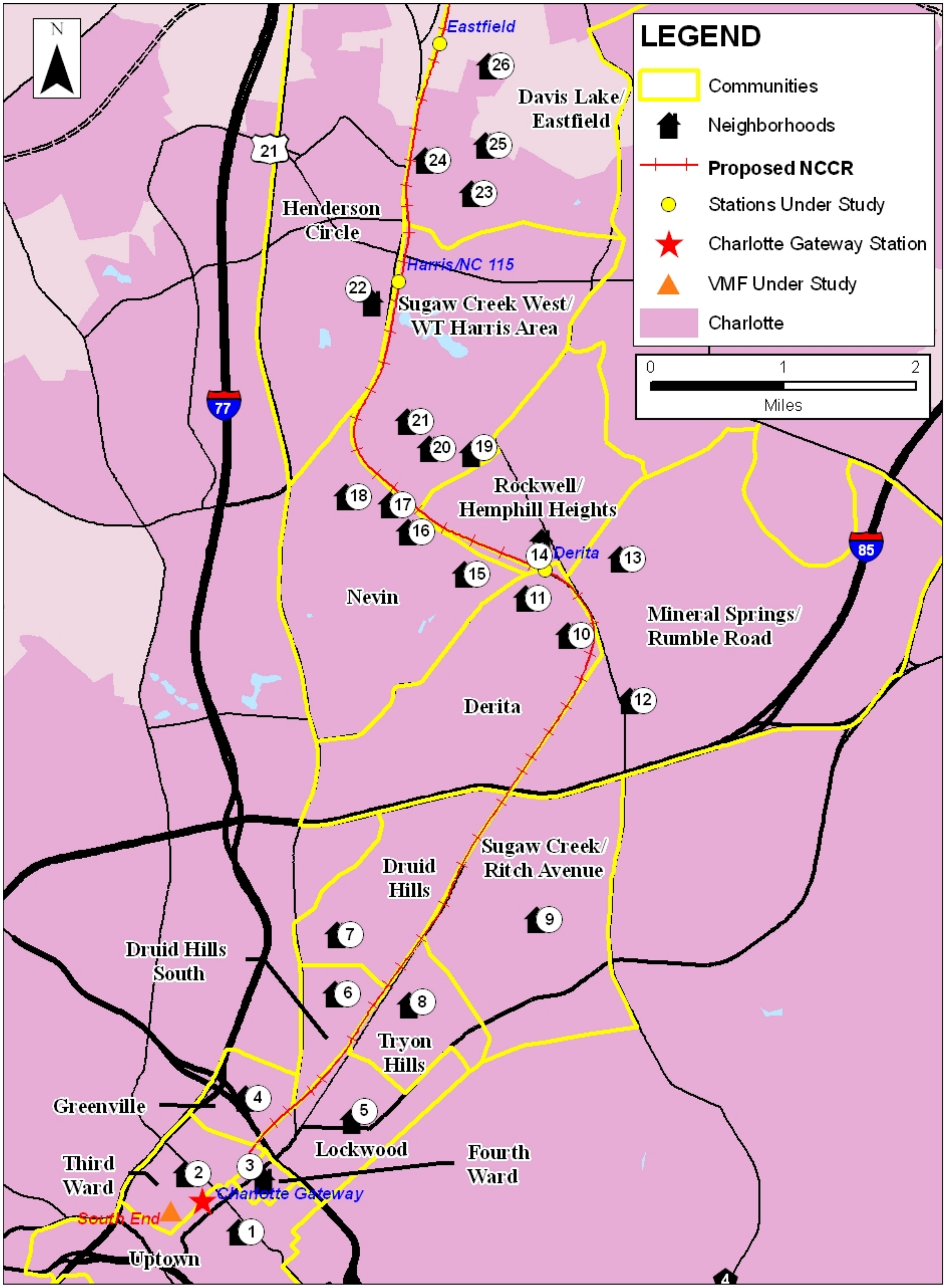

Figure 3.3-1a	Neighborhoods and Communities

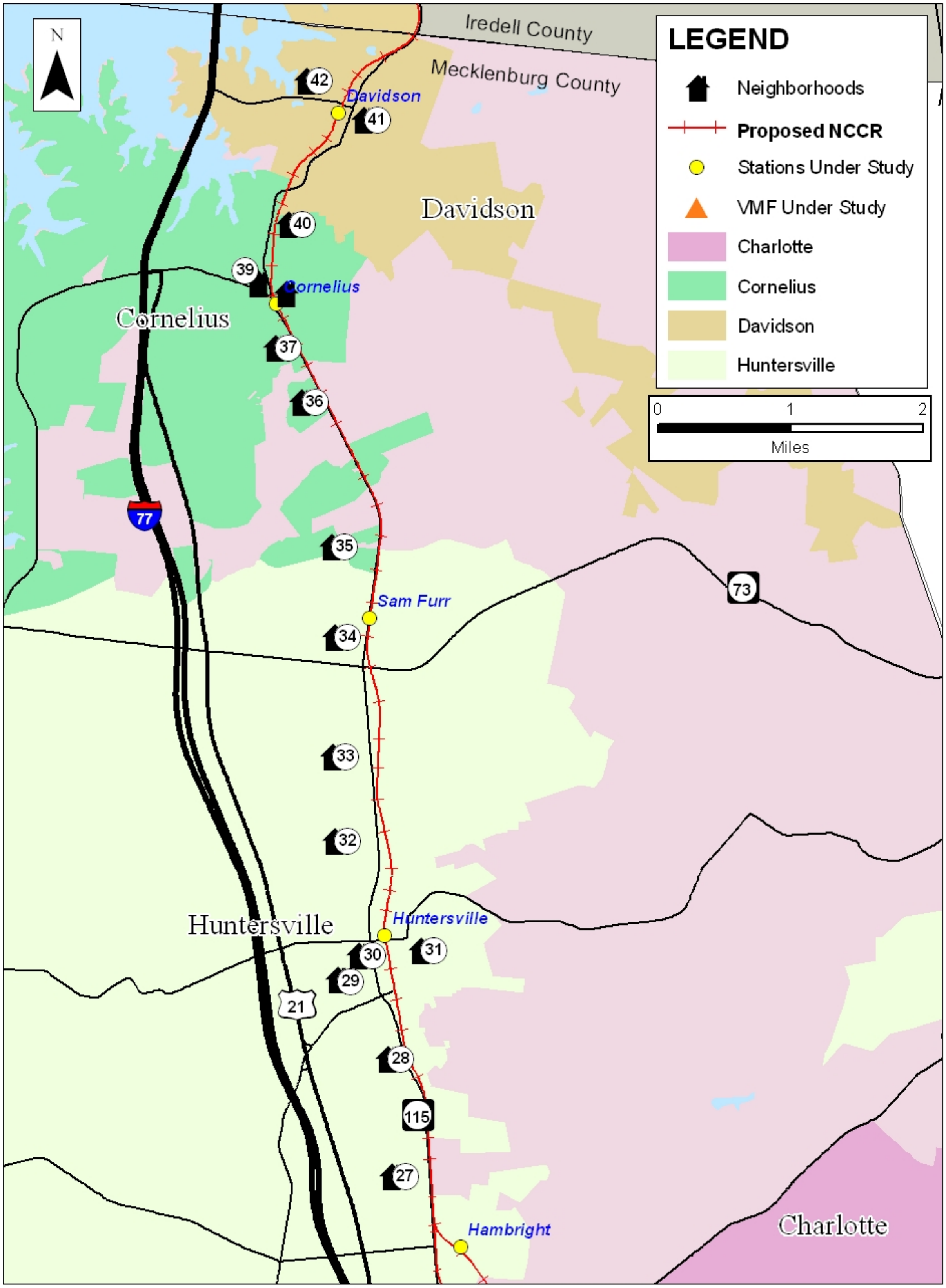

Figure 3.3-1b	Neighborhoods and Communities

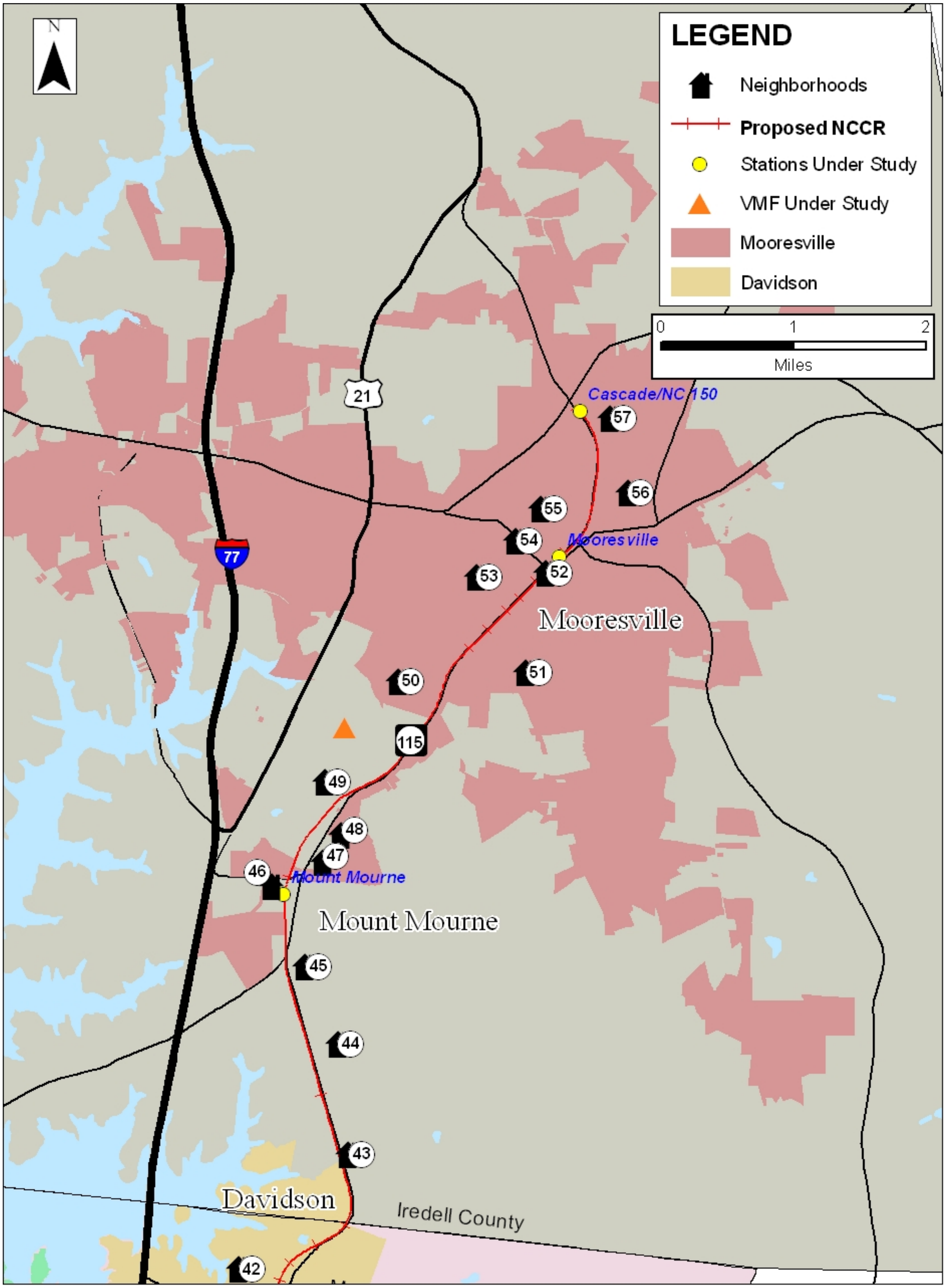

Figure 3.3-1c Neighborhoods and Communities

Table 3.3-1. Communities and Neighborhoods within 300 Feet of the NCCR

Community	Map Ref – Neighborhood	Station Area*
Charlotte and North Mecklenburg County		
Center City Charlotte	1 – Uptown	Charlotte Gateway Station
	2 – Third Ward	
	3 – Fourth Ward	
Greenville	4 – Greenville	(Not within one quarter-mile of a station)
Lockwood	5 – Lockwood	
Druid Hills	6 – Druid Hills South	(Not within one quarter-mile of a station)
	7 – Druid Hills North	
Tryon Hills	8 – Tryon Hills	
Sugaw Creek/ Rich Avenue	9 – Sugaw Creek/ Rich Avenue	Derita
Derita	10 – Fairstone	
	11 – Grenelefe Village	
Mineral Springs/ Rumble Road	12 – Randomwood	
	13 – Forest Pond	
Rockwell/ Hemphill Heights	14 – Nevin Creek	
Nevin	15 – Poplar Springs	
	16 – Generals Estates	
	17 – Devongate	
	18 – Crater Park	
Sugaw Creek West/ WT Harris	19 – Christenbury Hills	Harris/ NC 115
	20 – Scotborough	
	21 – Oakbrooke	
Henderson Circle	22 – Holly Vista	
Davis Lake/ Eastfield	23 – Downing Creek	(Not within one quarter-mile of a station)
	24 – Bridle Ridge	
	25 – Davis Ridge	
	26 – Spring Park	Eastfield
Huntersville	27 – Plum Creek	(Not within one quarter-mile of a station)
	28 – Monteith Park	
	29 – Greenfield	
	30 – town center	Huntersville
	31 – Vermillion	
	32 – Shepherd's Vineyard	(Not within one quarter-mile of a station)
	33 – Harvest Point	
	34 – Cambridge Grove	Sam Furr
Huntersville/ Cornelius	35 – Caldwell Station	(Not within one quarter-mile of a station)
Cornelius	36 – Heritage Green	
	37 – Wellsley Village	Cornelius
	38 – Antiquities	
	39 – town center	
	40 – Town Heights	
Davidson	41 – town center / Davidson College	Davidson
	42 – The Woods at Davidson Lake	(Not within one quarter-mile of a station)

Table 3.1-1. Communities and Neighborhoods within 300 Feet of the NCCR (continued)

Community	Map Ref – Neighborhood	Station Area*
Iredell County		
Mount Mourne	43 – Kennerly	(Not within one quarter-mile of a station)
	44 – Oakridge	
	45 – Torrence Tavern Estates	
	46 – Legacy	Mount Mourne
	47 – Station 115	
	48 – Foxfield	
	49 – Waterlynn	(Not within one quarter-mile of a station)
Mooresville	50 – Muirfield	(Not within one quarter-mile of a station)
	51 – Mills Village	Mooresville
	52 – Downtown Mooresville	
	53 – West Wilson Avenue	
	54 – McLelland	
	55 – West Iredell	
	56 – Park/McNeely Ave North	Cascade/ NC 150
	57 – Cascade	

Source: Mecklenburg and Iredell County 2005 GIS; Parsons Brinckerhoff
* Some communities are independent of station communities.

3.3.3.2 Communities and Neighborhoods

With the exception of the proposed Bryton development at the new Hambright station, none of the neighborhoods illustrated in Figure 3.3-1a-c are bisected, bifurcated or otherwise physically disrupted by the rail line. There are seven proposed residential displacements in the LPA Alternative and three in the MOS Alternative. Four of the seven residential units are in isolated semi rural locations, with no true neighborhood identity. All of the proposed residential displacements are the result of intermediate station improvements, vehicle maintenance construction, rail crossing closure or frontage road development.

The cohesion and identity of the communities and neighborhoods will not be adversely impacted. The existing railroad line preceded much of the settlement and development in the corridor. The existing rail line, for the most part, defined the nature and character of the neighborhoods and communities in the study area for more than a century. In general, the communities and neighborhoods that developed on either side of the rail line were integrally linked to the railroad as it transported the agricultural output and textile mill production which drove the bulk of the economy up to the mid 20th century.

The northern towns of Huntersville, Cornelius, Davidson and Mooresville as well as Center City Charlotte have adopted zoning and transit station area plans that will position the proposed commuter use for the rail line as a major community feature linking the neighborhoods into a more cohesive and integrated community than before.

3.3.3.3 Community Facilities and Resources

Community facilities include emergency services (fire, police, and EMS), community centers, schools and universities, libraries, senior centers, hospitals, and places of worship. Within 300 feet of the NCCR line, there are 48 community facilities of every type. Thirteen of the community facilities are in Charlotte, five in Huntersville, six in Cornelius, nine in Davidson, four in unincorporated Iredell County, and 11 in Mooresville. Almost half of the community facilities are places of worship. These are listed in Table 3-2 and illustrated in Figure 3.3-2a-c. Parks are discussed and shown in Section 3.11 (Parklands).

There are nine police districts, seven fire districts, and 27 school service areas (11 elementary, 2 intermediate, 8 middle, and 6 high schools) that either have service areas that cross the tracks or are within approximately 400 feet of the corridor. Most of the EMS districts in both Iredell and Mecklenburg counties are bisected, not bordered by the corridor. The exception is in Iredell County, where the portion of one police district is bordered by the corridor. Most of the fire districts in Mecklenburg and Iredell Counties are also bisected by the corridor. Table 3.3-3 summarizes the number of each type of district from the two counties that are either bordered or bisected by the corridor.

Table 3.3-2. Community Facilities located in parcels within 300 Feet of the NCCR

Name of Facility/Resource	Type of Facility/Resource	Nearest Station Alternative
Charlotte		
1) Johnson and Wales University	College/University	Charlotte Gateway
2) Greater Mount Moriah Primative Baptist	Place of Worship	Charlotte Gateway
3) Greenville Congregation of Jehovah's Witnesses	Place of Worship	Charlotte Gateway
4) Cn Jenkins Memorial Church	Place of Worship	Charlotte Gateway
5) Church of God & Saints of Christ	Place of Worship	Charlotte Gateway
6) Druid Hills Traditional International Baccalaureate Elementary	School	Charlotte Gateway
7) Oakdale Elementary at Druid Hills K-5 (Temporary Location)	School	Charlotte Gateway
8) Derita Alternative School	School	Derita
9) Derita Post Office	Post Office	Derita
10) Derita Baptist Church	Place of Worship	Derita
11) Jesus Christ Full Gospel Church	Place of Worship	Derita
12) Independence Hill Baptist	Place of Worship	Eastfield
13) The Good News House	Place of Worship	Eastfield
Huntersville		
14) Huntersville A.M.E. Zoin Church	Place of Worship	Huntersville
15) Huntersville A.R.P. Church	Place of Worship	Huntersville
16) Huntersville Untied Presbyterian	Place of Worship	Huntersville
17) New Beginnings Moravian Church	Place of Worship	Huntersville
18) North Mecklenburg Voluntary Rescue	Rescue Station	Huntersville
Cornelius		
19) Children's Schoolhouse Pre-School	School	Sam Furr
20) Praise of His Glory Church	Place of Worship	Sam Furr
21) Bailey Road Park	Park	Sam Furr
22) Cornelius-Lemley Fire and Rescue Station #1	Rescue Station	Cornelius
23) Town of Cornelius Town Hall	Government	Cornelius
24) Grace Coventant Foursquare Gospel	Place of Worship	Cornelius
Davidson		
25) Davidson United Methodist Church	Place of Worship	Davidson
26) Molly McKay Youth House	Community Center	Davidson
27) Davidson Fire Department	Fire Station	Davidson
28) Davidson Police Department	Police Station	Davidson
29) Davidson Town Hall	Government	Davidson
30) Davidson Post Office	Post Office	Davidson
31) Davidson Senior Center	Community Center	Davidson
32) Davidson Presbyterian Church	Place of Worship	Davidson
33) Davidson College	College/ University	Davidson

Table 3.3-2. Community Facilities located in parcels within 300 Feet of the NCCR (continued)

Name of Facility/Resource	Type of Facility/Resource	Nearest Station Alternative
Southern Iredell County		
34) Caldwell Chapel A.M.E. Zion Church	Place of Worship	Mount Mourne
35) Mount Mourne Volunteer Fire Department	Fire Station	Mount Mourne
36) Mount Mourne Post Office	Post Office	Mount Mourne
37) Community Four Square Gospel Church	Place of Worship	Mount Mourne
Mooresville		
38) Mooresville Municipal Golf Course	Community Center	Mooresville
39) Moore Park	Park	Mooresville
40) Southside Baptist Church	Place of Worship	Mooresville
41) Broad St Methodist Church Of Mooresville	Place of Worship	Mooresville
42) Mooresville Public Library	Library	Mooresville
43) First Presbyterian Church Of Christ	Place of Worship	Mooresville
44) Charles Mack Citizen Center	Community Center	Mooresville
45) Mitchell Community College	College/ University	Mooresville
46) Reid United Memorial Church	Place of Worship	Mooresville
47) Watkins Chapel A.M.E. Zion Church	Place of Worship	Cascade / NC 150
48) National Guard Armory	Government	Cascade / NC 150

Source: Mecklenburg and Iredell County 2005 GIS; Parsons Brinckerhoff

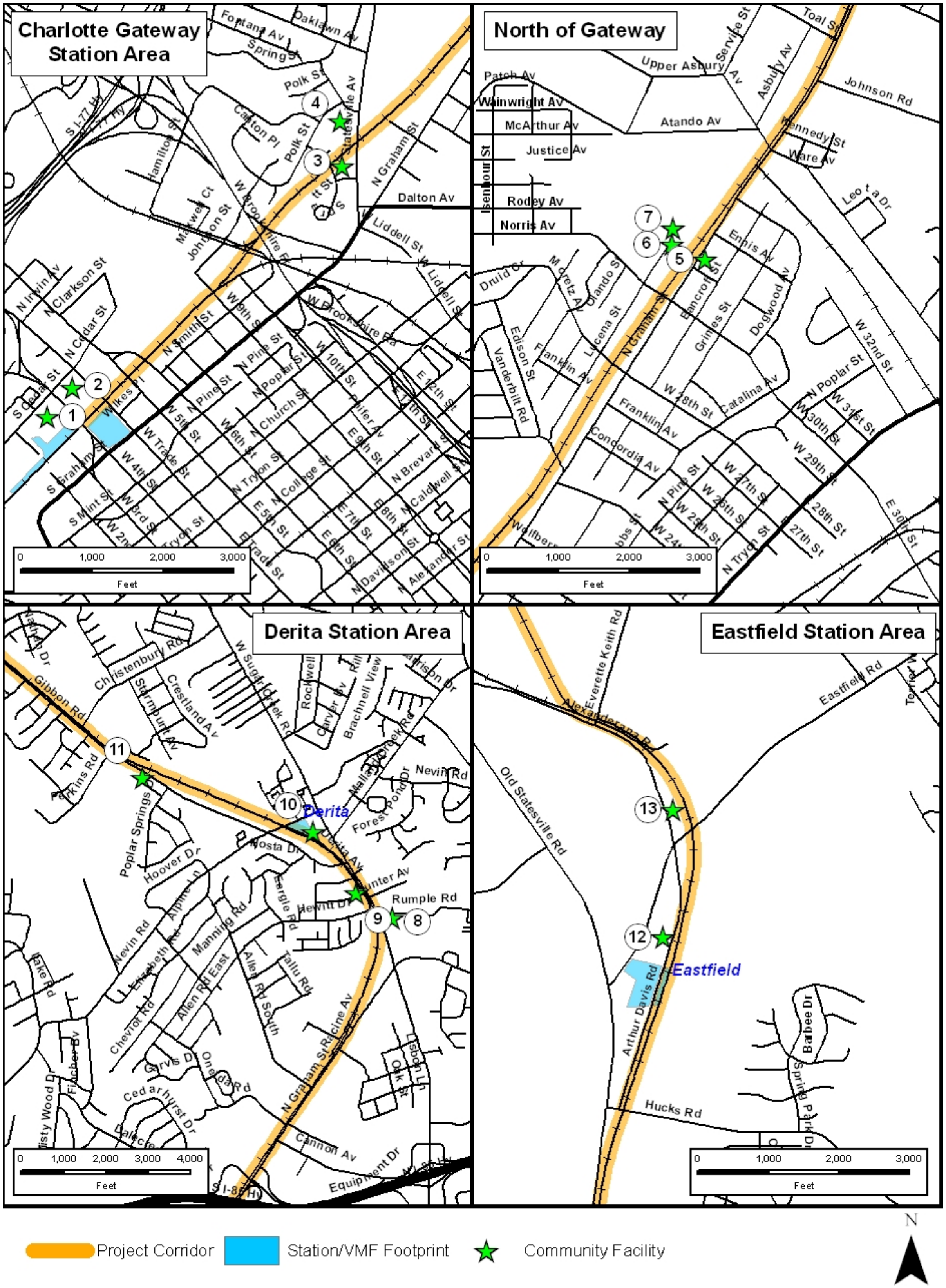

Figure 3.3-2a	Community Facilities

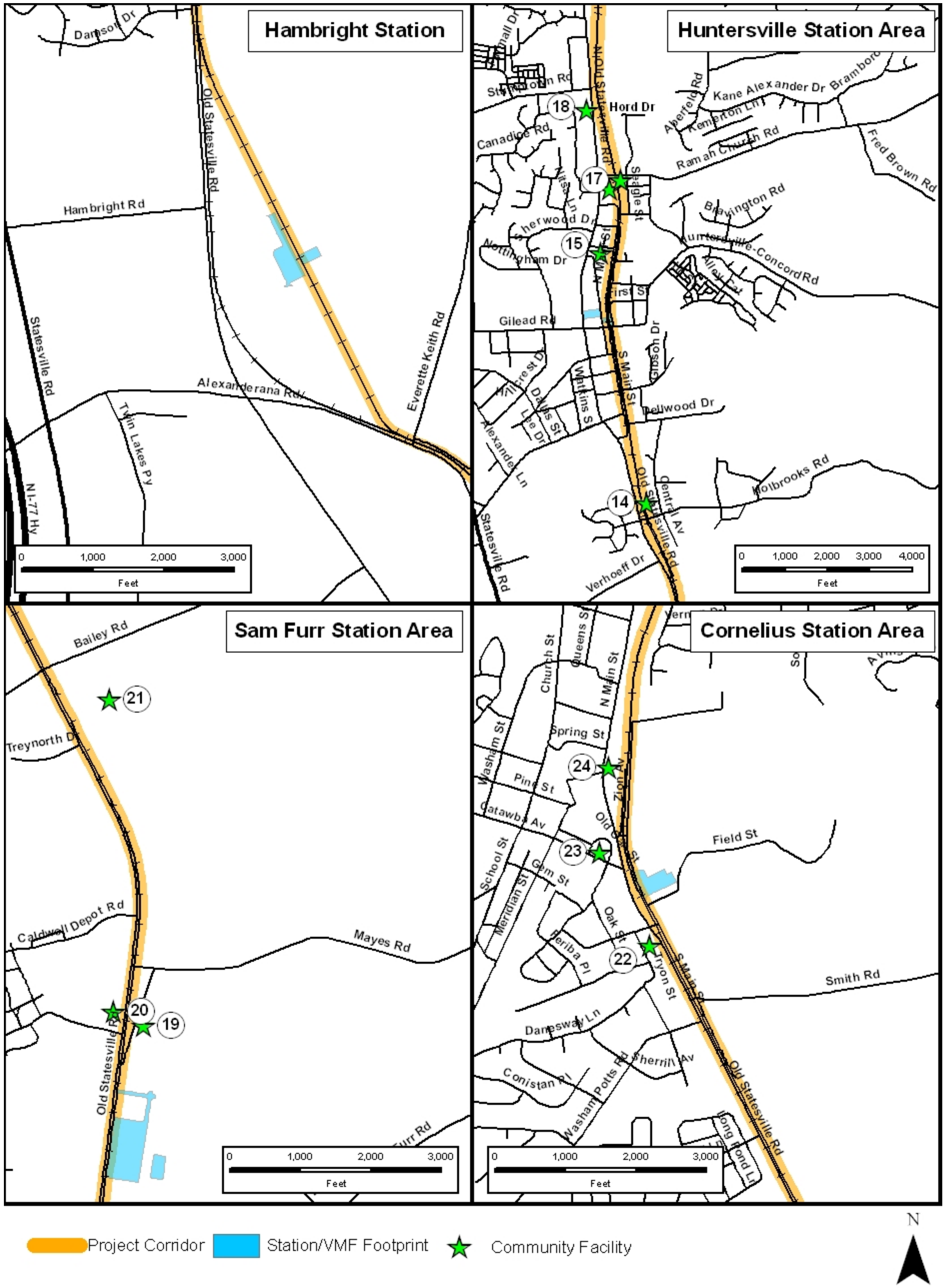

Figure 3.3-2b	Community Facilities

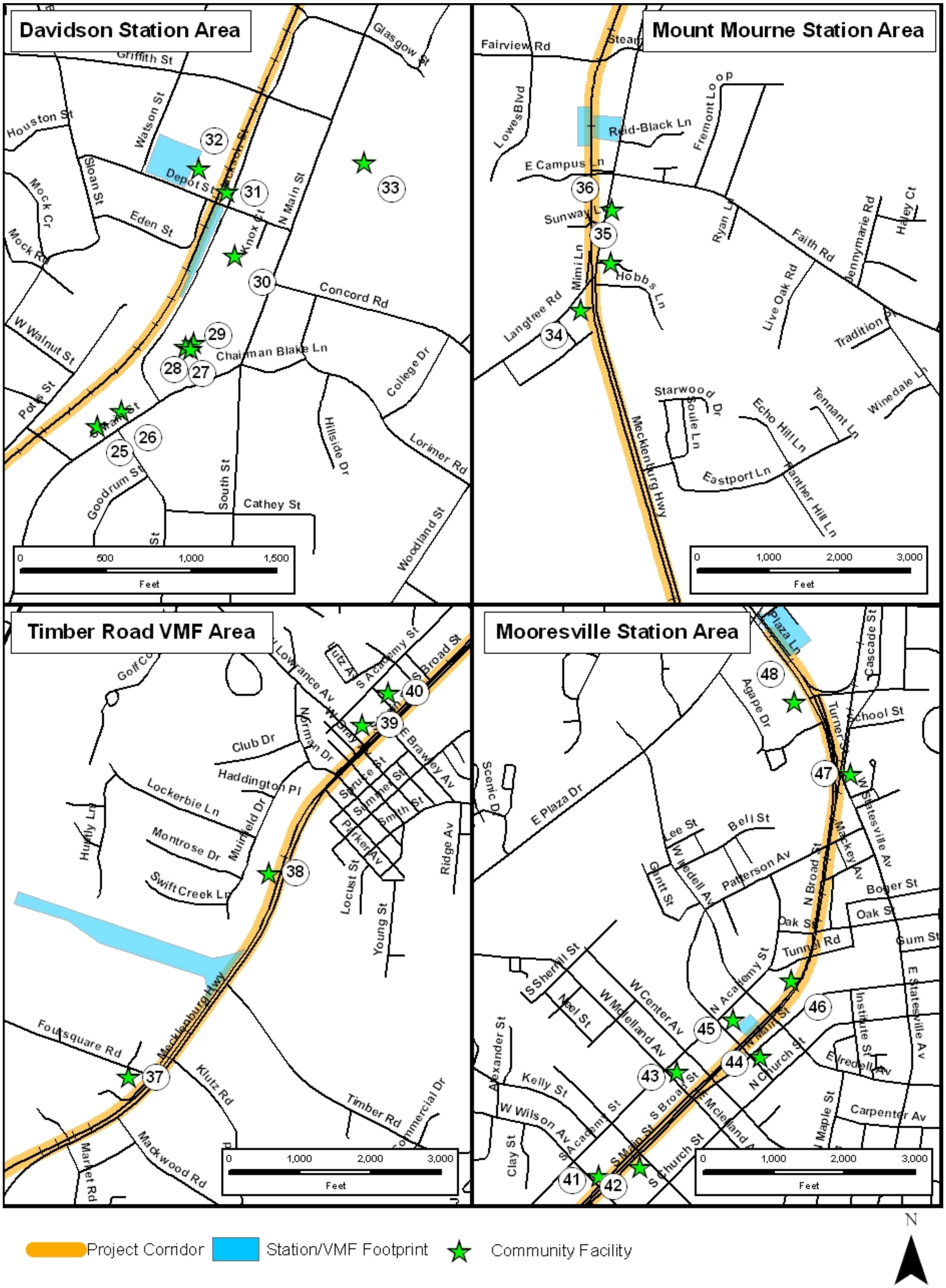

Figure 3.3-4c Community Facilities

Table 3.3-3. Fire, EMS, and School Service Areas along the NCCR

Jurisdiction	Fire Districts	EMS Districts	School Service Areas		
			Elementary	Middle	High
Iredell County	3	1	1	1	1
Town of Mooresville[1,2]	na	na	2	1	1
Mecklenburg County[3]	2	3	10	6	4
Entire Corridor	5	4	13	8	6

Source: Mecklenburg and Iredell County 2005 GIS; Parsons Brinckerhoff
[1] Resources shared with Iredell County
[2] Includes Elementary and Intermediate Schools.
[3] The Charlotte-Mecklenburg School system includes the City of Charlotte and the towns of Huntersville, Cornelius, and Davidson

3.3.4 Environmental Impacts and Benefits

This section describes project impacts by neighborhood associated with the NCCR alternatives and addresses the potential for crime in station areas. The neighborhood discussion addresses changes in community cohesion, potential disturbances such as noise, changes in accessibility, and potential effects on community services.

Refer to the Displacements discussion in Section 3.2 (Displacements) for information regarding specific business and residential displacements and/or takings. Although some discussion of noise impacts is included in the following section, refer to the complete Noise Section in Section 3.6.

3.3.4.1 Community and Neighborhood Impacts

This section discusses the potential effects of the NCCR project to neighborhood cohesion, accessibility, and community services for the communities and neighborhoods. The existing railroad has been in operation since 1861. Many of these communities have developed around the railroad and are defined by the railroad. With the exception of the proposed closing and consolidation of private and public grade crossings for public safety, the implementation of the NCCR along the same rail line would not create a new barrier to social interaction, community functioning, or general access to community services.

NCCR impacts on these communities are associated with stations, the vehicle maintenance facility, or site-specific impacts to particular properties or streets as a result of changes to grade crossings. Where there are site-specific differences, these are noted by neighborhood in the sections that follow. Impacts with respect to low-income and minority neighborhoods are discussed in Section 3.15 (Environmental Justice).

The existing railroad has at-grade crossings of existing streets. Safe rail operation requires that some form of train warning be implemented at these crossings with the introduction of the NCCR project. Some at-grade crossings will be closed permanently in preparation for the new service. Those that remain open will be upgraded. For many residences and businesses who may lose existing access across the tracks, frontage roads would be provided and extended to the nearest public road crossing or a new private crossing would be built to allow access.

Noise impacts to neighborhoods resulting from crossings are to be minimized by designating the certain residential areas as a “quiet zone.” Wheel/rail noise will be reduced by the use of new continuously welded rail construction as well as elimination of short radius rail curvature and utilization of the most current wheel muffling technology. Section 3.6 (Noise) discusses these impacts and suggests less intrusive ways to mitigate train wheel noise and audible at-grade crossing protection. These impacts would not occur with the No-Action Alternative.

As a train comes though a community, it can generate ground-level vibration. Such vibration can vary according to the type and condition of the soil. Depending on its condition, soils are able to increase or decrease the vibration impact. The CATS team performed a vibration impact assessment of the areas in the vicinity of the NCCR to determine the number of potentially affected properties between the proposed stations. The results are segmented by location on the NCCR line and the speed of the train going through the area. Section 3.6 (Noise) describes these impacts and ways to mitigate vibration.

Impacts on communities along the NCCR corridor are presented by jurisdiction. Figure 3.3-1 in shows the general locations of neighborhoods and communities along the corridor. Chapter 2, lists grade crossings in the North Corridor and their future condition.

3.3.4.2 Community Services

Because communities and their facilities and services have developed around the railroad, implementation of the NCCR project generally would not create new barriers to these services.

Many of the community facilities would be affected positively by the NCCR because of the proximity to the rail stations. Hospitals, churches, schools, and community centers near the rail stations would become more accessible to the community.

All of the EMS districts in both Iredell and Mecklenburg counties are bisected, not bordered by the railroad. All of the fire districts in both counties are also bisected by the railroad. The NCCR project would increase gate closures on emergency routes. The NCCR project, in most cases, would close the gates for less than one minute. There will be a few isolated incidents where the gates may close longer than one minute (See Chapter 4 for a discussion on the traffic impacts of the additional gate closures).

3.3.5 Neighborhood Safety and Security Mitigation

3.3.5.1 Safety and Security Design Features at NCCR Stations

CATS is committed to the safety of its customers and the communities it serves. Safety and security impacts affecting neighborhoods as the result of the NCCR line would be addressed by local law enforcement, public discourse, stakeholder meetings, or other methods. The following station design techniques can create a sense of comfort and security for transit users and transit neighbors while deterring potential undesirable behavior.

- Natural Access Control. The station site should provide some natural indications of where passengers are and are not allowed. These include short fences, low landscape elements, signs and paving treatments.

- Natural Surveillance. Locating station elements near residential or commercial buildings that have windows facing the station serve as an indicator to potential violators that they are being watched.

- Lighting. Pedestrian and station areas should be well lighted, but this lighting should diminish in intensity and height near buildings in the neighborhood. If the light is too bright or the fixtures are too high, users of adjacent buildings might shade their windows, indicating to potential lawbreakers that no one is watching the station area.

3.3.5.2 Safety and Security Features at NCCR Stations

Local law enforcement would be responsible for security at the stations. They would patrol the park-and-ride lots in order to maintain a security presence. Closed circuit television (CCTV) cameras would be installed by CATS on trains, station platforms, and in park-and-ride lots. Such systems would be monitored at the central control center. All trains, platforms and park-and-ride lots would be equipped with emergency call boxes for contacting CATS central control center. The control center would have information concerning call location and could be in contact with local law enforcement or emergency services.

CATS will modify and extend appropriate conditions of their existing System Safety Program Plan (SSPP) prior to beginning the Final Design phase of the project. Such a plan would address numerous issues including security at stations, safety at highway/railroad grade crossings (see Chapter 4), dealing with trespassers and many other railroad operation related issues.

3.3.6 Literature Cited

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3.4 Visual and Aesthetic Quality

Major public improvement projects can have varying degrees and types of impacts on the visual and aesthetic quality of the built and natural environment. The impacts can range from very intrusive to hardly noticeable. Visual environments can be viewed as negative, or they can improve and contribute in a positive way to the appearance and image of communities.

3.4.1 Legal and Regulatory Framework

This section addresses the provisions of NEPA in accordance with federal environmental law, USDOT technical guidance related to environmental documentation and specific regulations related to general environmental conditions as well as specific resource protection and preservation measures. In certain cases, state environmental codes are addressed. The following laws, regulations, executive orders and related policy guidance direct much of the foregoing documentation:

- NEPA, 1969
- Uniform Relocation Assistance and Real Property Acquisition Policies Act, 1970
- CEQ *Regulations for Implementing NEPA (40 CFR 1500-1508),*
- FHWA's *Environmental Impact and Related Procedures (23 CFR 771*)
- 23 U.S.C. 109(h) and 23 U.S.C. 138 (Section 4(f) of the DOT Act)
- The reporting requirements of 23 U.S.C. 128

Visual impacts to historic resources are protected under Federal law through Section 106 of the National Historic Preservation Act of 1966, as amended and implementing regulation 36 CFR 800 as revised on May 18, 1999.

According to the USDOT document *Guidance for Preparing and Processing Environmental and Section 4(F) Documents* a "DEIS [Draft Environmental Impact Statement] should state whether the project alternatives have a potential for visual quality impacts. When this potential exists, the draft EIS should identify the impacts to the existing visual resource, the relationship of the impacts to potential viewers of and from the project as well as measures to avoid, minimize or reduce the adverse impacts" (FHWA, 1987).

3.4.2 Methodology

Compatibility or contrast with the existing built and natural environment's visual or aesthetic context is assessed from two perspectives. First, the views afforded users of the proposed NCCR project are evaluated. Second, the visibility of the project is evaluated from the perspective of the surrounding environment and, specifically, those sites considered particularly sensitive to changes of setting or view.

Given these two perspectives, a general overview of the NCCR's visual and aesthetic character along the rail line is presented in the first section. The second section identifies the different types of viewers along the rail line, and the third section describes views for travelers using the rail line. Finally, visually sensitive resources are described.

Landscape units are defined as areas with similar existing visual characteristics. These areas generally have similar type and density of development, or a similar amount and character of undeveloped open space.

During the Agency Scoping process, local, state, and federal agencies offered preliminary comments on the North Corridor. Although comments were made on related issues (such as the need to curtail sprawl and environmental justice concerns) no comments specifically referenced a visual resource.

3.4.3 Existing Conditions and Resources

3.4.3.1 Existing Visual Characteristics and Aesthetic Quality

The railroad tracks and track bed are the dominant visual elements of the railroad within the project area, however these elements are located at ground level, and do not significantly affect the landscape. Other elements contributing to the character of the railroad corridor include railroad bridges and overpasses, crossing signals and gates, and existing signal system infrastructure. There are three overpasses along the NCCR, which are owned by NS railroad.

- I-85
- WT Harris Boulevard
- Cornelius / Davidson corporate limits.

Existing railroad infrastructure includes:

- the Davidson and Mooresville depot buildings
- active and abandoned railroad sidings to businesses and warehouses.

In many areas along the NCCR line, the visual characteristics are typical of development found around a railroad corridor with heavy industrial uses and little or no vegetation between the tracks and development. In some portions of the study area vegetation partially or entirely blocks views of the railroad. In others areas the corridor is unobstructed. In these areas the visual characteristics of the corridor vary from developed residential, commercial, and industrial land to open space. The following sections describe the existing visual characteristics for each landscape unit within the study area.

Currently, NS provides daily local freight service (one round-trip train per day) to various rail shippers along the NCCR between Charlotte and Davidson. However, freight service north of the Ameristeel plant (one mile north of Harris Boulevard in Charlotte) is infrequent. As a result, those portions of the NCCR in northern Charlotte, Huntersville, Cornelius, and Davidson typically experience less-than-daily freight trains. NS also operates one daily roundtrip train between Barber, NC, and the flour mill in Mooresville, located between the proposed Mooresville and Cascade/NC 150 stations. Thus, residents in the Cascades area of Mooresville living adjacent to the rail line typically see up to two trains each day.

Urban

Urban landscape units are characterized as having high density development with mixed land uses and major transportation infrastructure. The view of traffic movement along the streets is nearly constant with passenger vehicles, buses, and small to large trucks. Vegetation is sparse.

Center City Charlotte (photo right) is the sole example of this type of landscape unit within the study area. A major potion of the rail line is elevated throughout this urbanized area with frequent daily freight service. Large volumes of vehicular traffic flow under and parallel to the rail line.

Industrial

Industrial landscape units tend to have small to large low-rise buildings with asphalt lots for loading/unloading freight and for customer/ employee parking. Traffic movement and signage is visually more dominate in these areas compared to urban landscape units. Vegetation is sparse to non existent.

The Graham Street corridor (photo right) is a typical example of an industrial landscape unit. The NCCR line mainly runs adjacent to the major roadway or directly behind the industrial buildings and has limited use. Large freight trucks and commuter traffic is constant during most of the day.

Town Center

A town center landscape unit typically has a cluster of commercial land uses and community facilities that serve the surrounding residential area. Passenger vehicles are visually more prominent than buses and trucks. There is more visible greenspace and tree canopy, particularly around residential areas.

Derita (photo right) is one example of a town center landscape unit. The NCCR line straddles a major thoroughfare to the east and a local street to the west. Daily freight train service is visible but viewsheds are dominated by heavy commuter and local traffic most of the day.

In Huntersville (photo right) the rail line passes along the east side of the commercial area and is not visible to most people that are conducting business in the downtown area or passing through. The two roadways that parallel the rail line have low volumes of traffic observed during the day. The rail line and current freight traffic is mainly in view of residential structures that front these roads.

Cornelius (photo right) is the third town center landscape unit. The rail line is a more prominent feature in downtown Cornelius compared to Huntersville. The rail line parallels a major roadway and is more visible to business patrons and travelers passing through. There are several residential homes and businesses that face the rail line or have the rail line directly behind the property.

The NCCR line through Davidson (photo right) is not a prominent feature in the downtown business district. Parallel roads are intermittent and carry low volumes of traffic. Most of the rail line runs along the back side of business and residential properties. Travelers passing through or conducting business in Davidson my take little notice of the existence of the rail line. Existing freight trains are infrequent.

In Mooresville, the NCCR line passes through the center of the business district with high volumes of traffic on the two parallel roadways. The rail line is a dominate feature in the downtown visual landscape. The original train depot (in photo right) is being used by a local non-profit group. Business patrons and travelers passing through downtown Mooresville will have frequent views of the rail line. Residents in the Cascades area of Mooresville living adjacent to the rail line typically see up to two freight trains each day.

Suburban

Suburban landscape units typically consist of single-family residential housing with some scattered small businesses and community facilities. The view of traffic movement along the streets is mostly passenger vehicles and the volume of traffic varies. There is ample green space and tree canopy.

The residential properties that front the rail line (previous photo) are often separated by a frontage road. Properties that have the rail line running along the back of the property line (photo right) have a mix of obstructed and unobstructed views of the rail line. More recently developed subdivisions are likely to have a visual buffer between the housing and rail line. The infrequent passing of freight trains is more visible in the older neighborhoods than the more recently developed subdivisions.

Rural

Rural landscape units have scattered housing with only a few commercial structures or community facilities. The observed volume of traffic and mix of vehicles varies from low volume local passenger vehicles to heavy traffic with passenger, truck, and buses. Vegetation is ample with a forested mix of pine and hardwoods as well as cultivated croplands and uncultivated pasture.

The views of the rail line vary depending on the proximity to the roadway and level of screening from vegetation. In some areas the traveler may lose sight of the rail while in other areas the rail line is directly adjacent to the road. Views of a passing train can be unnoticed or brief.

3.4.3.2 Views of Rail Facilities

Views of the railroad facilities are those from roadways and adjacent properties. Those viewing the railroad facilities from adjacent properties include residents, employees, and patrons of commercial and industrial properties, and those using public areas. Views from surrounding land uses can be unlimited or unobstructed, with nothing blocking the view of the project area. Views also can be limited or blocked by vegetation or structures. Photo images are for illustration purposes only and do not represent proposed designs for NCCR facilities or equipment used.

The view of the railroad generally will not change. There will be some minor alignment shifts, undercutting, and additional sidings that will be introduced to the viewer but the overall appearance of the railroad will be basically the same as it exists today. Some undercutting may improve the views by lowering the profile of the railroad and allowing more background vistas. For the Hambright Alternative, the railroad alignment will be relocated. Existing track and track elements will be removed. The new realignment will be noticeable at the end locations, but the remaining section will be constructed in an undeveloped area, screened from nearby roads or buildings. As the Hambright area develops, there will be residential and businesses constructed near the rail line, which will be visible to those living and visiting the area. In the event of a grade separation at Sam Furr Road, the view of the railroad will change. The extent of this visual change will depend on the design of the separation but the area affected will be isolated.

The views of rail crossings will change where new crossing gates are installed. These changes may go unnoticed for the general traveler since crossing gates are a common feature where railroads exist. Those living and working in the area may also overlook the change except perhaps when a train is passing and the gates and flashing lights are activated. Existing gates will also be more noticeable with the introduction of the commuter rail service since they will be activated more frequently than what is currently observed.

Passing trains will be observed more often with the commuter rail service. This will be more apparent to the viewer in the town center, suburban, and rural landscape units where there are fewer buildings and the volume of truck and bus traffic is lower (example photo right). The commuter trains will be less noticeable in the Industrial landscape unit due to the larger volume of truck movement and distractions from signage and large low profile buildings. Commuter trains may go unnoticed in the urban landscape unit since there are already frequent passes of freight trains, large volumes of large and small vehicles passing nearby, and large structures in the background.

The most noticeable change in the views of the rail facilities will be the train stations and associated infrastructure, such as parking, station platforms, and lighting. The proposed station design criteria provides for the basic amenities necessary for station operation. Joint use with commercial interests or other agencies such as the post office or library will be provided for on a case by case basis. In some areas, existing depots may be used.

Station design, materials, color and roof pitch will be resolved with the local jurisdictions and may vary from station to station. The architectural character of the station shall be based on example of existing architecture found in the community or region. The historic styles of the region shall be blended into a contemporary structure that draws inspiration from the local architectural context.

The proposed stations in the rural and suburban landscape units will be more noticeable depending on the progression of development in the area. Stations that will be more visible are those that are constructed and in operation prior to the development of the surrounding area. Stations built in areas that are already developing or in conjunction with a proposed development will be less obvious. Stations built within the town center landscape units may intentionally be designed to draw attention to the structure as part of an overall TOD plan. Since several of the communities along the rail corridor have or once had a station depot, the reopening or introduction of a new station may enhance the visual landscape.

Under the CGS Full Build Alternative, the proposed CGS in the urban landscape unit will include a mix of uses including offices and retail. The design will blend into the existing visual landscape of Center City Charlotte.

A final component of the views of the rail facilities is the VMF. The VMF and storage area will be used to clean, inspect, store and provide light repairs to the locomotives and passenger coaches used for North Corridor service. The two VMF alternatives under consideration will have different visual perspectives. The Timber Road VMF alternative would be located in a rural setting north of the Mount Mourne Station. The rails leading to the facility will be perpendicular to the road with the maintenance building being over 1,000 feet away. This layout will limit the extent of the view for vehicles passing by. There are a few homes to the north of the site that may have views of the facility if no visual screening is provided. The South End VMF would be located south of the CGS. The location and design of the structure will be consistent with the existing visual fabric of the surrounding area.

3.4.3.3 Views from the Rail line

This section describes views for travelers using the rail line. It highlights areas where travelers using the commuter rail could be introduced to areas where views currently are not open to large numbers of people. This section also notes outstanding views from the rail line.

Through the suburban and town center landscape units, the primarily areas that will have new views for the rail users are personal spaces such as the backyards of residences. In these areas, views from the corridor sometimes are partially blocked by a thin vegetative buffer or fencing but in many cases are unobstructed. These encounters will typically be brief except near stations where the train operates at slower speeds and rear facing units exist. Most of the remaining views in the suburban and town center landscape units will be similar to those experienced by traveling by road.

In the industrial landscape units, views of loading docks and storage areas will be visible to the traveler. These areas will likely be considered less appealing than most views along the corridor but the visual attractiveness will be similar to what would be experienced from the fronting roadways. The section of the rail line, where these types of visual elements mostly exist, is

along the Graham Street corridor where no stations are proposed.

Sections of the rail corridor that travel through the rural landscape units will not necessarily introduce new views to the passengers. Most of the rural landscape is currently visible from the existing roadways. Views of open space and pasture land however will likely be visually pleasing to the traveler.

The most outstanding view from the rail line will be the approach to Center City Charlotte, which is part of the urban landscape unit. The attractive skyline will be visible from several miles north along the corridor. As the commuter train advances toward the CGS, the view of the skyline will become larger and expand. These views will be most dramatic during early morning hours when the City is illuminated with lights.

3.4.3.4 Visually Sensitive Resources

Resources that could be visually sensitive, either in terms of the sensitivity of viewers from the resource or their contribution to attractive views, are listed in Table 3.4-1. These resources include homes, some churches, parks/recreational areas, and eligible historic resources. These are resources that, in most cases, are at least partially shielded from the NCCR line by vegetation or some other obstruction. Certain historic resources also are considered visually sensitive and are noted in the table. (See Section 3.10,Historic Architectural and Archaeological Resources for more information).

Table 3.4-1. Visually Sensitive Resources (within 300 feet of NCCR line)

Landscape Unit	Visually Sensitive Resources	Surrounding Land Uses	Features Blocking View of Rail ROW
Center City Charlotte to Interstate 277	Pinewood Cemetery*; Elmwood Cemetery*; Virginia Paper Company Warehouse*, former US Post Office*, Fourth Ward (Charlotte Historic District)*; Seaboard Street Industrial Historic District*	Office, commercial, entertainment	None for cemetery and on Smith St; Buildings
Interstate 277 to Interstate 85	North Graham St Industrial Historic District*; Interstate Granite Corporation*; Mitchell-Distribution Company/Carolina Tractor and Equipment Company*; Greenville; Lockwood; Druid Hills; Tryon Hills neighborhoods	Residential, industrial/ commercial	Buildings in most areas
Interstate 85 to Gibbon Rd/Old Statesville Rd intersection	Derita Baptist Church; AME Zion Complex; Residential areas along Gibbon Road; Cochran-Robinson House*; Fred Gibbon Farm*	Residential, industrial; commercial	Buildings in some areas, thin vegetative buffer in residential area ; unlimited in other areas
Gibbon Rd/ Old Statesville Rd intersection to Hambright Rd	Blythe Legette Elementary School; Alexander Middle School; North Mecklenburg High School; Croft Historic District*; Wilson House and Farm*	Residential, industrial, instituional	Thin tree buffer around residential areas; Dense vegitation along Old Statesville Rd; None near schools
Hambright Rd to Sam Furr Rd	Residential areas near Huntersville town center; Charles and Laura Alexander House*; House Nos. 159* and 160*; Hutnersville Commercial Block*; Huntersville Ice House*; Huntersville Associate Reformed Presyterian Church*	Commercial, office, residential	Thin vegetation
Sam Furr Rd to Catawba Ave	Caldwell Station School*; Jacob Alonzo Dove House*; Frank Sherrill House*; Confederate Monument*; Robbins House*; Cornelius town center	Residential, institutional (government), industrial	Thin tree buffer
Catawba Ave to Iredell County Line	House No. 95*; Davidson College*; Lingle Hut*	Institutional, residential, some industrial	Thin tree buffer
Iredell County Line to Timber Rd	Houses Nos. 79* and 82*; George Houston House*; Mount Mourne*; Lowe's Home Improvement Headquarters; Lake Norman Medical Center; Golf Course	Residential, office, industrial	None for residences along Old Statesville Rd; tree buffer
Timber Rd to Williams St	Downtown Mooresville (including Historic District* and southern expansion); Mill Village Historic District*; Mooresville Cotton Mill; Issac Harris House*; former Manse Presbyterian Church; Dense residential area south of downtown; Cook's Grocery Store and House*; Watkins Chapel A.M.E. Zion Church*; National Guard Armory*; Espy Brawley House*; Cascade Neighborhood	Commercial, office, residential, industrial	Thin tree buffer

Source: Parsons Brinckerhoff, 2006

* Eligible for or on the National Register of Historic Places

Examples of visually sensitive resources are shown in Table 3.4-2. These include two cemeteries in Center City Charlotte, a residential area in Charlotte, the Derita Baptist Church, the three schools in southern Huntersville near the NS “O” line, the Huntersville town center, the Cornelius town center, Davidson College, downtown Mooresville, and various areas along Old Statesville Road where homes abut the NS “O” line.

Table 3.4-2. Examples of Visually Sensitive Resources

Druid Hills Elementary School	
Several churches, such as the Derita Baptist Church (pictured)	
Cemeteries such as Pinewood and Elmwood in Center City Charlotte, and Oak Grove (pictured with railway in foreground)	

Source: Parsons Brinckerhoff, 2006

3.4.4 Environmental Impacts and Benefits

The NCCR would affect visual quality only at selected station locations and track areas and not along the entire project. These impacts would result from removal of or reduction in existing vegetative screens of the existing railroad, new track work, and from construction of station or parking lot infrastructure adjacent to residential areas or historic resources. NCCR passengers would have views into backyards, normally private spaces, at some locations. In these areas, views from the rail line sometimes are partially blocked by a thin vegetative buffer or fencing but in many cases are unobstructed.

Visual impacts from the perspective of low-income and minority communities are discussed in Section 3.15 (Environmental Justice). The No-Action Alternative would have no visual impacts.

Because the rail line has been in existence since the mid-19th century, there would not be a substantial change in views along the corridor. The only change in views would be the rails and the ties (which would be the same as what is currently there, except newer) and the stations, which are the only part of the NCCR that would be different from existing conditions. Stations will be built according to architectural guidelines as determined by open public process. Stations will also be built to address the local historic and aesthetic context.

3.4.5 Mitigation

Application of context sensitive design principles would be used to help mitigate visual and aesthetic impacts of the NCCR. This concept provides for better integration of the project's infrastructure into the community with compatible materials, station area design guidelines, soft and hard landscaping, signing and lighting, and public art. Site furnishings would be carefully selected, detailed and placed at stations and park-and-ride (PNR) lots to complement the surrounding environment. In areas where there would be a substantial change in views from adjoining neighborhoods or other sensitive resources and where sufficient ROW exists, planting of a vegetative screen could soften any negative visual effects.

In addition, CATS has expressed its commitment with each jurisdiction within the North Corridor to create station areas conforming to local land use plans and, when applicable, Historic District guidelines. CATS has communicated its flexibility to work with each of the Towns regarding station design and appearance. Station elements such as signage, the CATS logo, way-finding, and platforms would be consistent throughout the North Corridor. Other elements, such as physical building attributes, architectural finishes and landscaping, would be left for each jurisdiction to customize and make their own to reflect the area's unique character.

3.4.6 Literature Citied

Cultural Resources Division, National Park Service. *National Historic Preservation Act of 1966*, as amended and implementing regulation 36 CFR 800 as revised on May 18, 1999.

City of Charlotte-Mecklenburg County, Charlotte Area Transit System, "Art-in-Transit," *CharMeck.org,* http://www.charmeck.org/Departments/CATS/Art+in+Transit/Home.htm, accessed 3 March 2006.

3.5 Air Quality

This section presents applicable federal air quality standards and discusses whether the NCCR project attains those standards. Air quality is a general term used to describe the pollutant levels in the atmosphere. The air quality analysis will identify the potential air quality effect associated with traffic conditions resulting from the construction and operation of the NCCR alternatives.

3.5.1 Legal and Regulatory Framework

In accordance with the Clean Air Act of 1970 (42 U.S.C. 7609, as amended in 1997 and 1990) the US Environmental Protection Agency (EPA) established National Ambient Air Quality Standards (NAAQS) for six criteria pollutants: carbon monoxide (CO), nitrogen dioxide (NO_2), ozone (O_3), particulate matter (PM_{10} and $PM_{2.5}$), sulfur dioxide (SO_2), and lead (Pb). These standards presented in Table 3.5-1, are also the official ambient air quality standards for the State of North Carolina. The "primary" standards have been established to protect the public health. The "secondary" standards are intended to protect the nation's welfare and account for air pollutant effects on soil, water, visibility, materials, vegetation, and other aspects of the general welfare.

3.5.2 Methodology

This section documents the expected air quality effects of the NCCR. Effects are examined from a microscale perspective or project level perspective. The impacts associated with two typical park-and-ride lots under a worst-case scenario are also presented. Construction related air quality considerations are discussed in Section 3.14 Construction Impacts.

3.5.3 Existing Conditions and Resources

3.5.3.1 Existing Air Quality Levels and Compliance in the Study Area

Air pollutant levels throughout North Carolina are monitored by a network of sampling stations operated under the supervision of the North Carolina Department of Environment and Natural Resources (NCDENR), Division of Air Quality. Data from the stations within the study area (Mecklenburg and Iredell counties) for 2004 is given in Table 3.5-2. The counties comprising the study area are in attainment for all pollutants except the eight-hour ozone standard.

Section 107 of the 1997 Clean Air Act Amendments requires the EPA to publish a list of all geographic areas not in compliance with the NAAQS. Areas not in compliance with the NAAQS are termed non-attainment areas. The designation of an area is made on a pollutant-by-pollutant basis. In July of 1997, EPA adopted an 8-hour standard for O_3 (0.08 parts per million (ppm)) and added $PM_{2.5}$ as a criterion pollutant to the NAAQS.

EPA evaluated the latest scientific data and developed a more protective standard after discovering that adverse health effects resulting from ozone exposure occur at lower concentrations spread out over longer periods of time. However, before EPA could apply the new 8-hour standard for ozone, the agency was delayed due to litigation concerning the 8-hour standard and its application. Finally, in spring of 2004, EPA designated areas in nonattainment with the 8-hour standard. Areas designated nonattainment under the 8-hour ozone standard have one year to demonstrate conformity in accordance with the procedures established by EPA at which time the 1-hour ozone standard will be revoked.

The NCCR study area is currently classified as being in attainment for all NAAQS pollutants except ozone and carbon monoxide. The project is located within the Metrolina nonattainment area for O_3 and the Charlotte nonattainment area for CO as defined by EPA. The 1990 Clean Air Act Amendments designated these areas as moderate nonattainment area for CO. However, due to improved monitoring data, these areas were re-designated as a maintenance area for CO on September 18, 1995. The area was designated moderate nonattainment for O_3 under the eight-hour ozone standard effective June 15, 2004.

In July of 1997, EPA added $PM_{2.5}$ as a criterion pollutant to the NAAQS. EPA designated $PM_{2.5}$ nonattainment areas on January 5, 2005. Only Greensboro-Winston Salem-High Point, North Carolina (Davidson and Guilford Counties) and Hickory, North Carolina (Catawba County) have been designated as $PM_{2.5}$ nonattainment areas.

Table 3.5-1. National Ambient Air Quality Standards

Pollutant	Averaging Period	National and State Standards	
		Primary	Secondary
Ozone (O_3)	1 Hour[b]	0.12 ppm (235 μg/m^3)	Same as Primary Standard
	8 Hour[c]	0.08 ppm (157 μg/m^3)	Same as Primary Standard
Carbon Monoxide (CO)	1 Hour[a]	35 ppm (40 mg/m^3)	-
	8 Hour[a]	9 ppm (10 mg/m^3)	-
Nitrogen Dioxide (NO_2)	Annual Average	0.053 ppm (100 μg/m^3)	Same as Primary Standard
Sulfur Dioxide (SO_2)	Annual Average	80 μg/m^3 (0.03 ppm)	-
	24 Hour[a]	365 μg/m^3 (0.14 ppm)	-
	3 Hour[a]	-	1300 μg/m^3 (0.5 ppm)
Particulate Matter (PM_{10})	Annual Arithmetic Mean[d]	50 μg/m^3	Same as Primary Standard
	24 Hour[e]	150 μg/m^3	Same as Primary Standard
Particulate Matter ($PM_{2.5}$)*	Annual Arithmetic Mean[d]	15 μg/m^3	Same as Primary Standard
	24 Hour[e]	65 μg/m^3	Same as Primary Standard
Lead (Pb)	Calendar Quarter	1.5 μg/m^3	Same as Primary Standard

Source: EPA, "National Primary and Secondary Ambient Air Quality Standards." (49 CFR 50).
Notes:
* New Standard effective September 16, 1997 (Final rules can be found in Federal Register July 18, 1997).
[a] Not to be exceeded more than once a year.
[b] 3-year average of the 4th highest 8-hour concentration many not exceed 0.08 ppm
[c] Areas not attaining the 1-hour standard by the end of 1997 must attain that standard before demonstrating attainment with the 8-hour standard
[d] Based on a 3-year average of annual averages.
[e] Based on a 3-year overage of annual 98th percentile values
Abbreviations:
ppm: parts per million; μg/m^3: micrograms per cubic meter; mg/m^3: milligrams per cubic meter

Table 3.5-2. Air Quality Measurement Summary for the Study Area

Pollutant	Mecklenburg County 620 Moretz Street 37-119-0003	Mecklenburg County 2210 Eastway Drive 37-119-0041	Mecklenburg County Filter Plant Davidson 37-119-1001
Carbon Monoxide (CO)			
Maximum 1-hour	NM	3.8	NM
# of 1-hr. conc>35 ppm	-	0	-
Maximum 8-hour	NM	3.2	NM
# of 8-hr conc. > 9 ppm	-	0	-
Nitrogen Dioxide (NO_2)			
Maximum 1-hour	NM	0.080	NM
Annual Arithmetic Mean (ppm)	-	0.0145	-
Annual Mean > 0.05 ppm	-	0	-
Particulate Matter (PM_{10})			
24 Hour Conc. (μg/m3)	47	NM	45
# of Concentrations > 150 μg/m3	0	-	0
Annual Arithmetic Mean (μg/m3)	24.6	-	21.5
Particulate Matter ($PM_{2.5}$)			
24 Hour Conc. (μg/m3)	NM	39.8	NM
# of Concentrations > 65 μg/m3	-	0	-
Annual Arithmetic Mean (μg/m3)	-	14.83	-
Ozone (O_3)			
1 Hour Maximum	NM	0.124	NM
# of Concentrations > .125 ppm	-	0	-
8 Hour Maximum	NM	0.098	NM
# of Concentrations > .085 ppm	-	4	-
Sulfur Dioxide (SO_2)			
24 Hour Conc. (μg/m3)	NM	0.015	NM
# of Concentrations > 0.14 ppm	-	0	-
Annual Arithmetic Mean (ppm)	-	0.032	-
Lead (Pb)			
Quarterly Average	NM	NM	NM

Source: NCDENR, Division of Air Quality, 2004 Statewide Annual Air Quality Concentration Summaries (April 2005)
Notes: * NM = Not Monitored

3.5.4 Environmental Impacts and Benefits

3.5.4.1 Pollutants Analyzed

Pollutants that can be traced principally to rail and highway vehicles and are thus relevant to the evaluation of the project impacts, include CO, hydrocarbons (HC), NO_2, O_3 and PM_{10}. Transportation sources account for a very small percentage of regional emissions of SO_2

and Pb; thus, a detailed analysis for those pollutants is not required. While the EPA has indicated that PM_{10} is a pollutant of concern for mobile source projects, the EPA has not adopted PM_{10} project-level analysis guidance.

CO impacts are localized. Even under the worst meteorological conditions and most congested traffic conditions, high concentrations are limited to within a short distance (300 to 600 feet) from heavily traveled roadways and fixed guideways. Consequently, it is appropriate to predict concentrations of CO on a regional and on a localized or project-level basis. HC and NO_2 emissions from all vehicle sources are of concern because of their role as precursors in the formation of ozone and particulate matter. Ozone is formed through a series of reactions that take place in the atmosphere in the presence of sunlight. Since the reactions are slow and occur as the pollutants are diffusing downwind, elevated ozone levels are often found many miles from sources of the precursor pollutants. The effects of HC and NO_2 emissions are, therefore, generally examined on a regional or “mesoscale” basis.

3.5.4.2 Microscale Air Quality Analysis Methods and Assumptions

Methodology

Project level, or “microscale,” air quality modeling was performed using the EPA’s mobile source emission factor model (MOBILE 6.2) and the CAL3QHC (version 2.0) air quality dispersion model. Following the guidelines set forth in the EPA’s *Guidelines for Modeling Carbon Monoxide from Roadway Intersections* (EPA-454/R-92-005), CO levels in the study area were estimated for the existing setting, the No-Action Alternative, and the NCCR alternatives.

Vehicular Emissions

Vehicular emissions were estimated using the EPA Mobile 6.2 vehicular emission factor model. Emissions factors are also greatly affected by speed, ambient temperature, vehicle age, and mileage distribution. An ambient temperature of 52.0° F and specific vehicle age and mileage distribution information was recommended by the NCDENR, Division of Air Quality. Emission estimates include the implementation of North Carolina’s inspection and maintenance (I/M) programs and anti-tampering program (ATP). Emission estimates were made for the years 2005, opening year, and 2030.

Dispersion Model

Mobile source models are the basic analytical tools used to estimate CO concentrations expected under given traffic, roadway geometry, and meteorological conditions. The mathematical expressions and formulations that comprise the various models attempt to describe an extremely complex physical phenomenon as closely as possible. The dispersion-modeling program used in this study for estimating pollutant concentrations near roadway intersections is the CAL3QHC (Version 2.0) dispersion model developed by the EPA and released in 1992.

CAL3QHC is a Gaussian model recommended in the EPA’s *Guidelines for Modeling Carbon Monoxide From Roadway Intersections* (EPA-454/R-92-005). Gaussian models assume that the dispersion of pollutants downwind of a pollution source follow a normal distribution around the center of the pollution source.

Different emission rates occur when vehicles are stopped (idling), accelerating, decelerating, and moving at different average speeds. CAL3QHC simplifies these different emission rates into the following two components:

1. Emissions when vehicles are stopped (idling) during the red phase of a signalized intersection.

2. Emissions when vehicles are in motion during the green phase of a signalized intersection.

The CAL3QHC (Version 2.0) air quality dispersion model has undergone extensive testing by the EPA and has been found to provide reliable estimates of inert (non-reactive) pollutant concentrations resulting from motor vehicle emissions. A complete description of the model can be found in the *User's Guide to CAL3QHC version 2.0: A Modeling Methodology for Predicting Pollutant Concentrations near Roadway Intersections* (EPA-454/R-92-006).

Traffic Information

Traffic data for the air quality analysis were derived from traffic counts and other information received from MUMPO. The microscale CO analysis was performed for the p.m. peak traffic period. This is the period when the greatest air quality effects of the proposed project are expected. Vehicle speeds used in the analysis were obtained from traffic operation forecasts undertaken for this study.

Analysis Sites / Receptor Locations

CO levels resulting from motor vehicles adjacent to the proposed NCCR project were estimated at five traffic intersections using the CAL3QHC (version 2.0) model. Sites were selected based on existing, no-action, and estimated future traffic conditions with the NCCR project and included the locations where the greatest project-related air quality impacts are expected to occur.

Receptor sites analyzed are listed in Table 3.5-3. Receptors were chosen at each intersection in accordance with the guidelines found in the EPA's *Guideline for Modeling Carbon Monoxide from Roadway Intersections* (EPA-454/R-92-005).

Table 3.5-3. Air Quality Analysis Site Locations

Site #	Description
1	NC115 and WT Harris Boulevard, Charlotte
2	NC115 and Gilead Road, Huntersville
3	NC115 and Sam Furr Road, Huntersville
4	NC115 and Catawba Avenue, Cornelius
5	NC115 and Iredell Avenue, Mooresville

Source: Parsons Brinckerhoff, 2005

Meteorological Conditions

The transport and concentration of pollutants emitted from motor vehicles are influenced by three principal meteorological factors: wind direction, wind speed, and the temperature profile of the atmosphere. The values for these parameters were chosen to maximize pollutant concentrations at each prediction site (i.e., to establish a conservative worst-case situation).

- Wind Direction. Maximum CO concentrations are normally found when the wind is assumed to blow parallel to a roadway adjacent to the receptor location. At complex intersections, however, it is difficult to predict which wind angle will result in maximum concentrations. At each receptor location, therefore, the approximate wind angle that would result in maximum pollutant concentrations was used in the analysis. All wind angles from 0° to 360° (in 10° increments) were considered.

- Wind Speed. CO concentrations are greatest at low wind speeds. A conservative wind speed of one meter per second (2.2 miles per hour) was used to predict CO concentrations during peak traffic periods.

- Temperature and Profile of the Atmosphere. An ambient temperature of 52°F, a "mixing" height (the height in the atmosphere to which pollutants will rise) of 1,000 meters, a surface roughness of 11.40 centimeters and neutral atmospheric stability (stability class D) conditions were used in estimating microscale CO concentrations. This data was found to be the most representative of the conditions existing along the study area.

The CO levels estimated by the model will generally be the maximum concentrations that could be expected to occur at each air quality receptor site analyzed. This is because of the assumption of the simultaneous occurrence of all worst-case parameters (peak hour traffic conditions, conservative vehicular operating conditions, low wind speeds, low atmospheric temperature, neutral atmospheric conditions, and maximizing wind direction).

Persistence Factor

Peak eight-hour concentrations of CO were obtained by multiplying the highest peak hour CO estimates by 0.61. This factor, recommended by the EPA, takes into account that over eight hours (as distinct from a single hour) vehicle volumes will fluctuate downwards from the peak, vehicle speeds may vary, and meteorological conditions, including wind speed and wind direction, will vary, as compared to the very conservative assumptions used for the single hour.

Analysis Years

The project's existing (2005), opening year, and design year (2030) were analyzed to determine the project's air quality effects.

Background Concentrations

Project-level modeling is used to predict CO concentrations resulting from emissions from motor vehicles using roadways immediately adjacent to the location at which predictions are being made. A CO "background" level must be added to this value to account for CO entering the area from other sources upwind of the receptors.

In consultation with the NCDENR, Division of Air Quality, a one-hour value of 1.8 ppm was used as background levels for this analysis. The eight-hour value was obtained by multiplying the one-hour CO value by 0.61.

3.5.4.3 Microscale Air Quality Analysis Findings

Maximum one-hour and eight-hour CO levels predicted at the six analysis sites within the study area are shown in Table 3.5-4 and Table 3.5-5, respectively. All predicted concentrations are below the applicable federal and state standards.

Table 3.5-4. Predicted Worst-Case One Hour CO Levels (ppm)

Site #	Description	Existing (2005)	No- Action (opening year)	NCCR (opening year)	No-Action (2030)	NCCR (2030)
1	NC115 and WT Harris Boulevard, Charlotte	4.00	3.70	5.2	4.00	5.9
2	NC115 and Gilead Road, Huntersville	3.90	3.40	5.2	3.70	5.5
3	NC115 and Sam Furr Road, Huntersville	5.40	4.80	6.6	5.20	7.7
4	NC115 and Catawba Avenue, Cornelius	4.20	3.50	5.5	3.30	5.8
5	NC115 and Iredell Avenue, Mooresville	2.50	2.60	4.5	2.60	4.8

Source: Parsons Brinckerhoff, 2005
National and State one-hour standard = 35 ppm
Values include one-hour background = 1.8 ppm

Table 3.5-5. Predicted Worst-Case Eight Hour CO Levels (ppm)

Site #	Description	Existing (2005)	No- Action (opening year)	NCCR (opening year)	No-Action (2030)	NCCR (2030)
1	NC115 and WT Harris Boulevard, Charlotte	2.4	2.3	3.2	2.4	3.6
2	NC115 and Gilead Road, Huntersville	2.4	2.1	3.2	2.3	3.4
3	NC115 and Sam Furr Road, Huntersville	3.3	2.9	4.0	3.2	4.7
4	NC115 and Catawba Avenue, Cornelius	2.6	2.1	3.4	2.0	3.5
5	NC115 and Iredell Avenue, Mooresville	1.5	1.6	2.7	1.6	2.9

Source: Parsons Brinckerhoff, 2005
National and State eight-hour standard = 9 ppm

The highest predicted one- and eight-hour CO concentration for the NCCR alternatives occurred at Site # 3 (NC115 and Sam Furr Road, Huntersville). Carbon monoxide levels were estimated at 12 receptor locations for this intersection. The total predicted CO level at a receptor includes the contributions of the other roadway links plus the background concentration. The highest total predicted one- and eight-hour concentrations at this site are 7.7 ppm and 4.7 ppm, respectively. The NAAQS standards are 35 ppm and 9 ppm, respectively. Thus, the NCCR is not predicted to cause or exacerbate a violation of the NAAQS for CO.

3.5.4.4 NCCR Park-and-Ride Analysis

PNR facilities are proposed at various station locations in the study area. These facilities could be a significant source of carbon monoxide concentrations because of the large number of cold-start vehicles exiting the facility during the peak departure period. The cold-start mode of vehicular operation represents one of the highest pollutant emitting stages of the driving cycle.

Park-and-ride facilities associated with the proposed project would range in size from 75 to 350 spaces. All of the proposed stations will be designed as at-grade structures. Two park-and-ride facilities were analyzed; one at the proposed Mount Mourne Station and the other at the proposed Eastfield Station. The analysis incorporated worst-case traffic assumptions to represent the greatest project-related air quality impacts expected to occur at these facilities. Receptors were placed adjacent to each facility at a distance of 10 feet and at potential sidewalk locations. The conservative CO levels were predicted using the EPA mobile source emission factor model (MOBILE 6.2) and the CAL3QHC (version 2.0) air quality dispersion model.

The predicted one- and eight-hour CO concentrations at nearby receptors for the proposed Mount Mourne Station park-and-ride facility were 3.7 ppm and 2.3 ppm, respectively. The predicted one- and eight-hour CO concentrations at nearby receptors for the proposed Eastfield Station park-and-ride facility were 4.1 ppm and 2.5 ppm, respectively. The analysis demonstrated that no violations of the one- or eight-hour CO standards, 35 ppm and 9 ppm, would occur with the addition of the proposed park-and-ride facilities.

3.5.4.5 Air Quality Conformity

The project is located in Mecklenburg and Iredell Counties, which are within the Metrolina nonattainment area for O_3 and the Charlotte nonattainment area for CO as defined by the EPA. The 1990 Clean Air Act Amendments (CAAA) designated these areas as moderate nonattainment area for CO. However, due to improved monitoring data, these areas were redesignated as maintenance for CO on September 18, 1995. The area was designated moderate nonattainment for O_3 under the eight-hour ozone standard effective June 15, 2004. Section 176(c) of the CAAA requires that transportation plans, programs, and projects conform to the intent of the State Implementation Plan (SIP) for air quality. The current SIP does not contain any transportation control measures for Mecklenburg County. The MUMPO 2030 Long Range Transportation Plan (LRTP) and the (2006 - 2012) MUMPO Transportation Improvement Program (TIP) conform to the intent of the SIP. The USDOT made a conformity determination on the LRTP on (April 20, 2005) and the TIP on (June 30, 2005). The current conformity determination is consistent with the final conformity rule found in 40 CFR Parts 51and 93. There are no significant changes in the project's design concept or scope, as used in the conformity analyses.

Since the project comes from a conforming Statewide Transportation Improvement Program (STIP) and is not predicted to cause or exacerbate a violation of the CO standard, the project conforms with the SIP for air quality conformance and the goals set forth in the CAAA and the EPA's Final Conformity Rule.

3.5.5 References

Clean Air Act Amendments (CAAA). 40 CFR Part 50-87.

U.S. Environmental Protection Agency, “National Primary and Secondary Ambient Air Quality Standards.” (49 CFR 50).

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U.S. Department of Transportation, Federal Highway Administration, Office of Planning, Environment, and Realty, Memorandum: Interim Guidance on Air Toxics Analysis in NEPA Documents, February 3, 2006.

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U.S. Environmental Protection Agency, Office of Air Quality Planning and Standards, CAL3QHC Version 2.0 - Air Quality Dispersion Model, June 1990

U.S. Environmental Protection Agency, Office of Air Quality Planning and Standards, Guidelines for Modeling Carbon Monoxide from Roadway Intersections (EPA-454/R-92-005), November 1992 and User‘s Guide to CAL3QHC version 2.0: A Methodology for Predicting Pollutant Concentrations near Roadway Intersections (EPA-454/R-92-006), 1995.

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North Carolina Department of Environment and Natural Resources, Division of Air Quality, MOBILE6.2 Model Inputs for Mecklenburg and Iredell Counties, December 13, 2005.

3.6 Noise and Vibration

This section presents:

- A description of how noise and vibration are measured,
- Information on transit and non-transit sources of noise and vibration,
- Criteria used by the FTA to assess transit noise and vibration impacts,
- The results of existing measured or estimated noise and vibration levels in the study area at noise and vibration sensitive land uses.
- An assessment of potential noise and vibration impacts from the proposed Project, and
- A discussion of mitigation measures to minimize the noise and vibration impacts.

The principal sources of existing noise and vibration in the study area are motor vehicles and freight trains. Because the proposed project follows existing rail or street routes, most adjacent land uses are already exposed to moderate noise levels.

3.6.1 Legal and Regulatory Framework

The potential noise and vibration impacts of the proposed alternatives for the NCCR project were assessed in accordance with FRA and FTA noise and vibration impact assessment guidelines. FRA follows the FTA guidelines, which are set forth in Transit Noise and Vibration Impact Assessment Manual (FTA report DOT-T-95-16, April 1995).

3.6.2 Human Perception of Noise

Sounds exist in the human and natural environment at all times. Some sounds are necessary or desirable for communication or pleasure, some are unnoticed, and some are simply unwanted or disturbing. By definition, unwanted sounds are called noise. The following sections provide a background for some of the concepts and terminology of sound and noise.

Sound is a disturbance that propagates in the environment as a wave through the medium of air, causing air particles to vibrate. Although the generating motion and the resultant motion of the air particles are very small, a sound wave of sufficient intensity can propagate over several miles.

Three distinguishing characteristics of environmental noise determine human subjective response to the noise. These are:

- Intensity or loudness
- Pitch or Frequency spectrum.
- Time-varying character.

3.6.2.1 Intensity

The first parameter of environmental noise intensity level, or loudness level is quantified in units called decibels (dB). The reason for the choice of the decibel scale is the following. Since the range of pressure variations that the human ear can detect is extremely large a compressed logarithmic scale (decibels) was devised in order to accommodate the large range. This scale is based upon the logarithm of the ratio of the received sound wave's mean square pressure to a reference sound wave's mean square pressure. The decibel or dB is the unit of this compressed scale. By using these units, the range of normally encountered sounds can be expressed in decibels as 20 to 140 dB rather than as a pressure ratio of 10 to 10,000,000.

3.6.2.2 Frequency

The second parameter of environmental noise that can be quantified is frequency. As a sound wave passes a point, the air pressure alternately rises and falls. Each time the pressure rises and falls, it completes one cycle. The number of cycles per second (called Hertz (Hz)) is the unit in which frequency is expressed.

Frequency is observed subjectively as the tone or pitch of a sound. The human ear can detect a wide range of frequencies: from about 20 to 17,000 Hz. The low frequencies (20 to 500 Hz) have a low-pitched, rumbling or bass, sound. The mid-frequencies range from roughly 400 to 4,000 Hz, where most speech information is carried. High frequencies are characterized by a "whine" and they range from 4,000 to 17,000 Hz.

3.6.2.3 A-Weighted Sound Level

The most commonly used measure of noise level is the A-weighted sound level (dBA). From many experiments with human listeners, scientists have found that the human ear is more sensitive to midrange frequencies than it is to either low or very high frequencies. At the same sound level, midrange frequencies are therefore heard as louder than low or very high frequencies. Noise measuring instruments (Sound Level Meters) takes into account the characteristic of the human ear by adjusting or weighting the spectrum of the measured sound to closely simulate the sensitivity of human hearing. The weighted spectrum is called the A-weighted sound level and it is a measure of sound intensity with frequency characteristics that correspond to human subjective response. The dBA sound level is accepted world-wide as the descriptor for assessing environmental noise.

An understanding of the following relationships is helpful in providing a subjective impression of changes in the A-weighted sound level:

- Except in carefully controlled laboratory experiments, a change in noise level of 1 dBA cannot be perceived.
- Outside of the laboratory, a 3 dBA change in noise level is considered a just-noticeable difference.
- A change in noise level of at least 5 dBA is required before the change is perceived as significant.
- A 10 dBA change is subjectively heard as approximately a doubling or halving in loudness, independent of the existing noise level.

For reference and orientation to the decibel scale, representative environmental noises and their respective dBA levels are shown in Table 3.6-1.

Table 3.6-1. Common Indoor and Typical Reactions

Sound Source	Noise Level (dBA)	Apparent Loudness	Typical Reaction	Activities
Military Jet, Air Raid Siren	135		Painfully loud	
	130	64 times as loud as base	Limit of Amplified Speech	
Amplified Rock Music	110	16 time as loud as base	Maximum Vocal Effort	
Jet Takeoff at 500 meters, Train Horn at 15 Meters	100	8 times as loud as base		
Freight Train at 15 Meters	95			
Heavy Truck at 15 Meters, Busy City Street, Loud Shout	90	4 times as loud as base	Very Annoying	
Busy Traffic Intersection	80	2 times as loud as base	Annoying	Highway Construction Sites
Highway Traffic at 15 Meters, Train Horn at 500 Meters, Noisy Restaurant	70	Base Reference	Telephone Use Difficult	Roadside Traffic
Predominantly Industrial Areas, Light Car Traffic at 15 Meters, City or Commercial Areas, Residential Areas Close to Industry, Noise Office	60	1/2 as loud as base reference	Intrusive	Outdoor Recreation
Quite Office	50	1/4 as loud as base reference	Beginning of Speech Interference	
Suburban Areas with Medium-Density Transportation				Kitchens/Bathrooms
Public Library	40	1/8 as loud as base	Quiet	Living/Dining/ Bedrooms
Soft Whisper at 5 Meters	30	1/16 as loud as base reference	Very Quiet	
	10	1/64 as loud as base reference	Just Audible	
Threshold of Hearing	0			

Source: FTA report DOT-T-95-16, April 1995

Note: The minimum difference in noise level noticeable to the human listener is 3 dBA. A 10 dBA increase in level appears to double the loudness, while a 10 dBA decrease halves the apparent loudness.

3.6.2.4 Sound Level Descriptors

The third basic characteristic of environmental noise is its time-varying character. Traffic and other noises found in communities tend to fluctuate from moment to moment. To measure this noise accurately, it is common practice to average noise energy (expressed in dBA) produced by different activities over a period of time in order to obtain a single number. This single number is called the equivalent continuous noise level (L_{eq}). Another noise measure takes into consideration the increased sensitivity of people to noise during sleeping hours. This measure is calculated by measuring hourly noise levels over a 24-hour period to calculate what is called the day-night sound level (L_{dn}).

The FTA uses both L_{eq} and L_{dn} in evaluating transit noise impacts. Use of L_{eq} and L_{dn} is appropriate because these levels are sensitive to the frequency of their occurrence and duration of the individual noise events. L_{eq} and L_{dn} are used in the assessment of noise from transit operations, which is characterized as infrequent noise.

3.6.2.5 FTA Noise Guidelines for Transit Projects

Noise impacts associated with the NCCR were assessed in accordance with FTA guidance manual Transit Noise and Vibration Impact Assessment (FTA Report DOT-T-95-16, April 1995). This assessment requires the identification of sensitive receptors along the proposed transit corridor and the measurement of existing noise levels in the absence of the Project at the sensitive receptors. The FTA noise impact criteria groups these receptors into three land use categories. These are defined in Table 3.6-2 along with the applicable noise level metric for each land use category.

Table 3.6-2. FTA Guidelines for Land Use Categories and Metrics for Transit Noise

Land Use Category	Noise Metric (dBA)	Description of Land Use Category
1	Outdoor $L_{eq}(h)$*	Tracts of land where quiet is an essential element in their intended purpose. This category includes lands set aside for serenity and quiet, and such land used as outdoor amphitheaters and concert pavilions, as well as National Historic Landmarks with significant outdoor use.
2	Outdoor L_{dn}	Residences and buildings where people normally sleep. This category includes homes, hospitals and hotels where a nighttime sensitivity to noise is assumed to be of utmost importance.
3	Outdoor $L_{eq}(h)$*	Institutional land uses with primary daytime and evening use. This category includes schools, libraries, and churches where it is important to avoid interference with such activities as speech, meditation and concentration on reading material. Buildings with interior spaces where quiet is important, such as medical offices, conference rooms, recording studios and concert halls fall into this category. Places for meditation or study associated with cemeteries, monuments, and museums. Certain historical sites, parks, and recreational facilities are also included.

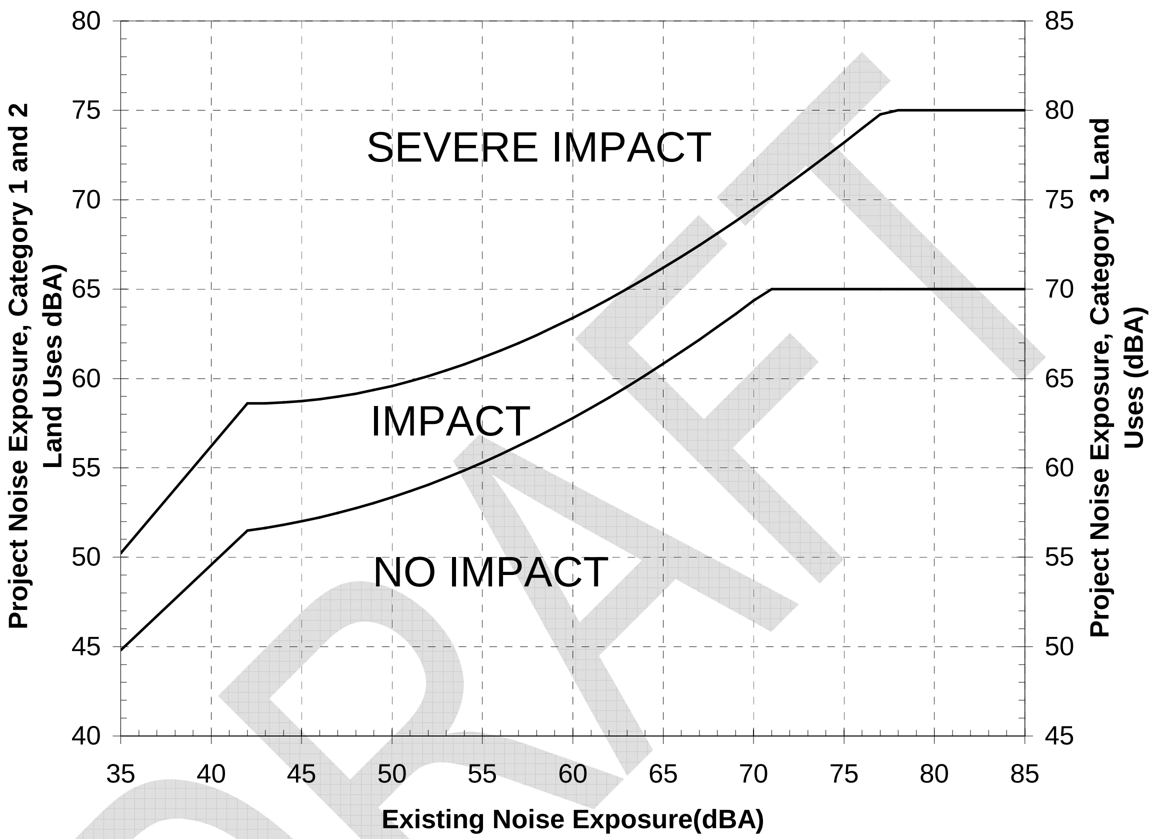
Source: FTA report DOT-T-95-16, April 1995

* Leq for the noisiest hour of transit-related activity during hours of noise sensitivity.

FTA guidelines are based on relative impact criteria whereby project noise impacts are assessed by comparing the increase in future total hourly Leq or Ldn project noise levels with the project against the existing ambient hourly Leq or Ldn noise levels without the project. Project impacts are categorized as “No Impact,” “Impact,” or “Severe Impact” as determined from the allowable increase in cumulative noise exposure over existing ambient noise levels.

Figure 3.6-1 shows the noise impact criteria for each land use category in terms of allowable increase in cumulative exposure. As the existing noise level increases, the allowable transit noise also increases, but the total amount by which that community’s noise can increase is reduced. The noise impact criteria are summarized in Table 3.6-3. The first column shows the existing noise exposure and the remaining columns show the additional noise exposure from the transit project that would cause either moderate or severe impact. The future noise exposure would be the combination of the existing noise exposure and the additional noise exposure caused by the transit project.

Figure 3.6-1. Noise Impact Criteria for Transit Projects



Source: Transit Noise & Vibration Impact Assessment, U.S. DOT, April, 1995.
Note: Noise exposure is in terms of $L_{eg}(h)$ for Category 1 and 3 land uses.
L_{dn} for Category 2 land uses.

Two levels of impacts are included in the FTA criteria. The interpretation of these two levels is summarized below:

- Severe Impact: Severe noise impacts at the sensitive land uses are considered "significant" .This term is used in NEPA and other implementing regulations. Noise mitigation will normally be specified for severe impact areas unless there is no practical method of mitigating the noise.
- Impact: In this range, other project-specific factors must be considered to determine the magnitude of the noise impact and the need for mitigation. These other factors can include the predicted increase over existing noise levels, the types and number of noise-sensitive land uses affected, existing outdoor-indoor sound insulation, and the cost effectiveness of mitigating noise to more acceptable levels.

Table 3.6-3. Noise Levels Defining Impact for Transit Projects

Existing Noise Exposure* L_{eq}(h) or L_{dn} (dBA)	Project Noise Impact Exposure, * L_{eq}(h) or L_{dn} (dBA)					
	Category 1 or 2 Sites			Category 3 Sites		
	No Impact	Impact	Severe Impact	No Impact	Impact	Severe Impact
<43	<Ambient +10	Ambient +10 to 15	>Ambient +15	< Ambient +15	Ambient +15 to 20	>Ambient +20
43	<52	52-58	>58	>57	57-63	>63
44	<52	52-58	>58	>57	57-63	>63
45	<52	52-58	>58	>57	57-63	>63
46	<53	53-59	>59	>58	58-64	>64
47	<53	53-59	>59	>58	58-64	>64
48	<53	53-59	>59	>58	58-64	>64
49	<54	54-59	>59	<59	59-64	>64
50	<54	54-59	>59	<59	59-64	>64
51	<54	54-60	>60	<59	59-65	>65
52	<55	55-60	>60	<60	60-65	>65
53	<55	55-60	>60	<60	60-65	>65
54	<55	55-61	>61	<60	60-66	>66
55	<56	56-61	>61	<61	61-66	>66
56	<56	56-62	>62	<61	61-67	>67
57	<57	57-62	>62	<62	62-67	>67
58	<57	57-62	>62	<62	62-67	>67
59	<58	58-63	>63	<63	63-68	>68
60	<58	58-63	>63	<63	63-68	>68
61	<59	59-64	>64	<64	64-69	>69
62	<59	59-64	>64	<64	64-69	>69
63	<60	60-65	>65	<65	65-70	>70
64	<61	61-65	>65	<66	66-70	>70
65	<61	61-66	>66	<66	66-71	>71
66	<62	62-67	>67	<67	67-72	>72
67	<63	63-67	>67	<68	68-72	>72
68	<63	63-68	>68	<68	68-73	>73
69	<64	64-69	>69	<69	69-74	>74
70	<65	65-69	>69	<70	70-74	>74
71	<66	66-70	>70	<71	71-75	>75
72	<66	66-71	>71	<71	71-76	>76
73	<66	66-71	>71	<71	71-76	>76
74	<66	66-72	>72	<71	71-77	>77
75	<66	66-73	>73	<71	71-78	>78
76	<66	66-74	>74	<71	71-79	>79
77	<66	66-74	>74	<71	71-79	>79
>77	<66	66-75	>75	<71	71-80	>80

Source: FTA. April 1995. *Transit Noise and Vibration Impact Assessment*.

- L_{dn} is used for land use where nighttime sensitivity is a factor; L_{eq} during the hour of maximum transit noise exposure is used for land use involving only daytime activities.

3.6.3 Existing Noise levels

To assess the existing conditions within the study area, noise measurements were conducted at 37 sites near the proposed alignment (Figure 3.6-2a-b). These short-term measurements were taken at each monitoring site for a period of 15 minutes which is considered to be representative of the whole one hour. The measurement sites were selected to provide geographic coverage and to be representative of existing and future land uses in the study area. Long term noise monitoring for 24-hours was performed at six sites to calculate the L_{dn}. Monitoring locations included residences, historic resources, and recreational areas. A brief description of each measurement location and its land use category was recorded.

The measurement sites were selected based on several additional factors, the most important of which was the site's potential sensitivity to changes in noise levels. At least one site was selected for each sensitive land use and each area where mitigation considerations may be needed. Generally, along the alignment, sensitive sites were close to each other and, therefore, one measurement site was representative of the entire potentially affected area. Measurements at a selected site were used to estimate noise exposure at nearby receivers that fell under the same land use category.

Noise measurements were taken using calibrated sound level meters: Quest 2900/Type II sound level meter for the short-term measurements and a Larson Davis 720 sound level meter for the long-term measurements. Calibration of the sound level meter was carried out in the field before and after each measurement using an acoustic calibrator whose calibration is traceable to the U.S. National Institute of Standards and Technology (NIST). All noise measurements were performed under acceptable climatic and street surface conditions.

When the proximity to the train noise source and the transit corridor is similar among the sensitive sites within a land use category, noise measurements taken at one site would be representative of noise conditions at all other sites within that land use category. This factor was considered during selection of individual noise monitoring sites by ensuring that constant characteristics (i.e., train speed, schedule and distance to track) for the worst-case noise effect could be projected for a large number of residences or blocks of apartments from measurements at a single site. Typical situations where representative measurement sites were used to estimate noise levels at other sites occurred when both shared the following characteristics:

- Proximity to the same transportation sources such as highways and train tracks and
- Similar type and density of housing such as single family homes and multi-family housing in apartment complexes.

Concurrent with noise measurements, notation was made of unusual noise events (sirens, pedestrian noises, barking dogs, aircraft, trains, etc.). The measurements were generally completed to provide statistically valid data during different times of the day, generally a.m. and p.m. peak hours.

3.6.3.1 Existing Sources of Noise

The principal sources of noise within most of the study area are motor vehicles. Freight trains contribute to some of the noise levels in the study area; more so near and within Center City Charlotte. Airplanes also contribute to the study area's noise levels near the southern end of the study area where planes approach the Charlotte Douglas International Airport. The study area itself lies well outside the generally acceptable limit of 65 L_{dn} airport noise contour. Since the proposed project follows existing rail and street routes, most of the community areas directly adjacent to the alignment are already exposed to moderate noise levels.

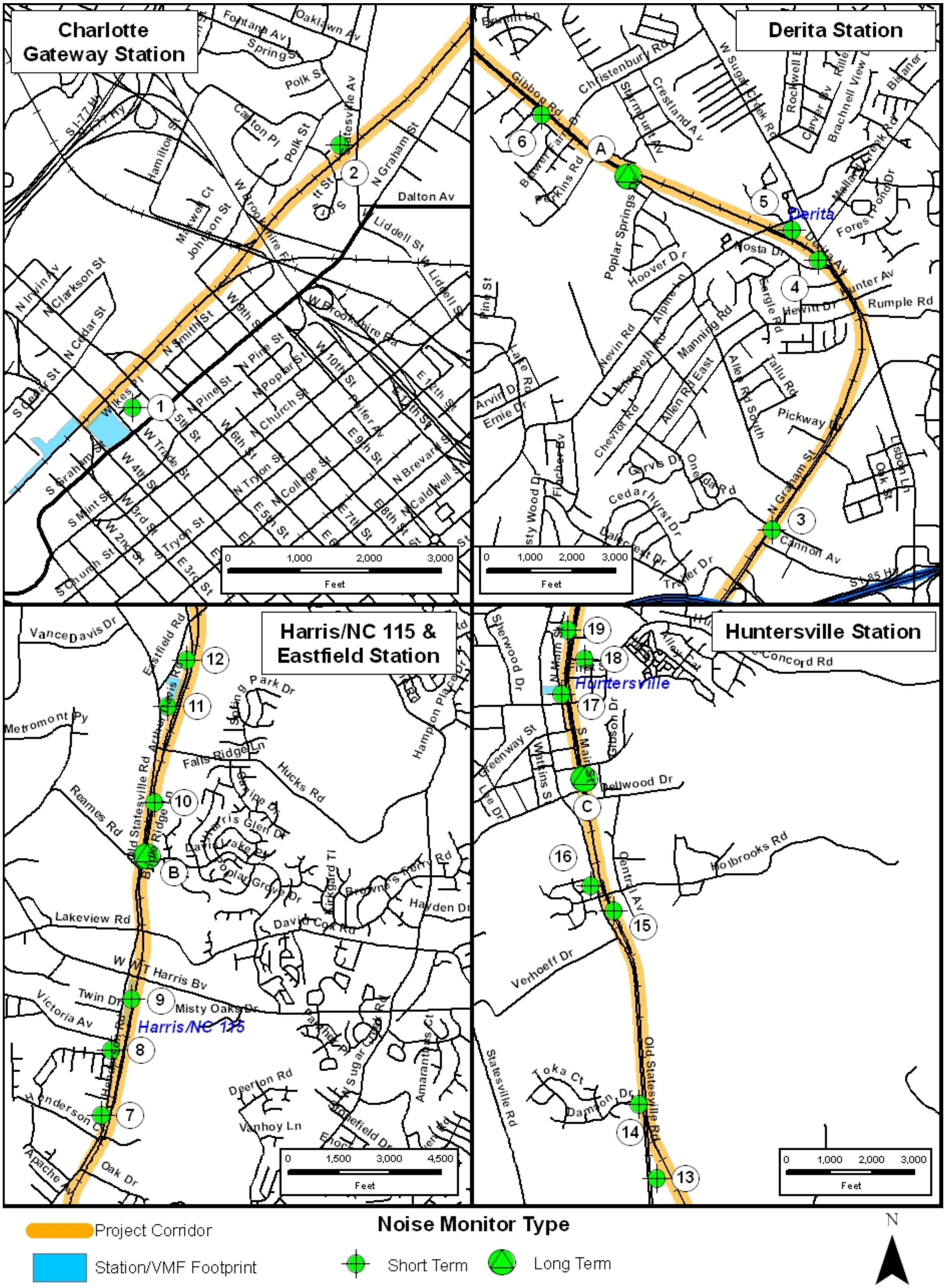


Figure 3.6-2a	Noise Monitoring Sites

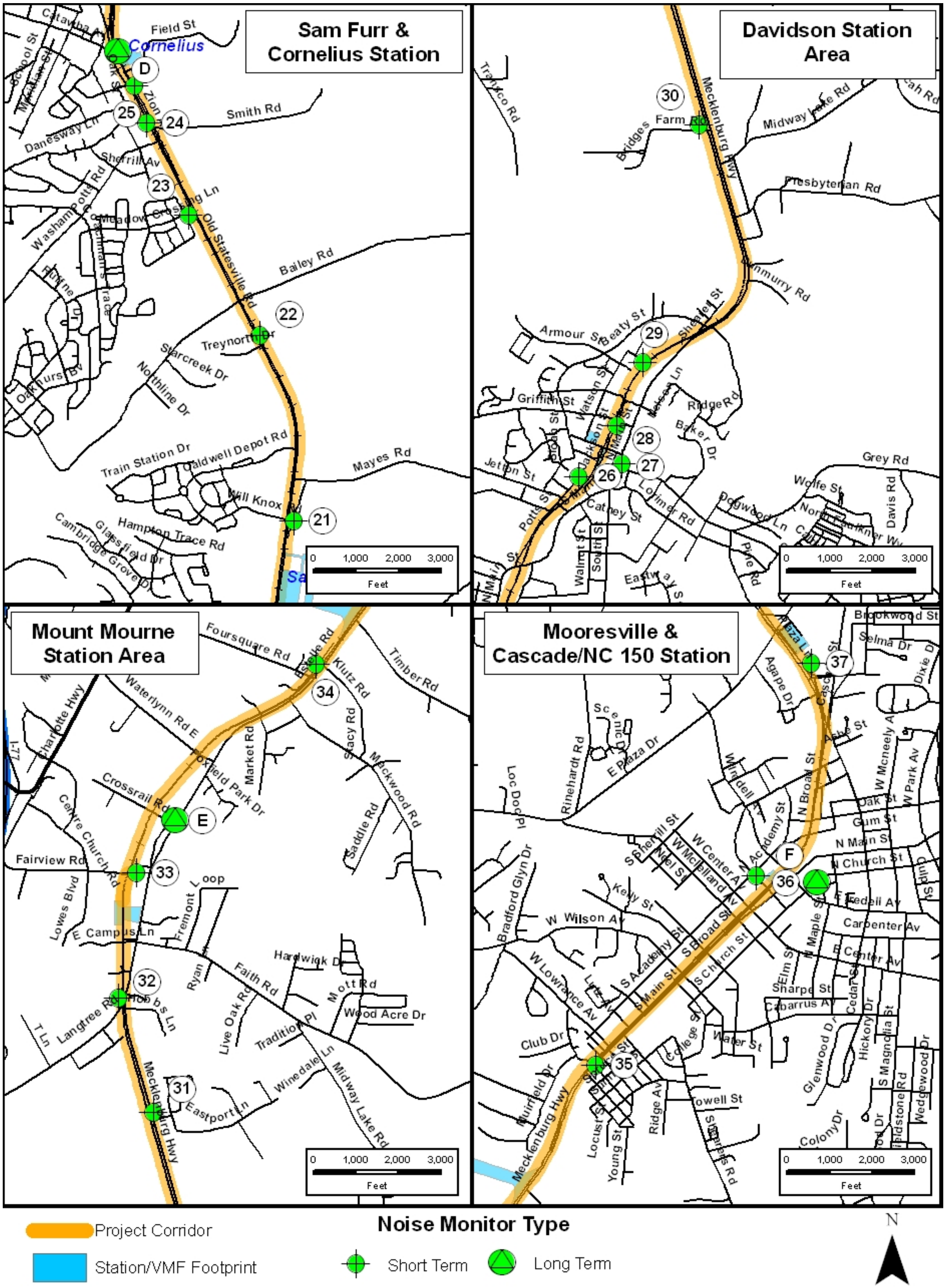


Figure 3.6-2b Noise Monitoring Sites

To better represent the existing noise levels along the corridor, a GIS application was developed to create existing road noise contours within the study area. These noise contours were generated based on the FHWA Traffic Noise Model (TNM) Version 2.5 that requires traffic related characteristics such as vehicles per hour, vehicle types, and vehicle speed. The noise contours were created for all roads within the corridor that had an estimated 100 vehicles per hour or more. Figure 3.6-3 represents an example of the road contours in an area where noise monitor readings were taken. The road noise contours were compared to the monitor readings to validate the GIS application.

3.6.4 Characteristics of Rail Noise

3.6.4.1 Wheel/Rail:

In general, operational noise from a rail transit system is a function of distance from the noise receptor to the tracks, as well as vehicle speed, type of track support structure (e.g., aerial structure), and the number of vehicles operating on the system. Noise exposure from operations depends on individual pass-by noise levels and the number of train pass-bys occurring in any given period (i.e., one hour or 24 hours). Other factors that can directly affect noise levels at a sensitive receptor include: the type of intervening terrain; whether or not there are natural or constructed noise barriers; or noise from existing local sources that will combine with the transit noise.

3.6.4.2 Train Horns

Another source of train noise is the noise generated by train horns. Traditionally, train horns are installed on locomotives to warn motorists or pedestrians of an approaching train at a highway-rail grade crossing. State law and railroad rules require that the horn be sounded 15-20 seconds prior to the train's arrival at the highway-rail crossing, but not more than ¼ mile in advance of the crossing. The horn is sounded in a "two long, one short, one long" pattern and repeated or prolonged until the crossing is occupied by the locomotive. In order to address safety concerns the horn volume must be between 96 dBA to 110 dBA when measured 100 feet forward of the locomotive in its direction of travel. The effects of the train horn noise in adjacent communities are quantified following the federal procedures and federal noise impact criteria.

3.6.4.3 Wheel Squeal

Another aspect of rail transit operating noise is wheel squeal. Wheel squeal is a tonal noise heard when rail cars travel around curves of small radii, causing the outer wheel to slip relative to the track at slow speeds. The slip occurs because the inside and outside wheels are fixed solid to a single axle. The noise produced by friction is high frequency in nature, and often is a source of annoyance. Potential impacts because of rail vehicle wheel squeal were examined for sensitive receptors approximately within 300 feet of curved tracks with a radius of curvature approximately 300 feet or less. Curves with a radius of less than 300 feet have the potential to produce wheel squeal depending on the current environmental conditions and condition of the track and rail transit wheels. Estimating daily contribution of wheel squeal noise is not meaningful, because occurrences and level of the wheel squeal noise cannot be accurately predicted. In addition, it is the maximum level because of the squeal, not the average contribution, which results in noise impact.

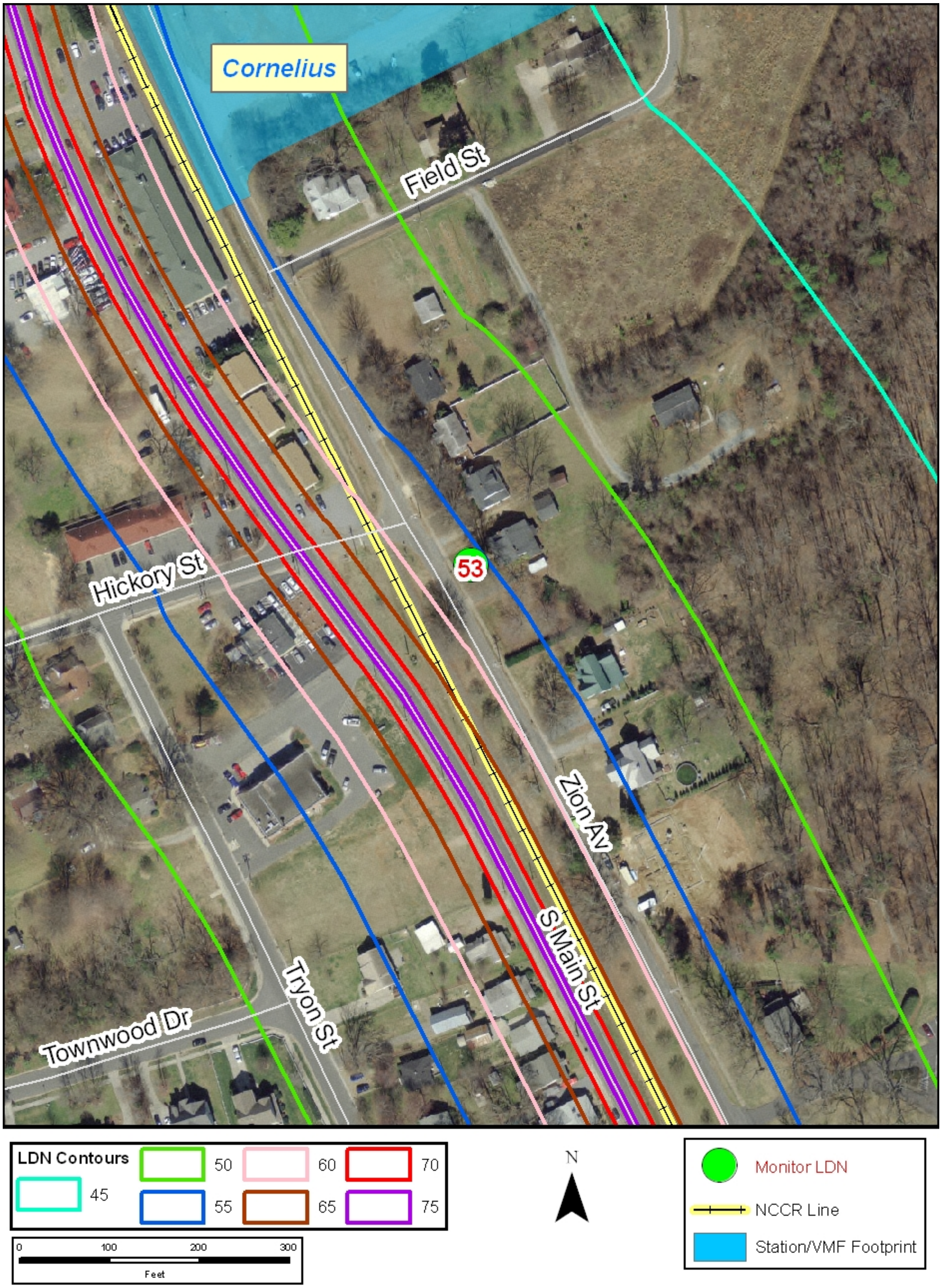


Figure 3.6-4	Road Noise Contours

3.6.4.4 Vehicle Maintenance Facility

The principal sources of noise that are likely to generate annoyance in residences near transit system VMFs are trains negotiating tight curves (wheel squeal noise), car wash facilities, and VMF movement of trains, including noise generated by workers, maintenance and storage operations and a public address system. These sources produce randomly occurring noises that are of considerably different character than typical community background noise and, therefore, if higher than the existing background noise level, they can be noticeable and intrusive. Most of the noises produced by the transit vehicles themselves are controlled to a level that would avoid impact on adjacent areas unless the separation distance from the VMF and the residential area is small.

3.6.5 Ground-Borne Vibration

Air-borne noise and ground-borne vibration are part of every rail transit system's operating environment. While ground-borne vibration is not a common environmental problem, it can cause buildings to shake and the rumbling sounds to be heard at properties located close to a transit system route or maintenance facility.

The common effects of ground-borne vibration include the sensation of floors moving, rattling of windows, shaking of items on shelves or hanging on the walls, and rumbling sounds. Damage to buildings is not usually a factor for transportation projects such as fixed guideway transit systems, but can occur during Project construction when blasting and/or pile driving is required.

To understand the effects of vibration it is important to understand how it is created, how it travels, and how it is perceived. Detailed vibration studies generally include the three key elements of train vibration which are source, path and receiver. The following is a discussion of these factors.

3.6.5.1 Source

Train systems running on a track cause vibrations in the track structure as well as in the ground over which the train passes. The amount of vibration energy created depends on many factors, including the weight and speed of the train, the suspension system, the smoothness of the wheels and the rail, and the presence of joints and gaps at switch points and crossovers. There are two basic vibration energy generation mechanisms:

- The moving train and passenger cars and;
- Irregularities in the wheel-track system.

The static load of the train is transmitted through the axle to the rails, ties, and embankment into the surrounding ground. As the train moves, its weight depresses the ground as it passes. The shape of this *dynamic* depression deepens and becomes broader with increasing train speed. The geometry of the rails can amplify this *dynamic* depression as the train travels through curves creating a vibration source with a strong horizontal component together with a vertical component.

Differences in the stiffness of the rails also create vibration energy that is transmitted to the embankment and the surrounding ground. Because the rail is only supported by the ties over part of its length, a pulse is created as the train travels along the track.

Other sources of vibration energy include the moving train and the cars themselves creating forces of reaction as they move from side to side and back and forth. Stationary sources such as switches and crossovers create mechanical energy as the train passes. Finally, the embankment itself, as it deforms under the weight of the passing train, affects the vibration energy by filtering out some frequencies and amplifying others

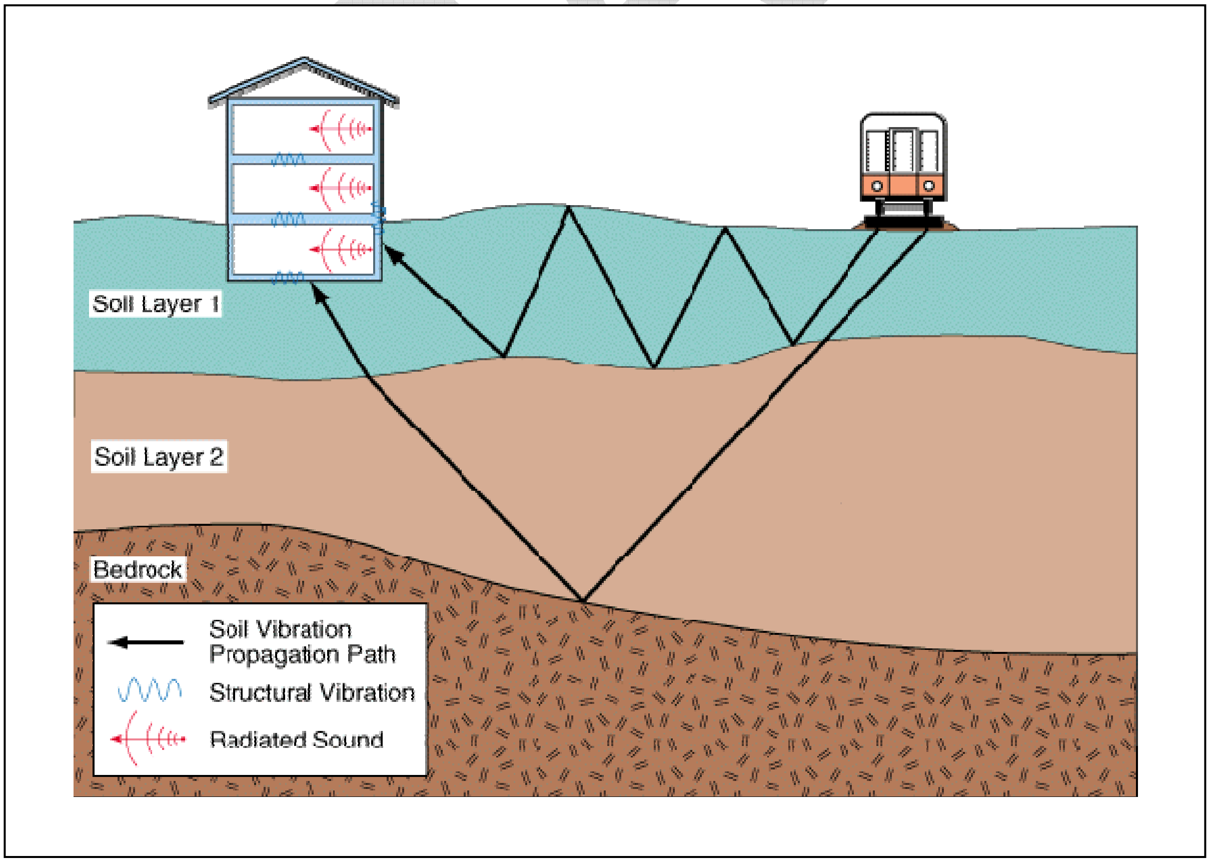
3.6.5.2 Path

Vibration energy from a source propagates through the ground to the foundation of nearby sensitive receivers such as residences. Usually the energy diminishes (attenuates) with distance from the source because of geometrical spreading and internal damping properties of the soil. However, in some circumstances, this energy can be focused to points close to the surface by the presence of underlying rock layers or variations of the soil layers. This is illustrated in Figure 3.6-4.

In order to predict the propagation of vibration energy through the ground, it is important to understand the characteristics and spatial variation of the soil. Propagation of this energy depends on several properties of the soil including: stiffness, specific impedance, internal damping, densities, propagation velocities and their variation inside the soil. In addition, the topography of an area can affect the strength of this vibration energy. It may be amplified at the top of hills or be reduced at bottom of depressions compared to what may be experienced at level ground. The groundwater table can also play a role in the strength of this energy.

Because soil strata characteristics and uncertainties of the geologic profile they affect wave refraction and reflection from boundaries of diverse soil layers, a detailed geotechnical analysis of the soil needs to be conducted to accurately model the attenuation of the vibration energy.

Figure 3.6-4. Propagation of Ground-Borne Vibration into Buildings



3.6.5.3 Receiver

The receivers of ground-borne vibration are people or vibration-sensitive activities in the buildings into which the vibration transmits. A building interacts with the surrounding soil. However, the foundation of a building does not move with same displacements as the surrounding soil. The affects of ground-borne vibration can be different for each building depending on the kind of foundation it has. Foundations may be a simple plate resting close to the soil surface, a basement in one or more floors, or a plate supported by piles.

A building is excited by vibration energy arriving from different directions as the train is moving along the embankment. This energy, which will arrive at a given time, has been emitted from the train at different times. Since the building is mounted to a completely rigid foundation, it will have several resonance frequencies. Therefore, the existing resonance frequencies of a building's foundation will filter the frequency of the incoming waves. As a consequence, some frequencies may easily excite the building while others may not. Again, Figure 3.6-4 illustrates how vibration energy from a source propagates through the ground to the foundation of a nearby building.

3.6.6 Human Perception of Ground-Borne Vibration

Although ground-borne vibration is sometimes noticeable outdoors, it is almost exclusively an indoor problem. Vibrations of floors and walls of the building may cause perceptible vibrations or rattling of windows or dishes, or even a rumbling noise heard by people inside. The rumbling noise is termed "ground-borne noise" as opposed to the "air-borne noise" from the train heard outside the house or inside with windows open. People often confuse low-frequency sounds with vibrations, especially sounds from diesel locomotives. Low frequency sound can cause windows to rattle and walls to shake in a manner similar to the effects of ground-borne vibrations. This phenomenon is termed "noise-induced vibrations." Although it is conceivable for ground-borne vibration from trains to cause building damage, it is almost never of sufficient amplitude to cause even minor cosmetic damage to buildings (characterized by slight cracks in the interior plaster of a typical building).

In order to determine the level at which ground-borne vibration interferes with human activity it is important to determine what scale to use. For some fields of interest, the range of vibration intensities is extremely wide and, as in the case of noise, a decibel scale is used. However, vibration decibels are based on a different scale than noise decibels. In other fields, vibration levels are usually restricted to narrow and direct measurement units (called engineering units). The frequency range of interest may be very small or very large. Further, the desired parameter for assessment purposes could be displacement, velocity, or acceleration caused by vibration.

In order to accommodate a wide range of data needs, a spectral analysis of vibration velocity and acceleration levels is needed to assess human perception. Velocity, a measure of the energy carried by vibration, is the preferred unit for assessing potential damage to buildings. A number of studies have indicated that sensitivity to vibration is relatively independent of frequency above approximately 12 Hz. Because of the general preference to use velocity as a measure of both annoyance and building damage, vibration criteria and predicted vibration levels are presented in terms of overall vibration velocity levels (VdB). Figure 3.6-5 illustrates common sources of vibration and the human or structural response to these velocity levels.

Although the perceptibility threshold is about 65 VdB, human response to vibration is not usually significant unless the vibration exceeds 70 VdB. A typical diesel locomotive at a distance of 50 feet and traveling at a speed of 50 mph will generate a vibration level of 85 VdB. A level of 90 VdB is roughly the level caused by slamming a heavy door in a house. Damage to buildings may occur at levels above 100 VdB, although damage to old, fragile or historic buildings may occur at levels above 95 VdB. There are no projected levels on the CATS Line that exceed 100 VdB and most are much lower.

3.6.7 Vibration Criteria

The impact threshold from ground-borne vibration and noise are based on the maximum levels for a single event. FTA's criteria account for variation in project type as well as frequency of event. The criterion distinguishes between projects with frequent and infrequent events by establishing a higher impact threshold for infrequent events to account for the same community response as evoked by frequent events. The criteria for acceptable ground-borne vibration are expressed in terms of rms velocity levels in decibels and the criteria for acceptable ground-borne noise are expressed in terms of A-weighted sound level. The impact threshold limits are specified for three land use categories defined below.

Table 3.6-4. FTA Ground-borne Vibration and Noise Impact Criteria[1]

Land Use Category	Vibration Velocity Impact Levels		Noise Impact Levels	
	Frequent Events[2]	Infrequent Events[3]	Frequent Events[2]	Infrequent Events[3]
Category 1: Buildings where low ambient vibration is essential for interior operations	65 VdB[4]	65 VdB[4]	NA[5]	NA[5]
Category 2: Residences and Buildings where people normally sleep	72 VdB	80 VdB	35 dBA	43 dBA
Category 3: Institutional land uses with primarily daytime use	75 VdB	83 VdB	40 dBA	48 dBA

Source: FTA report DOT-T-95-16, April 1995

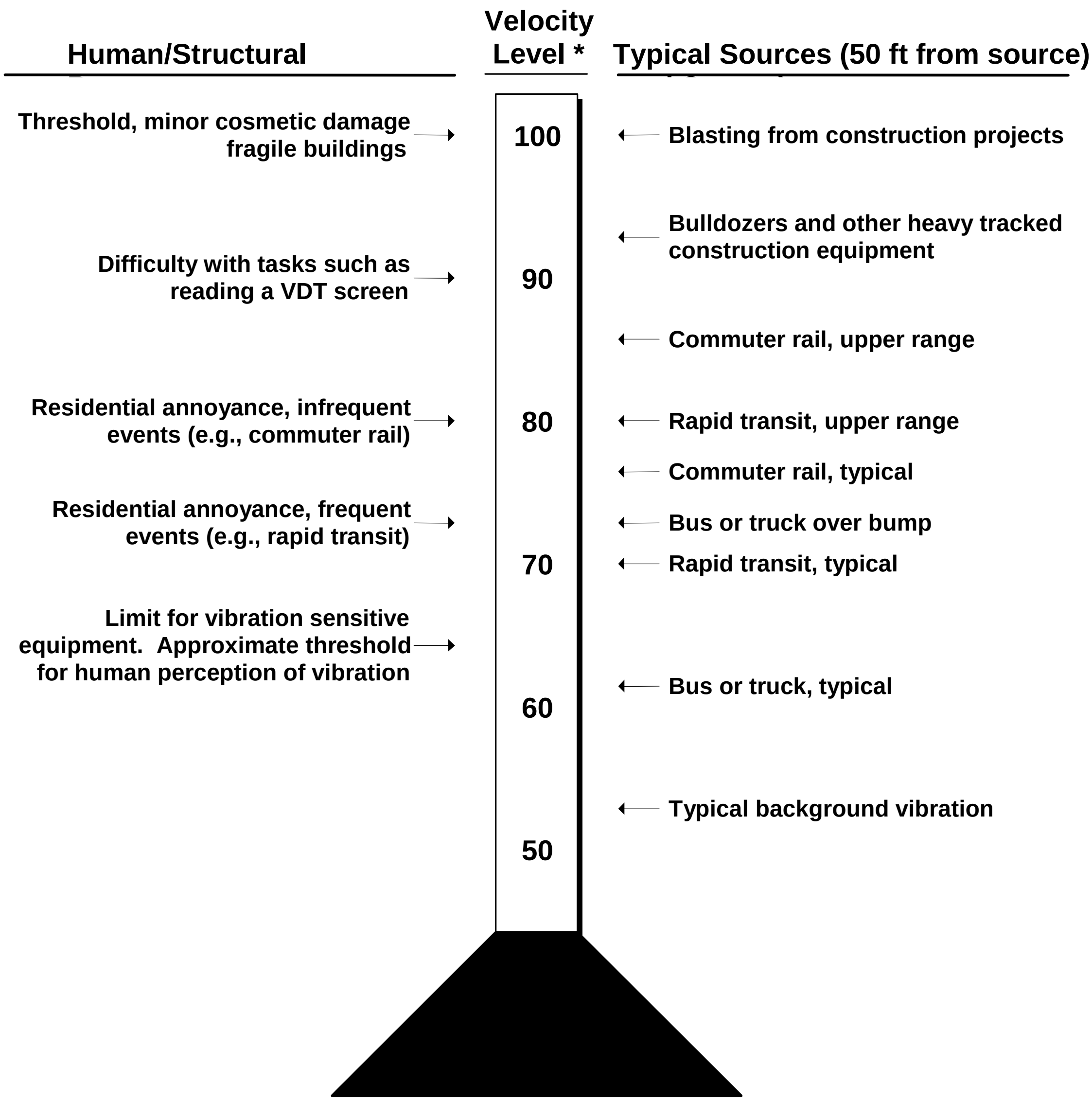
Notes:

1. Vibration Levels Expressed in VdB are 1 micro inch/sec and noise levels in dBA.
2. "Frequent Events" is defined as more than 70 vibrations per day. Most rapid transit projects fall into this category.
3. "Infrequent Events" is defined as fewer than 70 vibration events per day. This category includes most commuter rail systems
4. This criterion limit is based on levels that are acceptable for most moderately sensitive equipment such as optical microscope.
5. Vibration-sensitive equipment is not sensitive to ground-borne noise.

3.6.8 Existing Vibration Conditions

Per FTA Transit Noise and Vibration Impact Assessment Manual (April 1995), no vibration measurements were taken because the major sources of vibration in the study area are automobiles, trucks, and buses. As seen in Figure 3.6-5, Common Vibration Sources and Levels, the vibration levels associated with these sources are below the threshold for human perception. While a freight train currently travels along the existing corridor, its contribution to the existing background vibration level is minimal. The propagation of any vibration energy associated with this train is limited because the train does not travel faster than 25 mph due to the existing condition of the track.

Figure 3.6-5. Common Vibration Sources and Levels



***** RMS Vibration Velocity Level in VdB relative to 10^{-6} inches/second*

Source: Transit Noise and Vibration Impact Assessment, FTA, DOT-T-95-16, April 1995

3.6.9 Environmental Impacts and Benefits

This section describes the potential noise and vibration impacts resulting from the construction and operation of the two NCCR alternatives. Potential noise and vibration effects include noise from train operations, noise from VMFs, and ground-borne vibration, generated by wheels rolling on rails.

The noise and ground-borne vibration analysis is predicated on the most intensive operational scenario. This was done to provide a worst case impact evaluation. Operation is based on Chapter 2 of this document.

3.6.9.1 Noise Prediction Methodology

The project-related noise levels were determined utilizing the Detailed Noise Analysis methodology as outlined in FTA's Transit Noise and Vibration Impact Assessment Manual (April 1995). This methodology involves the development of prediction models to compute future train-induced noise levels at various speeds along the corridor. In general, the detailed noise analysis comprised the following steps:

- Identification of sensitive receptors – Sensitive receptors were chosen to represent existing noise exposure and potential future noise levels from the proposed NCCR alternatives. Generally, along the alignment, sensitive sites were close to each other and, therefore, one measurement site was representative of the potentially affected area. Measurements at a selected site were used to estimate noise exposure at nearby receivers that fell under the same land use category

- Determine the existing noise levels – Noise measurements were performed at each representative receptor site to establish existing conditions. It was observed traffic on adjacent roadways and streets was the dominate noise source at each receptor location.

- Develop road noise contours – Road noise contours were generated using a GIS application based on traffic volumes and speed. The results were validated using the noise monitoring site readings.

- Development of prediction models – Future Project noise level impacts along the entire corridor was determined utilizing FTA's approved noise prediction models and distance propagation algorithms. The model required inputs such as reference sound exposure level of the train, number of cars, train speed, hourly operational volumes, and distance to receptor. Propagation path adjustment factors can be invoked in the model as well. However level terrain was assumed for the surrounding community. In addition, shielding by intervening buildings between rail alignment and noise sensitive receptors was ignored in order to provide a conservative analysis. Two types of locomotive with two coach train sets were assessed in this analysis; one representing a locomotive with a reference sound exposure level (SELref) of 92 dBA with coaches having a SELref of 82 dBA, the other represented a locomotive with a SELref of 86 dBA and coaches having a SELref specification of 75 dBA.

- Project-related noise impacts were determined using FTA impact criteria - The FTA model computes L_{dn} levels for Category 2 receptors and computes peak-hour L_{eq} levels for Category 1 and 3 receptors. However, in order to provide a worst case impact evaluation L_{dn} levels were used to determine impacts for all land use categories. For future conditions, noise levels from non-rail sources were assumed to be unchanged from existing conditions.

- Mitigation recommendations – If future noise level impacts at sensitive locations are predicted to occur, recommendations were made for mitigation measures intended to reduce noise levels at receptor locations to comply with established FTA criteria limits.

3.6.9.2 Noise Impact Assessment

Noise impacts were determined along the entire corridor by applying the FTA guidelines contained in the Manual for Transit Noise and Vibration Impact Assessment (FTA, April 1995). The future predicted train noise was contrasted with existing measured noise levels and the FTA noise criteria to determine noise impacts and their severity.

Future noise level impacts along the entire corridor were determined utilizing FTA's approved noise prediction models and distance propagation algorithms. From this analysis, noise contours were developed to account for all potential future noise impacts. Again, the future predicted train noise was contrasted with existing levels and the FTA noise criteria to determine noise impacts and their severity. Noise impacts that were identified for each alternative for two types of locomotives under two different scenarios: 1) without the train horn at grade crossings, and 2) with train horns. An illustration of the estimated noise contours generated by each locomotive type is shown in Figure 3.6-6. When compared with the existing noise contours levels, defined areas were developed for impact and severe impact classifications. The results of the analysis are shown in Table 3.6-5 for each alternative under consideration.

For impacts classified under severe impact category, as defined by the FTA, the largest number of Category 1 and 2 sites, ranging from 1,124 to 1,348, result from the sounding the train horn at grade crossings. Without horns, the number of sites falling under the severe impact category would drop to a range of 0 to 16. CATS is committed to purchasing locomotives that have the lower SELref of 86 dBA, which will eliminate the number of Category 1 and 2 severe impact sites and reduce the number of impacted sites to 17 under the quite zone assumption. Figure 3.6-7a-b identifies the location of the 17 Category 1 and 2 impact sites under the 86 dBA locomotive without train horn scenario.

Table 3.6-5. Summary of Noise Impacts by With and Without Train Horns

		86 dBA Locomotive		**92 dBA Locomotive**	
		LPA Alternative	**MOS Alternative**	**LPA Alternative**	**MOS Alternative**
Total Number of Affected Sites					
Without Train Horn		21	21	322	292
With Train Horn		2,405	1,881	2,453	1,931
Number of Affected Sites by Impact Category					
Land Use Category 1&2					
Without Train Horn	Impact	17	17	294	269
	Severe Impact	0	0	16	16
With Train Horn	Impact	1,073	772	1,112	811
	Severe Impact	1,328	1,105	1,329	1,113
Land Use Category 3					
Without Train Horn	Impact	4	4	12	7
	Severe Impact	0	0	0	0
With Train Horn	Impact	1	1	1	1
	Severe Impact	3	3	11	6

Source: Parsons Brinckerhoff, 2007

Figure 3.6-6 Train Noise Contours

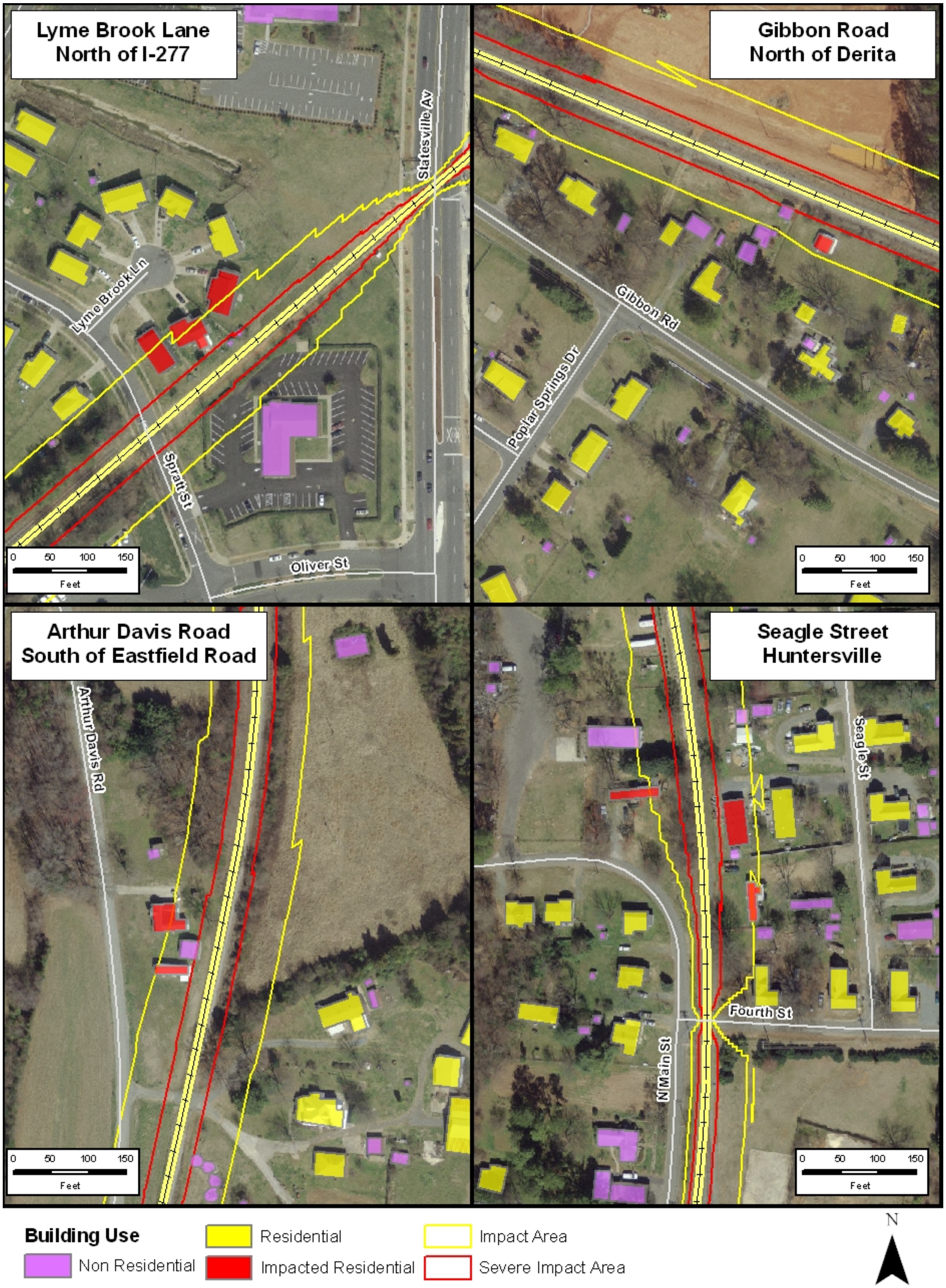


Figure 3.6-7a Category 1 and 2 Impacted Sites

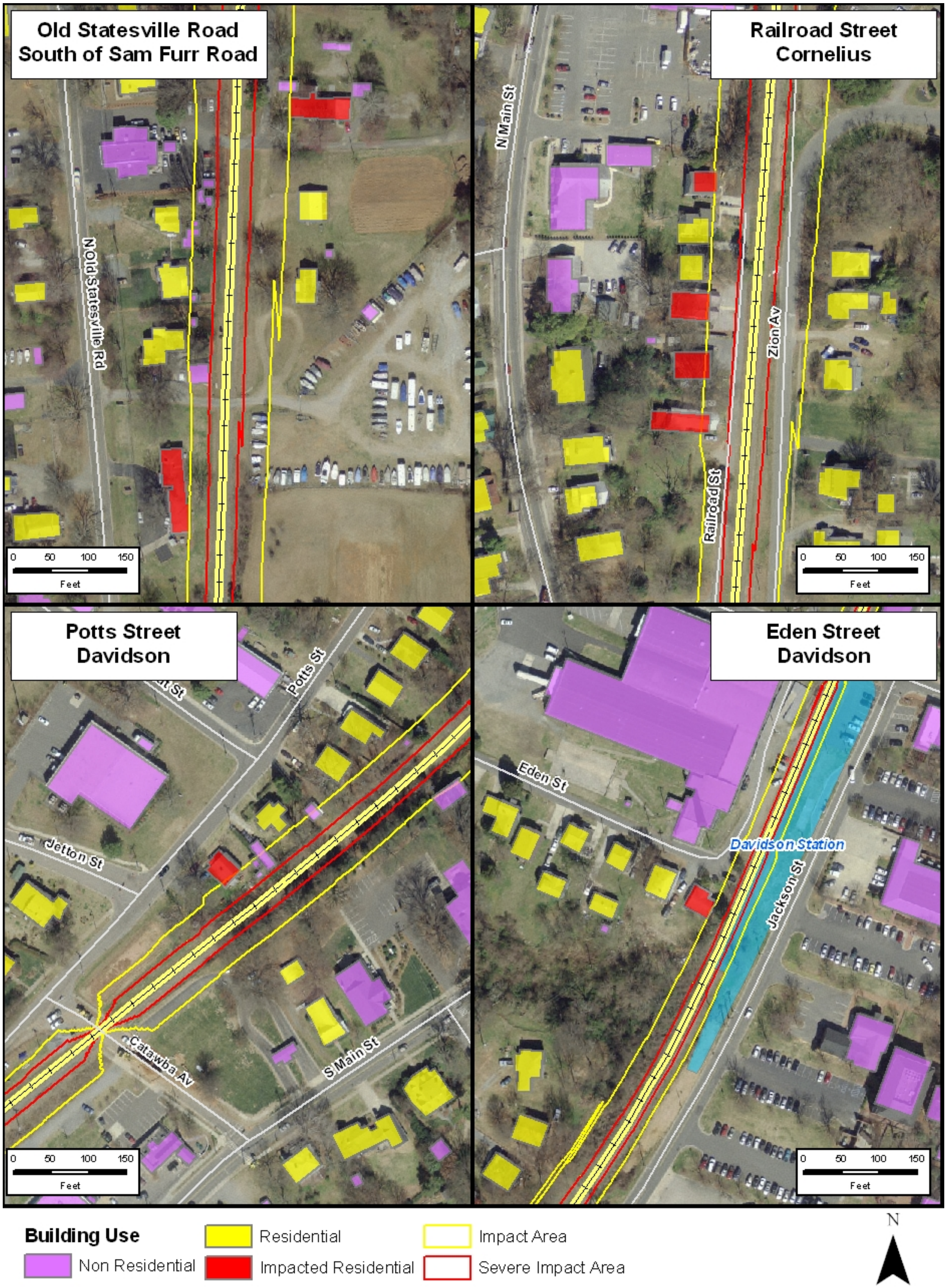


Figure 3.6-7b Category 1 and 2 Impacted Sites

3.6.9.3 Wheel Squeal

Curves with a radius of less than 300 feet have the potential to produce wheel squeal depending on the current environmental conditions and condition of the track and rail transit wheels. However, none of the proposed NCCR alternatives have curves with a radius less than 1000 feet. Therefore, noise impacts associated with wheel squeal is not anticipated to occur as a result of this project.

3.6.9.4 Vehicle Maintenance Facility

The nearest sensitive receptor to the Timber Road VMF is at a distance of approximately 250 feet from the VMF boundary. There are scattered homes within 500 feet of the boundary with clear line-of-sight to the VMF. L_{eq} noise levels from VMF operations are expected to lie in the range of 49 to 57 at these homes.

The noise levels from VMF activities would generally satisfy the daytime criteria at most of the residential sites near the VMF site. It is recommended that noise producing VMF activities be limited to daytime hours. However, some of the VMF activities that are known to generate high levels of impulse noise with distinguishable audible characteristics could be annoying to residents near the sensitive receptor sites within 300 feet. Therefore, nighttime VMF activities, other than trains moving in the VMF site, should be performed inside a closed building, which is the normal practice in VMF sites.

3.6.10 Vibration Methodology

Generally, annoyance from train-generated vibration velocity will reach its maximum level with the passage of an individual locomotive. For this project, the diesel locomotive will establish the maximum vibration velocity at each sensitive receptor site. Increase in the number of train passages does not increase the magnitude of ground vibration, but rather increase the number of peaks associated with the passage of each individual train in a given period of time. FTA's ground-borne vibration criterion Table 3.6-6 for "infrequent" train movements near land use "Category 2" was used for the impact assessment. The impact threshold maximum vibration velocity level for this exclusively residential category is 80 VdB.

Table 3.6-6. FTA Ground-borne Vibration and Noise Impact Criteria[1]

Land Use Category	Vibration Velocity Impact Levels		Noise Impact Levels	
	Frequent Events[2]	Infrequent Events[3]	Frequent Events[2]	Infrequent Events[3]
Category 1: Buildings where low ambient vibration is essential for interior operations	65 VdB[4]	65 VdB[4]	NA[5]	NA[5]
Category 2: Residences and Buildings where people normally sleep	72 VdB	80 VdB	35 dBA	43 dBA
Category 3: Institutional land uses with primarily daytime use	75 VdB	83 VdB	40 dBA	48 dBA

Source: FTA report DOT-T-95-16, April 1995

Notes:

1. Vibration Levels Expressed in VdB are 1 micro inch/sec and noise levels in dBA.
2. "Frequent Events" is defined as more than 70 vibrations per day. Most rapid transit projects fall into this category.
3. "Infrequent Events" is defined as fewer than 70 vibration events per day. This category includes most commuter rail systems
4. This criterion limit is based on levels that are acceptable for most moderately sensitive equipment such as optical microscope.
5. Vibration-sensitive equipment is not sensitive to ground-borne noise.

The vibration velocity level at each sensitive receptor site is speed dependant. Therefore, the effects of ground-borne vibration will need to be assessed based on the maximum vibration velocity level caused by trains traveling at different speeds. The maximum vibration velocity level associated with these speeds varies with distance from the train track to potentially sensitive receptors. Generally, the faster the train travels the farther the ground-borne vibration energy travels. The train speeds were derived from speed profiles for a GP40 locomotive and its associated passenger cars. A GP40 was selected to represent a common diesel locomotive likely to be used for this project. Table 3.6-7 shows the distance at which sensitive receptors would be potentially affected by ground-borne vibration. This determination is based on the speed of a passing locomotive where the impact threshold of 80 VdB for infrequent events is met or exceeded.

3.6.11 Vibration Impact Assessment

Impacts were determined in accordance with the General Vibration Assessment Procedure as outlined in FTA's Transit Noise and Vibration Impact Assessment (April 1995). This procedure results in a conservative estimate of vibration impacts expected to occur as a result of the project. However, care must be taken when interpreting these impacts because actual ground-borne vibration levels may differ from predicted levels. FTA's guidelines state that predicted ground-borne vibration levels can be 0 to 5 decibels greater than the impact threshold. In other words, there is still a significant chance (at lease 50%) that the actual ground-borne vibration levels will be below the impact threshold. Therefore, a detailed vibration analysis would be required during final design of the project. The following is a discussion of the vibration impacts associated with the proposed project.

The results of the conservatively estimated vibration velocity levels and impact assessment based on FTA's ground-borne vibration criterion are presented in Table 3.6-8. The table lists the number of sensitive receptors (Category 2) located along the proposed NCCR alternatives that would be potentially affected by ground-borne vibration. A total of 95 residences would potentially be affected with vibration velocity levels of 80 VdB or higher from each train passage. The number of potentially affected properties is based on the operational speed of the train as it travels from one station to the next (acceleration, deceleration).

Table 3.6-7. CATS North Corridor Ground-Borne Vibration Level Look-up Table

Speed (MPH)	Ground-borne Vibration Levels (VdB) at Various Distances from Train Track																		
	25 ft	**30 ft**	**35 ft**	**40 ft**	**45 ft**	**50 ft**	**55 ft**	**60 ft**	**65 ft**	**70 ft**	**75 ft**	**80 ft**	**85 ft**	**90 ft**	**95 ft**	**100 ft**	**105 ft**	**110 ft**	**115 ft**
20	**81**	79	78	77	76	75	74	74	73	73	72	71	70	69	69	68	67	66	66
25	**83**	**81**	**80**	79	78	77	76	76	75	75	74	73	71	71	70	69	68	67	67
30	**85**	**83**	**82**	**81**	79	77	77	77	76	76	75	74	72	72	71	71	70	69	68
35	**86**	**83**	**82**	**81**	**80**	79	78	78	77	77	77	75	74	73	72	72	71	70	70
40	**87**	**85**	**84**	**83**	**82**	**81**	**80**	**80**	79	79	78	77	76	75	73	73	72	72	72
45	**88**	**86**	**85**	**84**	**83**	**82**	**81**	**81**	**80**	**80**	79	79	78	77	75	74	73	73	72
50	**89**	**87**	**86**	**85**	**84**	**83**	**82**	**82**	**81**	**81**	**80**	79	78	77	76	75	74	74	73
55	**90**	**88**	**87**	**86**	**85**	**84**	**83**	**83**	**82**	**82**	**81**	**80**	79	78	77	76	75	75	74
60	**91**	**89**	**88**	**87**	**86**	**85**	**84**	**84**	**83**	**83**	**82**	**81**	**80**	78	77	77	76	76	75
65	**91**	**89**	**89**	**88**	**87**	**85**	**84**	**84**	**84**	**83**	**82**	**81**	**80**	79	79	78	77	76	76
70	**92**	**90**	**89**	**88**	**87**	**86**	**85**	**85**	**84**	**84**	**83**	**82**	**81**	**80**	**80**	79	78	78	77
75	**93**	**91**	**90**	**89**	**88**	**87**	**86**	**86**	**85**	**85**	**84**	**83**	**82**	**81**	**81**	**80**	79	79	78
80	**93**	**92**	**91**	**90**	**89**	**88**	**87**	**87**	**86**	**86**	**85**	**84**	**83**	**82**	**82**	**81**	**80**	**80**	79

Source: Charlotte Area Transit System (CATS), 2006

Table 3.6-8. Vibration Impact Assessment Potentially Affected Properties Located between Proposed Stations

From Station to Station	Train Speed MPH												
	20-24	25-29	30-34	35-39	40-44	45-49	50-54	55-59	60-64	65-69	70-74	75-79	Total
Gateway to Derita						1			1	4		1	7
Derita to WT Harris										2			2
WT Harris to Eastfield													0
Eastfield to Hambright							2						2
Hambright to Huntersville								2	3	3			8
Huntersville to Sam Furr						1	3	11	2	5			22
Sam Furr to Cornelius						1	2	3	2	2	2	6	18
Cornelius to Davidson			1		1	5		4	7				18
Davidson to Mt Mourne					2	2	1	3					8
Mt Mourne to Mooresville						1	1	3	4	1			10
Mooresville to Williams Street													0
Eastfield to Huntersville													0
Total			1		3	11	9	26	19	17	2	7	95
LPA			1		3	11	9	26	19	17	2	7	95
MOS			1		3	10	8	23	15	16	2	7	85

Source: Parsons Brinckerhoff, 2006

3.6.12 Noise Mitigation

The following paragraphs provide a brief overview of rail noise mitigation. In conjunction with the FHWA, the FTA has issued a regulation implementing NEPA's general policy on environmental mitigation. The policy states that measures necessary to mitigate adverse impacts are to be incorporated into the project, and that such measures are eligible for federal funding when FTA determines that "…the proposed mitigation represents a reasonable public expenditure after considering the impacts of the action and the benefits of the proposed mitigation measures." While the NEPA provides broad direction, a more explicit statutory basis for mitigating adverse noise impacts is contained in the federal transit laws. Before approving a Federal grant, the FRA must make a finding that "…the preservation and enhancement of the environment, and the interest of the community in which a project is located, were considered; and no adverse environmental effect is likely to result from the project, or no feasible or prudent alternative to the effect exists and all reasonable steps have been taken to minimize the effect."

Mitigation of noise impacts from rail projects may involve treatments at three fundamental components of the noise problem: 1) at the noise source, 2) along the source-to-receiver propagation path, or 3) at the receiver. Generally, the transit agency has the authority to treat the source and some elements of the propagation path, but may have little or no authority to modify anything at the receiver end.

Practical noise mitigation measures that are employed in reducing noise from train operations are summarized in the FTA *Guidance Manual: Transit Noise and Vibration Impact Assessment* (April 1995). Mitigation options include the following:

- Select quieter system wide components (e.g., continuous welded rail, tie and ballast track work, resilient wheels, skirts on the vehicle to reduce equipment noise, etc.);
- Tailor operation plans to provide reduction in noise and vibration levels (e.g., reduce vehicle speed, eliminate blowing of horns by train vehicles at grade crossings through establishment of quiet zones, proper vehicle maintenance, etc.); and
- Add design features (e.g., noise barriers if adequate space is available, lubricate track at curves, track-bed isolation, moveable point switch frogs, etc.).

In addition to the mitigation methods listed above, CATS is committed to implementing two mitigation steps that would eliminate all severe impacts and greatly minimize other impacted properties:

- CATS plans to purchase train sets that have the lower locomotive SELref of 86 dBA and coaches with 75 dBA SELref specifications
- CATS intends to upgrade all public at-grade crossings to ensure eligibility for Quiet Zone treatment, thereby eliminating the need to sound the train horn as trains approach each crossing.

The use of Quiet Zones to eliminate the noise associated with train horns is discussed below.

3.6.12.1 Train Horn Noise Mitigation at Grade Crossings

Railroad operating rules generally require the use of train horns at grade crossings to warn motorists and pedestrians of approaching trains. The Swift Rail Development Act of 1994, Public Law 103-440, directed US DOT to require the use of train horns at public highway-rail crossings. Proposed regulations were issued in 1999 to implement this mandate. These proposed regulations also allow for the creation of quiet zones through the use of supplemental safety measures at the crossings so that routine horn sounding would not be necessary.

A variety of approaches is available for reducing train horn noise near roadway/rail at-grade crossings in the proposed Federal Regulation. Communities wanting to set up a quiet zone would be able to do so by equipping crossings with four-quadrant automatic gates with lights. For a quiet zone to be established under the proposed rule, the grade crossing improvements must protect all tracks at the treated crossings (freight and passenger). Any quiet zone created would apply to freight trains as well. The NCCR would install four-quadrant gates at public grade crossings that remain open as part of this project (see Section 4.4.2 in Chapter 4). Other permissible measures include median barriers, paired one-way streets, and enforcement cameras similar to those used to ticket red-light runners. Both four-quadrant gates and median barriers could cause significant noise reduction because trains could pass without sounding horns. A four-quadrant gate system would generally be more expensive than a median barrier and, therefore, is considered the standard for cost estimating purposes at this time. The final determination of cost-effectiveness would depend on whether or not a substantial number of sensitive receptors would be protected by the elimination of horn soundings, and whether there would be other benefits, such as safety improvements to reduce the potential occurrence of train-vehicle accidents.

3.6.12.2 Other Noise Mitigation Options

Other noise abatement strategies that may be considered are as follows:

- Noise Barriers to Control Wheel/Rail Noise - Construct noise barriers along the track at close distance to the track. Noise barriers are walls designed to interrupt the path of sound between the source (wheel/rail interface) and noise sensitive areas. The performance of noise barriers depends on the relative heights of the noise source, the barrier type, and the sensitive area. Barriers are better for shielding wheel-rail noise (which originates near the height of the rail) than horn noise (which originates from the top of the train). The typical wheel-rail noise reduction ranges from 5 to 15 dBA. Barriers typically perform better in higher speed operating areas, where wheel/rail noise dominates.

- Sound Insulation for Affected Residences - At some locations, noise barriers would likely be unacceptable to the community. At these locations, other noise abatement options could be considered. One such option is to acoustically insulate the affected homes from train noise. Though providing window sound insulation would not reduce train noise levels in outdoor areas, such an approach would satisfy quiet conditions in the interior residential spaces. Residential sound insulation treatments usually involve improving windows because windows are the most significant paths of incoming noise, or “weak links.”

The selection of which mitigation option is ultimately chosen is dependant upon its cost effectiveness. This determination will be assessed during the final design phase of the project. Due to the high cost of some mitigation measures, a cost effectiveness criterion needs to be established. CATS believe that any mitigation proposed by the project can provide the necessary mitigation in those places where it is both warranted and achievable.

3.6.13 Vibration Mitigation

The purpose of vibration mitigation is to minimize the adverse effects that the project generated ground-borne vibration will have on adjacent sensitive structures. If vibration mitigation is required, the following FTA recommended mitigation options would include the following procedures where applicable:

3.6.13.1 Maintenance:

- Rail grinding on a regular basis
- Wheel truing to re-contour the wheel
- Vehicle reconditioning programs
- Installing wheel flat detector systems

3.6.13.2 Special track support systems:

- Resilient rail fasteners with vertical stiffness in the range of 30,000 lb. /in. will reduce vibration by as much as 5 to 10 VdB at frequencies above 30 to 40 Hz. These are used to fasten the rail to concrete track slabs.

- Ballast mats can provide 10 to 15 VdB attenuation at frequencies above 25 to 30 Hz. Placing rubber "ballast mats" under the track will dampen vibrations at most locations where vibration impacts occur. The mats can reduce vibration levels, but actual performance depends on soil conditions – the mats work best over hard rock and are less effective over soft soils.

- Resiliently supported ties consist of concrete ties supported by rubber pads. The rails are fastened directly to the concrete ties using standard rail clips. They reduce low frequency vibration in the range of 15 to 40 Hz.

- Floating slabs which consist of a concrete slab supported on resilient elements, usually rubber or similar elastomer. Their primary application is in tunnel sections. The primary disadvantage of floating slabs is that they tend to be the most expensive of the vibration control treatments.

- Other marginal treatments include using heavier rail, thicker ballast or heavier ties. There is also some indication that vibration levels are lower with wood ties compared to concrete ties. However, there is little confirmation that any of these marginal treatments will make a significant change in the vibration levels.

3.6.13.3 Other Vibration Mitigation Options

- Building modifications to reduce vibration levels. Vibration isolation of buildings basically consists of supporting the building foundation on elastomer pads similar to bridge bearing pads. However, this is usually only an option for new construction.

- Adjustments to the vibration transmission path such as the use of trenches. However, the depth of the trench must be proportional to the wavelength of the vibration source.

- Operational changes such as reducing the operational speed of the train especially were it passes particularly sensitive areas.

- Acquisition of affected properties.

The selection of which mitigation option is also a function of cost effectiveness. This determination will be assessed during the final design phase of the project. Due to the high cost of some mitigation measures, a cost effectiveness criterion needs to be established. Mitigation proposed by the project should be warranted, achievable and feasible.

Follow up testing after service starts to determine the actual vibration levels caused by the trains can be provided should vibration levels be suspected beyond the projections. That circumstance is considered unlikely because the projections are intentionally conservative to avoid understating impacts.

3.6.14 References

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Federal Highway Administration, “23 CFR Part 772: Procedures for Abatement of Highway Traffic Noise and Construction Noise - Final Rule.” Federal Register, Vol. 47, No. 131, July 8, 1982.

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North Carolina Department of Transportation, Traffic Noise Abatement Policy, September 2004 (http://www.ncdot.org/doh/preconstruct/pe/ohe/NoiseAir/).

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Transit Noise and Vibration Impact Assessment, FTA, DOT-T-95-16, April 1995.

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3.7 Ecosystems

Ecological resources identified within and near the project area include terrestrial plant communities and associated wildlife habitat, wildlife corridors, waters of the United States (including wetlands), threatened and endangered species, and unique natural areas. Certain waters of the United States which serve as public water supplies and/or which are afforded additional levels of protection because of their water quality are also discussed in Section 3.8 (Water Resources and Floodplains/Floodways).

3.7.1 Legal and Regulatory Framework

Authorization for discharges of dredged or fill material into waters of the United States would be required from the U.S. Army Corps of Engineers under Section 404 of the Clean Water Act and Title 33, Part 323 of the *CFR*. The authorization (permit) would be needed in the event of unavoidable effects to jurisdictional waterways and water bodies (as described in Section 3.7.4.1) or wetlands (as also described in Section 3.7.4.1). In anticipation of cumulative impacts, an Individual Permit would likely be required for the entire project. The Clean Water Act provides for public notice and review of permit applications, as well as review by the U.S. Fish and Wildlife Service (USFWS) and approval by the EPA. Because no navigable waters would be affected, a permit issued under the provisions of Section 10 of the Rivers and Harbors Acts of 1899 would not be required from the Corps. A Water Quality Certification pursuant to Section 401 of the Clean Water Act would be needed from the NCDENR, Division of Water Quality (DWQ). This permit is required in association with the Corps of Engineers' Section 404 permitting process. The only terrestrial communities that could be subject to regulatory review are (1) those portions of upland stream buffers subject to state and local stream buffer programs and (2) any terrestrial communities which could be subject to USFWS consultation under Section 7 of the Endangered Species Act because they support a protected species or serve as critical habitat for a protected species.

3.7.2 Methodology

Ecosystems and the natural resources comprising them were identified along the project corridor and at sites of proposed stations and VMF through review of published records, databases, and maps along with field investigations. Sources consulted include: U.S. Geological Survey (USGS) topographic quadrangles; USFWS National Wetland Inventory (NWI) maps and protected species lists; NRCS soil surveys; North Carolina Natural Heritage Program (NCNHP) database and mapping; North Carolina BasinPro GIS databases; state and county park inventories of plant and animal species; and aerial photography. Terrestrial natural communities were classified using the North Carolina 1996 land coverage program along with their comparable classification under the 1990 Classification of the Natural Communities of North Carolina: Third Approximation. Land coverage mapping was updated in affected portions of the bi-county area using 2002 color aerial photography. Waters of the United States (wetlands and deepwater habitats) were classified using USFWS's Classification of Wetlands and Deepwater Habitats of the United States (Cowardin, et al; 1979).

3.7.3 Terrestrial Ecology

3.7.3.1 Existing Conditions and Resources

<u>Terrestrial Plant Communities</u>

As classified and mapped (project-updated) under the North Carolina 1996 land coverage program, twelve general terrestrial plant communities occur within Iredell County and

Mecklenburg County (hereinafter referred to as “the bi-county area”). These terrestrial plant communities along with their comparable classification under the 1990 Classification of the Natural Communities of North Carolina (Third Approximation) are presented in Table 3.7-1.

Table 3.7-1. Terrestrial Plant Communities of Iredell and Mecklenburg Counties

Plant Community (1996 NC Land Coverage / Updated 2005)[1]	Comparable Plant Community (Classification of the Natural Communities of North Carolina: Third Approximation)	Total Acreage Within Bi-County Study Area	Percent of Bi-County Study Area
Deciduous Shrubland	Successional Stage of Mesic Mixed Hardwood Forest	996	0.13
Evergreen Shrubland	Successional Stage of Xeric Hardpan Forest	2,485	0.33
Mixed Hardwoods / Conifers	Dry Oak-Hickory Forest	49,333	6.6
Mixed Shrubland	Successional Stage of Dry Oak-Hickory Forest	502	0.07
Mixed Upland Hardwoods	Mesic Mixed Hardwood Forest	282,555	37.7
Mountain Conifers	Xeric Hardpan Forest	1,076	0.14
Other Broadleaf Deciduous Forests	Mesic Mixed Hardwood Forest	50.8	0.01
Other Needleleaf Evergreen Forests	Xeric Hardpan Forest	405.6	0.05
Southern Yellow Pine	Xeric Hardpan Forest	42,648	5.7
Unmanaged Herbaceous Upland	N/A	1,410	0.2
Cultivated	N/A	25,168	3.4
Managed Herbaceous Cover	N/A	199,182.2	26.6
TOTAL		**605,811.8**	**80.93**

[1] Land coverage mapping updated in affected portions of the study area using 2002 color aerial photography.

Due to widespread development and agricultural practices, only approximately eight percent of the bi-county area is comprised of natural and managed terrestrial plant communities. Forests comprise the dominant natural terrestrial plant community, while agricultural lands (managed herbaceous cover) comprise the dominant managed terrestrial plant community. Figure 3.7-1a-d shows the distribution of these plant communities as mapped under the North Carolina land coverage program (1996) and updated using 2002 color aerial photography.

Mixed upland hardwoods is the most widespread natural community, comprising approximately 3.7 percent of the bi-county area. This plant community typically represents natural succession from the hardwood/pine community where pines no longer share canopy dominance. Typical tree species include beech (*Fagus grandifolia)*, sweetgum (*Liquidambar styraciflua*), red maple (*Acer rubrum*), silver maple (*Acer saccharinum*), tulip poplar (*Liriodendron tulipifera*), post oak (*Quercus stellata*), willow oak (*Quercus phellos*), white oak (*Quercus alba*), southern red oak (*Quercus falcata*), southern shagbark hickory (*Carya carolinae-septentrionalis*), mockernut hickory (*Carya tomentosa*), pignut hickory (*Carya glabra*), short-leaf pine (*Pinus echinata*), red mulberry (*Morus rubra*), American elm (Ulmus americana), and wild black cherry (Prunus serotina). Typical scrub/shrub species include saplings of the aforementioned canopy species, dogwood (*Cornus florida*), red cedar (*Juniperus virginiana*), black jack oak (*Quercus marilandica*), big-leaf magnolia (*Magnolia macrophylla*), winged elm (*Ulmus alata*), common privet (*Ligustrum sinense*), and redbud (*Cercis canadensis*). Typical herbaceous species include seedlings of species comprising the canopy and scrub-shrub layers, common blue violet (*Viola papillionacea*), bracken (*Pteridium aquilinum*), river oats (*Chasmanthium latifolia*), pokeweed (*Phytolacca americana*), false Solomon's seal (*Smilacina racemosa*), and heartleaf (*Hexastylis arifolia*). Typical vine species include trumpet creeper (Campsis radicans), poison ivy (*Toxicodendron radicans*), greenbrier (*Smilax rotundifolia*), Japanese honeysuckle (*Lonicera japonica*), greenbriers (*Smilax* spp.), and muscadine (*Vitis rotundifolia*). In locations where this community occurs in wetlands and adjacent to perennial streams, the canopy typically consists of water oak (*Quercus nigra*), red maple, sweetgum, black gum (*Nyssa sylvatica*), and sycamore (*Platanus occidentalis*). Based primarily on species composition and species associations, this community also includes a shrub-dominated successional stage throughout much of the study area (deciduous shrubland of Table 3.7-1).

At 0.64 percent of the bi-county area, mixed hardwoods/conifers comprise the second most widespread natural community within the study area. Within this community, pine and hardwood tree species share dominance. Typical tree species include loblolly pine (*Pinus taeda*), short-leaf pine, scrub pine (*Pinus virginiana*), sweetgum, red maple, silver maple, tulip poplar, post oak, willow oak, white oak, southern red oak, water oak, southern shagbark hickory, mockernut hickory, pignut hickory, red mulberry, sycamore, and wild black cherry. Typical scrub/shrub species include saplings of the aforementioned canopy species, dogwood (*Cornus florida*), red cedar, black jack oak, redbud, cucumber tree (*Magnolia tripetala*), male-berry (*Lyonia ligustrina*), common privet, and groundsel (*Baccharis halimifolia*). Typical herbaceous species include seedlings of species comprising the canopy and scrub-shrub layers, common pokeweed, river oats, and blue violet. Typical vine species include trumpet creeper, poison ivy, Japanese honeysuckle, greenbriers, and muscadine. Based primarily on species composition and species associations, this community also includes a shrub-dominated successional stage throughout much of the study area (mixed shrubland of Table 3.7-1).

At 0.56 percent of the bi-county area, the southern yellow pine community comprises the third most widespread natural community within the project area. This community is typically dominated by short-leaf pine. Other common species include scrub pine, red cedar, pokeweed, common greenbrier (*Smilax rotundifolia*), sumacs (*Rhus* spp.), goldenrods (*Solidago* spp.), common ragweed (*Ambrosia artemesiifolia*), and Japanese honeysuckle. Based primarily on species composition and species associations, this community also includes a shrub-dominated successional stage throughout much of the study area (evergreen shrubland of Table 3.7-1).

Areas mapped as high-intensity and low-intensity development comprise approximately 92 percent of the bi-county area. Managed herbaceous cover (covering 2.6 percent of the bi-county area) and other plant communities falling within developed areas have been substantially altered from the natural condition. Plants found in maintained (landscaped) communities are a combination of horticultural varieties of grasses, forbs, and shrubs. In unmaintained areas, common species include sumacs, goldenrods, buttercups (*Rananculus* spp.), pokeweed, common ragweed, lamb's quarters (*Chenopodium album*), curly dock (*Rumex crispus*), common flax (*Linium usitatissimum*), common chickweed (*Stellaria media*), St. Johnswort (*Hypericum perforatum*), jimsonweed (*Datura stramonium*), Queen Anne's lace (*Daucus carota*), common milkweed (*Asclepias syriaca*), bitter nightshade (*Solanum dulcamara*), Venus' looking glass (*Triodanis perfoliata*), teasel (*Dipsacus sylvestris*), dog-fennel (*Eupatorium capillifolium*), poison ivy, greenbriar, and Japanese honeysuckle.

Terrestrial Wildlife Habitat

Terrestrial wildlife habitat within the project area is somewhat limited in diversity and extent due to the extended history of agriculture and the more-recent history of residential, commercial, and industrial development along the existing rail corridor and major roadways paralleling the railway. Prominent habitats within the project area are characterized as (1) inner core forest habitat, (2) edge habitat surrounding forest stands, (3) agricultural fields, and (4) larger contiguous "old field" and scrub/shrub communities. Wildlife species abundance and diversity depend upon the quality, size, and interconnectivity of each particular habitat. In general, undisturbed or relatively undisturbed areas have greater species richness than developed or urbanized areas. Within the project area, one of the most abundant and diverse habitats is edge habitat between relatively densely wooded and open to sparsely wooded tracts. The species richness of a particular edge habitat is often higher than that of either of the bordering habitats because of relatively greater diversity of conditions.

Because of fragmentation by development, agriculture, and the regional road network, large expanses of forests are not common within the study area. As a result of this fragmentation, wildlife species richness does not differ greatly between plant communities - with the exception of lower species richness and greater frequency of cultivars and alien species in urbanized areas and more species richness within a forest core community near the proposed Hambright station. The wildlife assemblage observed and/or reported within the study area is typical of the upper Piedmont of southern North Carolina.

Dominant mammalian species include white-tailed deer (*Odocoileus virginianus*), gray squirrel (*Sciurus carolinensis*), raccoon (*Procyon lotor*), opossum (*Didelphis virginiana*), eastern cottontail (*Sylvilagus floridanus*), muskrat (*Ondatra zibethicus*), striped skunk (*Mephitis mephitis*), gray fox (*Urocyon cinereoargenteus*), and red fox (*Vulpes fulva*). Small forest-dwelling mammals are also common. These small mammals include mice, moles, and shrews.

Dominant birds include a variety of nuthatches (Sittidae), sparrows (Emberizidae), vireos (Virionidae), warblers (Parulidae), wrens (Troglodytidae), and woodpeckers (Picidae), along with chimney swift (*Chaetura pelagica*), blue jay (*Cyanocitta cristata*), American crow (*Corvus brachyrhynchos*), eastern phoebe *(Sayornis phoebe*), northern mockingbird (*Mimus polyglottos*), Carolina chickadee (*Parus carolinensis*), American robin (*Turdus migrotorius*), common grackle (*Quiscalus quiscula*), wood thrush (*Hylocichla mustelina*), European starling (*Sturnus vulgaris*), northern cardinal (*Cardinalis cardinalis*), Canada goose (*Branta canadensis*), and mourning dove (*Zenaida macroura*). Birds of prey inhabiting forest lands of the study area include red-tailed hawk (Buteo jamaicensis), sharp-shinned hawk (*Accipiter striatus*), and broad-winged hawk (Buteo platypterus). Based on data compiled from Audubon Society Christmas Bird Counts and USGS Breeding Bird Surveys, 118 migratory bird species listed for protection under the Migratory Bird Treaty Act are reported to occur within the bi-county area. Of these 118 species, 100 are strictly terrestrial and are not dependent on aquatic habitat for any portion of their life cycle. Of the 100 terrestrial species reported for the study area, 24 have been identified as "Species of Management Concern" by the USFWS. Of the 24 terrestrial "Species of Management Concern" within the study area, 22 are non-game species listed because populations are small and/or declining; while two are game species listed because populations are below management goals or are decreasing.

Reptiles observed at the time of field investigation or verified by the NC Department of Natural Heritage (NC-DNH) as inhabiting the study area include eastern box turtle (*Terrapene carolina*), eastern fence lizard (*Sceloporus undulatus*), five-lined skink (*Eumeces fasciatus*), eastern timber rattlesnake (*Crotalus horridus*), northern black racer (*Coluber constrictor*), brown snake (*Storeria dekayi*), and eastern garter snake (*Thamnophis sirtalis*). Although not observed at the time of field investigation or listed on the NC-DNH county-wide database, the following snake species can also be reasonably expected to inhabit the study area: racer (*Coluber constrictor*), rat snake (*Elaphe obsolete*), eastern hognose snake (*Heterodon platyrhinos*), milk snake (*Lampropeltis triangulum*), common kingsnake (*Lampropeltis getulus*), brown snake (*Storeria dekayi*), eastern ribbon snake (*Thamnophis sauritus*), and copperhead (*Agkistrodon contortrix*).

<u>Wildlife Corridors and Biodiversity</u>

Wildlife corridors are connections between or paths through natural communities that provide a means for species to travel within or between their preferred habitats. Wildlife corridors are generally divided into three categories: line corridors, strip corridors, and riparian corridors. Examples of line corridors include roads, fencelines or hedgerows along property lines, and drainage ditches. Narrow strips of forest between two forest islands and transmission lines are examples of strip corridors that permit species dispersal from one habitat area to another. Streams and rivers along with the vegetated riparian zones along the streams and rivers are primary examples of riparian corridors that provide habitat for aquatic and terrestrial species. Wildlife corridors between natural areas such as parks, greenways, and other undeveloped land are more valuable than rights-of-ways through urban or suburban areas because undeveloped lands typically contain greater species richness and higher quality habitats (Kricher, 1988). Good quality wildlife corridors typically range in width from 330 to 3,300 feet (Payne and Bryant, 1994).

Wildlife corridors within the project area are limited because of the highly fragmented nature of natural plant communities and the scarcity of riparian corridors (a function of relatively high position in the landscape). No prominent corridors were identified that connect two unique natural communities. The project corridor does not intersect any greenways or parks. The portion of the project area through the Hambright area has a greater likelihood of supporting higher quality wildlife habitats than other portions of the project area because there is less developed land and larger contiguous forest tracts in this area; however, natural corridors connecting this area to other wildlife habitats are located downstream along unnamed tributaries to Cane Creek and within forested tracts to the east of the project area.

3.7.3.2 Environmental Impacts and Benefits

<u>Direct Effects to Terrestrial Plant Communities and Associated Wildlife Habitat</u>

Direct effects to natural terrestrial plant communities resulting from construction of new stations and new track are presented in Table 3.7-2 and are shown in Figure 3.7-1a-d. Direct effects to natural terrestrial plant communities resulting from construction of the VMF, are discussed below and are shown in Figure 3.7-1a-d. Ending the NCCR at Mount Mourne would reduce impacts to terrestrial plant communities by 0.02 acre for the MOS alternative. The Timber Road VMF would directly affect 2.24 acres of natural terrestrial plant communities, whereas the South End VMF would affect no natural terrestrial plant communities. The No-Action Alternative will result in no predictable direct effects to natural terrestrial plant communities.

Table 3.7-2. Direct Effects of New Construction on Terrestrial Plant Communities and Associated Wildlife Habitat [1]

PLANT COMMUNITY	LPA		MOS	
	Acreage Affected	% of Bi-County Total	Acreage Affected	% of Bi-County Total
Deciduous Shrubland	0	0	0	0
Evergreen Shrubland	0	0	0	0
Mixed Hardwoods / Conifers	7.58	0.001	7.58	0.001
Mixed Shrubland	0	0	0	0
Mixed Upland Hardwoods	14.98	0.002	14.82	0.005
Mountain Conifers	0	0	0	0
Other Broadleaf Deciduous Forests	0	0	0	0
Other Needleleaf Evergreen Forests	0	0	0	0
Southern Yellow Pine	1.81	0.0002	1.79	0.0004
Unmanaged Herbaceous Upland	0	0	0	0
Cultivated	0	0	0	0
Managed Herbaceous Cover	26.32	0.004	26.23	0.013
TOTAL	**50.69**	**0.007**	**50.42**	**0.02**

[1] Does not include effects associated with VMFs.

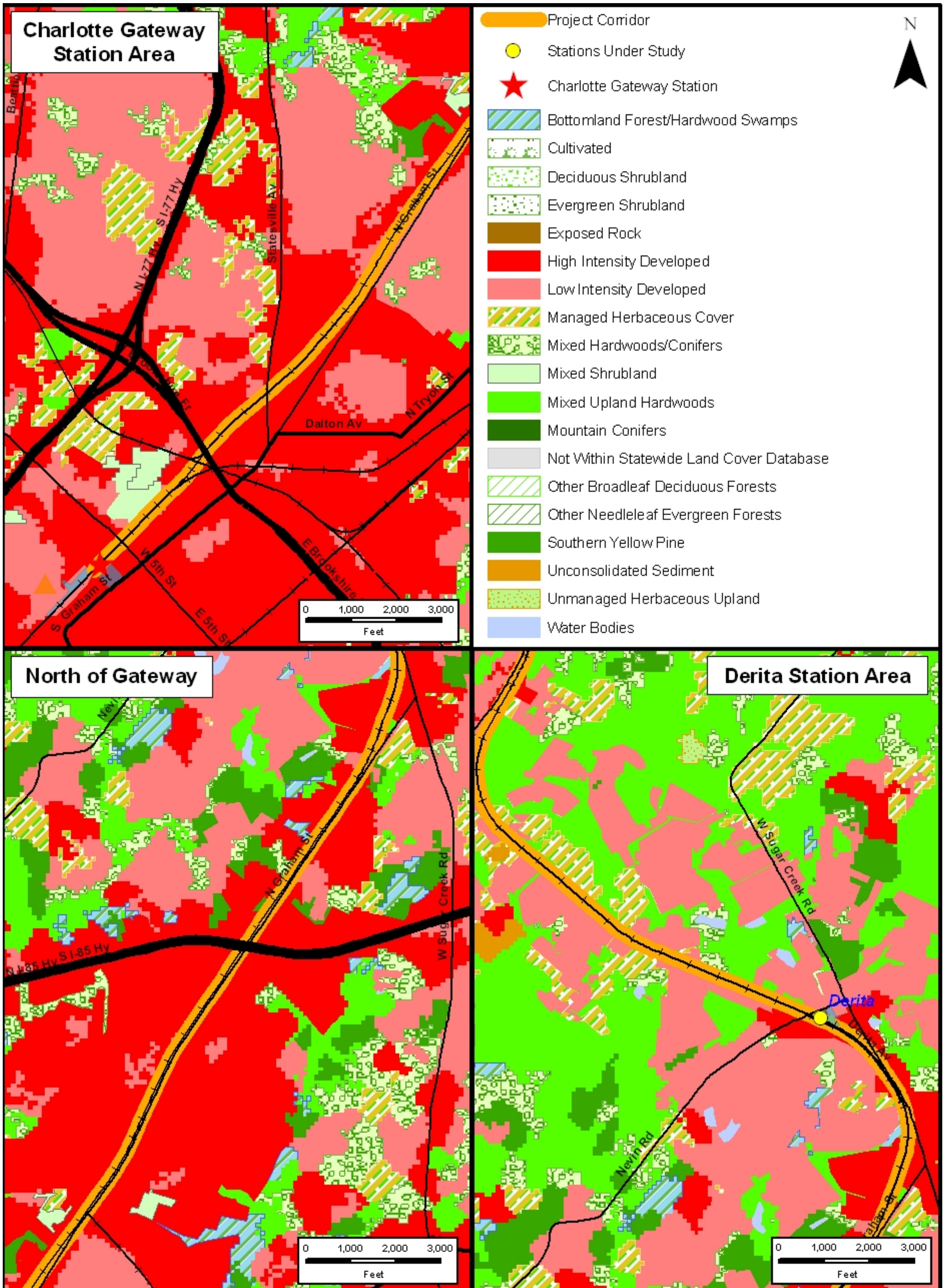

Figure 3.7-1a	Terrestrial Plant Communities and Associated Wildlife Habitats

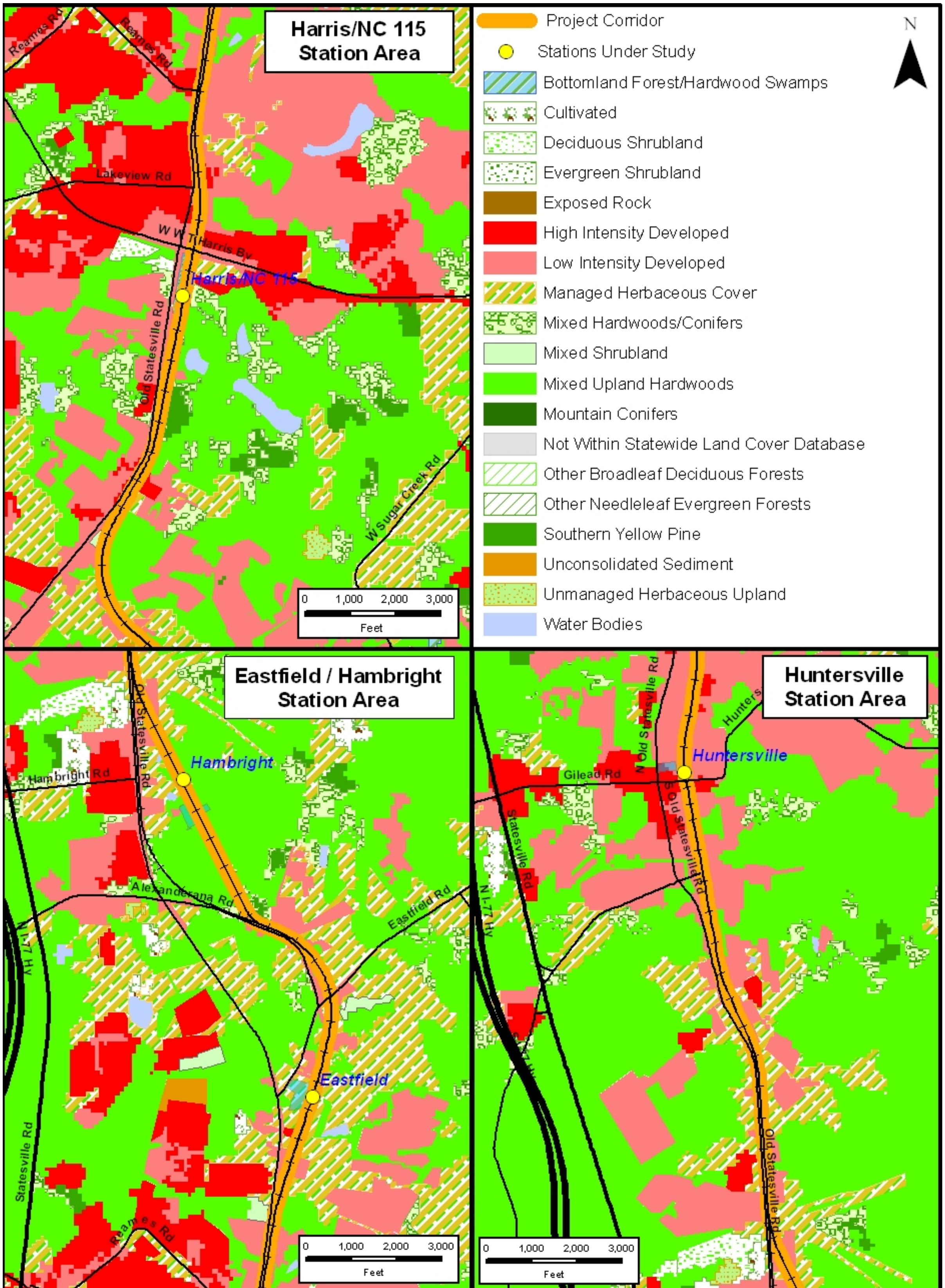

Figure 3.7-1b — Terrestrial Plant Communities and Associated Wildlife Habitats

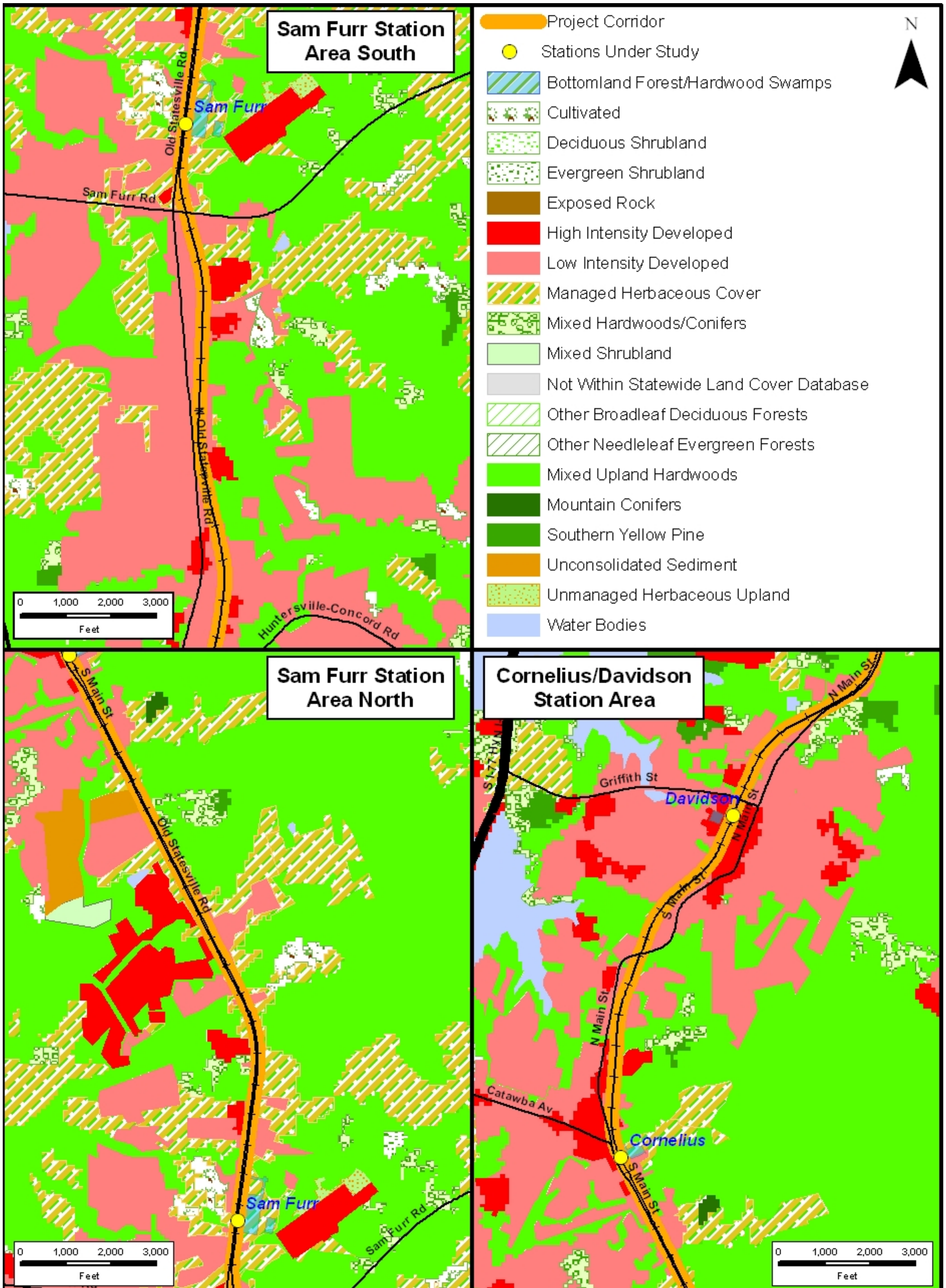

Figure 3.7-1c | Terrestrial Plant Communities and Associated Wildlife Habitats

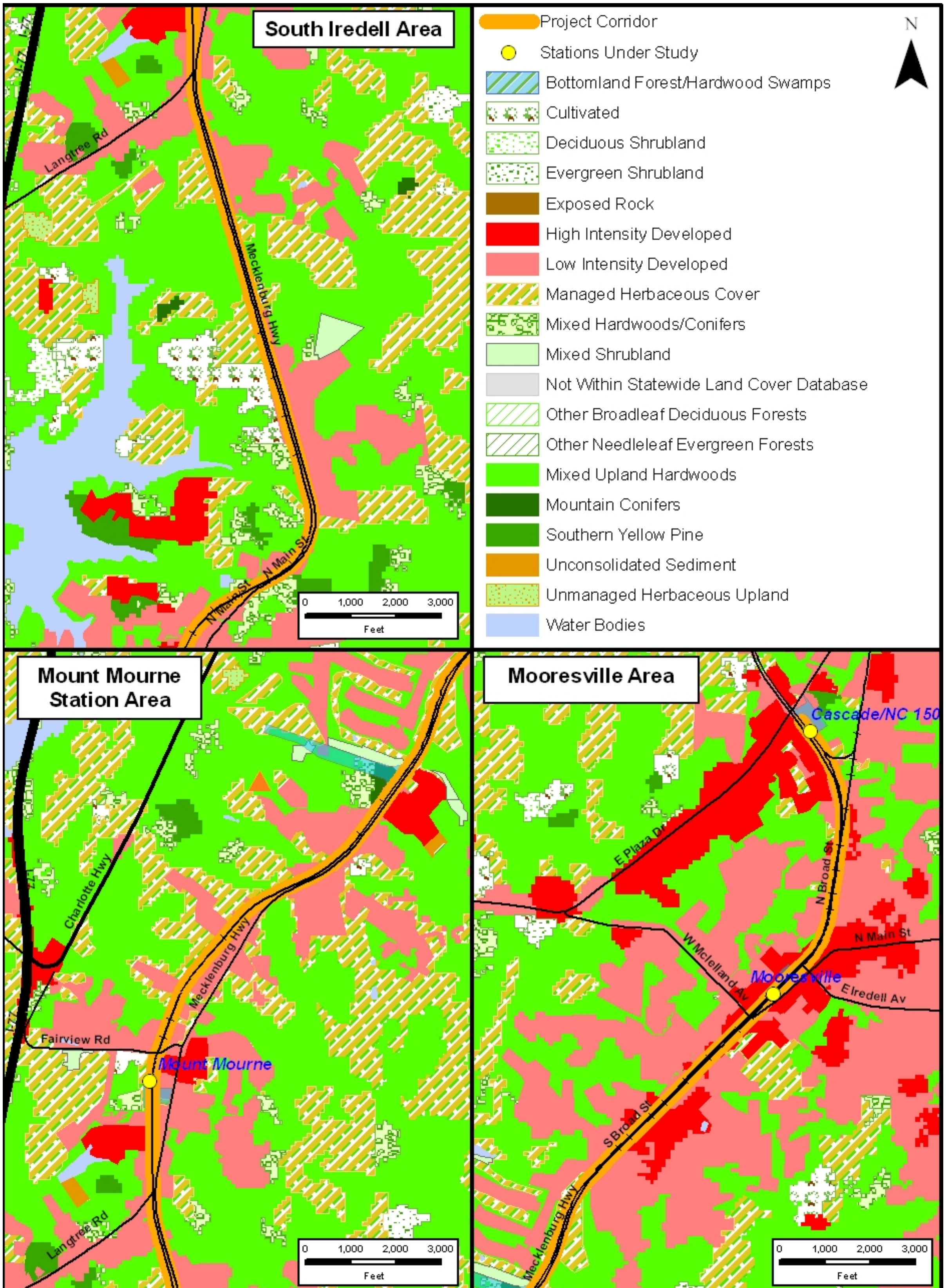

Figure 3.7-1d | Terrestrial Plant Communities and Associated Wildlife Habitats

Indirect Effects to Terrestrial Plant Communities and Associated Wildlife Habitat

Indirect effects to terrestrial natural plant communities potentially resulting from development reasonably expected to occur within the 0.25-mile buffer surrounding each proposed station are presented in Table 3.7-3. Indirect effects with respect to upland forest habitat not only include the 0.25-mile buffer around proposed stations (most notably to forests in the vicinity of the Harris, Hambright, Cornelius, and Mount Mourne stations), but also include a 300-foot buffer along the track to account for increased noise and water quality effects (a function of more trains per day) which would penetrate forest habitat important to forest dwelling species – particularly migratory birds. Substantial acreage of upland hardwood forest are likely to be cleared by private development in the Harris, Hambright, Cornelius and Mount Mourne station areas prior to the opening year of the NCCR. Hence the indirect effect acreages are overstated.

Table 3.7-3. Indirect Effects of Station-Induced Development on Terrestrial Plant Communities and Associated Wildlife Habitat [1]

PLANT COMMUNITY	LPA		MOS	
	Acreage Affected	% of Bi-County Total	Acreage Affected	% of Bi-County Total
Deciduous Shrubland	6.09	0.0008	6.09	0.0008
Evergreen Shrubland	0	0	0	0
Mixed Hard-woods/Conifers	67.60	0.009	67.06	0.009
Mixed Shrubland	11.21	24.05	9.62	0.001
Mixed Upland Hardwoods	521.68	0.07	455.95	0.06
Mountain Conifers	3.78	0.0005	0	0
Other Broad-leaf Deciduous Forests	0	0	0	0
Other Needle-leaf Evergreen Forests	0	0	0	0
Southern Yellow Pine	18.79	0.003	14.38	0.002
Unmanaged Herbaceous Upland	1.74	0.0002	1.74	0.0002
Cultivated	19.92	0.003	19.92	0.003
Managed Herbaceous Cover	370.60	0.05	305.96	0.04
TOTAL	**1,021.41**	**0.14**	**881.26**	**0.12**

Because of their industrial nature, neither the Timber Road VMF nor the South End VMF would have the potential of inducing nearby development; therefore, neither would result in indirect effects to natural terrestrial plant communities. The No-Action Alternative would not lead to increased indirect effects to natural plant communities or associated wildlife habitat.

Direct Effects to Wildlife Corridors and Biodiversity

Prominent wildlife corridors within construction limits of the NCCR are not present because of the highly fragmented forest communities adjacent to the NCCR line and the high position of the project area within the landscape (i.e., along watershed divides). No prominent wildlife corridors were identified that connect two natural communities. The project area does intersect transmission line rights-of-way or riparian corridors that may be potential wildlife corridors. Portions of the project comprising the realigned Hambright section would have a greater likelihood of affecting higher quality wildlife corridors than other portions of the project area because there are more undeveloped lands in this area; however, as previously stated, natural corridors connecting this area to other wildlife habitats are located downstream along unnamed tributaries to Cane Creek and within forested tracts to the east of the project area. The No-Action Alternative would not result in increased impacts to existing wildlife corridors or biodiversity parameters.

Indirect Effects to Wildlife Corridors and Biodiversity

No prominent wildlife corridors extend into the 0.25-mile buffer surrounding proposed stations or the VMF; therefore, no indirect adverse effects are anticipated. In addition, no prominent wildlife corridors extend into the 300-foot buffer along the existing rail line, nor will access or development be increased at any point along the existing track due to proposed improvements; therefore, no indirect adverse effects are anticipated. The No-Action Alternative would not lead to increased indirect effects to wildlife corridors or regional biodiversity.

3.7.3.3 Mitigation

Construction of new track, stations, and a VMF would convert a portion of forest lands and agricultural lands to developed land or managed plant communities. Cut and fill will be limited to the minimum amount necessary to ensure structural stability of the rail bed and appurtenant features. The implementation of Best Management Practices (BMPs) for erosion and sediment control will help minimize secondary impacts to adjoining communities and habitat.

CATS will not plant any prohibited noxious-weed seeds as listed on the statewide list. All seeds used by CATS will be tested in accordance with the North Carolina Seed Law. CATS will work with the NCDENR to implement a plan to restrict the spread of invasive species if any are found in the project area. Preventative measures that will be employed include: the inspection and cleaning of construction equipment; commitments to ensure the use of invasive-free mulches, top soils, and seed mixes. Eradication strategies will be deployed should invasion occur.

It is not expected that habitat impacts will adversely affect migratory birds at the population level given the prevalence of forested and agricultural/pasture resources in the bi-county area. When entering into a contract with a construction contractor, CATS will notify contractors of the criminal penalties associated with taking migratory bird nests or otherwise harming migratory birds. In order to minimize and avoid impacts to migratory birds during construction, the contractor will not be allowed to disturb, destroy, or remove active nests during the nesting season. The removal of unoccupied or inactive nests from the construction site will also be avoided where practicable, and the contractor will not be permitted to collect, capture, relocate, or transport migratory birds, eggs, young, or active nests without a permit.

Impacts to the 0.97 acre to 2.23 acres of upland forest and associate habitat directly affected under the various build alternatives can be mitigated through such means as habitat restoration/enhancement, conservation initiatives, riparian corridor restoration, establishing vegetated buffers along field edges for edge habitat, and upland forest corridor restoration. Payment-in-lieu to the North Carolina Wildlife Resources Commission (NCWRC) for purchase of lands for preservation and enlargement of wildlife management areas would also be considered by CATS as mitigation for habitat impacts should the project proceed to construction.

3.7.4 Waters of the United States of America (Including Wetlands) and Riparian Ecology

3.7.4.1 Existing Conditions and Resources

<u>Waterways and Water Bodies</u>

The majority of the area investigated in the field (i.e., those areas likely to be affected by project construction) is located along watershed divides which are characterized by relatively high elevations, well-drained soils, presence of ephemeral or intermittent stream courses, and scarcity of perennial streams.

Approximately 432.36 acres of waterways and water bodies considered to be waters of the United States occur within the bi-county area (Table 3.7-4). These 432.36 acres of waterways and water bodies comprise 0.06 percent of the 705,277–acre bi-county area. As mapped under the NWI program, approximately 26.71 acres of deepwater pond habitat (i.e., water depths exceeding 6.6 feet) are classified as palustrine, unconsolidated bottom, permanently flooded, and impounded systems (PUBH) under the USFWS Classification of Wetlands and Deepwater Habitats of the United States (Cowardin, et al; 1979). Those man-made ponds likely to be affected by project construction appear to have been created primarily for private recreational fishing and as reservoirs for crop irrigation and livestock watering (i.e., farm ponds).

Table 3.7-4. Waterway and Water Body Types Mapped Within the Corridor Study Area

Waterway or Water Body Type	Cowardin Classification	Total Corridor Study Area Linear Feet	Total Corridor Study Area Acreage
Limnetic, Lacustrine Unconsolidated Bottom	L1UB	N/A	121.00
Palustrine, Floating Vascular, Aquatic Bed	PAB4	N/A	0.15
Palustrine, Permanently Flooded, Unconsolidated Bottom [1]	PUBH	N/A	26.71
Permanently Flooded, Lower Perennial, Riverine Unconsolidated Bottom	R2UBH	611,552.87	280.78
Temporarily Flooded, Lower Perennial, Riverine Unconsolidated Shore	R2USA	N/A	0.34
Seasonally Flooded, Intermittent, Riverine Streambed	R4SBC	24,497.05	3.38
TOTAL	**N/A**	**636,049.92**	**432.36**

[1] Within water depths greater than 6.6 feet.

Wetlands

Wetlands are regulated as a category of "waters of the United States" and are subject to US Army Corps of Engineers' jurisdictional consideration under Section 404 of the Clean Water Act (33 CFR 328.3). Wetlands are defined by the presence of three criteria: hydrophytic vegetation, hydric soils, and evidence of hydrology during the growing season (USDA, 1987).

Based on NWI mapping and selective ground-truthing, approximately 628.69 acres of wetlands occur within the bi-county area. These 628.69 acres of wetlands comprise 0.09 percent of the 705,277–acre bi-county area. Primary wetland types mapped under the NWI program within the bi-county area along with total acreages for each of the types are presented in Table 3.7-5. The predominant wetland type encountered is broad-leaved deciduous, forested palustrine wetlands, which comprise 545.25 acres or 86.7 percent of the total bi-county wetland acreage. Figure 3.7-2a-c shows locations of wetlands within the bi-county area along with potentially affected wetlands.

Table 3.7-5. Primary Wetland Types Mapped Within the Corridor Study Area

Wetland Type	Cowardin Classification	Total Corridor Study Area Acreage
Unconsolidated Bottom Littoral Lacustrine	L2UB	0.07
Persistent Emergent Palustrine	PEM1	6.44
Broad-Leaved Deciduous, Forested Palustrine	PFO1	545.25
Broad-Leaved Deciduous, Scrub-Shrub Palustrine	PSS1	49.72
Permanently Flooded, Unconsolidated Bottom Palustrine[1]	PUBH	26.71
Seasonally Flooded, Unconsolidated Shore Palustrine	PUSC	0.50
TOTAL	**N/A**	**628.69**

[1] Within water depths less than 6.6 feet.

Wetland Characteristics. Broad-leaved deciduous, palustrine, forested wetlands (PFO1) occur adjacent to streams and on broad flat depressions throughout much of the bi-county area. The dominant canopy species in these wetland types include red maple (*Acer rubrum*), sweetgum (*Liquidambar styraciflua*), loblolly pine (*Pinus taeda*), black gum (*Nyssa sylvatica*), willow oak (*Quercus phellos*), water oak (Quercus nigra), American elm (*Ulmus americana*), and tulip poplar (*Liriodendron tulipifera*). Variations in the plant community composition are dependent upon the hydrologic regime and disturbances.

Broad-leaved deciduous, palustrine, scrub-shrub wetlands (PSS1) are typically found on broad flat depressions, immediately upstream of farm ponds, and within previously cleared areas. The dominant plant species in these wetlands include saplings of canopy species vegetating nearby or previously timbered forested wetlands along with the following shrub species: tag alder (*Alnus serrulata*), black willow (*Salix nigra*), red osier dogwood (*Cornus stolonifera*), elderberry (*Sambucus canaensis*), giant cane, (*Arundinaria gigantea*), and umbrella magnolia (*Magnolia tripelata*). Variations in the plant community composition are dependent upon the hydrologic regime and disturbances.

The bi-county area also supports persistent emergent palustrine (PEM1) wetlands. This wetland type typically supports a plant community dominated by wool-grass (*Scirpus cyperinus*), soft rush (*Juncus effusus*), dotted smartweed (*Polygonum punctatum*), net-veined chainfern (*Woodwardia areolata*), various grasses (*Panicum* spp.), smartweeds and tearthumbs (*Polygonum* spp.), and sedges (*Carex* spp.; *Cyperus* spp.). Permanently flooded, unconsolidated bottom palustrine wetlands (PUBH) occur within portions of diked/ impounded water bodies having water depths less than 6.6 feet. This wetland type typically supports a plant community dominated by sedges and water lilies (*Nymphaca odorata*). Seasonally flooded, unconsolidated shore palustrine wetlands occur along larger water bodies of the bi-county area – the vast majority along the shoreline of Lake Norman.

<u>Water-Dependent Wildlife and Migratory Birds</u>

Amphibians inhabiting the study area include the American toad (*Bufo americanus*), spring peeper (*Hyla crucifer*), green frog (*Rana clamitans*), southern two-lined salamander (*Eurycea bislineata cirrigera*), and northern dusky salamander (*Desmognathus fuscus fuscus*).

The majority of the project area is located along watershed divides which are characterized by relatively high elevations, well-drained soils, presence of ephemeral or intermittent stream courses, and scarcity of perennial streams. Due to their position in the landscape, no fish or aquatic mollusks were observed within streams in areas likely to be affected by project construction - nor were any observed at the time of investigation within the short segment of a perennial stream (an unnamed tributary to Cane Creek) which could be affected by construction of a station near Hambright.

As stated in Section 3.7.3.1, Audubon Society Christmas Bird Counts and USGS Breeding Bird Surveys indicate that 118 migratory bird species listed for protection under the Migratory Bird Treaty Act occur within the bi-county area. Of these 118 species, 18 are dependent on aquatic habitat for at least a portion of their life cycle (i.e., are water-dependent). Of the 18 water-dependent species reported for the study area, seven have been identified as "Species of Management Concern" by the USFWS. Of the seven water-dependent "Species of Management Concern" within the study area, one is a non-game species listed because populations are small and/or declining; while six are game species listed because populations are below management goals or are decreasing.

3.7.4.2 Environmental Consequences

<u>Direct Effects to Waterways and Water Bodies</u>

Direct effects to waterways and water bodies resulting from construction of new stations, the VMF, and new track are presented in Table 3.7-6 and are shown in Figure 3.7-2a-d. The No-Action Alternative would have no direct effects on wetlands.

Table 3.7-6. Direct Effects to Waterways and Water Bodies

Waterway or Water Body [2]	LPA		MOS	
	Acreage Affected	% of Corridor Study Area	Acreage Affected	% of Corridor Study Area
L1UB	0	0	0	0
PAB4	0	0	0	0
PUBH1	0.015	0.06	0.015	0.06
R2UBH	0	0	0	0
R2USA	0	0	0	0
R4SBC	0	0	0	0
TOTAL (all water types)	**0.015**	**0.004**	**0.015**	**0.004**

[1] Within water depths greater than 6.6 feet.

[2] L1UB (Limnetic, Lacustrine Unconsolidated Bottom); PAB4 (Palustrine, Floating Vascular, Aquatic Bed); PUBH (Palustrine, Permanently Flooded, Unconsolidated Bottom); R2UBH (Permanently Flooded, Lower Perennial, Riverine Unconsolidated Bottom); R2USA (Temporarily Flooded, Lower Perennial, Riverine Unconsolidated Shore); R4SBC (Seasonally Flooded, Intermittent, Riverine Streambed).

Indirect Effects to Waterways and Water Bodies

Indirect effects to waterways and water bodies potentially resulting from development reasonably expected to occur within the 0.25-mile buffer surrounding each proposed station are presented in Table 3.7-7. The No-Action Alternative would not lead to increased indirect effects to waterways or water bodies.

Table 3.7-7. Indirect Effects of Station-Induced Development on Waterways and Water Bodies

Waterway or Water Body [2]	LPA		MOS	
	Acreage Affected	% of Corridor Study Area	Acreage Affected	% of Corridor Study Area
L1UB	0	0	0	0
PAB4	0	0	0	0
PUBH[1]	1.54	5.77	1.54	5.77
R2UBH	0	0	0	0
R2USA	0	0	0	0
R4SBC	0	0	0	0
TOTAL (all water types)	**1.54**	**0.36**	**1.54**	**0.36**

[1] Within water depths greater than 6.6 feet.

[2] L1UB (Limnetic, Lacustrine Unconsolidated Bottom); PAB4 (Palustrine, Floating Vascular, Aquatic Bed); PUBH (Palustrine, Permanently Flooded, Unconsolidated Bottom); R2UBH (Permanently Flooded, Lower Perennial, Riverine Unconsolidated Bottom); R2USA (Temporarily Flooded, Lower Perennial, Riverine Unconsolidated Shore); R4SBC (Seasonally Flooded, Intermittent, Riverine Streambed)

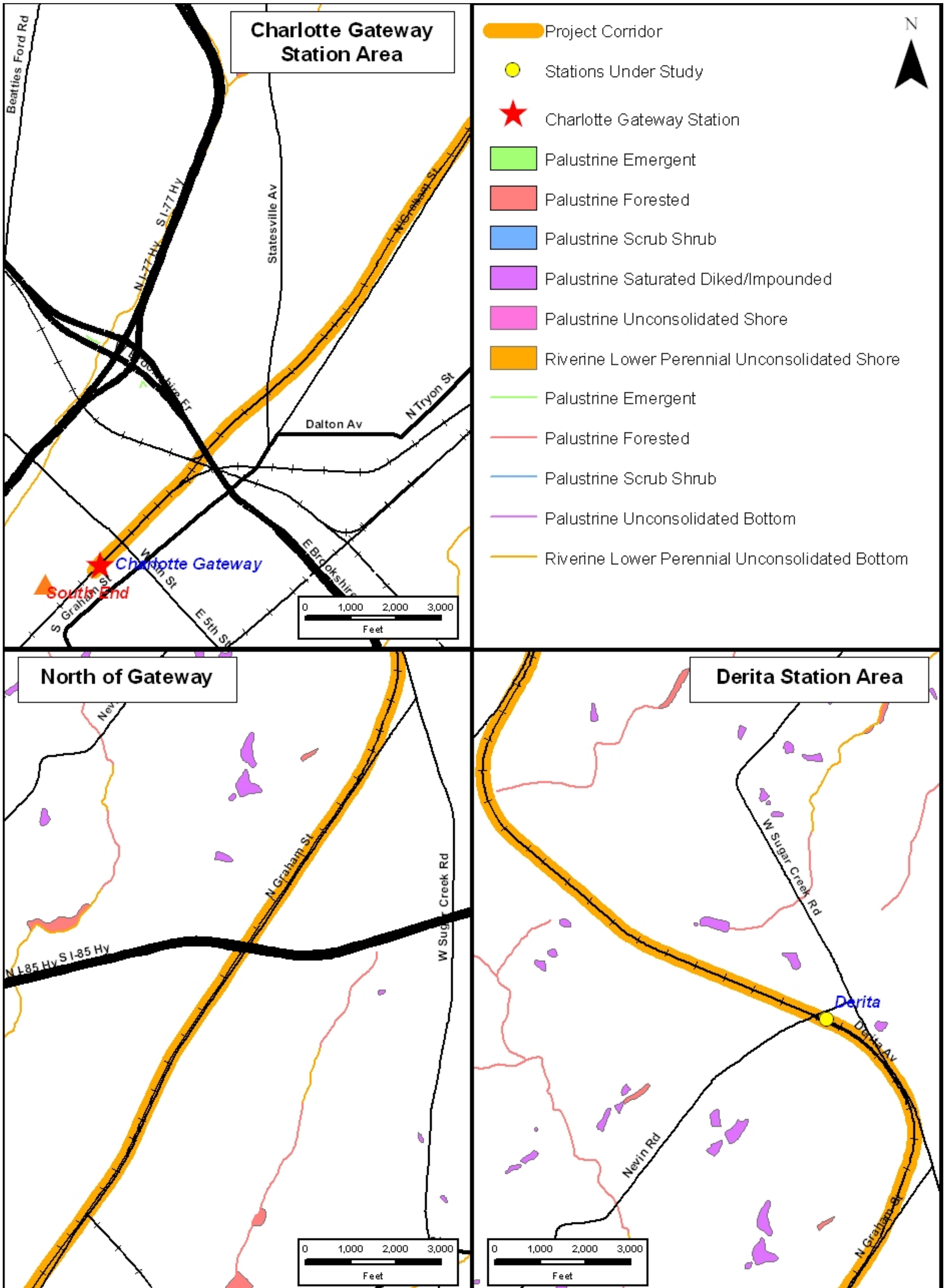

Figure 3.7-2a | Affected Waters of US including Wetlands

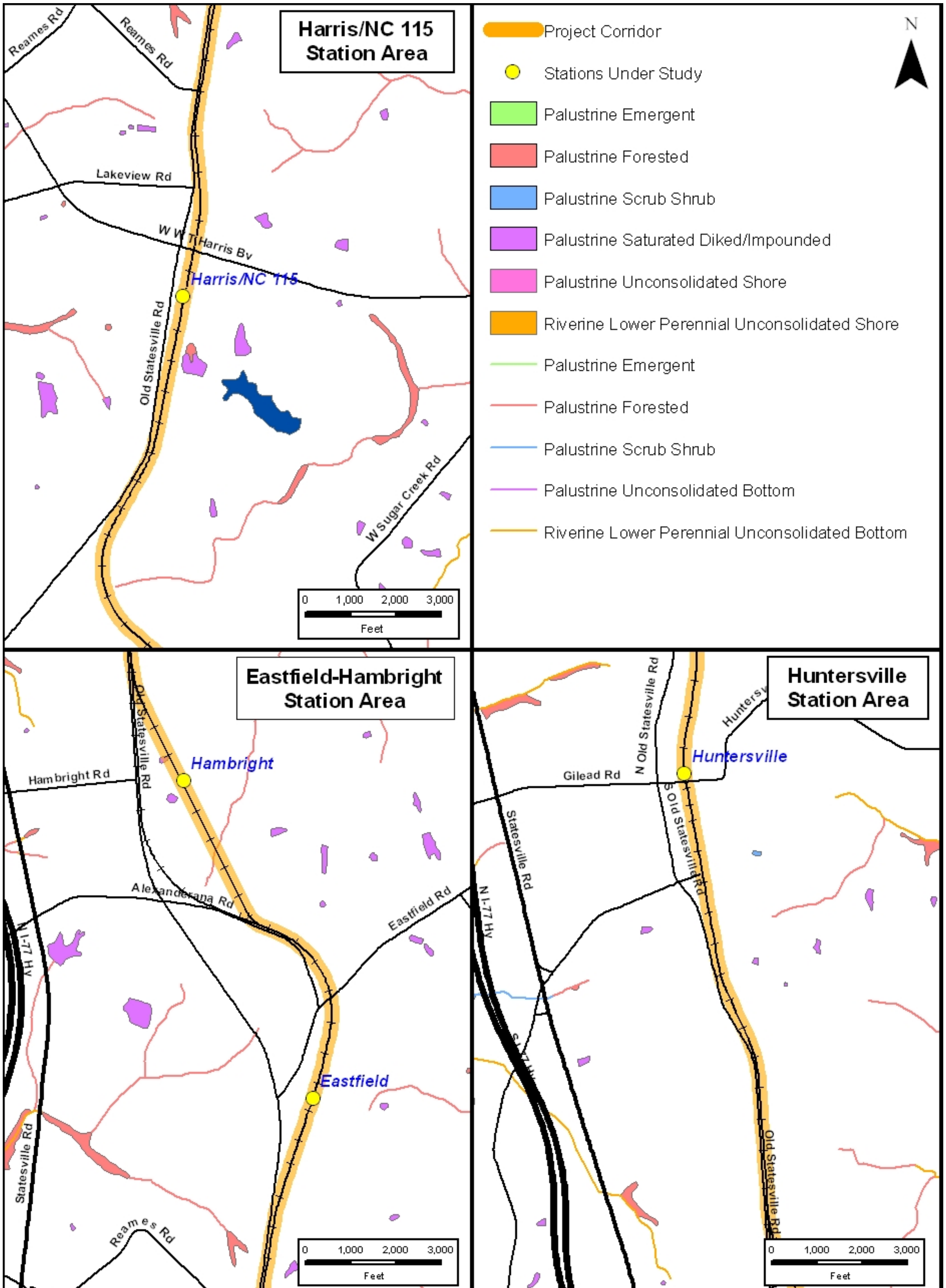

Figure 3.7-2b Affected Waters of US including Wetlands

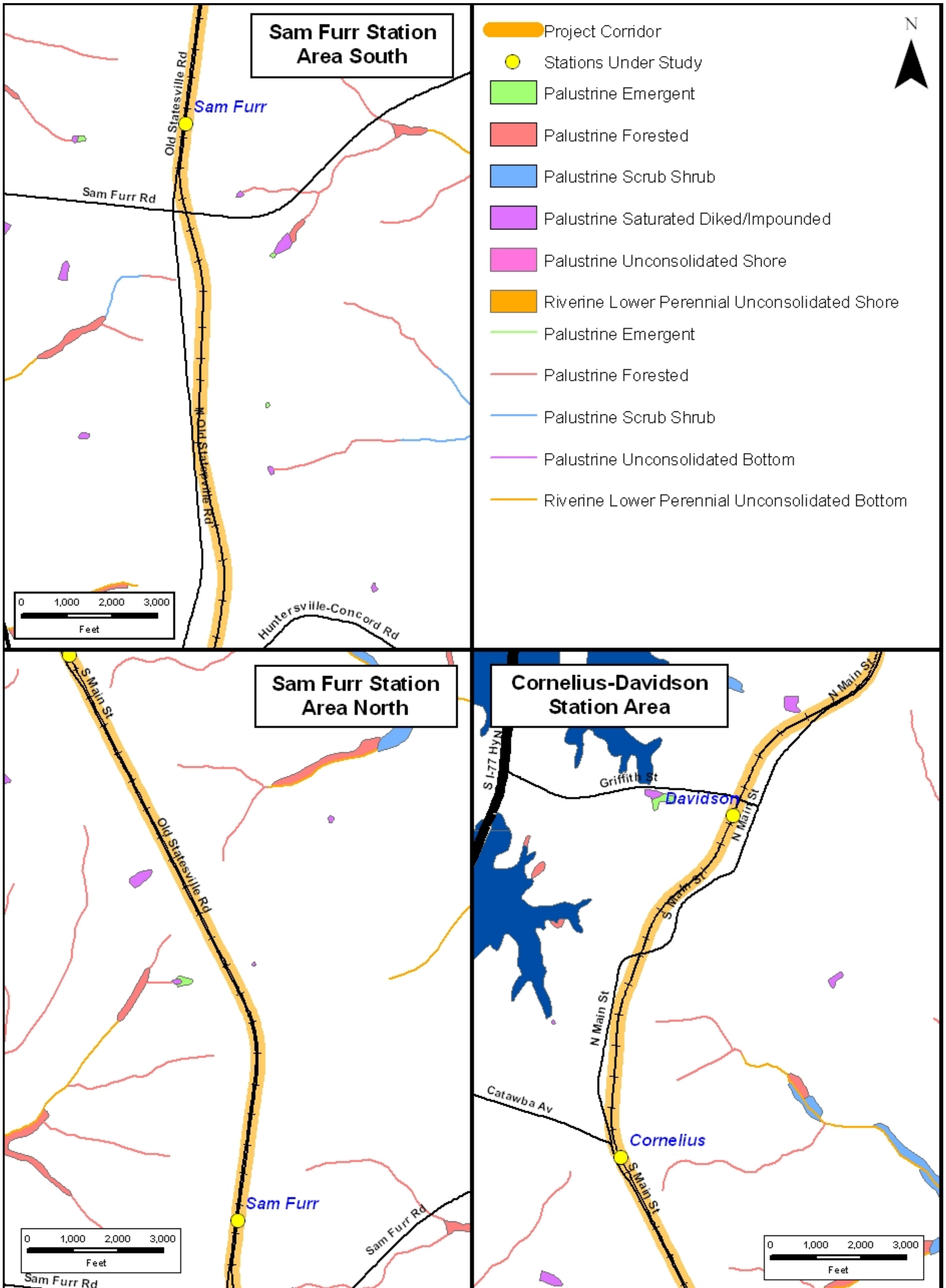

Figure 3.7-2c — Affected Waters of US including Wetlands

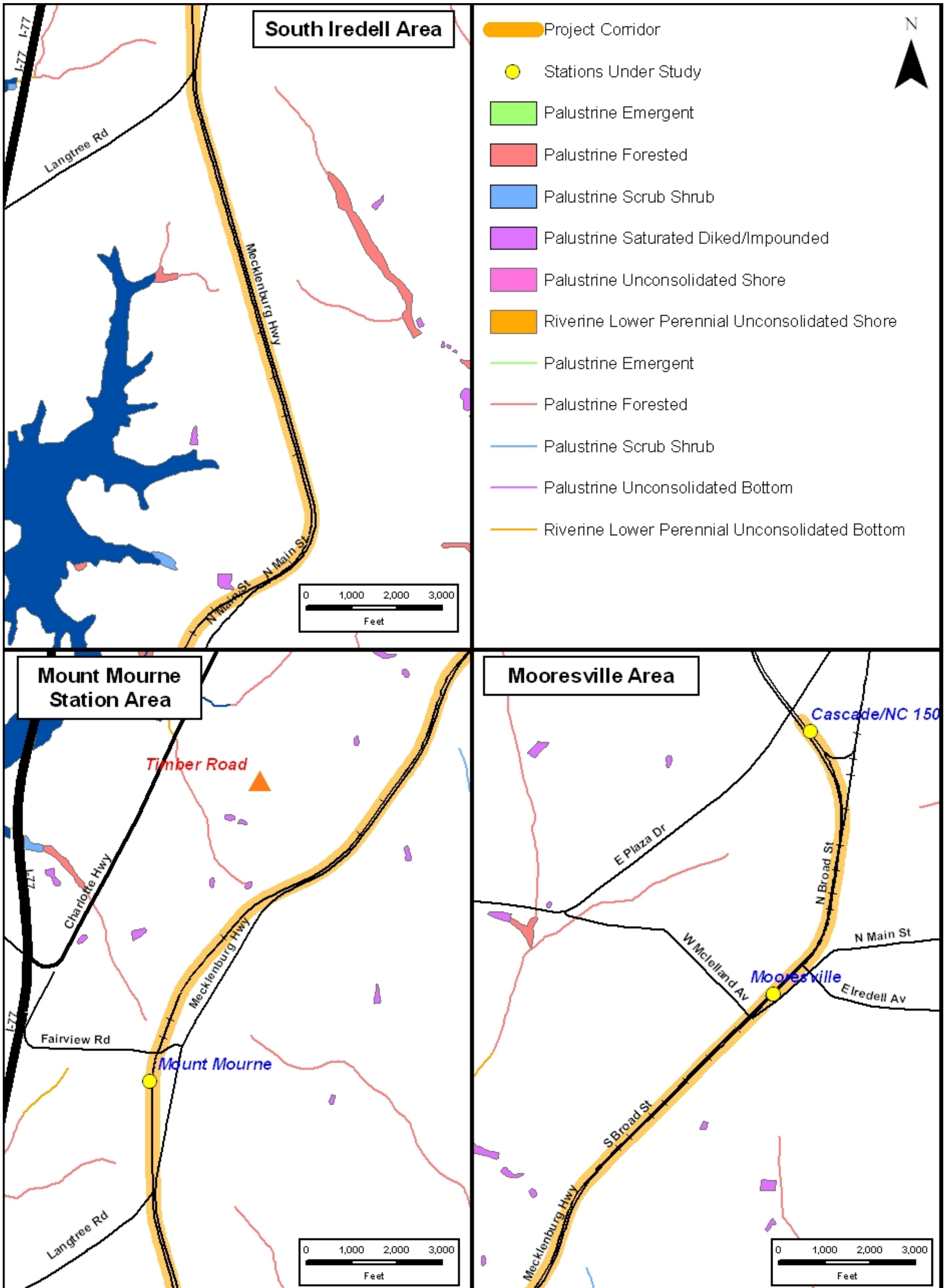

Figure 3.7-2d Affected Waters of US including Wetlands

Direct Effects to Wetlands

Table 3.7-8 presents wetland impacts by alternative. Wetland resources that occur within the proposed NCCR construction limits are illustrated on Figure 3.7-2a-d. Most wetland impacts would occur within the proposed Hambright station area. The No-Action Alternative would not impact wetlands. Impacts on wetland resources by the NCCR were evaluated based on a wetlands determination, rather than wetlands delineation. The NCCR would affect from 0 to 0.145 acre of wetlands taking into account the rail line and station alternatives, but not VMF alternatives.

There is no differences in wetland impacts between the NCCR alternatives, as the only impact is within the Bryton development near the Hambright station, which would affect 0.145 acre of wetlands (or 0.02 percent of the bi-county total). The Timber Road VMF would affect 2.12 acres of wetlands, whereas the South End VMF would affect no wetlands.

Table 3.7-8. Direct Effects to Wetlands

WETLAND TYPE	LPA		MOS	
	Acreage Affected	**% of Corridor Study Area**	**Acreage Affected**	**% of Corridor Study Area**
L2UB	0	0	0	0
PEM1	0	0	0	0
PFO1	0.13	0.024	0.13	0.024
PSS1	0	0	0	0
PUBH[1]	0.015	0.056	0.015	0.056
PUSC	0	0	0	0
TOTAL (all wetland types)	**0.145**	**0.023**	**0.145**	**0.023**

[1] Within water depths less than 6.6 feet.

[2] L2UB (Unconsolidated Bottom Littoral Lacustrine); PEM1 (Persistent Emergent Palustrine); PFO1 (Broad-Leaved Deciduous, Forested Palustrine); PSS1 (Broad-Leaved Deciduous, Scrub-Shrub Palustrine); PUBH (Permanently Flooded, Unconsolidated Bottom Palustrine); PUSC (Seasonally Flooded, Unconsolidated Shore Palustrine)

Note: Does not include 2.12 acres of direct effects associated with the Timber Road VMF.

Indirect Effects to Wetlands

Indirect effects to wetlands potentially resulting from development reasonably expected to occur within the 0.25-mile buffer surrounding each proposed station are presented in Table 3.7-9. The No-Action Alternative would not lead to increased indirect impacts to wetlands.

Table 3.7-9. Indirect Effects of Station-Induced Development on Wetlands

WETLAND TYPE	LPA		MOS	
	Acreage Affected	% of Corridor Study Area	Acreage Affected	% Corridor Study Area
L2UB	0	0	0	0
PEM1	0.68	10.56	0.68	10.56
PFO1	2.92	0.54	2.92	0.54
PSS1	0	0	0	0
PUBH[1]	1.54	5.76	1.54	5.76
PUSC	0	0	0	0
TOTAL (all wetland types)	**5.14**	**0.82**	**5.14**	**0.82**

[1] Within water depths less than 6.6 feet.
[2] L2UB (Unconsolidated Bottom Littoral Lacustrine); PEM1 (Persistent Emergent Palustrine); PFO1 (Broad-Leaved Deciduous, Forested Palustrine); PSS1 (Broad-Leaved Deciduous, Scrub-Shrub Palustrine); PUBH (Permanently Flooded, Unconsolidated Bottom Palustrine); PUSC (Seasonally Flooded, Unconsolidated Shore Palustrine)

Note: No indirect effects associated with the Timber Road VMF.

3.7.4.3 Mitigation

All of the direct impacts upon wetland systems occur in or around the Hambright Station in the Bryton development. As the Bryton development is proceeding ahead of the NCCR project, it is possible that the wetland impacts, Section 404 permit and mitigation issues may be resolved prior to actual CATS action in the Bryton area. In the event this is not the case, the following discussion applies.

Using conventionally prescribed mitigation ratios of 2:1 for forested wetlands, 1.5:1 for scrub/shrub wetlands, and 1:1 for emergent wetlands, it is estimated that a total of 0.26 acre of forested wetlands compensation would be required to mitigate impacts associated with the LPA and MOS alternatives (see Table 3.7-10). It is estimated that another 3.11 acres of scrub-shrub and forested wetlands compensation would be required to mitigate impacts associated with the Timber Road VMF. All wetland effects are within the Yadkin River Basin, therefore all required mitigation should be provided within the same basin as near to the affected site (Hambright) as possible. In-place (i.e., within the same watershed), in-kind (i.e., wetland type for wetland type) mitigation at the prescribed ratios would be the intended means for wetlands mitigation, where feasible. Because wetlands restoration is considered by the regulatory agencies to be the preferred means for mitigating wetland impacts, special effort will be given to locating and restoring prior-converted wetlands. The diked/impounded palustrine habitat listed as PUBHh's in Table 3.7-8 are farm ponds and other man-made open-water features. Because of their man-made origin and relatively low functions and values, no mitigation measures have been proposed specifically for these PUBHh's; however, certain functions associated with these PUBHh's would be replaced at enhanced levels through the inclusion of extended wet detention basins as part of the proposed stormwater management system.

Table 3.7-10. Wetland Mitigation Requirements

Wetland Type [1]	Prescribed Mitigation Ratio	Area Affected (acres)		Mitigation Required (acres)	
		LPA	MOS	LPA	MOS
PFO1A-C	2:1	0.13	0.13	0.26	0.26
PSS1A-C	1.5:1	0	0	0	0
PEM1A-C	1:1	0	0	0	0
TOTAL		**0.13**	**0.13**	**0.26**	**0.26**

[1] PFO1A-C (temporarily to seasonally flooded broad-leaved deciduous forested palustrine wetland); PSS1A-C (seasonally flooded broad-leaved deciduous scrub/shrub palustrine wetland); and PEM1A-C (temporarily to seasonally flooded persistent emergent palustrine wetland).

Note: Does not include 3.11 acres of mitigation required for Timber Road VMF.

Mitigation opportunities are limited in Mecklenburg and Iredell counties because of the extensive urban development in both of these counties. No operational wetland mitigation banks currently exist within the study area or nearby portions of affected watersheds. Restoration of prior-converted croplands or farmed wetlands outside the project region would be considered only if opportunities for other types of wetlands mitigation within the region are determined to be imprudent or infeasible. Should restoration of prior-converted croplands or farmed wetlands prove infeasible (in whole or in part), other mitigation measures such as wetlands compensation (i.e., construction of man-made wetlands), preservation of existing wetlands, and payment-in-lieu into the North Carolina Wetland Restoration Fund (WRF) would also remain as viable options.

The No-Action Alternative would serve as a wetlands avoidance alternative. In addition, the 600-foot-wide study corridor would allow designers to shift the centerline of sidings and realigned segments during final design to further minimize wetland impacts. All practicable measures to minimize wetland impacts would be further considered and implemented during design of the selected alternative - especially with respect to forested and scrub/shrub wetlands. Unavoidable impacts associated with the selected alternative would be minimized to the fullest degree practicable and appropriate compensation provided. Impacts associated with the LPA and MOS alternatives near the proposed Hambright station will likely be addressed by the developer of the Hambright station area. If a build alternative is selected, a final mitigation plan will be developed during the permit application process.

3.7.5 Threatened or Endangered Species

Threatened and endangered species are animal and plant species protected by either the federal or state government because their populations are decreasing for such reasons as habitat loss, habitat competition, and other man-induced impacts such as pesticide usage. Species with the federal designation of endangered or threatened receive protection under the Endangered Species Act of 1973. The term “endangered” refers to a species “which is in danger of extinction throughout all or a significant portion of its range.” The term “threatened” refers to a species “which is likely to become an endangered species within the foreseeable future throughout all or a significant portion of its range.”

3.7.5.1 Affected Environment

Federal-Listed Protected Species

Six federal-listed protected species were identified by state natural resource agencies as potentially being present within one or more of the 7.5-minute quadrangles encompassing the project. None of these federal-listed protected species were observed during the field investigation; however, formal protected species surveys were not conducted. Table 3.7-11 lists federal-listed protected species by county based on data provided by the USFWS (dated 2005). The NCNHP database was also reviewed for known locations of federal-listed protected species. Based on field reconnaissance, approximately 12 percent of the project area (i.e., managed herbaceous cover and unmanaged herbaceous upland) represents potential habitat for three federal-listed endangered plant species - Schweinitz's sunflower, smooth coneflower (*Echinacea laevigata*), and Michaux's sumac (*Rhus michauxii*). The 12 percent estimate likely overestimates potential habitat somewhat because it is based on the total area of each of the aforementioned land cover types rather than their subsets of partially shaded edge habitat.

Table 3.7-11. Federal-Listed Protected Species by County

Common Name	Scientific Name	Status	County
Bald eagle	*Haliaeetus leucocephalus*	Threatened [1]	Mecklenburg
Bog turtle	*Clemmys muhlenbergii*	Threatened	Iredell
Carolina heelsplitter	*Lasmigona decorata*	Endangered	Mecklenburg
Schweinitz's sunflower	*Helianthus schweinitzii*	Endangered	Mecklenburg
Smooth coneflower	*Echinacea laevigata*	Endangered	Mecklenburg
Michaux's sumac	*Rhus michauxii*	Endangered	Mecklenburg

[1] Proposed for delisting.

State-Listed Protected Species

Species with the North Carolina status of Endangered, Threatened, Endangered-Special Concern, or Threatened-Special Concern are protected under the North Carolina Endangered Species Act (G.S. 113-331 *et seq*.) and the North Carolina Plant Protection and Conservation Act of 1979 (G.S. 106-202.12 *et seq*.). Threatened or endangered species of special concern require monitoring but may be collected and sold under regulations adopted under the Plant Protection and Conservation Act. State-listed protected species reported to occur within Mecklenburg and Iredell counties are presented in Table 3.7-12.

Table 3.7-12. State-Listed Protected Species by County

Common Name	Scientific Name	Status	County
Bald eagle	*Haliaeetus leucocephalus*	Threatened [1]	Mecklenburg
Bog turtle	*Clemmys muhlenbergii*	Threatened	Iredell
Carolina heelsplitter	*Lasmigona decorata*	Endangered	Mecklenburg
Creeper	*Strophitus undulatus*	Threatened	Mecklenburg
Carolina creekshell	*Villosa vaughaniana*	Endangered	Mecklenburg
Schweinitz's sunflower	*Helianthus schweinitzii*	Endangered	Mecklenburg
Smooth coneflower	*Echinacea laevigata*	Endangered - SC	Mecklenburg
Michaux's sumac	*Rhus michauxii*	Endangered - SC	Mecklenburg
Tall larkspur	*Delphinium exaltatum*	Endangered - SC	Mecklenburg
Georgia aster	*Symphyotrichum georgianum*	Threatened	Mecklenburg
Cone-shaped sedge	*Carex conoidea*	Threatened	Iredell
Littleleaf sneezeweed	*Helenium brevifolium*	Endangered	Iredell

[1] Proposed for delisting.

Description of Protected Species and Habitat Requirements

The following paragraphs describe each federal-listed and state-listed species in the counties containing the NCCR.

Bald Eagle: The bald eagle (*Haliaeetus leucocephalus*) is a large raptor that is presently listed as threatened (proposed for de-listing) by the USFWS and is also listed as threatened by the state. In 1982, there were no bald eagle nests in North Carolina. In 1998, there were 17 nests; in 2000, there were 34 nests. Several new nests were located during the 2002 nesting season. The bald eagle's recovery has lead to a proposal for delisting the bald eagle from the federal "List of Endangered and Threatened Wildlife". The bald eagle forages along coastal areas, rivers, and large bodies of water. Nesting sites are commonly located in large forested areas adjacent to marshes, on farmland, or in seed tree cut-over areas. Currently, threats to the bald eagle include poaching, loss of nesting trees, pollution of food sources, and waterfront development.

Bog Turtle: On November 4, 1997, the USFWS extended Endangered Species Act protection to conserve the northern population of the bog turtle (*Clemmys muhlenbergii*), which has seriously declined in the northeast United States. The northern population of the bog turtle, which ranges from New York and Massachusetts south to Maryland, is designated as threatened. The southern population of the bog turtle (ranging from southern Virginia to northern Georgia) is also protected with a threatened designation on both a federal and state level because its physical appearance is similar to the northern population. The southern bog turtle population is separated from the northern population by approximately 250 miles; however, individual bog turtles in the southern population closely resemble individuals in the northern bog turtle population, causing difficulty in enforcing prohibitions protecting the northern population. As a result, the USFWS has designated the southern population as "threatened (similarity of appearance)." Illegal collection (primarily for the national and international pet trade) as well as loss and modification of the bog turtle's wetland habitat have resulted in a reduction of the species' range and a decline in the size of the remaining population. Critical habitat consists of open-canopy, herbaceous wetlands (sedge meadows and fens) bordered by wooded areas. These wetlands are comprised of a mosaic of micro-habitats which include dry pockets, saturated areas, and areas that are periodically flooded. Although historically reported within Iredell County, the bog turtle was last observed more than 20 years ago.

<u>Carolina Heelsplitter</u>: The Carolina heelsplitter (*Lasmigona decorate*) is a freshwater mussel that was federally listed as endangered on June 30, 1993. The species is also listed as endangered by the state. The Carolina heelsplitter currently has a very fragmented, relict distribution, but historically was known from several locations within the Catawba and Pee Dee river systems in North Carolina and the Pee Dee and Savannah river systems, and possibly the Saluda River system, in South Carolina. Only six populations of the species are presently known to exist. In North Carolina, one small remnant population occurs in the Catawba River system in Waxhaw Creek, a tributary to the Catawba River in Union County, and another small population occurs in a short stretch of Goose Creek, a tributary to the Rocky River in the Pee Dee River system in Union County. Historically, the species was reported from small to large streams and rivers as well as mill ponds. Presently, the species is known to occur in only six small streams and one small river and is usually found in mud, muddy sand, or muddy gravel substrates along stable, well-shaded stream banks; however, in Mountain Creek in Edgefleld County, South Carolina, two live individuals were found near the center of the stream channel in a relatively silt-free substrate comprised primarily of a mixture of sand, gravel, and cobble. It is conceivable that this is the preferred habitat type for the species and that, in other areas, degradation of the gravelly substrates has restricted the species to less suitable habitats. The decline in the species throughout its range has been attributed to siltation resulting from poorly implemented agricultural, forestry, and development activities; golf course construction; road construction and maintenance; runoff and discharge of municipal, industrial, and agricultural pollutants; habitat alterations associated with impoundments, channelization, dredging, and sand mining operations; and other natural and human-related factors that adversely modify the aquatic environment. The low numbers of individuals and the restricted range of each of the surviving populations makes them extremely vulnerable to extirpation from a single catastrophic event or activity (such as a toxic chemical spill, temporary failure of a waste treatment facility, channel alteration, etc.). Also, existing and potential future land uses of the surrounding area threaten the habitat and water quality of all populations with increased discharge or runoff of silt, sediments, and organic and chemical pollutants. Although it has been reported within Mecklenburg County, the species has not been observed in the county within the last 20 years. Due to the relatively high position of the project area in the landscape (along watershed divides) and its relatively well-drained nature, suitable habitat for the Carolina heelsplitter (i.e., mud, muddy sand, or muddy gravel substrates along stable, well-shaded stream banks) was not encountered in the vicinity of the proposed project.

<u>Creeper</u>: The creeper (*Strophitus undulatus)* is a freshwater mussel which is currently listed as threatened by the state. The range of the creeper includes both the Atlantic Slope and the Interior Basin. It is found through the Mississippi and Ohio drainages from Central Texas to Lake Winnipeg, Canada. In the Atlantic Slope, it occurs from the Savannah River in South Carolina to the St. Lawrence River in Canada. This species has been taken from silt, sand, gravel, and mixed substrates. Throughout its range it has been found from headwater streams, to large rivers and lakes, to a depth of 12 feet. Although the NCNHP lists the creeper as being present in Mecklenburg County, the NCWRC's 2004 Wildlife Action Plan, the NHP 2001 List of the Rare Animal Species, and the NC Mussel Atlas do not report the species as being present within the river basins contained within the project construction limits. Due to the relatively high position of the project area in the landscape (along watershed divides) and its relatively well-drained nature, suitable habitat for the creeper was not encountered in the vicinity of the proposed project.

<u>Carolina Creekshell</u>: The Carolina creekshell (*Villosa vaughaniana*) is a freshwater mussel that is currently listed as endangered by the state. The Carolina creekshell is usually found in silty sand or clay along the banks of small streams. In areas of abundance, they have also been found occupying substrates of mixed sand and gravel. The range of the Carolina creekshell includes the Catawba and Yadkin-Pee Dee river basins in North and South

Carolina, and the Upper Cape Fear River Basin in North Carolina. The species is reported in Mecklenburg County in the Goose and Mallard creek subbasins of the Pee Dee River Basin, and the Six Mile Creek Subbasin of the Catawba River Basin (i.e., along the Mecklenburg/Union county line). The project area does not encroach into any of the aforementioned watersheds. Due to the relatively high position of the project area in the landscape (along watershed divides) and its relatively well-drained nature, suitable habitat for the Carolina creekshell was not encountered in the vicinity of the proposed project.

<u>Schweinitz's Sunflower</u>: Schweinitz's sunflower (*Helianthus schweinitzii*) is an endangered plant that was federally listed as endangered on May 7, 1991. The species is also listed as endangered by the state. It is believed that this species formerly occupied prairie like habitats or Post Oak/Blackjack Oak savannas that were maintained by fire. Current habitats include roadsides, power line clearings, old pastures, woodland openings, and other sunny or semi-sunny situations. Schweinitz's sunflower is known from a variety of soil types but is generally found growing on shallow, poor, clayey, and/or rocky soils, especially those derived from mafic rocks. In the few sites where Schweinitz's sunflower occurs in relatively natural vegetation, the natural community is considered a Xeric Hardpan Forest (Schafale and Weakley, 1990). Schweinitz's sunflower is endemic to the Piedmont physiographic province of North Carolina and South Carolina. The species is currently known from Anson, Cabarrus, Davidson, Gaston, Mecklenburg, Montgomery, Randolph, Rowan, Stanly, Stokes, Surry, and Union counties in North Carolina and York and Lancaster counties in South Carolina. Schweinitz's sunflower is threatened by fire suppression, highway construction, residential and industrial development, and maintenance activities in roadside and utilities rights-of-way. Although no individual plants were identified during field investigation, suitable habitat (i.e., roadsides, power line clearings, old pastures, and woodland openings) was observed in the vicinity of the proposed project.

<u>Smooth Coneflower</u>: Smooth coneflower (*Echinacea laevigata)* is a plant species which was federal-listed as endangered on October 8, 1992. Smooth coneflower is currently state-listed as a species of special concern; however, because it is also listed as endangered by the state, it may be collected from the wild and sold only under regulations adopted under the Plant Protection and Conservation Act. The reported historical range of smooth coneflower included Pennsylvania, Maryland, Virginia, North Carolina, South Carolina, Georgia, Alabama, and Arkansas. The species is now known to survive only in Virginia, North Carolina, South Carolina, and Georgia. Six populations survive in North Carolina. The North Carolina populations are in Durham and Granville counties. The habitats of smooth coneflower are open woods, cedar barrens, roadsides, clearcuts, dry limestone bluffs, and power line rights-of-way, usually on magnesium- and calcium-rich soils associated with limestone (in Virginia), gabbro (in North Carolina and Virginia), diabase (in North Carolina and South Carolina), and marble (in South Carolina and Georgia). Optimal sites are characterized by abundant sunlight and little competition in the herbaceous layer. The suppression of a competing or shading overstory by natural fires and grazing of large herbivores are factors which historically affected the range of this species. Many of the associated herbs are also cormophytic (i.e., species requiring full sun or little shading) which depend on periodic disturbances to reduce the shade and competition of woody plants. Sixty populations of smooth coneflower have been reported historically from 24 counties in eight states. Over two-thirds of the historic populations have been eliminated. The most serious threats to the species' continued existence are collecting, residential and industrial development, encroachment of woody vegetation, highway construction and improvement, and certain types of roadside and power line right-of-way maintenance. Shading of roadsides and the railroad right-of-way by adjacent forest trees and routine mowing reduce the suitability of habitat within the NCCR project area for the species. Although no individual plants were identified during field investigation, suitable habitat (i.e., open woods, roadsides, clearcuts, and power line rights-of-way) was observed in the vicinity of the proposed project.

<u>Michaux's Sumac</u>: Michaux's sumac (*Rhus michauxii*) was listed as endangered on September 28, 1989 due to its rarity and vulnerability to threats. Michaux's sumac is

currently state-listed as a species of special concern; however, because it is also listed as endangered by the state, it may be collected from the wild and sold only under regulations adopted under the Plant Protection and Conservation Act. Michaux's sumac is historically thought to be endemic to the coastal plain and piedmont of the Carolinas, Georgia, and Florida. At present, only 36 extant populations are known - with 31 in North Carolina, three in Virginia, and two in Georgia. Currently, the plant is documented in the following North Carolina counties: Richmond, Hoke, Moore, Scotland, Franklin, Davie, Robeson, and Wake. Michaux's sumac grows in sandy or rocky open woods in association with basic soils. Apparently, this plant survives best in areas where some form of disturbance has provided an open area. At least twelve of the plant's populations in North Carolina are on highway rights-of-way, roadsides, or on the edges of artificially maintained clearings. Two other populations are in areas with periodic fires, and two populations exist on sites undergoing natural succession. One population is situated in a natural opening on the rim of a Carolina bay. Perhaps the most crucial factor endangering this species is its low reproductive capacity. A low percentage of the plant's remaining populations have both male and female plants. The NCNHP wrote, ". . . because of the clonal nature of this species and the scarcity of populations containing both male and female plants, the remaining populations may actually consist of only about two dozen genetic individuals." The plant is also threatened by fire suppression and habitat destruction due to residential and industrial development. Two of the plant's historic populations were destroyed by development, one by the construction of a water tower, and one by the conversion of the site to pine plantation. Although no individual plants were identified during field investigation, suitable habitat (i.e., highway rights-of-way, roadsides, and edges of artificially maintained clearings) was observed in the vicinity of the proposed project.

Tall Larkspur: Tall larkspur (*Delphninium exaltatum*) is a plant that is currently state-listed as a species of special concern; however, because it is also listed as endangered by the state, it may be collected from the wild and sold only under regulations adopted under the Plant Protection and Conservation Act. The species' preferred habitat is rich woods. It ranges from Minnesota southeast to Illinois and Pennsylvania, south to Georgia, west to Oklahoma, and north to Nebraska and Iowa. The flower structure is similar to that of Rocket Larkspur (Consolida ajacis), which is often cultivated in gardens and may escape to roadsides and waste places. Although it has been reported within Mecklenburg County, the species has not been observed in the county within the last 20 years.

Georgia Aster: Georgia aster (*Symphyotrichum georgianum* (*Aster georgianus* Alexander)) is a plant that is currently listed as threatened by the state. The species occurs in dry open areas which are often disturbed sites. It is known from only North Carolina, South Carolina, Georgia, and Alabama. Populations are very scattered. The species is rare and diminishing. Over one-third of the less than one hundred populations once known are already lost. The species is reported by the NCNHP to occur in Iredell County.

Cone-Shaped Sedge: Cone-shaped sedge (*Carex conoidea*) is a plant that is currently listed as threatened by the state. The species occurs in moist meadows and prairies, and along shores of lakes, ponds, and rivers (usually in acidic sands or loams). It is reported to occur in Connecticut, Delaware, Illinois, Indiana, Iowa, Maine, Massachusetts, Michigan, Minnesota, Missouri, New Hampshire, New Jersey, New York, North Carolina, Ohio, Pennsylvania, Rhode Island, Vermont, Virginia, and Wisconsin. Cone-shaped sedge is an uncommon plant throughout most of its wide range and is most frequent in New England. It is unusual in the Carex family Griseae in that it inhabits open sites and is the only species of the family regularly found in sunny habitats. Cone-shaped sedge often grows with *C. buxbaumii, C. tetanica, and C. pallescens*. Although reported to occur within Iredell County, the report is considered to be "obscure" by the NCNHP. No individual plants or suitable habitat were identified during field investigation.

Littleleaf Sneezeweed: Littleleaf sneezeweed (*Helenium brevifolium*) is an upright, unbranched, perennial plant that is currently listed as endangered by the state. Its preferred habitat is wet ditches, pond margins, bogs, and lowlands. Because of its preferred habitat, the plant is sometimes confused with honeycomb head (genus Balduina). No individual plants or suitable habitat were identified during field investigation.

3.7.5.2 Environmental Consequences

No individual specimens or populations were observed during field reconnaissance within 0.25 mile of the NCCR; however, formal protected species surveys were not conducted.

Direct Effects to Federal-Listed and State-Listed Protected Species

Based on field reconnaissance, approximately 12 percent of the project area contains suitable habitat for three federal-listed and state-listed endangered plant species (Schweinitz's sunflower, smooth coneflower, and Michaux's sumac). Although no individual specimens were observed during field investigation, these species prefer open woodland and disturbed areas, and are capable of becoming established within these and other similar habitats in the project corridor. Table 3.7-13 summarizes acreages of suitable habitat that would be potentially affected by the NCCR. Because there were no individual specimens observed, effects associated with the NCCR would be limited to removal or management (mechanical and/or chemical control of vegetation) of potential habitat for the three aforementioned protected plant species. The No-Action Alternative would have no direct effects on threatened and endangered species.

The following paragraphs describe the likelihood of the federal-listed and state-listed protected species discussed in the previous section being affected by the project.

Bald Eagle: According to the county-wide list of natural heritage resources provided by the NCDNH, the bald eagle has been documented in portions of Mecklenburg County west of the project area (i.e., around Lake Norman). No suitable habitat for eagle nesting sites (tall dead standing timber surrounding expanses of open water) exists within areas that would be affected by the proposed project. The project would not encroach upon any quarter-mile radius surrounding an existing eagle nesting site.

Bog Turtle: According to the county-wide list of natural heritage resources provided by DNH, the bog turtle has been documented in portions of Iredell County north and west of the project area. No individual specimens or suitable habitat for the species (open-canopy, herbaceous wetlands containing a mosaic of micro-habitats and bordered by wooded areas) were observed within areas that would be affected by the proposed project.

Carolina Heelspitter: The Carolina heelsplitter has not been observed in Mecklenburg County within the last 20 years. No individual specimens or suitable habitat for the species (mud, muddy sand, or muddy gravel substrates along stable, well-shaded stream banks) were observed within areas that would be affected by the proposed project.

Michaux's Sumac: The NCNHP's records indicate that this species has not been documented within one mile of the project corridor. Although no individual plants were identified during field investigation, 4,588 acres (approximately 6.59 percent of the bi-county area) was identified as potential habitat for Michaux's sumac. Table 3.7-13 summarizes the number of acres of potential habitat affected for each of the NCCR alternatives. The majority of the impact on habitat for this plant would be from station construction. The total direct effects of each alternative on Michaux's sumac suitable habitat (i.e.,rights-of-way, sandy disturbed open woods, and edges of maintained clearings) would range from as low as 0.19 acres for the MOS alternative (0.0041 percent of the bi-county total) to as high as 0.30 acres for the LPA-H alternative (0.0066 percent of the bi-county total). The No-Action Alternative would have no predictable direct impacts on suitable habitat for Michaux's sumac.

Schweinitz's Sunflower: The NCNHP's records indicate that this species has not been documented within one mile of the project corridor. Although no individual plants were identified during field investigation, 626.09 acres (approximately 0.9 percent of the bi-county area) is potential habitat for Schweinitz's sunflower. Table 3.7-13 summarizes the number of acres of potential habitat affected for each of the NCCR alternatives. The total direct effects of each alternative on Schweinitz's sunflower suitable habitat (i.e., roadsides, powerline clearings, old pastures, and woodland clearings) would range from as low as 0.07 acres for the MOS alternative (0.012 percent of the bi-county total) to as high as 0.10 acres for the LPA-H alternative (0.016 percent of the bi-county total). The No-Action Alternative would have no predictable direct impacts on suitable habitat for Schweinitz's sunflower.

Smooth Coneflower: The NCNHP's records indicate that this species has not been documented within one mile of the project corridor. Although no individual plants were identified during field investigation, 4,475 acres (approximately 6.4 percent of the bi-county area) potential habitat for smooth coneflower. Table 3.7-13 summarizes the number of acres of potential habitat for each of the NCCR alternatives. The total direct effects of each alternative on smooth coneflower suitable habitat (i.e., roadsides, powerline clearings, clearcuts, and open woods) would range from as low as 0.24 acres for the MOS alternative (0.0054 percent of the bi-county total) to as high as 0.26 acres for the LPA alternative (0.0058 percent of the bi-county total). The No-Action Alternative would have no predictable direct impacts on suitable habitat for smooth coneflower.

Table 3.7-13. Potential Direct Effects to Suitable Habitat for Threatened and Endangered Species

Alternative	Suitable Habitat Affected (acres)					
	Schweinitz's Sunflower		Michaux's Sumac		Smooth Coneflower	
	Acres Affected	% of Bi-County Total	Acres Affected	% of Bi-County Total	Acres Affected	% of Bi-County Total
LPA	0.10	0.016	0.30	0.0066	0.26	0.0058
MOS	0.08	0.013	0.28	0.0061	0.24	0.0054

Direct Effects to State-Listed Only Protected Species

As discussed in the following sections, no impacts to protected species that are only state-listed (i.e., not also federally listed) would result from any of the NCCR alternatives.

Creeper: Due to the relatively high position of the project area in the landscape and its relatively well-drained nature, no suitable habitat for the creeper, or individual specimens, were encountered within areas that would be affected by the proposed project.

Carolina Creekshell: Due to the relatively high position of the project area in the landscape and its relatively well-drained nature, no individual specimens of the Carolina creekshell, or suitable habitat for the species (silty sand or clay along the banks of small streams, or substrates of mixed sand and gravel), were encountered within areas that would be affected by the proposed project.

Tall Larkspur: Although tall larkspur has been reported within Mecklenburg County, the species has not been observed in the county within the last 20 years. No individual specimens were observed within areas that would be affected by the proposed project.

Georgia Aster: The species is reported by the NCNHP to occur in Iredell County. No individual specimens were observed within areas that would be affected by the proposed project.

Cone-Shaped Sedge: Although reported to occur within Iredell County, the report is considered to be “obscure” by the NCNHP. No individual plants or suitable habitat (moist meadows and prairies, and along shores of lakes, ponds, and rivers) were identified during field investigation within areas which could be affected by the proposed project.

Littleleaf Sneezeweed: No individual plants or suitable habitat (wet ditches, pond margins, bogs, or lowlands) were identified during field investigation within areas which could be affected by the proposed project.

Indirect Effects to Protected Species

As previously discussed, the project area contains suitable habitat for three federal-listed and state-listed endangered plant species (Schweinitz’s sunflower, smooth coneflower, and Michaux’s sumac). Although no individual specimens were observed within 0.25 mile of proposed station locations during field investigation, these species prefer open woodland and disturbed areas, and are capable of becoming established within these and other similar habitats within the 0.25-mile buffer. Table 3.7-14 summarizes acreages of suitable habitat for each protected species that would be potentially affected by induced development around proposed stations. The No-Action Alternative would have no predictable direct impacts on suitable habitat for Schweinitz’s sunflower, Michaux’s sumac, or smooth coneflower.

Table 3.7-14. Indirect Effects of Station-Induced Development on Suitable Habitat for Threatened and Endangered Species

Alternative	Suitable Habitat Affected (acres)					
	Schweinitz’s Sunflower		Michaux’s Sumac		Smooth Coneflower	
	Acres Affected	% of Bi-County Total	Acres Affected	% of Bi-County Total	Acres Affected	% of Bi-County Total
LPA	48.05	7.68	76.42	1.67	67.98	1.52
MOS	41.53	6.63	63.57	1.39	57.05	1.27

3.7.5.3 Mitigation Measures

No direct or indirect effects to known populations or individual specimens of a protected species would result from construction of the proposed NCCR. Given the lack of species occurrences, along with the widespread presence of suitable habitat for Schweinitz’s sunflower, smooth coneflower, and Michaux’s sumac within the bi-county area (as much as 4,264 acres of roadsides, power line clearings, old pastures, and woodland openings), mitigation to preserve potential suitable habitat is considered unnecessary.

3.7.6 Special or Unique Habitats

3.7.6.1 Affected Environment

Special or unique habitats (i.e., Significant Natural Heritage Areas, Natural Heritage Element Occurrences, and Significant Aquatic Endangered Species Habitat) identified within the bi-county area by the NCNHP are shown in Figure 3.7-3. No special or unique habitats identified by the NCNHP are located within the NCCR corridor, at station site alternatives, at VMF alternative locations, or within 0.25 mile of a proposed station site or VMF. Field inspections also did not identify any special or unique habitats within the project corridor.

3.7.6.2 Environmental Consequences

No special or unique habitats would be directly or indirectly affected by the proposed project (see Figure 3.7-3).

3.7.6.3 Mitigation Measures

Mitigation measures are not applicable because no special or unique habitats would be directly or indirectly affected by the proposed project.

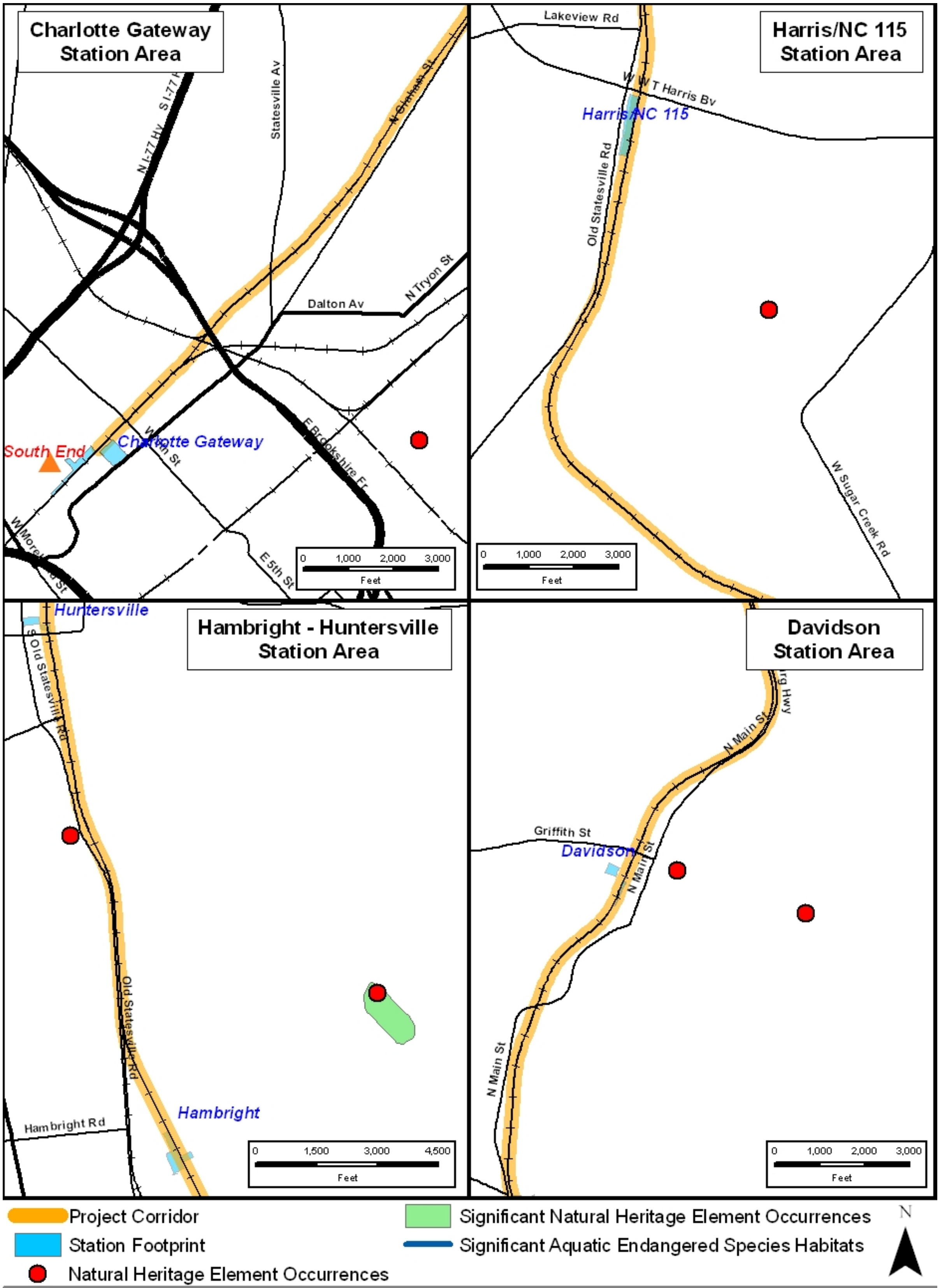

Figure 3.7-3	Special or Unique Habitats

3.8 Water Resources and Floodplains/Floodways

3.8.1 Legal and Regulatory Framework

Certain surface water resources such as rivers, lakes, and streams are subject to jurisdictional consideration under Sections 303(b) and 401 of the Clean Water Act. Surface water resources in the bi-county area are a combination of perennial streams, intermittent streams, ephemeral streams, non-jurisdictional stormwater channels and ditches, and open water bodies (reservoirs and farm ponds). An EPA National Pollutant Discharge Elimination System permit for stormwater discharge would be required under 40 CFR 122.

Protection of floodplains and floodways is required by Executive Order 11988, *Floodplain Management*; USDOT Order 5650.2, *Floodplain Management and Protection*; and 23 CFR 650. The intent of these regulations is to avoid or minimize encroachments within the 100-year (base) floodplain, where practicable, and to avoid supporting land use development that is incompatible with floodplain values.

The U.S. Water Resources Council's *Floodplain Management Guidelines for Implementing Executive Order 11988* defines a regulatory floodway as "the area regulated by Federal, State or local requirements; the channel of a river or other watercourse and the adjacent land areas that must be reserved in an open manner, i.e., unconfined or unobstructed either horizontally or vertically, to provide for the discharge of the base flood so the cumulative increase in water surface elevation is no more than a designated amount (not to exceed one foot as set by the National Flood Insurance Program [NFIP])."

3.8.2 Methodology

Surface water and groundwater resources were identified within the bi-county area. Resources identified include surface water resources (streams, ponds, and reservoirs) and groundwater resources (water supply wells and groundwater recharge/discharge areas). These resources were identified through the review of existing resource agency data, records, and maps, and through field investigation. Sources consulted include the USGS topographic quadrangles, the USGS National Hydrography Dataset (NHD) geodatabase, USDA Natural Resource Conservation Service soil surveys, NCDENR BasinPro data, and aerial photography.

Federal Emergency Management Agency (FEMA)-mapped 100-year floodplains and regulatory floodways were identified within the NCCR project area, including in the vicinity of proposed stations and VMF locations. These resources were identified through the review of existing resource agency data, records, and maps. Sources consulted include FEMA flood insurance studies and local floodplain ordinances.

3.8.3 Existing Conditions and Resources

3.8.3.1 Surface Water Resources

As defined under the federal system (specifically the USGS), the study area falls within four hydrologic units - the Lower Catawba hydrologic unit (USGS Hydrologic Unit Code [HUC] 03050103), the Upper Catawba hydrologic unit (USGS HUC 03050101), the South Yadkin hydrologic unit (USGS HUC 03040102), and the Yadkin hydrologic unit (USGS HUC 03040105). North of the community of Derita, the existing rail line extends along the drainage divide separating the Lower Catawba hydrologic unit from the Yadkin hydrologic unit, the drainage divide separating the Upper Catawba hydrologic unit from the Yadkin hydrologic unit, and the drainage divide separating the Upper Catawba hydrologic unit from the South Yadkin hydrologic unit. South of the community of Derita, the existing rail line falls within the Lower Catawba hydrologic unit, where it extends along the drainage divide separating Irwin Creek and an unnamed tributary to Little Sugar Creek. Quantities of surface water resources within each of the four hydrologic units of the bi-county area are presented in Table 3.8-1.

Table 3.8-1. Surface Water Resources of the Bi-County Area

HYDROLOGIC UNIT	PERENNIAL STREAMS (feet)	INTERMITTENT STREAMS (feet)	WATER BODIES (acres)
Lower Catawba	848,659	3,070,529	1,257
Upper Catawba	1,587,830	4,499,026	26,314
South (Lower) Yadkin	2,381,914	4,625,376	1,598
(Upper) Yadkin	711,989	2,393,898	676
TOTAL*	5,530,392	14,588,829	29,845

*Total values for hydrologic units represent only the portion of the Hydrologic Unit that is within the Bi-county area.

Figure 3.8-1a-c shows locations of perennial streams and mapped intermittent streams of the bi-county area. From north to south, headwaters of major streams in the vicinity of the existing rail line include those of several unnamed tributaries of the Catawba River, Dye Creek, several unnamed tributaries of the West Branch Rocky River, McDowell Creek, Ramah Creek, Torrance Creek, Cane Creek, Dixon Branch, an unnamed tributary of Clarks Creek, an unnamed tributary of Mallard Creek, Doby Creek, Irwin Creek, and an unnamed tributary of Little Sugar Creek. NCDENR-DWQ records were reviewed to determine the best usage classification and bioclassification (formerly known as benthic macroinvertebrate ambient network [BMAN]) for major water resources present in the vicinity of the existing rail line, proposed stations, and proposed VMFs. Stream bioclassification is a measure of the long-term trends in water quality at fixed monitoring stations determined by sampling for select benthic macroinvertebrates. No federally- or state-designated wild and scenic rivers are found within the project area.

<u>Best Usage Classification</u>. Where recognized as not being a water supply resource, nearly all perennial streams within the bi-county study area have been assigned a water quality classification of “C” (surface fresh waters that are regulated because of their best usage for aquatic life propagation and survival, fishing, secondary recreation, and agriculture). Where recognized as being a potential water supply resource, most other perennial streams within the bi-county study area have been assigned a water quality classification of water supply (WS)-IV (waters protected as water supplies which are generally in moderately to highly developed watersheds and which are suitable for all class “C” uses). For each of these classifications, unnamed streams (including intermittent streams) carry the same classification as that assigned to the stream segment to which they are a tributary. Lake Norman is classified as WS-IV waters within a critical area (CA), which is land adjacent to a water supply intake where risk associated with pollution is greater than from remaining portions of the watershed.

No Outstanding Resource Waters (ORW) are located within the bi-county study area. The only High Quality Waters (HQW) within the bi-county study are those of Coddle Creek, located approximately 0.5 mile east of the existing rail line.

<u>Bioclassification</u>. The NCDENR-DWQ stream bioclassification system addresses the long-term trends in water quality at fixed monitoring stations by sampling for selected benthic macroinvertebrates. Stream bioclassifications range from “excellent” to “poor”, where a bioclassification of “excellent” means water quality was associated with both high species richness and the presence of many intolerant macroinvertebrate species, while a bioclassification of “poor” means the more sensitive macroinvertebrate species have been

eliminated from the stream as a result of degraded water quality. Areas upstream of fixed monitoring bioclassification stations (including unnamed tributaries to monitored streams) carry the same bioclassification as the closest downstream fixed monitoring bioclassification station. Upstream reaches can, however, have different bioclassifications than the fixed monitoring bioclassification station when there is a permitted or un-permitted surface water discharge separating the upstream reach and the fixed monitoring bioclassification station.

Nineteen rated fixed monitoring bioclassification stations and five non-rated fixed monitoring bioclassification stations are located within the Mecklenburg County portion of the Catawba River basin. Of the 19 rated stations, eight have a bioclassification of "poor", seven have a bioclassification of "fair", three have a bioclassification of "good-fair", and one has a bioclassification of "good". No streams within the Mecklenburg County portion of the Catawba River basin have been assigned a bioclassification rating of "excellent". The fact that 15 of the 19 stations (or 79 percent) have a bioclassification of "fair" to "poor" is a reflection of the degree of stream degradation attributed to development and agricultural activity within this portion of the basin.

Four rated fixed monitoring bioclassification stations are located within the Iredell County and Mecklenburg County portion of the Yadkin River basin. Of the four rated stations, one has a bioclassification of "fair", one has a bioclassification of "good-fair", one has a bioclassification of "good", and one has a bioclassification of "excellent". The fact that 2 of the 4 stations (or 50 percent) have a bioclassification of good to excellent is a reflection of the relatively better stream quality within this portion of the basin which is attributed to lesser amounts of development and agricultural activity.

Catawba River Basin Riparian Buffer Rule. In August 2004, North Carolina adopted a management strategy and accompanying Rule titled the "Catawba River Basin: Protection and Maintenance of Riparian Buffers" (the Rule). The Rule serves to "protect and preserve existing riparian buffers along the Catawba River mainstem below Lake James and along mainstem lakes from and including Lake James to the North Carolina and South Carolina border in the Catawba River Basin in order to maintain their pollutant removal functions as an aid in protecting the water quality of the lakes and connecting river segments". The buffer is divided into two zones. Zone 1 begins at the top of the bank or full pond level and extends 30 feet landward on all sides of the surface water. Within Zone 1, existing forest vegetation must be preserved. Zone 2 begins at the outer edge of Zone 1 and extends 20 feet landward. Zone 2 is maintained to provide a stable vegetated area that is undisturbed except for certain activities specified under the Rule. Grading and revegetation of Zone 2 is allowed provided that the health of Zone 1 is not compromised. The buffer requirements apply to all sides of an existing natural water body including intermittent streams, perennial streams, lakes, and ponds. Ditches, manmade stormwater channels, and ponds and lakes for animal watering, irrigation, or other agricultural uses that are not part of a natural drainage way are exempt from the Rule. The Rule exempts some project activities such as road crossings, roadside ditches, rail crossings, and bridges. Any project that demonstrates that there is no practicable alternative to a zone encroachment is required to minimize disturbance and, depending on the activity, provide mitigation. The project must provide maximum nutrient removal, erosion protection, have the least adverse effect on aquatic life and habitat, and protect water quality to the maximum extent practical with best management practices. Stream buffers are shown in Figure 3.8-2a-c.

Local Stream Buffer Rules. Mecklenburg County along with the localities of Charlotte, Huntersville, Cornelius, and Davidson has variations of the state's Surface Water Improvement and Management (SWIM) ordinance. This ordinance is intended to stabilize water quality countywide and prevent further degradation through the establishment and preservation of stream buffers. Each stream buffer is comprised of a Stream Side Zone, a Managed Use Zone, and an Upland Zone. Along each side of the stream, the total width of the buffer ranges from 35 feet for drainage areas of 100 acres or less, to 50 feet for drainage areas of 300 acres or less, to 100 feet for drainage areas of 640 acres or less. Except for permitted activities (including flood control structures, bank stabilization, installation of utilities, and road crossings), activities within the Stream Side Zone are “very restricted” (no cutting or clearing allowed). Activities within the Managed Use Zone are “restricted” (limited clearing), permitting such limited uses as stormwater best management practices, bike paths, and greenway trails. Activities within the Upland Zone are “restricted” (maintenance of grass or other herbaceous ground cover), permitting such limited uses as lawns, gardens, gazebos, and non-commercial storage buildings less than 150 square feet.

Although no mandatory stream buffer rules have yet been adopted by the state for the Yadkin River basin, local rules apply to applicable portions of the Yadkin River basin, and recommended state buffers have been mapped by the NCDENR-DWQ as part of the BasinPro GIS database.

Surface Water Supply Resources. As shown in Figure 3.8-3a-c, no streams classified as WS sources of the NCDENR-DWQ classification are located within the vicinity of the proposed NCCR. As also shown on Figure 3.8-3a-c, no surface water intakes are located within the vicinity of the proposed NCCR.

3.8.3.2 Groundwater Resources

As of year 2000, approximately 46,545 persons (or 5.7 percent of the total bi-county population) were served by groundwater. Based on 2005 records on file with NCDENR, 226 groundwater supply wells, seven groundwater supply systems, three groundwater treatment plants, and two groundwater supply storage facilities are located within the bi-county study area. Groundwater resources of the study area are shown in Figure 3.8-4a-c.

3.8.3.3 Floodplains (100-year) and Regulatory Floodways

Natural and beneficial values of study area floodplains include natural attenuation of flood flows, open space, and wildlife habitat. The existing rail line extends along the drainage divide separating the Lower Catawba hydrologic unit from the Yadkin hydrologic unit, the drainage divide separating the Upper Catawba hydrologic unit from the Yadkin Drainage Basin, the drainage divide separating the Upper Catawba hydrologic unit from the South Yadkin hydrologic unit, and the drainage divide separating Irwin Creek and an unnamed tributary to Little Sugar Creek. As a result, the existing rail corridor does not encroach upon any FEMA-mapped floodplains or regulatory floodways. Cane Creek and its tributaries in the vicinity of the proposed Hambright station do not border upon any FEMA-mapped floodplains, nor do they contain any FEMA-designated regulatory floodways.

3.8.4 Environmental Consequences

General characteristics of water resources likely to be affected by the proposed project (i.e., those in the vicinity of or immediately downstream of project components) were determined through field investigation.

3.8.4.1 Surface Water Resources

Direct Effects to Surface Water Resources

As previously discussed, the existing rail line is located along drainage divides (i.e., within the uppermost landscape and within headwaters only). Although a number of ephemeral streams are crossed by the existing track, no perennial or mapped intermittent streams are crossed. The following drainage features are located within 150 feet of the centerline of the existing rail line and, because of an increase in the frequency of train trips and anticipated increases in stormwater pollutants, are located within a zone of potential influence with respect to water quality changes: the uppermost 105 feet of the North Prong Clark Creek; the uppermost 50 feet of the West Branch Rocky River; the uppermost 20 feet of an unnamed tributary of the Catawba River; and several thousand square feet of an unnamed pond located approximately 1,300 feet upstream of Lake Norman. Crossings of three intermittent streams, tributaries of Cane Creek would be required if the track is relocated and a Hambright station constructed in the proposed Bryton TOD development.

Ephemeral streams that will be affected by changes in stormwater runoff (i.e., those within 150 feet of the track centerline) and intermittent streams that will be affected by new track construction in the Bryton/Hambright area are shown in Figure 3.8-1a-c. For new track, NCCR impacts to intermittent streams were determined by estimating the number of crossings and the total length of streams (measured along the centerline of the stream) that would be affected by each crossing. Table 3.8-2 summarizes these impacts. No perennial streams or open water bodies would be directly affected by construction of the NCCR. The total length of intermittent streams affected would be 749 linear feet for the LPA and MOS alternatives. The Timber Road VMF would affect an additional 33 feet of intermittent stream, whereas the South End VMF would directly affect no streams or water bodies.

Table 3.8-2. Stream Resources Directly Affected

Alternative	Intermittent Streams Affected by Construction (linear feet)	% of Bi-County Total	Ephemeral or Intermittent Streams Affected by Water Quality Changes (linear feet)	% of Bi-County Total	Total Streams Affected (linear feet)	% of Bi-County Total
LPA	513	0.0035	236	0.0016	749	0.0051
MOS	513	0.0035	236	0.0016	749	0.0051

Most of the streams within the construction limits affected by the project have culverts that extend under the existing railroad tracks. At locations of proposed sidings or track relocation, these culverts would be extended using best available measures to minimize impacts to streams. The No-Action Alternative would not impact surface water resources.

Catawba River Basin and Local Buffer Encroachments. Section 3.8.3.1 describes the Rule adopted by the NC Environmental Management Commission, titled the “Catawba River Basin: Protection and Maintenance of Riparian Buffers”. This Rule establishes buffer requirements adjacent to water bodies in the basin to preserve and maintain sheet flow and nutrient removal. Approximately half the streams that would be crossed by the NCCR are within the Catawba River Basin and are subject to the Rule. The Rule designates a 50-foot-wide riparian buffer directly adjacent to the banks of the surface waters in the Catawba River Basin.

Although no mandatory stream buffer rules have yet been adopted by the state for the Yadkin River basin, local rules apply to applicable portions of the Yadkin River basin. For purposes of this assessment, recommended state buffers (mapped by the NCDENR-DWQ as part of the BasinPro GIS database) have been applied (see Figure 3.8-2a-c).

The Catawba River basin rules require energy dissipaters and level spreaders to be placed prior to entering the buffer with a railroad or road crossing to ensure that stormwater flow is diffused as it passes through the buffer. Railroad drainage ditches cannot drain directly into tributaries of the Catawba River.

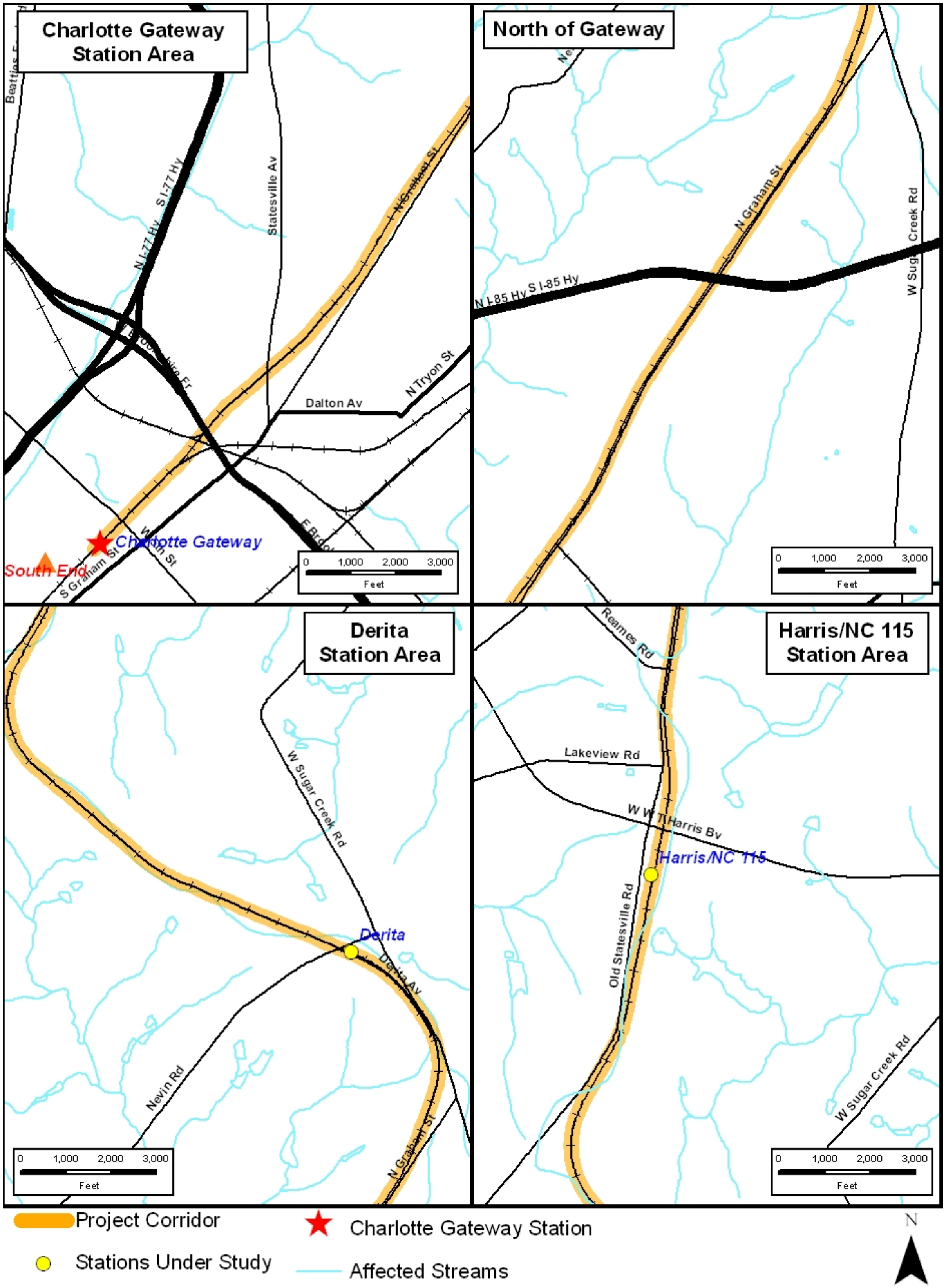

Figure 3.8-1a	Affected Streams

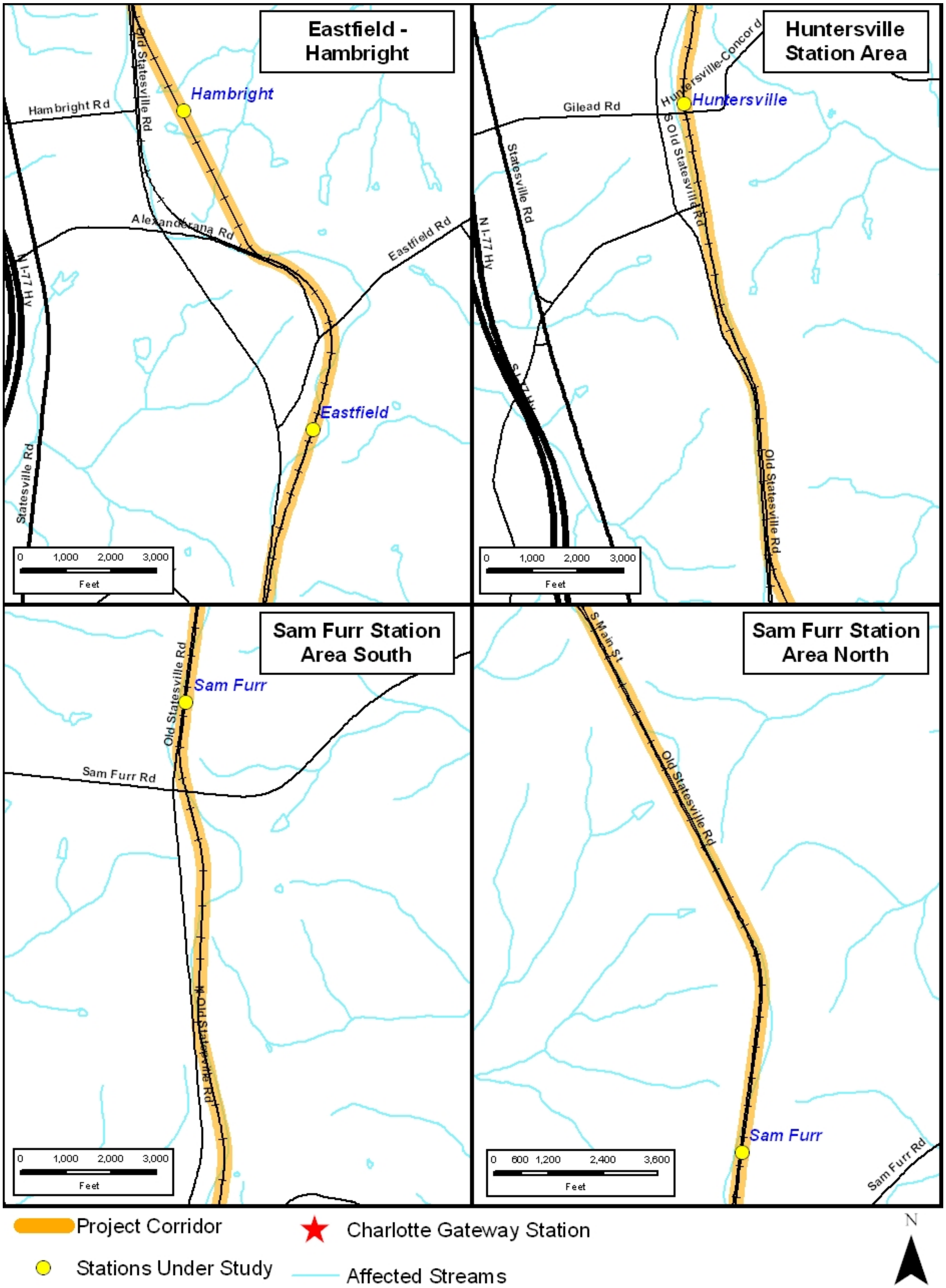

Figure 3.8-1b	Affected Streams

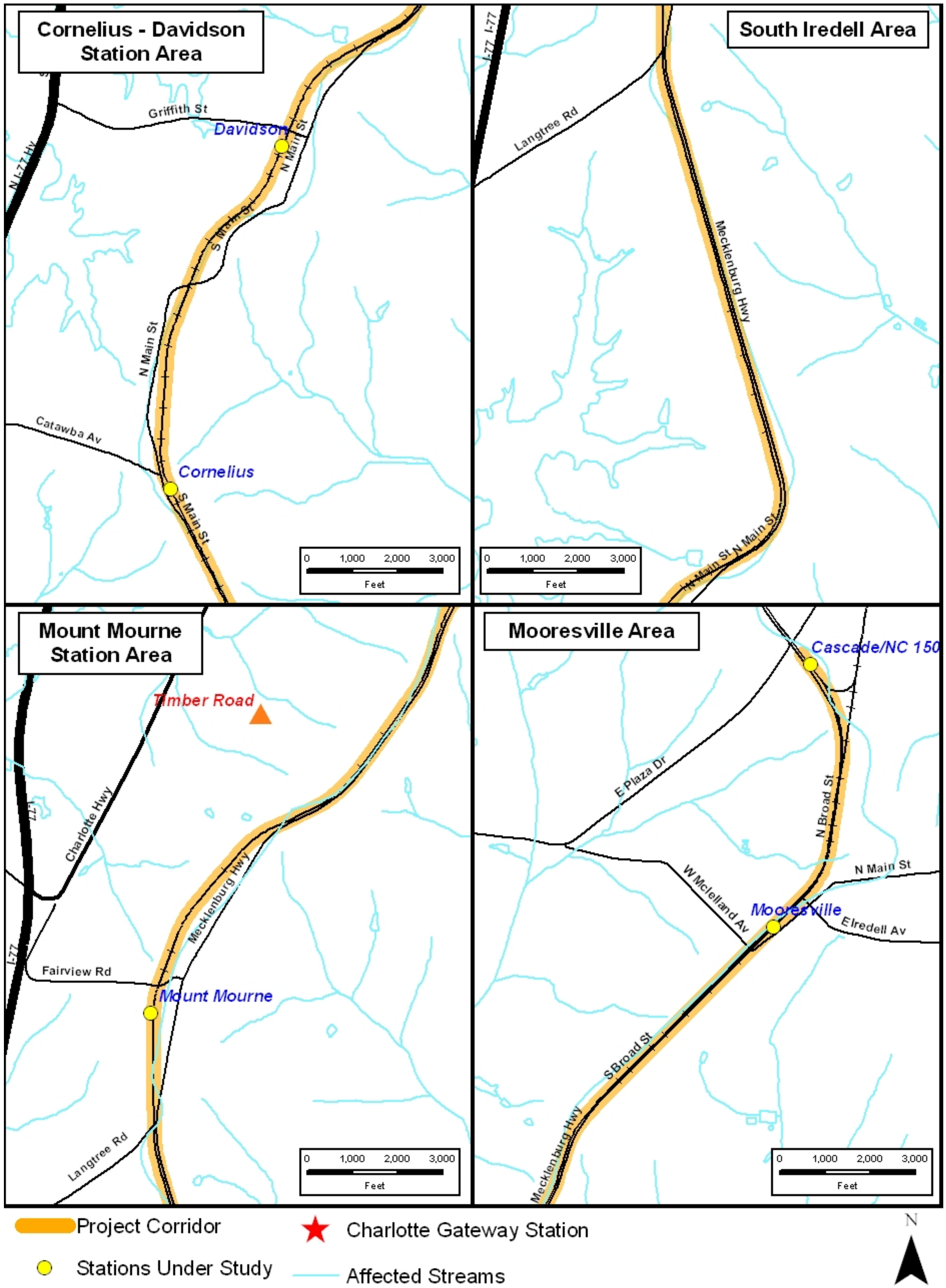

Figure 3.8-1c	Affected Streams

New track proposed for the Hambright station would cross three intermittent streams, tributaries to Cane Creek; thereby affecting 2.12 acres of state-regulated stream buffer (see Table 3.8-3 and Figure 3.8-2a-c). The NCCR project would widen the railroad embankment by 14 feet along proposed sidings; however, encroachment into stream buffers due to provision of sidings would not be required.

Table 3.8-3. State-Regulated Stream Buffers Directly Affected

ALTERNATIVE	Stream Buffers Affected (acres)	% of Bi-County Total	Named Streams Affected
LPA	2.12	0.0014	Cane Creek
MOS	2.12	0.0014	Cane Creek

Surface Water Supply Resources. No streams classified as WS or surface water intakes would be directly affected by any proposed components of the NCCR (Figure 3.8-3a-c). Stormwater Management During Construction. Stormwater management during construction would include management practices to eliminate or reduce the exposure of construction materials and processes to stormwater. Contractors would use traditional BMPs during the construction of the NCCR, including vegetative buffers, grass swales, catch basins, energy dissipaters, level spreaders, and infiltration devices.

Measures that could be employed to help reduce stormwater pollution during construction include: 1) roofs and decks to protect material loading and unloading areas; 2) grading practices that divert stormwater away from the loading and unloading areas; 3) sweeping of streets, paved yards, and parking lots; and 4) roofs over onsite waste piles.

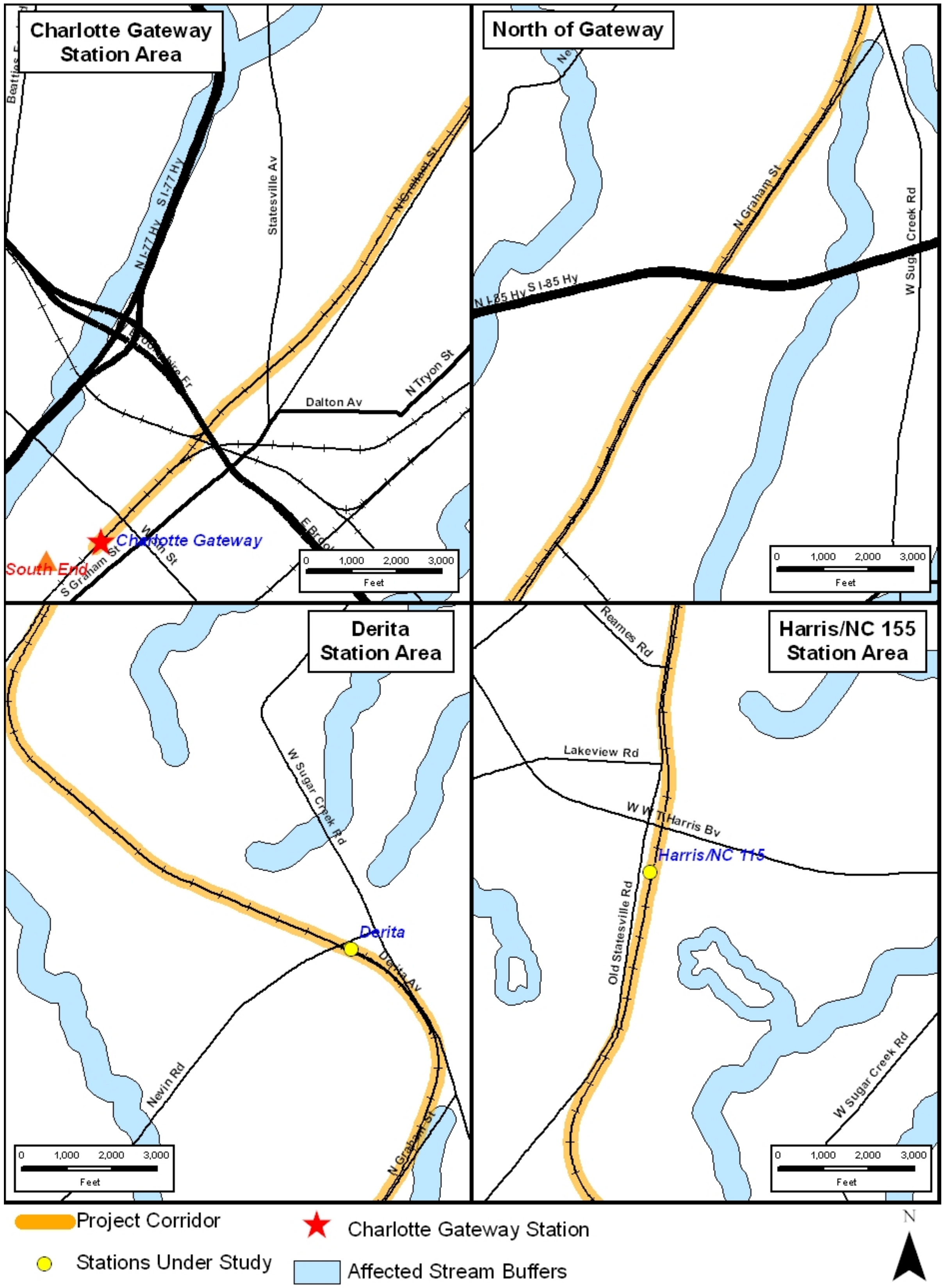

Figure 3.8-2a | Affected Stream Buffers

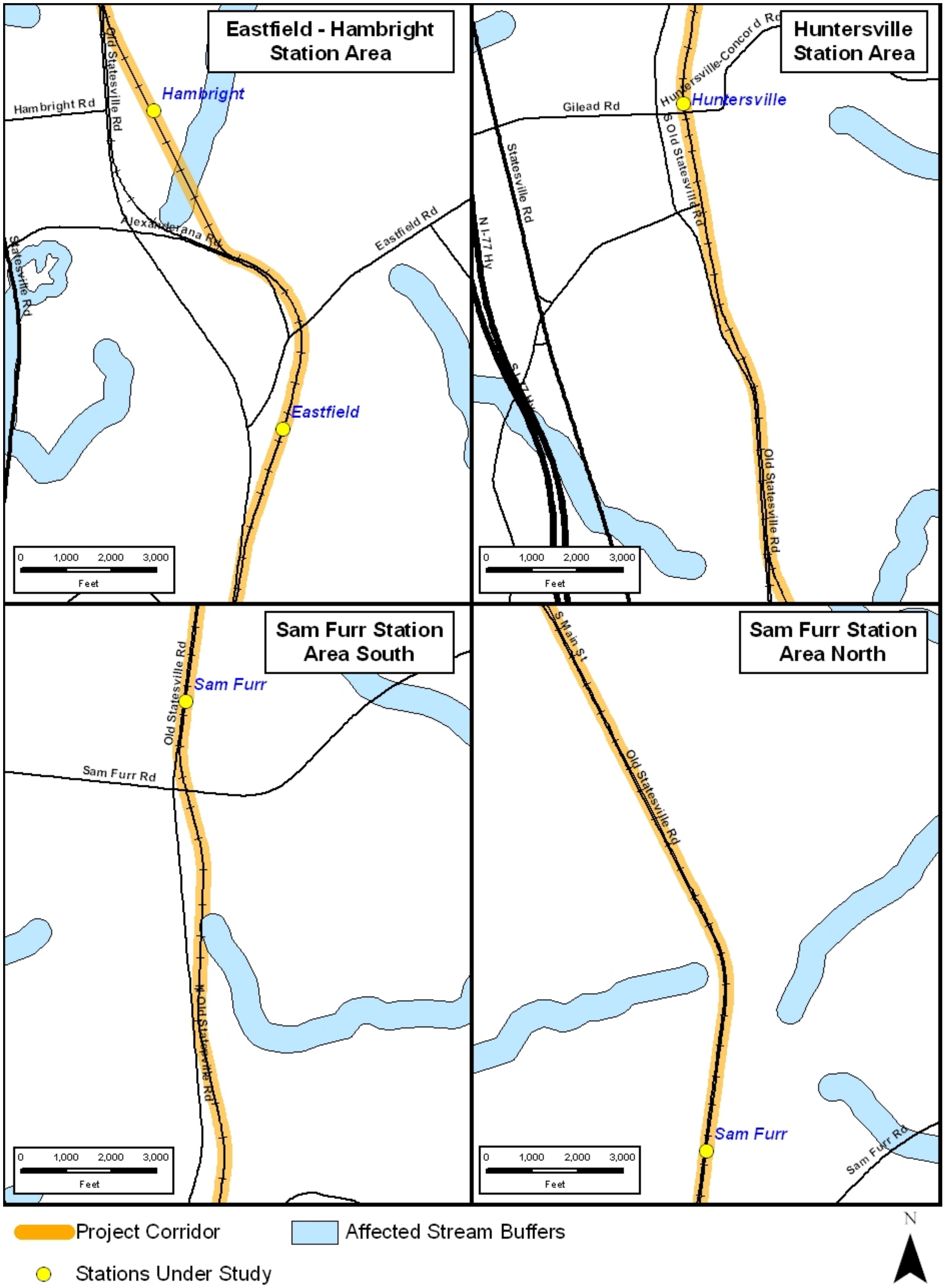

Figure 3.8-2b Affected Stream Buffers

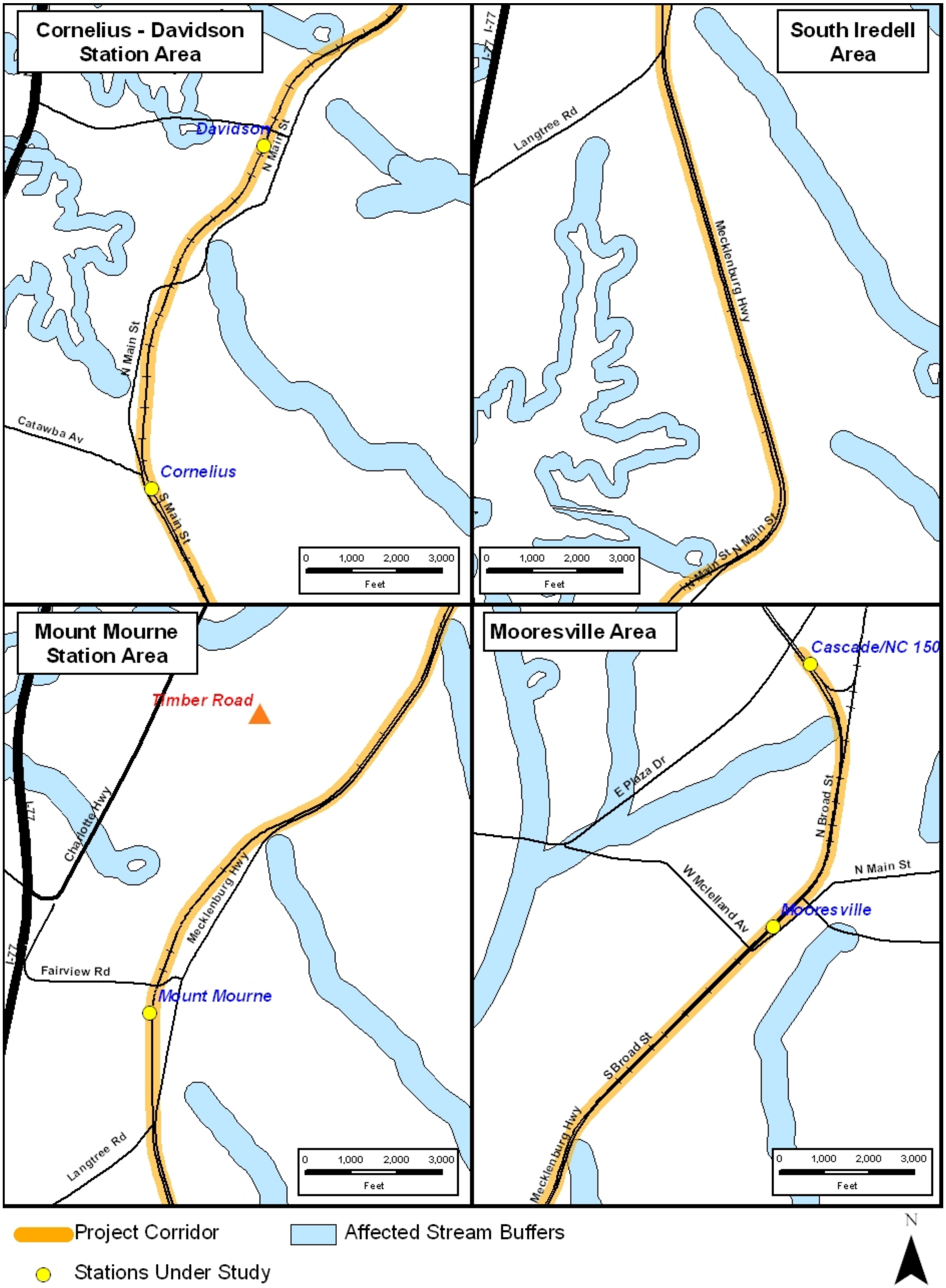

Figure 3.8-2c Affected Stream Buffers

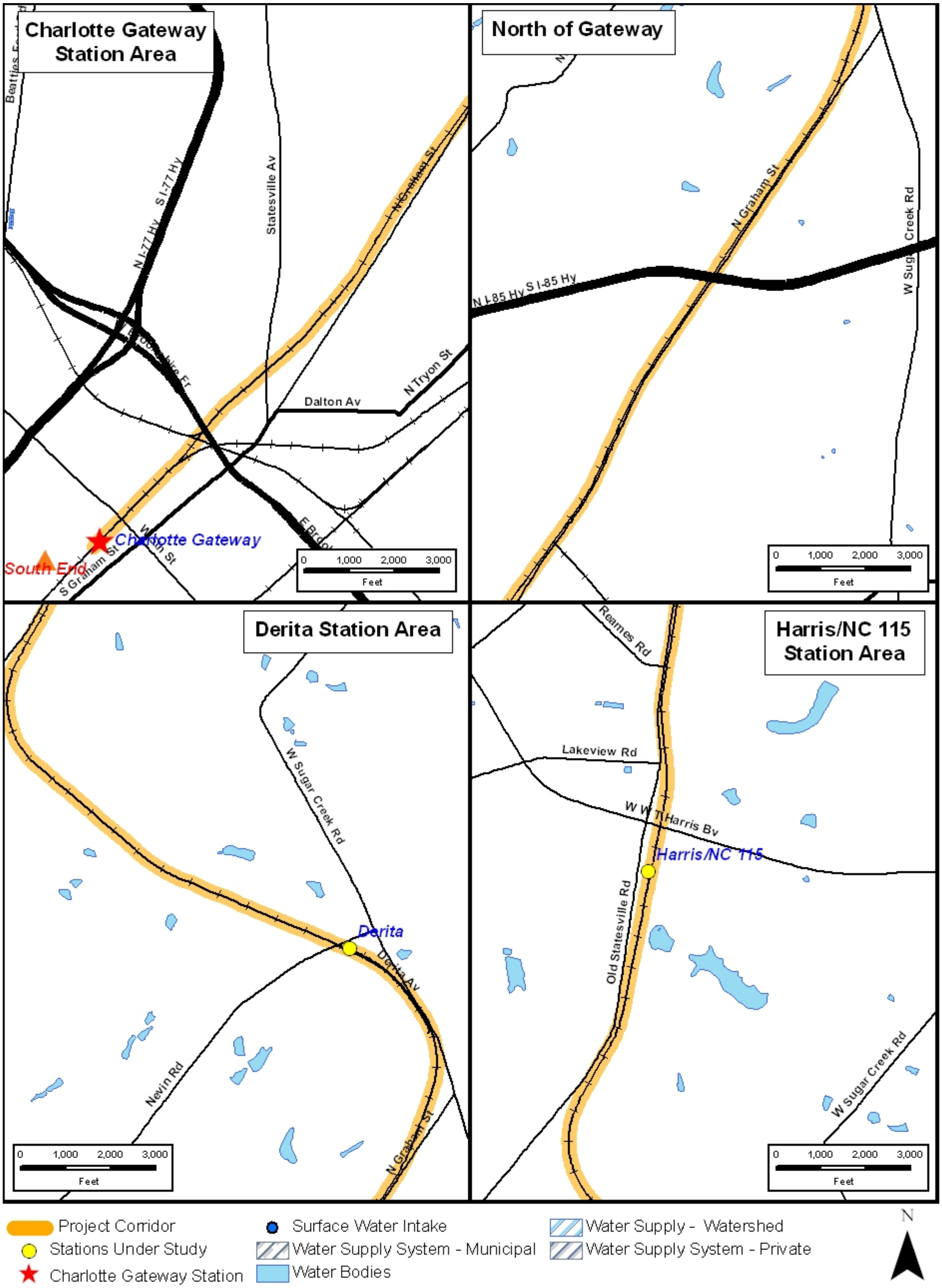

Figure 3.8-3a

Surface Water Resources

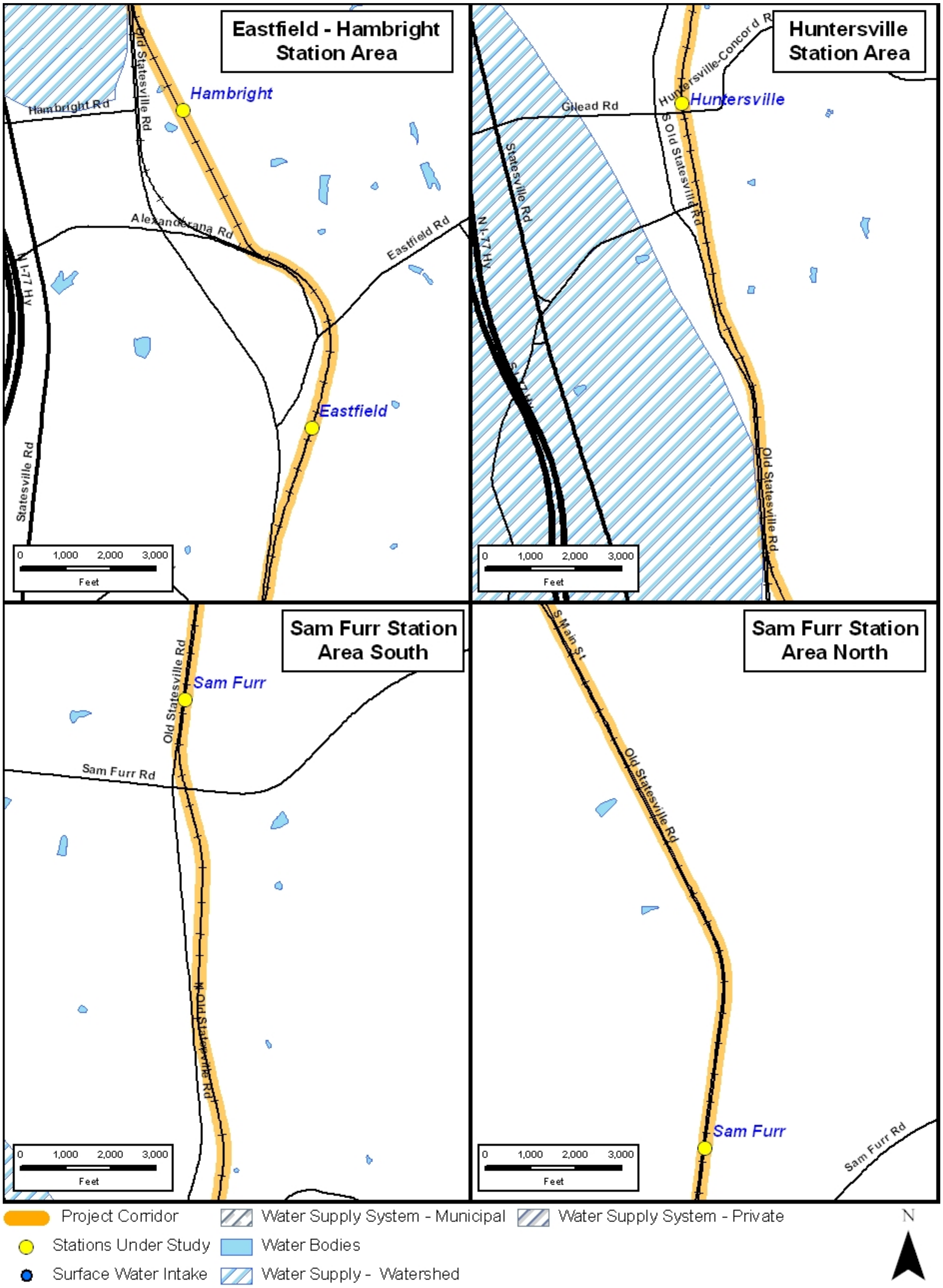

Figure 3.8-3b Surface Water Resources

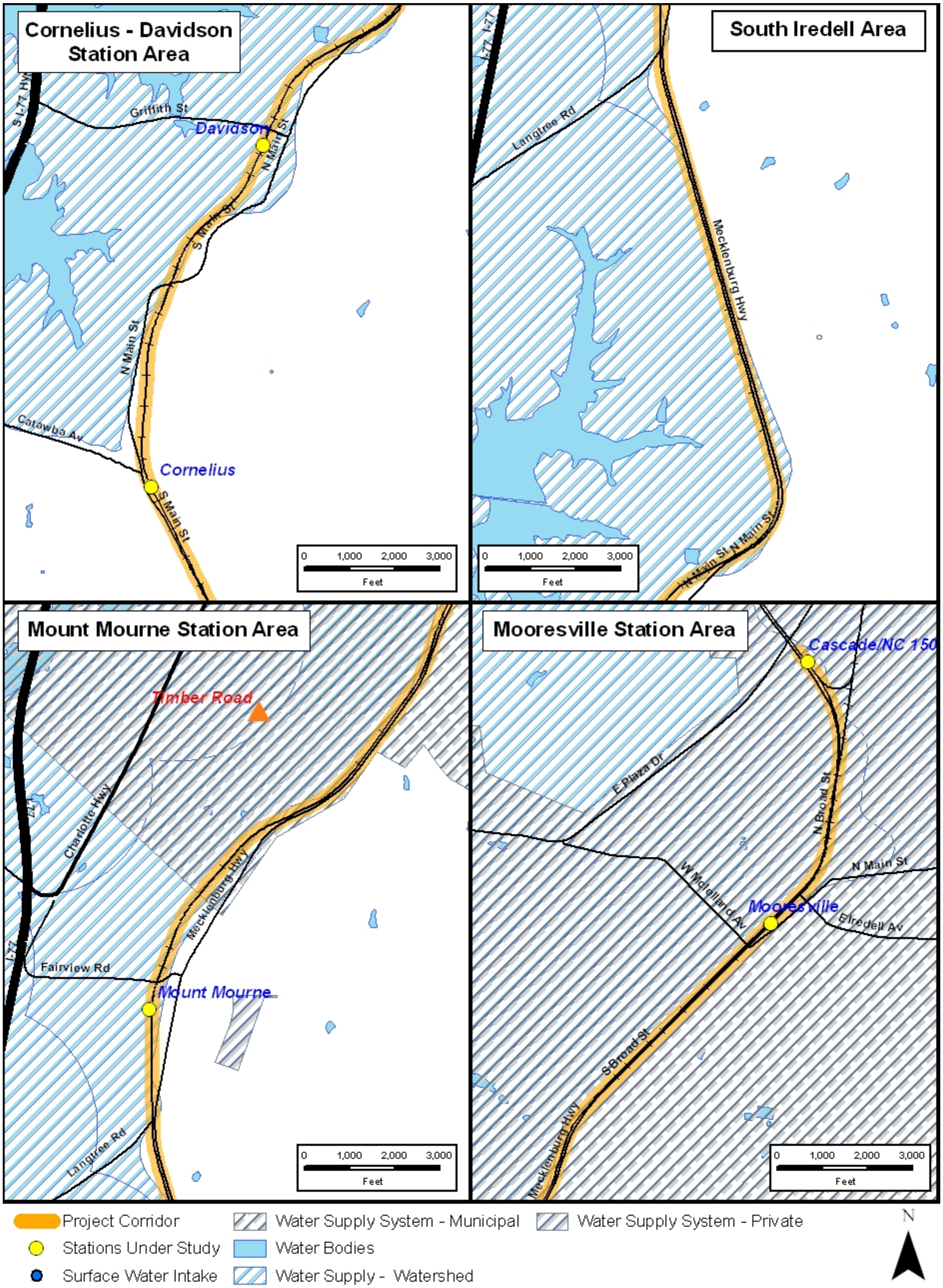

Figure 3.8-3c Surface Water Resources

Indirect Effects to Surface Water Resources

For surface water resources identified within 0.25 mile of stations proposed under each of the NCCR alternatives, Table 3.8-4 summarizes indirect effects which could occur as a result of development potentially induced around the newly constructed stations. Overall, future development around the Hambright station area could indirectly affect the greatest number of surface water resources within 0.25 mile - with 3,299 linear feet of perennial streams, 22,805 linear feet of intermittent streams, and 3.15 acres of open water bodies. Because of their industrial nature and associated lack of induced development, neither the South End VMF nor the Timber Road VMF would indirectly affect streams or water bodies.

Table 3.8-4. Stream Resources: Indirectly Affected within 0.25 Mile of Stations

Alternative	Perennial Streams Affected (linear feet)	% of Bi-County Total	Inter-mittent Streams Affected (linear feet)	% of Bi-County Total	Total Streams Affected (linear feet)	% of Bi-County Total	Water Bodies Affected (acres)	% of Bi-County Total
LPA	3,299	0.060	22,805	0.16	26,104	0.13	3.15	0.011
MOS	3,299	0.060	20,229	0.14	23,528	0.12	3.15	0.011

For stream buffers identified within 0.25 mile of stations proposed under each of the NCCR alternatives, Table 3.8-5 summarizes indirect effects which could occur as a result of development potentially induced around the newly constructed stations. Overall, future development around the Hambright station area could indirectly affect the greatest acreage of stream buffers within 0.25 mile (67.15 acres). Because of their industrial nature and associated lack of induced development, neither the South End VMF nor the Timber Road VMF would indirectly affect stream buffers.

Table 3.8-5. State and Local Regulated Stream Buffers: Indirectly Affected within 0.25 Mile of Stations

Alternative	Stream Buffers Affected (acres)	% of Bi-County Total	Named Streams Affected
LPA	67.15	0.045	Unnamed tributary to Dye Creek, unnamed tributary to West Branch Rocky River, Reeds Creek, Cane Creek
MOS	50.38	0.034	Unnamed tributary to Dye Creek, unnamed tributary to West Branch Rocky River, Reeds Creek, Cane Creek

The nearest stream classified as a WS of the NCDENR-DWQ classification is Torrence Creek, located 1.1 miles downstream of the 0.25-mile buffer surrounding a proposed NCCR station (specifically, at Huntersville). The nearest surface water intake is located 2.5 miles downstream of the 0.25-mile buffer surrounding a proposed NCCR station (specifically, at Davidson). Given this degree of separation, as well as stormwater and erosion control measures that would be required under state and local programs as future development within the 0.25-mile buffer occurs, no indirect adverse effects to surface water resources are likely to occur.

3.8.4.2 Groundwater Resources

Direct Effects to Groundwater Resources

As illustrated by Figure 3.8-4a-c, no groundwater supply wells, wellhead protection zones, treatment/storage facilities, or groundwater recharge or discharge areas would be directly affected by construction of the NCCR. The No-Action Alternative would not impact groundwater resources.

Indirect Effects to Groundwater Resources

As presented in Table 3.8-6 and as illustrated by Figure 3.8-4a-c, one groundwater supply well could be indirectly affected by development potentially induced by construction of the proposed Mount Mourne station.

Table 3.8-6. Groundwater Resources: Indirectly Affected that are within 0.25 Mile of Stations

Station/ Facility	Resource Type	System Name	Population Served	Probable Distance from Projected Development (feet)	Nature of Effect
Mount Mourne	Groundwater Supply Well	Diamond Head Subdivision	1,001	No closer than 100 feet	Potential stormwater pollutant loading and other forms of contamination

3.8.4.3 Floodplains (100-Year) and Regulated Floodways

Direct Effects upon 100-Year Floodplains and Regulatory Floodways

Based upon a review of the FEMA maps, no 100-year floodplains or regulatory floodways would be directly affected by the proposed NCCR project. The No-Action Alternative would, likewise, not impact 100-year floodplains or regulatory floodways.

Indirect Effects upon 100-Year Floodplains and Regulatory Floodways

The 0.25-mile buffer surrounding the proposed Timber Road VMF encroaches on 25.55 acres of 100-year floodplain along Reed Creek (in the Catawba River Basin) and 11.07 acres of floodplain along the West Branch of the Rocky River (in the Yadkin River Basin) for a total of 36.62 acres. No regulatory floodway has been designated by FEMA within the area of encroachment. Because of the industrial nature of the VMF, no reasonably foreseeable development would be induced in the vicinity of the VMF and, thus, no indirect effects to flood-prone areas located downstream of the project are expected.

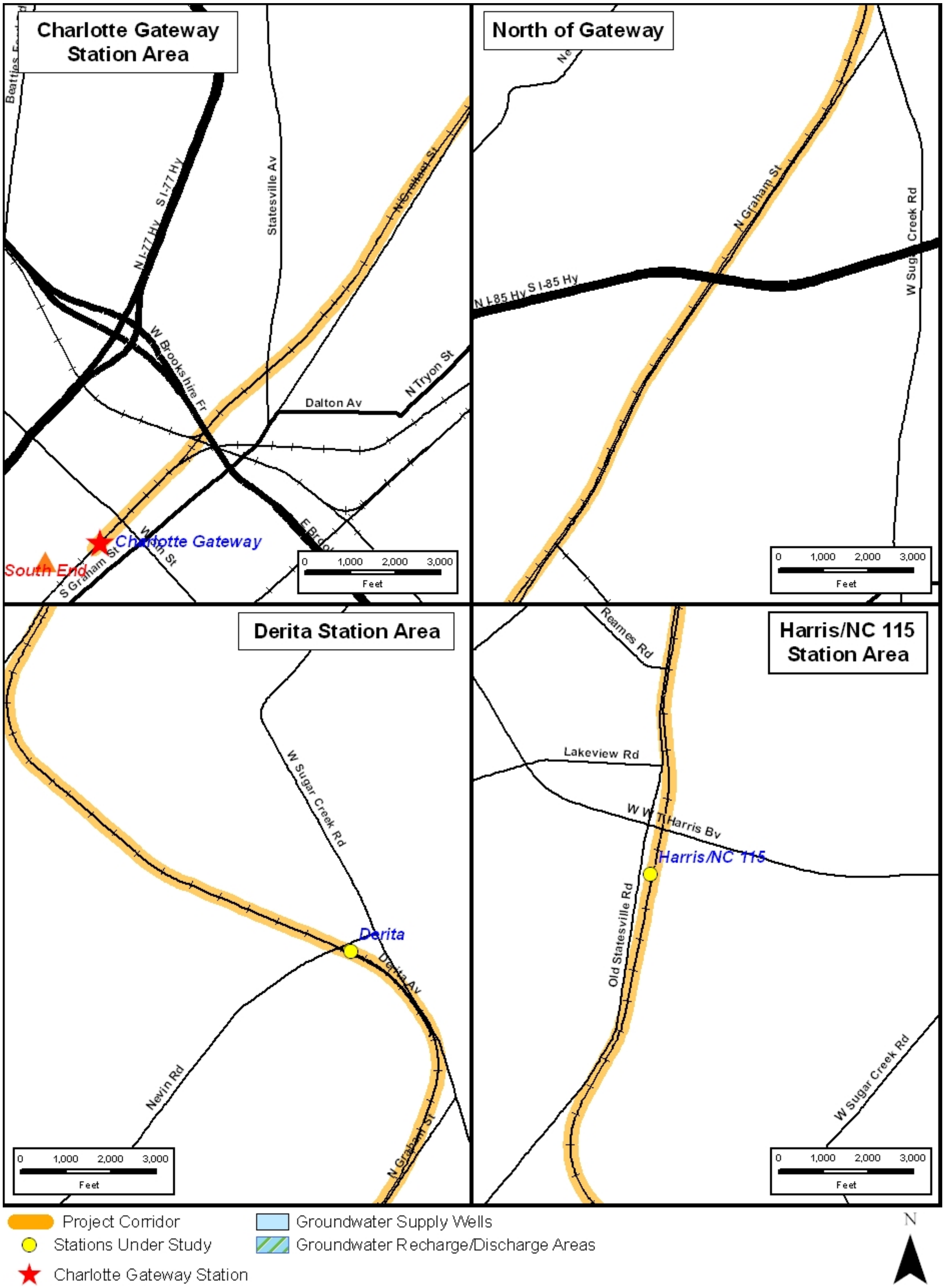

Figure 3.8-4a Ground Water Resources

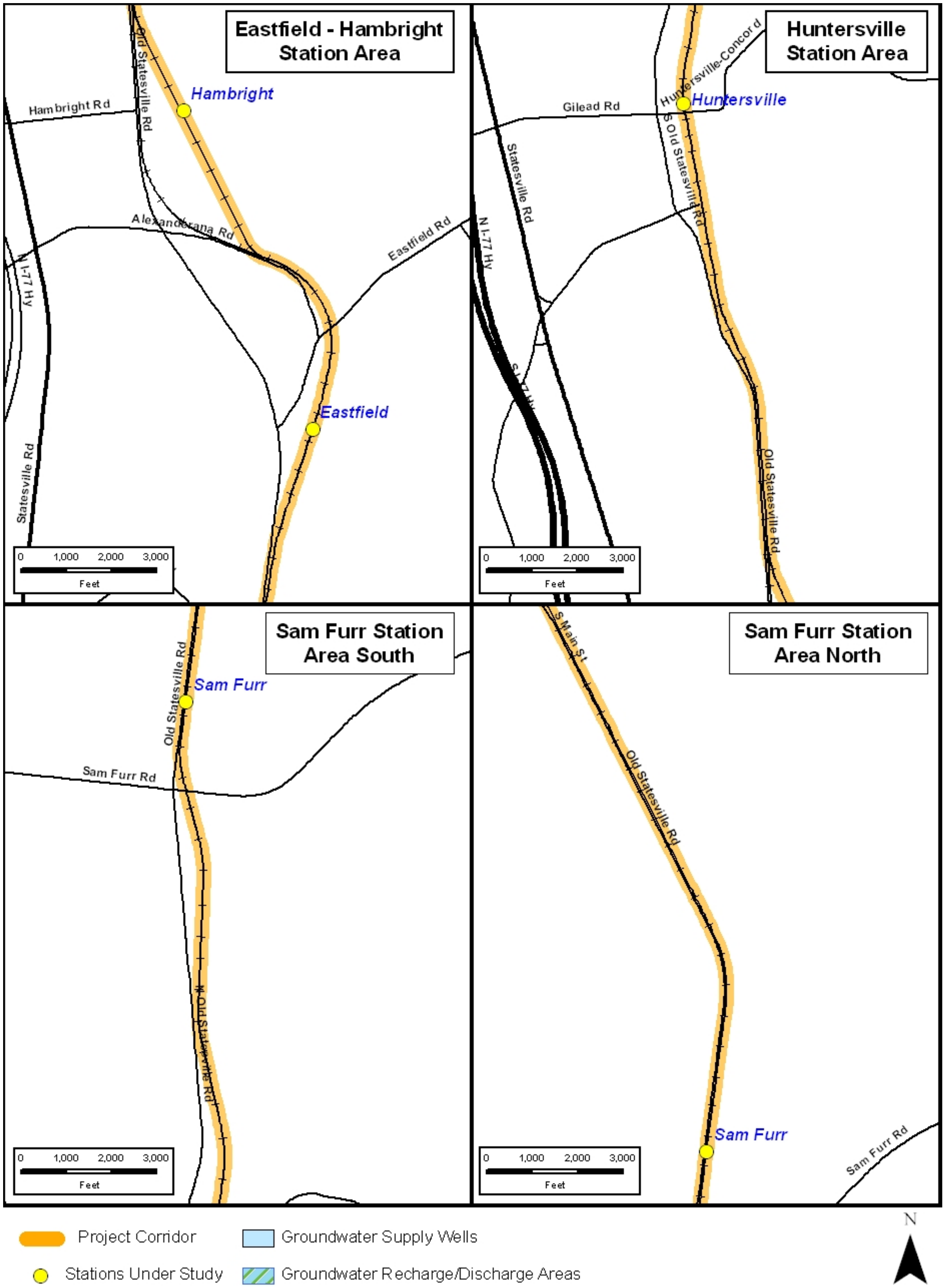

Figure 3.8-4b | Ground Water Resources

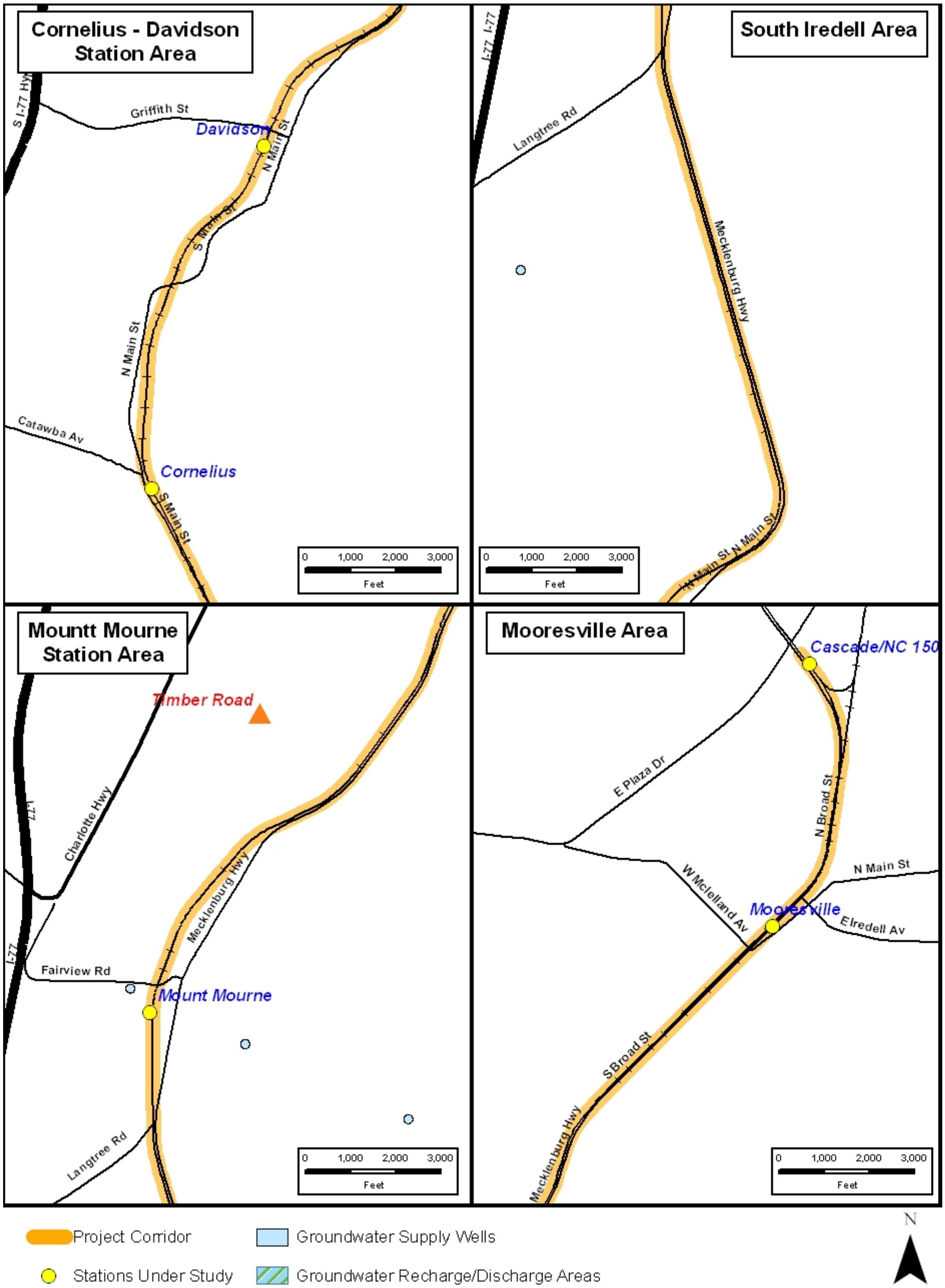

Figure 3.8-4c	Ground Water Resources

3.8.5 Mitigation

3.8.5.1 Surface Water Resources

During preparation of Section 401/404 Permits, CATS would coordinate with the NCDENR-DWQ and the U.S. Army Corps of Engineers, where required, to develop appropriate crossing strategies in the event stream bed restoration and alteration becomes necessary. Currently, no stream alteration, relocation or restoration is anticipated.

To protect surface water resources (especially water supply streams) and surface water intakes located downstream of the proposed project, sedimentation and erosion control practices used during the construction of the NCCR will reflect current local and state standards. Several best management practices exist for the elimination or reduction of sediment during construction. Methods that may be employed during construction could include silt fences, temporary seeding, temporary diversions, sediment traps, and temporary stream crossings. Silt fences capture sediment from sheet flow by reducing the velocity of flow, thereby allowing sediment deposition. Temporary seeding is used to stabilize denuded areas that would not be brought to their final grade for several weeks or months. Temporary diversions above disturbed slopes prevent flow across unprotected slopes and divert excess runoff away from level areas. Temporary sediment traps at various points along the project prevent sedimentation runoff during rain events. Temporary stream crossings allow some construction traffic to cross streams during the construction of the rail system, thereby reducing the potential for erosion. Erosion control during construction will be guided by the following standards:

- The City of Charlotte's "Best Management Practices for the Protection of Surface Waters"
- The Erosion and Sediment Control Planning and Design Manual by NCDENR, revised 1998.
- The North Carolina Department of Transportation (NCDOT) Roadway Standard Drawings, July 2006 and the NCDOT Standard 2006 Specifications for Erosion Control and Roadside Development.

3.8.5.2 Groundwater Resources

No components of the NCCR would be located within the 100-foot wellhead protection zone recommended by the state of North Carolina for public groundwater supply wells. To mitigate temporary construction impacts, an erosion and sediment control plan would be developed in accordance with state and local sediment and erosion guidelines (see standards above in subsection 3.8.5.1.

Measures developed to protect the Diamond Head Subdivision groundwater supply well from future development around the Mount Mourne station would be determined by Iredell County as development is proposed and should include: routing of runoff laden with deicing agents away from wellhead protection zones; stormwater management facilities developed during later design phases to optimize free ion retention (through use of organic soil linings, etc.); and development of Spill Prevention, Contingency, and Countermeasure (SPCC) plans. SPCC plans would be developed in accordance with any wellhead protection ordinances subsequently developed by Iredell County. Future stormwater management systems can be designed to intercept and retain spilled materials before they can reach the water supply well (through use of detention/ retention basins and stormwater conveyance routes which avoid direct infiltration to aquifer recharge areas and wellhead protection zones). These stormwater facilities would be designed with adequate detention times to allow recovery of spilled contaminants before such contaminants can reach a critical groundwater supply area.

3.8.5.3 Floodplains (100-Year) and Regulated Floodways

Mitigation for indirect effects to downstream floodplains may include a package of measures such as:

- Use of pervious surfaces as part of station construction, where practicable.
- Installation of stormwater management/retention facilities as part of station design.
- Use of rain gardens as buffers in park and ride lots.
- Where culverts extend beneath the existing railroad embankment, they would be lengthened so that the existing drainage function would be maintained.

With implementation of these mitigation measures, construction of the NCCR would not result in adverse indirect affects on natural and beneficial floodplain values of downstream floodplains. With implementation of stormwater management facilities, the project would not result in any substantial change in flood risks or damage and would not have substantial potential for interruption or termination of emergency services or emergency evacuation routes.

3.9 Energy

Operating a passenger vehicle, bus, or rail requires some form of energy. While implementing new service (commuter rail) in the study area consumes additional energy, the entire region could benefit by reduction in energy consumption by other modes, such as passenger vehicles, buses, and trucks. The following paragraphs detail the net change in energy consumption in the region as a result of the proposed build alternatives.

3.9.1 Regulatory Framework

SAFETEA-LU amendments to Section 5309(d)(2)(B) continue to require that projects proposed for New Starts funding be justified based on a comprehensive review of a number of criteria, including environmental benefit of the project to the region. Energy consumption/impact is one of the measures of environmental benefit which is part of the New Starts Project Justification Criteria.

3.9.2 Methodology

Energy is consumed during the construction and operation of transportation projects. Energy is used during construction to manufacture materials, transport materials, and operate construction machinery. Operational energy consumption includes fuel consumed by vehicles using the project, and a negligible amount of energy for signals, lighting and maintenance. Fuel consumption depends on the number of vehicle miles traveled (VMT) and the travel conditions, such as vehicle type, speed of travel, roadway grade, and pavement type. For a given vehicle, speed is the most important factor that affects energy consumption.

Common units of energy measurement are joules and British Thermal Units (BTUs). Because these are relatively small units, energy is often reported in giga Joules (1,000,000,000 joules) and million BTUs (1,000,000 BTUs). One giga Joule is the equivalent of .95 million BTUs (MBTUs). Even larger amounts of energy are reported in Tera BTUs (1,000,000 MBTUs). One liter of gasoline contains approximately 0.03 giga joules of energy (1 gallon = 0.13 MBTUs). As a point of reference, the caloric intake for an adult person is approximately three giga Joules per year (2,000 Calories = .008 giga Joules).

<u>Energy Consumption for Vehicle Operation -</u> analysis within the project study area is based on the transportation analyses prepared for this project. Net changes in overall energy use for the VMT and speed values calculated from the transportation forecasting model for the study area are as follows:

- **Highway Operational Energy Consumption -** Average daily VMT was summarized based on the latest travel demand model results (*June 2006*) for the No-Action, TSM, LPA, and MOS alternatives from the Charlotte Department of Transportation (CDOT). Daily VMT was annualized and the differences were calculated between build alternatives and No-Action and TSM. These VMT differences were then multiplied by energy consumption factor (BTU/VMT) by vehicle class (Passenger vehicles, buses and trucks) to estimate the impacts. It is assumed that a typical passenger vehicle would consume 6,233 BTU per VMT, heavy trucks would use 22,046 BTU/VMT, and buses would consume 41,655 BTU/VMT.

- **Transit Operational Energy Consumption -** Energy consumed by operating the proposed commuter rail is based on train miles of travel (TMT). Train miles of travel for the No-Action, TSM, LPA, and MOS alternatives were summarized from the travel demand model. The differences in the TMT were multiplied by energy consumption rate

(BTU/TMT) to estimate the impacts. It is assumed that a typical LRT would consume 77,739 BTU per TMT and commuter rail uses 100,000 BTU per mile of travel.

3.9.3 Impacts

Table 3.9-1 summarizes the VMT and energy consumption for 2030 No-Action, TSM, and the build alternatives (LPA and MOS). Due to limited rail transit in the region, rail VMT is insignificant. Therefore, highway vehicles (autos and buses) accounts for majority, if not the entire 108 million daily VMT in the region. There is very little change in overall VMT between the various alternatives. Annual VMT in the region would decrease from the No-Action and TSM Alternatives with both of the NCCR alternatives. These reductions would be slightly offset by the diesel propulsion requirements for the new rail service introduced with the build alternatives.

In summary, LPA alternative results in a higher reduction in energy consumption as compared to the MOS because the LPA is estimated to divert more drivers to NCCR as compared to the MOS alternative. Table 3.9-1 also shows the change in energy consumption under LPA and MOS as compared to the No-Action and TSM Baseline alternatives. Note that, as per FTA's guidance, Table 3.9-1 reports BTU consumption for transportation operations (auto, transit, and commercial) only, and does not consider energy consumed for construction, equipment manufacturing, and heavy maintenance activities.

3.9.4 Mitigation

Because the build alternatives would result in a decrease in long-term energy use compared to No-Action or TSM, no mitigation would be required. Any transportation control measures to reduce traffic volumes and congestion would also decrease energy consumption. Measures to maintain transportation and construction practices that reduce energy consumption could reduce energy demand during the construction period.

Table 3.9-1. NCCR Alternative - Energy Consumption

Vehicle Class	Regional VMT/year (millions)				Change in Emissions (tons/ year)	Energy Consumption	Change in BTU/ year (millions)	Change in BTU/ year (millions)	Change in BTU/ year (millions)	Change in BTU/ year (millions)
	No-Action	TSM/ Baseline	LPA	MOS	PM-10	(BTU/Veh-mile)	LPA vs. No-Action	MOS vs. No-Action	LPA minus TSM	MOS minus TSM
Passenger Veh. (LDV/LDT)	30,770.10000	30,770.10000	30,7761.19923	30,766.35231	-11.56	6,233	-54,547	-23,359	-55,478	-23,359
Trucks/ Heavy-Duty Vehicles	1,381.00000	1,381.00000	1,380.69695	1,380.92170	-1.14	22,046	-6,681	-1,726	-6,681	-1,726
Bus	19.63440	22.99110	22.65240	22.29540	0.12	41,655	125,715	110,844	-14,109	-28,979
Light Rail	0.56580	0.56580	0.56580	0.56580	0.00	77,739	0	0	0	0
Commuter Rail (Diesel)	-	-	0.48030	0.41370	2.31	100,000	48,030	41,370	48,030	41,370
Energy Consumption By All Modes	223,097,415	223,237,238	223,209,000	223,224,543	0.98		111,585	127,128	-28,238	-12,695

NOTES:

1. Highway vehicle miles of travel (autos and trucks) is estimated from CDOT model.
2. Savings in VMT under LPA and MOS is based on North Corridor Commuter Rail ridership, vehicle occupancy rate, average trip length, and estimate of mode share prior to the commuter rail.
3. Energy consumption data based on Transportation Energy Data Book, 16th Edition.
4. Calculation methodology based on Energy Information Administration (1996) and Delucchi (1996) and as applied in the South Corridor LRT Report.

3.9.5 Reference

USDOE, 2002. *Transportation Energy Data Book: Edition 22*. U.S. Department of Energy, Oak Ridge National Laboratory.

FY08_Reporting_Instructions_-_final_-_5-15-06.doc

Reporting Instructions for Sect. 5309 New Starts Criteria.pdf

3.10 Historic Architectural and Archaeological Resources

This section describes the historic architectural and archaeological resources within the project's Area of Potential Effect (APE), and describes the potential project impacts. Historic architectural and archaeological resources may include districts, sites, buildings, structures, or objects.

3.10.1 Legal and Regulatory Framework

Section 106 of the National Historic Preservation Act of 1966 (NHPA), as amended (16 U.S.C. Section 470(f)), applies to all projects that have federal involvement (e.g., funding, permits) and to properties that are listed in or determined eligible for inclusion in the National Register of Historic Places (NRHP). The NHPA requires federal agencies to take into account the effects of their undertakings on historic properties, including archaeological sites, and to consult SHPO and other parties to develop and evaluate alternatives or modifications to the undertaking that could avoid, minimize, or mitigate adverse effects to historic properties. The Advisory Council on Historic Preservation (ACHP) is afforded a reasonable opportunity to comment on such undertakings. The requirements of Section 106 are implemented under Title 36, Section 800 of the CFR (36 CFR 800), "Protection of Historic Properties." Compliance with NEPA of 1969, (42 U.S.C. §4321) Section 101(b) is being undertaken concurrently with the Section 106 process.

Archaeological sites are also protected under the Archaeological and Historic Preservation Act of 1974 (16 U.S.C. 469a), often referred to as the Moss-Bennett Act; the Archaeological Resources Protection Act of 1979; and Executive Order 11593.

Section 4(f) of the USDOT Act of 1966, as amended (49 U.S.C. 303), prohibits the use of land from publicly owned parks, recreation areas, wildlife or waterfowl refuges, or historic sites unless a determination is made that: (1) there is no feasible and prudent alternative to using such land; and (2) the program or project includes all possible planning to minimize harm to the land resulting from its use. The word "use" means the taking or acquisition of land or property for construction of a permanent transportation facility. When the proximity impacts of a transportation project on Section 4(f) property, even without the acquisition of the property, are so great that the purposes of the property are substantially impaired, Section 4(f) may also apply. Section 4(f) applies only to USDOT projects.

3.10.2 Area of Potential Effect

The evaluations of effects are based upon a Phase II survey undertaken within an APE. The APE was determined in consultation with the SHPO to include all areas of direct and indirect effects along the existing rail alignment and around the proposed transit stations. The APE extends approximately 150 feet on either side of the center line of the transit corridor except in the areas around station sites where the APE extends 250 feet from the edges of the station sites to encompass bordering blocks. The APE and the historic resources were identified in the Phase II Architectural Resource Survey Report (dated 12 December 2005).

3.10.3 Existing Resources

3.10.3.1 Historic Architectural Resources

The methodology for the Phase II architectural survey consisted of historical research and intensive level field work within the APE to identify all properties that are either listed in, or are potentially eligible for listing in, the NRHP. In addition, properties designated as landmarks by the Charlotte-Mecklenburg Historic District Commission or the Charlotte-

Mecklenburg Historic Landmarks commissions were also considered during this survey, as they are considered eligible for the NRHP.

During the research phase, the architectural survey files at the Charlotte-Mecklenburg Historic Landmarks Commission and the SHPO in Raleigh were searched. Especially useful were the series of countywide and thematic architectural studies of Charlotte, rural Mecklenburg County, and Iredell County. Local historians, property owners, planners, and historic preservation specialists were also contacted to gain an understanding of specific resources.

The field work consisted of an architectural survey of every property within the APE that was considered to be at least fifty years of age. Residential, commercial, and industrial historic districts, as well as individual buildings were examined. A sufficient number of photographs were taken to support evaluations of eligibility. The field work was conducted between February and August 2005 and September to October 2007. 100 percent of the APE was examined. Subsequent to the field work, the principal investigators developed an inventory list that included brief descriptions and NRHP eligibility evaluations for each surveyed resource.

Two hundred twenty-four (224) resources (individual properties and historic districts) were identified within the APE as warranting National Register evaluation. Of these, forty-four (44) are on the NRHP or are recommended as eligible for the NRHP. Table 3.10-1. lists the NRHP listed and eligible architectural historic resources identified within the APE. The location of each site is shown in Figure 3.10-1a-c.

Table 3.10-1. NRHP Listed or Eligible Historic Architectural Properties in Project APE

Survey Site #	Site Name	Location	NRHP Status, NRHP Criterion of Eligibility
1	Espy Watt Brawley House	Mooresville, corner NC 115 and Williams Street	NRHP Listed, C for architecture
2	U.S. Army National Guard Armory	Mooresville, west side of NC 115	NRHP Eligible, C for architecture
11	Watkins Chapel A.M.E.Zion Church	Mooresville, Cascade Street at Statesville Street	NRHP Eligible, A for history, C for architecture
16	Cook's Grocery Store and House	Mooresville, 500 Block Patterson Avenue	NRHP Eligible, A for commerce
25	Mooresville Downtown Historic District	Mooresville, Commercial Core	NRHP Listed, A for community development, C for architecture
26-28	Mooresville Downtown HD-Proposed Southern Boundary Expansion	Mooresville, 2 gas stations, What-a-Burger	NRHP Eligible, A for commerce, C for architecture
36	Isaac Harris House	Mooresville, 330 South Main Street	NRHP Eligible, C for architecture
43	Former Presbyterian Church Manse	Mooresville, 251 South Broad Street	NRHP Eligible, C for architecture
45	Proposed Mooresville Cotton Mill Village Historic District	Mooresville, roughly bounded by Norman, Dingle, Parker, Mills, Lowrance, Catawba and Wilson, both sides of railroad tracks	NRHP Eligible, A for industry, C for architecture
46	Portion of Mooresville Cotton Mills	Mooresville. Adjacent to Survey # 45 above	NRHP Eligible, C for architecture
62	Mount Mourne	Mount Mourne, west side of NC 115, north of Crossrail Rd.	NRHP Listed, A for historic association and C for architecture
71	George Houston House	Mount Mourne vicinity, east side NC 115, south of SR 1223	NRHP Listed, C for architecture
79	House	Mount Mourne vic., west side NC 115, s. of Bridges Farm Road	NRHP Eligible, C for architecture
82	House	Mount Mourne vicinity, west side NC 115, near Quality Lane	NRHP Eligible, C for architecture
84	Proposed Davidson Historic District	Davidson, Encompasses town core, Main Street, Concord Rd	NRHP Eligible, A for education, commerce and industry, C for architecture
95	House	Cornelius, 20520 North Main Street	NRHP Eligible, C for architecture
115	Confederate Monument	Cornelius, Zion Avenue, north of Smith Road	NRHP Eligible, A for social history, C for architecture
131	Frank Sherrill House	Cornelius, 19415 South Main Street	NRHP Eligible, C for architecture
135	Jacob Alonzo Dove House	Cornelius, 19309 South Main Street	NRHP Eligible, C for architecture
144	Caldwell Station School	Caldwell Station, east side NC 115, 1 mile north of NC 73	NRHP Eligible, A for education, C for architecture

Table 3.10-1. NRHP Listed/Eligible Properties in Project APE (continued)

Survey Site #	Site Name	Location	NRHP Status, NRHP Criterion of Eligibility
152	Huntersville Associate Reformed Presbyterian Church	Huntersville, 200 Bigham Street	NRHP Eligible, C for architecture
155	Huntersville Ice House	Huntersville, just north of Gilead Road	NRHP Eligible, A for commerce
156	Huntersville Commercial Block	Huntersville, 100-106 Main Street	NRHP Eligible/Local Landmark, A for commerce, C for architectrure
159	House	Huntersville, east side Church St., south of Huntersville-Concord Rd	NRHP Eligible, C for architecture
160	House	Huntersville, east side Church St., north of Greenway Street	NRHP Eligible, C for architecture
164	Charles and Laura Alexander House	Huntersville, east side Church St., s.outh of Gibson Park Drive	NRHP Eligible/Local Landmark, C for architecture
183	Wilson House and Farm	Huntersville vicinity, east side of NC 115	NRHP Eligible/Local Landmark, C for architecture
191	Croft Historic District	Croft, west side of NC 115 at intersection of SR 2483	NRHP Eligible/Local Landmark, A for commerce, C for architecture
197	Fred Gibbon Farm	Derita, north sideof SR 2519 at Christenbury Road	NRHP Eligible, A for agriculture, C for architecture
199	Cochran-Robinson House	Derita, 2411 Derita Avenue	NRHP Eligible, C for architecture
203-204	Mitchell Distributing Co./Carolina Tractor and Equipment Co.	Charlotte, 3535 and 3401 North Graham Street	NRHP Eligible, A for commerce, C for architecture
205	Interstate Granite Corporation	Charlotte, nw corner North Graham Street and Norris Avenue	NRHP Eligible, A for commerce, C for architecture
208	North Graham Street Industrial Historic District	Charlotte, bounded by Dalton, Woodward, Statesville, N. Graham	NRHP Eligible, A for industry and commerce, C for architecture
209	Seaboard Street Historic District	Charlotte, bounded by Seaboard, North Smith, West Eleventh, West Ninth	NRHP Eligible, A for industry and commerce, C for architecture
210	Southern Railway Bridge	Charlotte, West Sixth Street at railroad	NRHP Eligible, A for transportation, C for engineering
211	Elmwood/Pinewood Cemetery	Charlotte, 700 West Fifth Street	NRHP Eligible/Local Landmark, C for design
212	Fourth Ward Historic District	Charlotte, bounded by West Trade, West Eleventh, North Church, North Smith, Railroad	NRHP Eligible/Local Landmark, C for architecture
215	Virginia Paper Company Warehouse	Charlotte, South Graham Street at West Third Street	NRHP Eligible, A for industry, C for architecture
216	(Former) U.S. Post Office	Charlotte, 401 West Trade Street	NRHP Eligible/Local Landmark, A for government, C for architecture
217	Lingle Hut	Charlotte, 219 Watson Street	NRHP Eligible, A for social history, C for architecture
224	South Cedar Street Industrial Historic District	Charlotte, bounded by West 1st Street, McNinch Street, Cedar Street, and Hill Street	NRHP Eligible, A for industry

Source: Matson Alexander, Parsons Brinckerhoff, 2008.

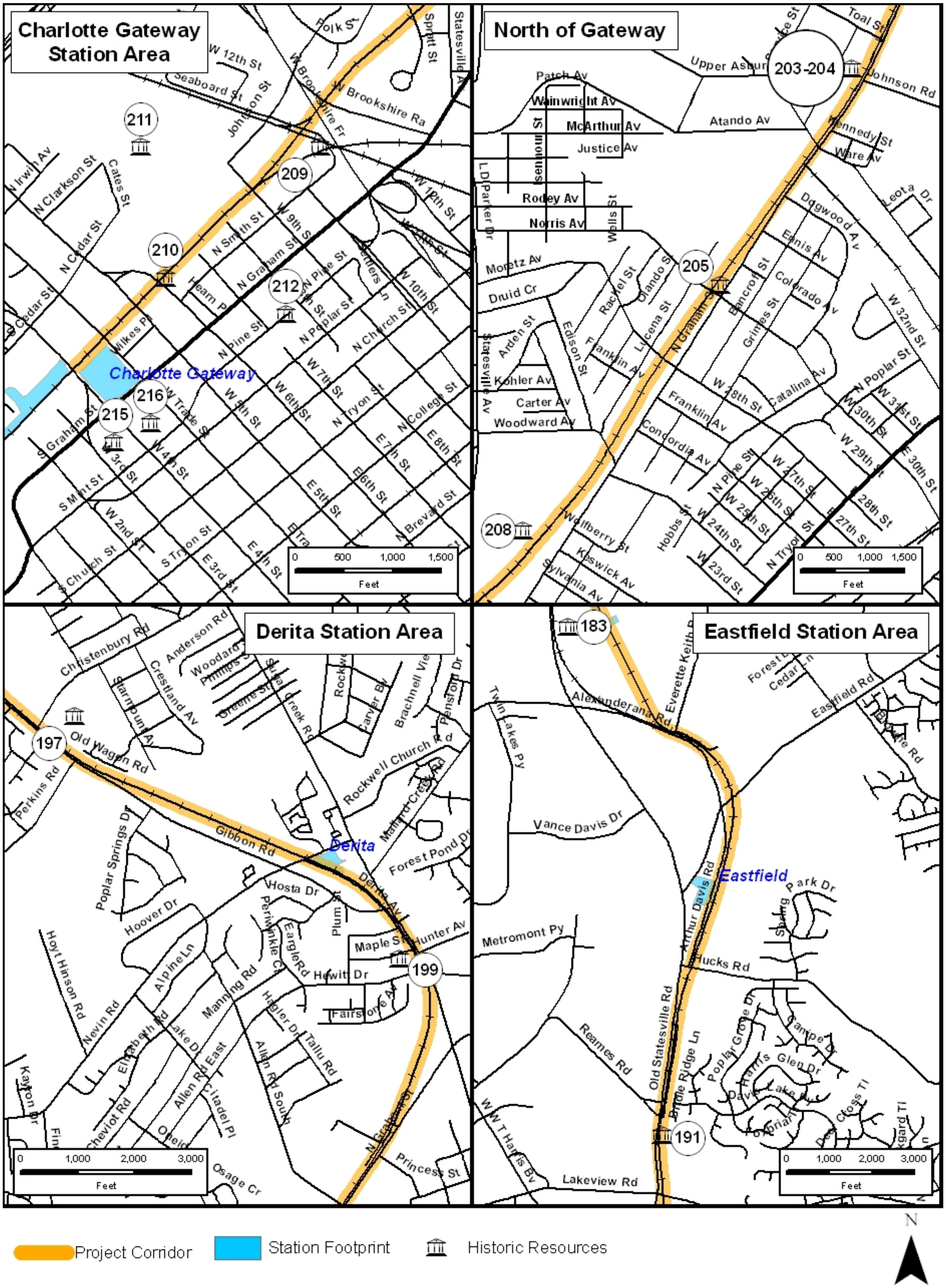

Figure 3.10-1a Historic Resources

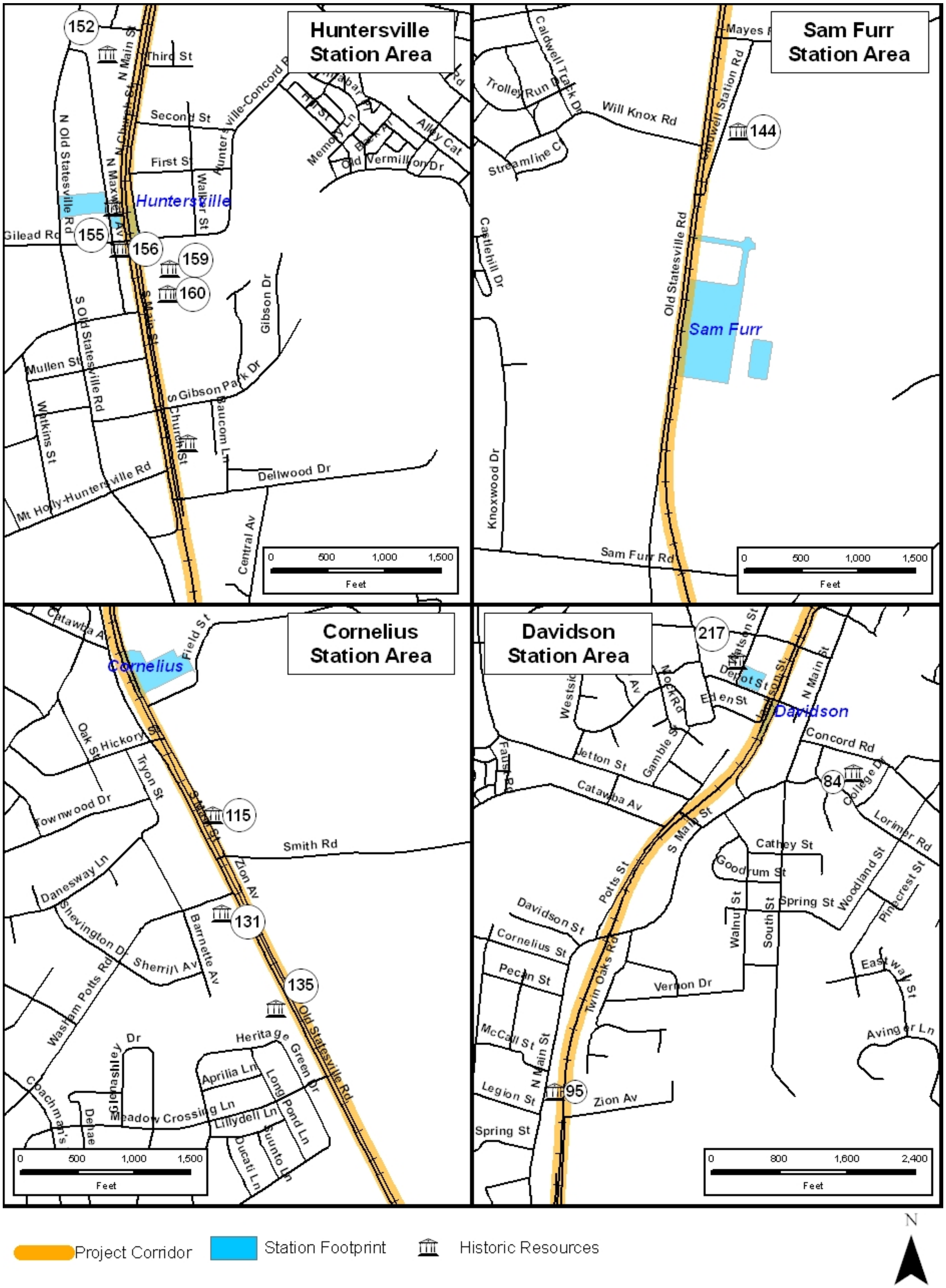

Figure 3.10-1b | Historic Resources

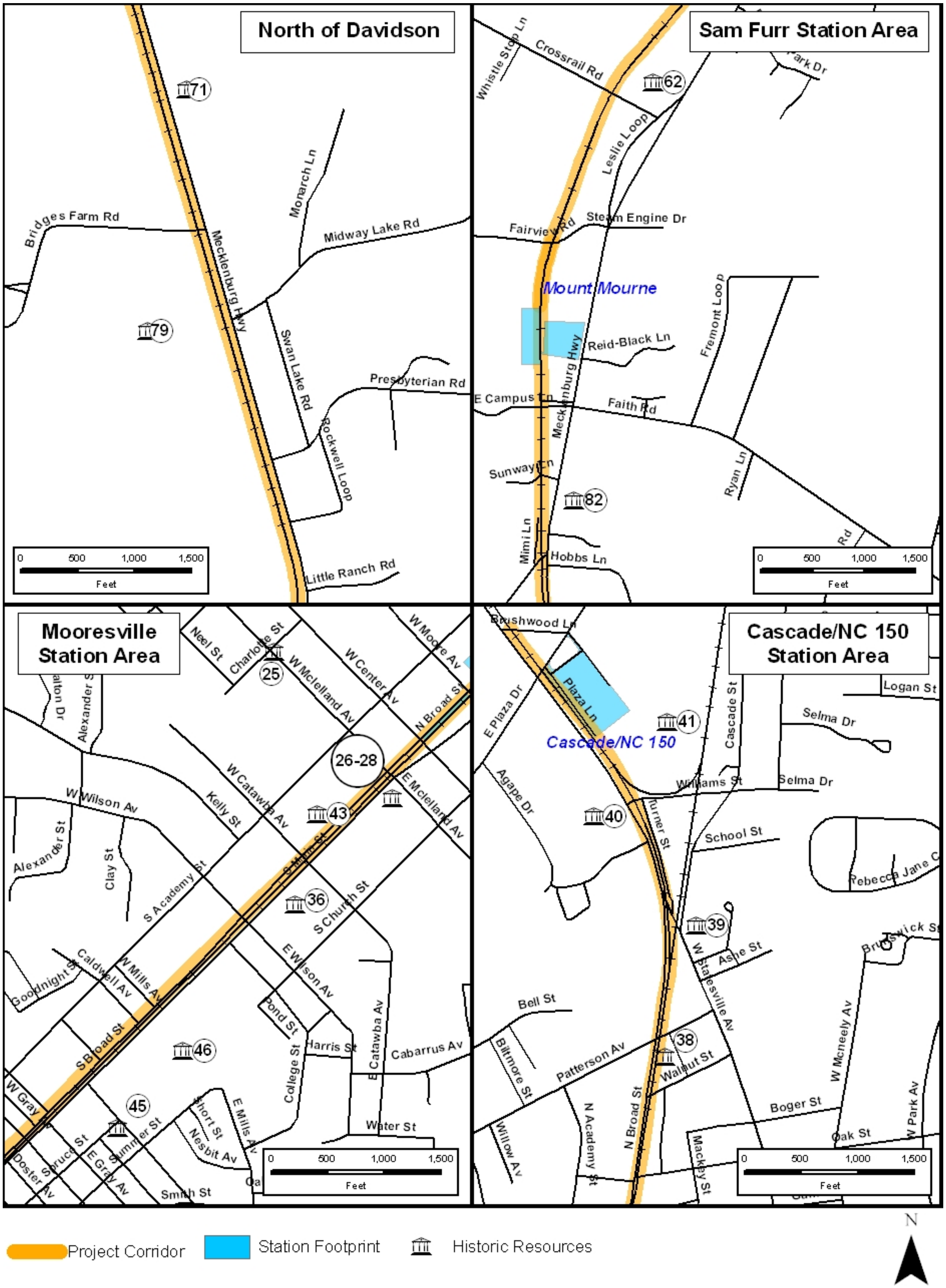

Figure 3.10-1c Historic Resources

3.10.3.2 Archaeological Resources

An Archaeological Survey was conducted in October and January of 2005 and 2006 respectively along the 30 mile rail APE, the 11 intermediate train stations and alternative VMF sites. The work consisted of a background review of the files and archives at the SHPO's office in Raleigh, the NC State University Archives, the Hackney Library at Barton College and the Edgecombe Library in Tarboro, NC. Visual inspection and where warranted shovel test pits were excavated at 30 meter intervals. Three archaeological sites, an isolated find were found and a previously recorded site was revisited. No cemeteries were found or recorded during the archaeological investigations. All three sites, the isolated find and the revisited site were recommended as not eligible for the NRHP.

By letter dated February 22, 2006 the SHPO concurred that none of the archaeological properties identified in the NCCR project area were eligible for the NRHP and noted that none of the sites retain any stratigraphic integrity nor do they have the potential to yield information important to history or prehistory.

3.10.4 Environmental Impacts and Benefits

The CATS, NCCR project would serve an area that is in the midst of dynamic change, particularly in the historically rural areas of Mecklenburg and Iredell counties. Because the commuter rail line would use the existing NS rail alignment, there are relatively few direct impacts from the proposed NCCR project. However, there are parts of the project APE that may incur indirect and cumulative effects in part because of the NCCR project but also because of already intensifying development pressure, numerous transportation projects, and master plans and rezonings intended to meet the challenges of aggressive regional growth.

The principal investigators are recommending no adverse effects for the direct actions associated with the proposed NCCR project. No historic properties would be taken under current designs, and thus there would be no Section 4(f) compliance issues. In several locations, particularly near station sites, adverse effects may result from the indirect and cumulative effects of rezonings for high density, transit-oriented land uses, the need for parking around stations, and increased development pressures. In most of these cases, possible adverse effects may result from future actions that would require additional information in order to make a full evaluation of effect. Table 3.10-2 provides a summary of recommended effects.

The archaeological survey for the NCCR project identified no NRHP eligible sites within the project corridor. Thus, the project would have no adverse effect on any resource as defined in Title 36, Section 800 of the CFR.

The No-Action Alternative would have no effect on either historic architectural or archaeological resources.

3.10.4.1 Historic Architectural Resources

<u>Potential Impacts</u>

Impacts on the historic architectural resources in the project corridor were determined in accordance with the Criteria of Adverse Effect, outlined in 36 CFR 800, the regulations that define Section 106 of the NHPA. Examples of adverse effects include:

- Physical destruction/damage;
- Alteration of a property;

- Removal of the property from its historic location;
- Change of the character of the property's use or of physical features within the property's setting that contribute to its historic significance;
- Introduction of visual, atmospheric or audible elements that diminish the integrity of the property's significant historic features, and;
- Neglect of a property that causes its deterioration.

Preliminary Evaluation of Effects reports dated May 26, 2006 and January 17, 2008 were reviewed by the SHPO with supplemental review comments provided on July 28, 2006. Further consultation in regards to a Determination of Effects occurred with the SHPO on September 20, 2006 and February 13, 2008. Table 3.10-2 summarizes the results of that consultation and Determinations of Effect for the project area's historic resources.

Table 3.10-2. Determination of Effect to Historic Architectural Resources

Number	Resource Name	Action	Recommended Effect
1	Espy Brawley House	Track Replacement	No Adverse Effect
		Cascade/NC 150 Station	No Effect
		Cascade & NC150/NC 115 Redevelopment	Possible Adverse Effect
2	Army National Guard Armory	Track Replacement	No Effect
		Cascade & NC 150/NC 115 Redevelopment	Possible Adverse Effect
11	Watkins Chapel A.M.E. Zion Church	Track Replacement	No Effect
16	Cook's Grocery Store and House	Track Replacement	No Adverse Effect
25	Mooresville Downtown Historic District	Mooresville Station	No Adverse Effect
		Track Replacement	No Adverse Effect
26-28	Mooresville Downtown Historic District Southern Boundary Expansion	Track Replacement	No Effect
36	Isaac Harris House	Track Replacement	No Effect
43	Presbyterian Church Manse	Track Replacement	No Effect
45	Mooresville Cotton Mill Historic District	Track Replacement	No Adverse Effect
		Closing RR Crossings	No Adverse Effect
62	Mount Mourne	Track Replacement	No Adverse Effect
		Mount Mourne Station	Possible Adverse Effect
71	George Houston House	Track Replacement	No Effect
79	House	Track Replacement	No Adverse Effect
82	House	Track Realignment	No Effect
84	Davidson Historic District	Davidson Station	No Adverse Effect
		Parking Deck	No Adverse Effect
		Track Replacement	No Adverse Effect
		Delburg St. Closing	No Adverse Effect
95	House	Track Replacement	No Adverse Effect
115	Confederate Monument	Track Replacement	No Effect
		Zion Avenue Widening	No Effect
131	Frank Sherrill House	Track Replacement	No Effect
		Zion Avenue Widening	No Effect
135	Jacob Alonzo Dove House	Track Replacement	No Effect
		Zion Avenue Widening	No Effect

Table 3.10-2. Determination of Effect to Historic Architectural Resources (continued)

Number	Resource Name	Action	Recommended Effect
144	Caldwell Station School	Track Replacement	No Effect
		New Rail Siding	No Effect
		Sam Furr Station	Possible Adverse Effect
152	Huntersville A.R.P. Church	Track Replacement	No Effect
155	Huntersville Ice House	Huntersville Station	Possible Adverse Effect
		Track Realignment	No Effect
156	Huntersville Commercial Block	Huntersville Station	Possible Adverse Effect
		Road/Rail Grade Improvements	No Effect
		Track Realignment	No Effect
159	House	Track Realignment	No Effect
160	House	Track Realignment	No Effect
164	Charles & Laura Alexander House	Church St. Realignment	No Effect
		Track Replacement	No Effect
183	Wilson House and Farm	New Rail Alignment	No Effect
		Hambright Station	Possible Adverse Effect
		Track Replacement	No Adverse Effect
191	Croft Historic District	Track Replacement	No Adverse Effect
		Closing RR Crossings	No Adverse Effect
197	Fred Gibbon Farm	Road/Rail Grade Improvements	No Adverse Effect
		Track Replacement	No Adverse Effect
199	Cochran-Robinson House	Track Replacement	No Effect
		New Rail Siding & Derita Avenue Realignment	No Adverse Effect
203-204	Mitchell Distributing Company/Carolina Tractor and Equipment Company	Track Realignment	No Adverse Effect
205	Interstate Granite Corporation	Track Replacement	No Adverse Effect
		Norris Street Crossing Improvements`	No Effect
208	North Graham Street Industrial Historic District	Track Replacement	No Adverse Effect
209	Seaboard Street Historic District	Reconfigure rail junction, construct new freight track, install quad gates at Seaboard St, replace ties and rail for commuter train..	No Adverse Effect
		Close West 9th Street	No Effect
210	Southern Railway Bridge	Construct new bridge, new rail lines and retaining walls.	No Effect for NCCR Adverse Effect for NCDOT/NS
		Replace ties and rail, install signals.	No Effect
211	Elmwood/Pinewood Cemetery	Construct new rail lines, retaining walls and bridge over West 6th Street.	No Effect
		Replace ties and rails, install signals	No Effect
		Close West 9th Street	No Effect

Table 3.10-2. Determination of Effect to Historic Architectural Resources (continued)

Number	Resource Name	Action	Recommended Effect
212	Fourth Ward Historic District	Replace ties and rails. Install signals.	No Effect
		Close West 9th Street	No Effect
		Construct Gateway Station	No Effect
215	Virginia Paper Company Warehouse	Construct Gateway Station	No Effect
216	Former US Post Office, Currently US District Court Building	Construct Gateway Station	No Effect
218	South Cedar Street Industrial Historic District	Construct Vehicle Maintenance Facility	No Effect
217	Lingle Hut	Sadler Square Parking Option for Davidson Station	No Effect

Source: Matson Alexander, Parsons Brinckerhoff, 2008

<u>Properties with Possible Adverse Effects</u>

The No-Action Alternative would have no adverse effects on historic properties. Under the four build alternatives, seven of the architectural historic properties have the possibility to be adversely impacted by the project under Section 106. Two properties (Espy Watt Brawley House and U.S. Army National Guard Armory) would possibly be adversely impacted by the LPA Alternative only. Five properties would possibly be adversely impacted by either of the two Build Alternatives. The possible adverse effects determinations for the NCCR are summarized below.

1. Espy Watt Brawley House, Mooresville, Iredell County

Action: In 2003, a new master plan was developed by the Town of Mooresville for the Cascade neighborhood, which encompasses the former Dixie Cotton Mill and its associated mill village, located just east of the Brawley property. The plan lists a number of recommendations or options for the redevelopment of this now dilapidated neighborhood that may have an effect on the Brawley property. The plan recommendations include: 1) the construction of new streets and sidewalks to link the neighborhood with the commuter rail station and NC 115; 2) the acquisition of the Brawley tract to preserve it as a community resource and to redevelop portions of the site; 3) the nomination of Dixie Mill and mill village to the National Register; 4) the creation of a conservation overlay district that would encompass the Brawley site; and 5) the creation of a Sub-Area for future transit-oriented and commercial development at the intersection of NC 115 and NC 150 (Cascade Neighborhood Master Plan March 2003: 2-61).

Effect: Not enough information is currently available to assess the effects of any of the master plan recommendations although the plan does recognize the importance of preserving the National Register Brawley property and even strongly recommends that the Town acquire the property to ensure its preservation. The plan also recommends preserving the nearby cotton mill and mill village through either National Register designation or the creation of a conservation overlay district that would offer protections to an area that is already experiencing development pressures. However, the possible construction of a mixed-use transit village near the intersection of NC 115 and NC 150 (see page 57 of Cascade Neighborhood Master Plan) and plans for better street and sidewalks connections between the commuter rail station and the Cascade neighborhood could threaten the roughly 21 acre Brawley House tract which lies between the commuter station and the neighborhood. Because of the proximity of the Brawley site both to the commuter station and to the NC 150/NC 115 intersection, specific development plans or changes in zoning in this area should be assessed for their effects on this National Register property.

2. U.S. Army National Guard Armory, Mooresville, Iredell County

Action: Among the recommendations made in the 2003 master plan for the Cascade neighborhood, the potential redevelopment at the NC 115/NC 150 intersection would occur within the vicinity of the National Guard Armory.

Effect: Not enough information is currently available to assess the effects of any of the master plan recommendations, but the possible construction of a mixed-use transit village near the intersection of NC 115 and NC 150 could threaten the National Guard Armory. Because of the proximity of the armory to the NC 150/NC 115 intersection, specific development plans or changes in zoning in this area should be assessed for their effects on this National Register-eligible property.

62. Mount Mourne, Iredell County

Action: The proposed Mount Mourne commuter rail station would include a small rail station building, a platform, storm water retention ponds, and a parking lot on the west side of the railroad and an additional parking lot on the east side of the corridor. The station site is located south of existing Fairview Road, and a proposed street leading south from Fairview would provide access to the west side parking lot. The site would also include landscaped areas. The station building, platform (with canopy), and parking lot would conform to the guidelines for commuter rail stations along the North Corridor route. The building would be one story, approximately 1000 square feet in size, and with a style that reflects regional architectural characteristics. The platform would be approximately 350 feet long, twelve feet wide, and twenty-five inches above the top of the rail.

The historic Mount Mourne plantation house is located just north of Fairview Road. A number of sizable institutional or corporate projects are planned for the areas around the station in the vicinity of the plantation. Furthermore, transit area mixed use zoning may be planned for Fairview Road.

Effect: The commuter station is located south of Fairview Road and has ample parking already planned for the station site as well as room for expansion. Thus, the station would have no direct impact on the former plantation site. However, a large-scale campus of corporate office buildings is being constructed for Lowe's Companies just south and west of the commuter station, and a regional hospital has been constructed on the north side of Fairview Road. These projects, as well as the possible rezoning of Fairview Road to transit area mixed use zoning may threaten the preservation of Mount Mourne, a rare survivor from the early nineteenth century. These current projects, as well as any rezonings or development plans, should be assessed for their effect on Mount Mourne.

144. Caldwell Station School, Caldwell vicinity, Mecklenburg County

Action: The proposed Sam Furr station would be built roughly 0.25 mile south of Caldwell Station School. The station facility would consist of a small passenger station that would be constructed on a currently undeveloped site. A passenger platform would be constructed along the east side of the existing tracks. The station building and canopied platform would conform to the guidelines for commuter rail stations along the North Corridor route. The building would be one story tall, approximately 1,000 square feet in size and designed in a style that reflects regional architectural characteristics. The platform would be approximately 350 feet long, twelve feet wide, and twenty-five inches above the top of the rail. On the east side of the station would be a large parking lot encircled by proposed streets. A regional stormwater retention pond, future parking lots, and proposed retail sites are planned for the area east of the station site while a new Mayes Road and connecting street would provide access to the station from NC 115.

Caldwell Station School is located on a side road that connects Mayes Road and NC 115. Although there are modern industrial facilities on the west side of NC 115 opposite the school, the surrounding area is currently sparsely developed.

Effect: The proposed construction of the Sam Furr station, and the projects associated with the new station, would not directly result in a taking of the historic school nor would the low scale station facility introduce significant visual or noise elements. However, the construction of the station, platforms, parking lots, commercial sites, and new streets may have indirect adverse effects by encouraging commercial development near the rail line that would threaten the school.

155. Huntersville Ice House, Huntersville, Mecklenburg County

Action: The proposed Huntersville station would consist of a new passenger station building that would be constructed on a currently undeveloped site south of the National Register eligible Huntersville Ice House. A passenger platform (with canopy) would be constructed along the west side of the existing tracks between Main Street and the rail line. The station and platform would occupy the sites of the original Huntersville railroad depot and platform. The station building and platform would conform to the guidelines for commuter rail stations along the North Corridor route. The building would be one story tall, approximately 1,000 square feet in size, and designed in a style that reflects regional architectural characteristics. The platform would be approximately 350 feet long, twelve feet wide, and twenty-five inches above the top of the rail.

West of the Ice House, across two-lane Maxwell Avenue, a parking lot associated with the station would be constructed on a lot now occupied by either modern or altered dwellings. The new parking lot would encompass 1.3 acres. A new street would be constructed along the south side of the proposed parking lot to connect Old Statesville Road and Maxwell Avenue. The proposed new street would terminate at the Ice House lot.

West of the tracks, Main Street would be widened slightly on its west side to accommodate the drop-off area for buses and cars. East of the tracks, Church Street would be widened slightly for parking and landscaping along the rail line.

The Huntersville Ice House is located on the west side of North Main Street which separates the resource from the rail corridor. In this area of Huntersville, the rail corridor is defined by North Main to the west and North Church Street to the east. The ice house is surrounded primarily by modern buildings.

Effect: The proposed construction of the Huntersville station, and the projects associated with the new station, would not directly result in a taking of the historic ice house nor would it introduce visual or noise elements that are not already present in this busy, commercial area of Huntersville. However, the construction of the station, platforms, parking lot, and new street may have indirect adverse effects by encouraging commercial development near the rail line that would threaten the Ice House, which is now owned by the Town of Huntersville. The resource occupies a prime location, just north of the proposed station in between the passenger platform and the proposed parking lot. Furthermore, the ice house is an unusual building type that would not lend itself readily to adaptive reuse thus making the property particularly vulnerable to demolition.

156. Huntersville Commercial Block, Huntersville, Mecklenburg County

Action: The new passenger platform for the proposed Huntersville station (see above action for Huntersville Ice House, No. 157) would be located north of Huntersville-Concord Road. Landscaping is planned for the south end of the platform. The proposed railroad station building, north of Huntersville-Concord Road, would be separated from the commercial block by the roadway and a modern building located just south of the station.

The Huntersville Commercial Block, a designated local historic landmark, stands approximately twenty-five feet west of the railroad tracks at the southwest corner of Main Street and Huntersville-Concord Road, separated from the tracks by two-lane Main Street. Two-lane Huntersville-Concord Road separates the commercial block from the proposed passenger platform and station to the north. The Huntersville Commercial Block faces east towards the tracks. The original Huntersville station and passenger platform stood on the sites of the proposed new station and platform, respectively.

Effect: The proposed station building and passenger platform are separated from the resource by Huntersville-Concord Road and modern construction. Thus, the proposed station would not result in a taking of historic property. The new station and platform also would not affect views from the commercial block which faces east towards Main Street and the tracks south of Huntersville-Concord Road. Moreover, the construction of the station and platform would occur on the sites of the original station and platform in Huntersville, thus restoring an historic association and view. Furthermore, because the proposed commuter trains would be quieter than existing freight trains, there should be no noise impacts from the new service.

There may be indirect effects on this commercial block because the proximity of the proposed station would create some development pressure around the resource. However, local landmark designation provides some protection by requiring that any new effects to the design of the property be formally reviewed by the Charlotte-Mecklenburg Landmarks Commission. Moreover, development in the area may provide this underutilized resource with greater opportunities for use and restoration.

183. Wilson House and Farm, Huntersville, Mecklenburg County

Action: The proposed Hambright station would be located on land approximately 500 feet east of the National Register boundaries for the Wilson House and Farm that is part of a proposed, large-scale (500 acres), residential, retail, and office development called Bryton. The Bryton request for rezoning includes both commuter rail options, moving the line east of the Wilson House and maintaining the route along its existing location. The Bryton development would take advantage of both the proximity of the North Corridor and the Charlotte Beltway (I-485) which crosses the A.P.E. just south of Mount Holly-Huntersville Road and the Wilson House and Farm property. Other north-south roads are also under construction in the vicinity to link the older east-west roads with the new beltway.

The proposed Hambright station would include an approximately three-acre parking lot, a station building, and a platform with canopy. A stormwater retention site would be located east of the parking lot. The station building, platform, and parking lot would conform to the guidelines for commuter rail stations along the North Corridor route. The building would be one story tall, approximately 1,000 square feet in size, and designed in a style that reflects regional architectural characteristics. The platform would be approximately 350 feet long, twelve feet wide, and twenty-five inches above the top of the rail. The private rail crossing that leads to the Wilson House and Farm property from NC 115 would remain open.

Effect: The proposed station site would not result in a taking of property from the historic Wilson Farm, nor should its view shed be greatly altered by the proposed station. The house is currently buffered from the station site by woodland. However, despite its status as a local landmark, the farm would probably face indirect impacts because of its proximity to the proposed station and the substantial Bryton development. Although the property is already vulnerable because of nearby I-485, the proximity of a commuter rail station would probably heighten these threats.

3.10.4.2 Archaeological Resources

The archaeological survey for the NCCR project identified no NRHP eligible sites within the project corridor. Thus, the project would have no adverse effect on any resource as defined in Title 36, Section 800 of the CFR.

3.10.5 Coordination and Mitigation

3.10.5.1 Coordination

CATS has coordinated this project pursuant to Section 106 of the NRHP.

Coordination with the North Carolina SHPO has been continuous since the early phases of project development. A Section 106 public involvement plan developed for this project was also submitted to the SHPO in late 2004. Early in the environmental document process, the SHPO was consulted regarding the development of the APE and for review and comment on the historic architecture and archeological survey findings regarding NRHP eligibility and project effects.

The ACHP will be invited to participate if an adverse effect to historic resources is identified.

Pursuant to 36 FR 800 CATS has attempted to identify Consulting Parties to participate in the process of identifying historic properties and the project's potential effects to such properties. In January 2005, letters were sent to representatives of the local governments along the corridor inviting them to serve as Section 106 Consulting Parties for this project. The governments were also asked to provide names of other parties with an interest in the historic resources of the project corridor. Two responses to the Consulting Party invitation were received, from towns of Cornelius and Mooresville, both of which will serve as Consulting Parties. CATS will invite, as appropriate, other individuals or organizations that are identified as having a demonstrated interest in project planning as it relates to historic resources. The Town of Cornelius and any other Consulting Parties identified will be: 1) informed of and invited to project-related public meetings and any special meetings related to project impacts to historic resources; 2) notified of the findings of the cultural resources reports regarding NRHP eligibility and Section 106 effects and asked to comment; and 3) invited to participate in the process to resolve adverse effects if such effects are identified.

CATS has and will continue to communicate with the public. Public meeting notices and meetings have included verbiage intended to solicit public input on historic properties along the corridor and the project's potential to impact such properties. A public hearing will be held for this project and CATS will provide a display board to illustrate impacts to historic properties and will explain the Section 106 process. Copies of the ACHP's *Citizen's Guide to Section 106 Review* will be made available to the public at the public hearing. Mail-outs to individuals and organizations on the project mailing list have also included a solicitation for comments on the project's impacts to historic properties.

3.10.5.2 Mitigation

<u>Archaeological Surveys and Resource Recovery</u>

The archaeological survey for the NCCR project identified no NRHP eligible sites within the project corridor.

Historic Architectural Resources

In order to address competing interests and concerns over historic architectural resources, it is recommended that the following agencies, organizations, or interested groups be included as parties to any subsequent consultation process with SHPO: For Mooresville, Mr. Jim King, A.I.C.P., Planner, Historic Preservation Commission, would represent the Town in the process. In Davidson, Mr. Leamon Brice, Town Manager; Mr. J. Kris Krider, Planning Director, Town of Davidson; Ms. Lauren Blackburn, Planner, Mr. Craig Lewis, Chairman, Design Review Board for Davidson Historic District (Local); Mr. Robert Lee, Chairman, Davidson station Area Planning Committee; and Ms. Brenda Barger, President, Davidson Historical Society, should all be consulted. For the Town of Huntersville, Mr. Zac Gordon, Director for Long Range Planning, should be involved in the process. Within Charlotte, representatives of the Charlotte-Mecklenburg Planning Department; Mr. John Rogers, Charlotte-Mecklenburg Historic District Commission, and Dr. Dan L. Morrill, Consulting Director, Charlotte-Mecklenburg Historic Landmarks Commission should all be invited to participate in the consultation process. Because the North Corridor project overlaps with the track re-alignment project south of the Brookshire Freeway (I-277) being undertaken by the NCDOT, Rail Division, this state agency should be included in the process. In addition to these governmental agencies or advisory boards, representatives of Lowe's Companies may be included because of the proximity of their large-scale corporate headquarters near the highly significant Mount Mourne plantation (National Register) in Iredell County.

Cemetery Relocation

The archaeological survey for the NCCR project identified no cemeteries within the project corridor APE. Should cemeteries, graves, stones or headstones be uncovered in later phases of project development, the reinterment and relocation of graves would take place under North Carolina General Statute 65-13, *Removal of Graves.* The graves would be relocated to a perpetually maintained cemetery. As required by law, descendents would be contacted, to the extent possible, prior to moving the graves.

Concluding Remarks

With the exception of the railroad bridge crossing NC 115 south of Davidson, there were no Adverse Effect Determinations on any of the archaeological or historic architectural resources throughout the 30 mile corridor. The effect on the bridge at Davidson will only be determined Adverse if testing determines that the bridge is no longer structurally sound. If testing determines that the bridge must be replaced, At that time further consultation with the SHPO, the Town of Davidson and CATS will occur and a Memorandum of Agreement regarding the bridge replacement will be developed.

The SHPO has advised that resources identified in Table 3.10-2 and further described on page 3-10 as "possible adverse effects" can be considered vulnerable properties. As such the SHPO has advised CATS and the Towns to act in an advisory capacity to developers who propose improvements on or adjacent to the properties. CATS has provided copies of the Phase II Architectural Resources Survey and Evaluation of Effects reports to the Towns of Huntersville, Cornelius, Davidson and Mooresville.

Between West 1st Street and West 6th Street in Center City Charlotte the historic properties consistent with Section 106 and within the Area of Potential Effects have been identified by the SHPO as follows:

- Fourth Ward Historic District
- Southern Railway Bridge
- Elmwood/Pinewood Cemetery

The SHPO has requested the NCDOT Rail Division initiate further consultation for these and other resources that may have surfaced from NCDOT evaluation of track improvements in this area.

Finally, conditional rulings of No Adverse Effect have been rendered on the following historic architectural resources:

- The SHPO will review any plans and drawings for platform design, signage and lighting at the existing historic Mooresville Depot and in the Mooresville Historic District.
- The SHPO will review any plans and drawings for platform design, signage and lighting at the existing historic Davidson Depot and in the Davidson Historic District.
- Should an Upper Level Parking Deck be constructed above the existing surface parking lot just east of Jackson Street, he SHPO will review any plans and drawings for the proposed deck.
- If the two lane frontage road (Caldwell Station Road) just west of Caldwell Station School requires improvements (widening), the SHPO will re-evaluate the effects determination pending review of the road improvement design.

The SHPO in their March 4, 2008 Determination of Effects letter, expressed reservations about the long term indirect and cumulative effects of the Charlotte Gateway Station on the Fourth Ward Historic District, the Virginia Paper Company warehouse and the former US Post Office (currently US District Courthouse). CATS is a department of the City of Charlotte and as such subscribes to City policy regarding protection of historic resources. The City works closely with the Charlotte Mecklenburg Historic Landmarks Commission and the Fourth Ward Neighborhood Association in the development of all plans for urban development in the Center City area. Charlotte's comprehensive planning. land use and transit oriented development strategy are outlined in Section 3.1.3.4 on page 3.1-13 of this chapter. Secondary and cumulative impacts are also described in Section 3.13 on page 3.13-1.

3.11 Parks and Recreation Areas

3.11.1 Legal and Regulatory Framework

The foregoing analysis is provided pursuant to Section 4(f) of the USDOT Act of 1966 and Section 6(f) of the Land and Water Conservation Fund (LWCF) Act of 1965.

Section 4(f) makes provisions for the preservation of public parks, recreational lands, wildlife refuges, waterfowl refuges and historic sites. Under Section 4(f), in order to gain approval for a federally sponsored/funded project which uses parks, refuges or historic sites, it must be determined that “there is no feasible or prudent alternatives to the use of the land”, and planning must “minimize harm” to the land (49 U.S.C. 303 and 23 CFR 771.135). For a public park or recreational land use to be considered a 4(f) property use, the park or recreational facility must be publicly owned, opened to the public and included in the master park plan of the local, state or federal agency which operates the park or recreational facility. The following facilities generally are not subject to 4(f) use protections:

- Privately owned theme parks which charge admission fees
- Private lakes and camping facilities which charge a fee for entry
- Homeowner association parks, clubhouses and golf courses
- Private or member only golf courses
- Conservation lands, parks and refuges held by private organizations or foundations such as the Izaac Walton League, Nature Conservancy, Ducks Unlimited and similar privately held or member only resource conservation organizations

Section 6(f) states that proposed federally sponsored/funded actions upon recreation lands where LWCFs were used for the planning, acquisition or development of the property are to be replaced subject to approval of the Department of the Interior.

> No property acquired or developed with assistance under this section shall, without the approval of the Secretary (of Interior), be converted to other than public outdoor recreation uses. The Secretary shall approve such conversion only if he finds it to be in accord with the then existing comprehensive statewide outdoor recreation plan and only upon such conditions as he deems necessary to assure the substitution of other recreation properties of at least equal fair market value and of reasonably equivalent usefulness and location.

3.11.2 Methodology

Section 4(f) and 6(f) eligible parks and recreational facilities within 300 feet of the centerline of the existing rail line were identified using various sources including but not limited to local area GIS data, web searches, local and regional maps, field visits, and contacts with local representatives. For each facility, the following characteristics were collected:

- Boundaries, size, ownership, and basis for ownership
- Location and characteristics of existing and planned activities and facilities
- Access and relation to similarly used lands in the vicinity
- Unusual characteristics that might reduce or enhance the value of the property
- Whether any park lands affected by the NCCR have received LWCFs (Section 6(f))

The data collected was assembled and a description of the affected park environment is provided. Each facility was assessed to determine if any environmental consequences would occur as a result of the NCCR project alternatives. The need for mitigation is discussed where warranted.

3.11.3 Existing Conditions and Resources

There are two parks and one golf course located within 300 feet of the NCCR. These facilities are listed in Table 3.11-1 and shown in Figure 3.11-1, along with the park's size, ownership, and characteristics. All of the facilities are public. The Mooresville Municipal Golf Course and Moor Park, which are within 100 feet of the proposed NCCR line, used LWCFs.

Table 3.11-1. Section 4(f) and 6(f) Parks and Recreation Areas Within 300 Feet of the NCCR Corridor

Park Name and (Distance to Railroad Centerline)	Size, Ownership, and Basis for Ownership	Location and Characteristics of Existing and Planned Activities and Facilities	Access and Relation to Similarly Used Lands in Vicinity	Unusual Character-istics	LWCFs (Section 6(f))
Bailey Road Park (0 feet. Railroad centerline is property line)	53.617 acres Town of Cornelius	South of Baily Road on east side of rail. Access off Bailey Road. Ballfields, soccer fields, tennis courts, basketball courts and playground.	None	None	No
Mooresville Municipal Golf Course (50 feet from railroad centerline)	181.92 acres Town of Mooresville	South of West Lowrance Ave on west side of rail in Iredell County. Access off West Wilson Avenue. Golf course for public use. Portions of course integrated with residential neighborhood.	600 feet south (along rail) of Moor Park. No linkage between facilities.	None	Yes
Moor Park (50 feet from railroad centerline)	5.0 acres Town of Mooresville	North of West Lowrance Ave on west side of rail in Iredell County. Access off South Broad Street or South Academy Street. Ball park for public use.	600 feet north (along rail) of Mooresville Municipal Golf Course. No linkage between facilities.	None	Yes

Source: Mecklenburg and Iredell County 2005 GIS; Parsons Brinckerhoff

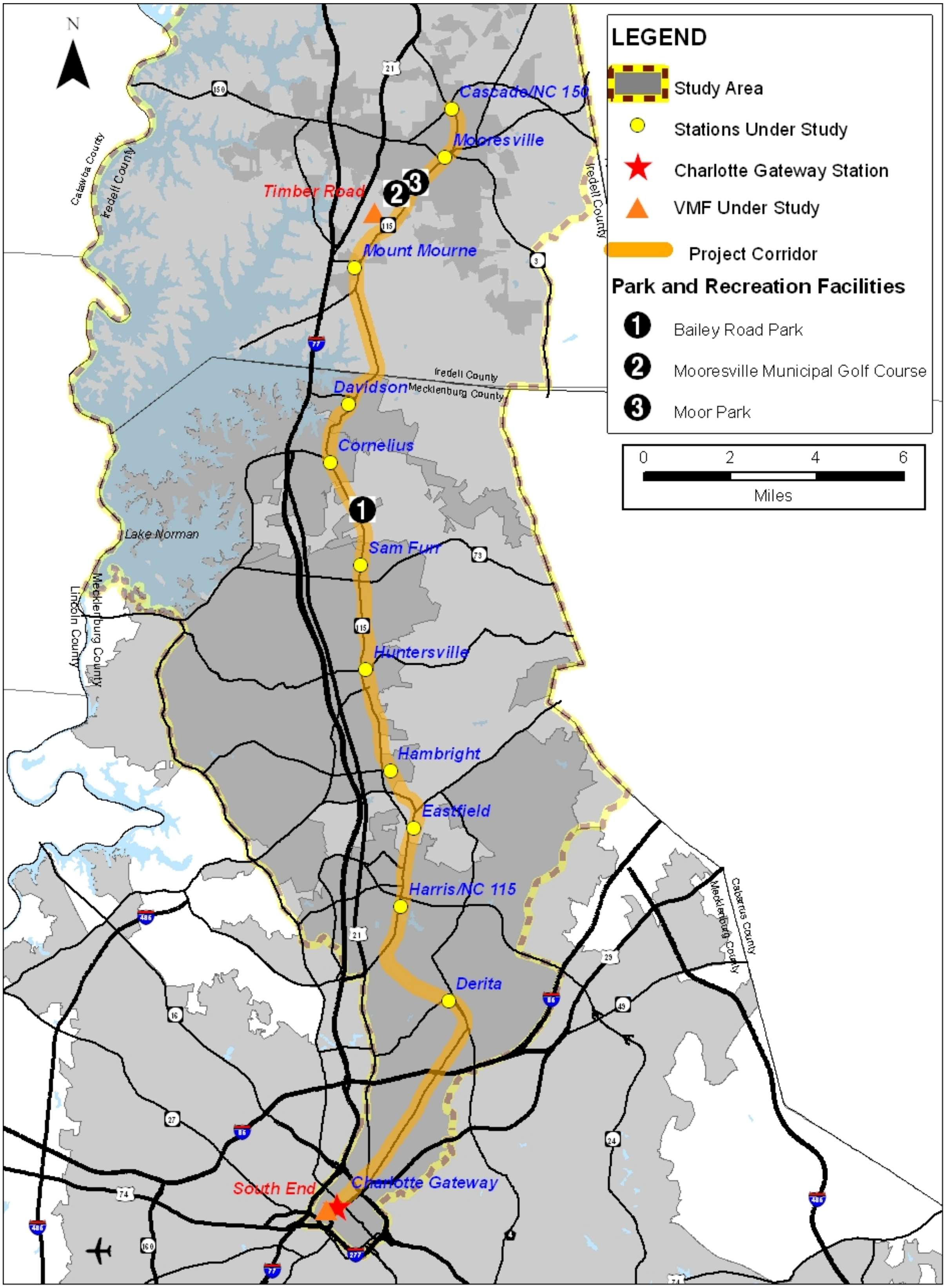

Figure 3.11-1	Parks and Recreation Facilities

3.11.4 Environmental Impacts and Benefits

Table 3.11-2 summarizes the relationship of parks and recreation facilities that are immediately adjacent to or within 300 feet of the existing rail centerline. The NCCR Build, TSM and No-Action alternatives would have no 4(f) use of the Mooresville Municipal Golf Course or the Moor Park facility. The NCCR TSM and No-Action alternatives would have no 4(f) use of the Bailey Road Park facility. A further discussion of the 4(f) consequences for the Bailey Road Park facility is provided in section 3.11.5 De Minimis Impacts.

Table 3.11-2. Parks and Recreation Areas Impacts

Alternative	Park or Recreation Facility	Owner-ship	Relationship to NCCR[1]
All Build Alternatives	Bailey Road Park	Public	The park property line follows the railroad centerline. The NCCR project would add a second track on the east side of the existing track for a siding. A portion of a walking path is approximately 60 feet from the railroad centerline. The closest ball field is approximately 110 feet from the railroad centerline. The ball field is fenced. Minor impact.
LPA Only	Mooresville Municipal Golf Course	Public	Two fairways are adjacent to the railroad. The course property line is approximately 50 feet from the railroad centerline. The NCCR project would use the existing track. No impact.
LPA Only	Moor Park	Public	The park property line is approximately 50 feet from the railroad centerline. The perimiter of the park is enclosed by fencing. South Broad Street is between the railroad and the park property. No impact.

Source: Mecklenburg and Iredell County 2005 GIS; Parsons Brinckerhoff
[1] Both the TSM and No-Action Alternative would have no impact on these park and recreation areas.

3.11.4.1 Bailey Road Park

Bailey Road Park is located between NC 73 (Sam Furr Road) and downtown Cornelius on the east side of the railroad. To access the park, visitors must cross the railroad from NC 115 (Old Statesville Road) or Bailey Road. Bailey Road currently dead ends to the east of the park, but the long-range plan is to extend the road to Davidson-Concord Road. This will provide additional access to the park. Parking is available on site and would not be affected by the NCCR project. The railroad centerline is the western property line of the park. The park is not fenced but the ball fields are surrounded by fencing. There is a walkway that circulates through the park that has a section near the railroad. The section of walkway closest to the railroad is approximately 60 feet form the rail centerline. The NCCR project would add a second track on the east side of the existing track for a siding. The distance between the track and the park amenities would be reduced to approximately 30 feet.

3.11.4.2 Mooresville Municipal Golf Course

Mooresville Municipal Golf Course is located on the west side of the railroad at the south end of the Town of Mooresville. The main access to the course is off West Wilson Avenue. Visitors coming from the east side of the railroad have several options for crossing to reach the course. Parking is available on site and would not be affected by the NCCR project. The two fairways that are adjacent to the railroad are partially screened from the railroad by trees and other vegetation. The NCCR project would use the existing track bed. The distance between the track and the course amenities would not change.

3.11.4.3 Moor Park

Moor Park is located west of the railroad on the northwest corner of West Lowrance Avenue and South Broad Street in Mooresville. The main access is from South Broad Street or South Academy Street. Visitors coming from the east side of the railroad have several options for crossing to reach the park. Parking is available on site and would not be affected by the NCCR project. South Broad Street runs between the railroad and the park property. The NCCR project would use the existing track bed. The distance between the track and the park amenities would not change.

3.11.4.4 Greenways and Bikeways

No existing bikeways or greenways would be affected by the NCCR. There are several planned greenways and bikeways in the project area. The NCCR project's effects on these are described in Chapter 4. The Town of Cornelius has a plan showing two greenways crossing the railroad at locations that are not in conjunction with an existing rail crossing. It is unlikely that NS would permit such a use of an active railroad because it would provide greater incentives for people to walk on the track or cross the tracks at locations between formal crossings.

Other planned greenways that approach, but do not cross, the railroad have complementary bikeway connectors that cross the railroad. Most of these proposed bikeway crossings, which are on existing or proposed roadways, are being accommodated in the design of the railroad crossings. Some planned bikeways are in conjunction with new roadways or roadways that are being widened or improved beyond the opening year of service. In these cases, the provision of bikeways will be incorporated with the roadway project.

3.11.4.5 Section 6(f) Resources

Two of the parks or parks facilities listed in Table 3.11-2 were funded with LWCF, known as Section 6(f) funds. The Mooresville Municipal Golf Course and Moor Park both approximately 50 feet from the NCCR line, were purchased with these federal funds but would not be affected by trackwork, stations, or construction activities.

3.11.4.6 Non 4(f) Park Resources

The Fairstone residential development off Hewitt Avenue in Derita has a small (0.38 acre) privately owned park. There is no formal parking for the park. The park can be accessed by a sidewalk leading from the Fairstone development. The railroad centerline is approximately 80 feet from the eastern property line of the park. The park is not fenced but there is a separate wooded parcel between the park and the railroad. There is no anticipated acquisition or taking of this property under any of the NCCR alternatives.

3.11.5 Section 4(f) De Minimis Impacts

Section 6009(a) of the SAFETEA-LU 2005, PL 109-59 amended the Section 4(f) legislation at Section 138 of Title 23 and Section 303 of Title 49 to simplify the processing and approval of projects that have only *de minimis* impacts on lands protected by Section 4(f). An impact to a park, recreation area, wildlife refuge or waterfowl refuge may be determined to be *de minimis* if the transportation use of the Section 4(f) resource, including consideration of impact avoidance, minimization, mitigation and enhancement measures does not adversely affect the activities, feature, and attributes that qualify the resource for protection under Section 4(f).

Bailey Road Park is adjacent to the existing rail alignment. The railroad centerline is the western property line of the park. The park is not fenced but the ball fields are surrounded by fencing. There is a walkway that circulates through the park that has a section near the railroad. The section of walkway closest to the railroad is approximately 60 feet from the rail centerline. The NCCR project would add a second passing track on the east side of the existing track for a siding. The distance between the centerline of the new passing track and the park walkway would be reduced to approximately 46 feet.

According to the Mecklenburg County assessor's files and available mapping, the existing railroad occupies property on Bailey Road Park (the Town of Cornelius). However, the occupation of that property and use of that property for railroad purposes has been permitted under an act of the North Carolina state legislature dating back to 1855 when the legislature granted "Charter Rights" to the railroad. The Charter Rights provide the railroad an undefined right of use for railroad operations which historically have included freight and passenger service. Technically, the NCCR Build alternative action to provide a second siding track on the east side of the existing track could be broadly interpreted as a use (taking) of the public park property. On the other hand a legal argument could be made that commuter rail service improvements are simply an exercise of the right of use conveyed by the State of North Carolina back in the mid 19^{th} century, long before the park or the Town of Cornelius existed. Historic mapping in the area indicates an industrial railroad siding existed in this area south of Bailey Road. The industrial siding has been removed.

Technical and legal discussions notwithstanding, SAFETEA-LU and the provisions of *de minimis* 4(f) determinations afford a working solution for Bailey Road Park. The following discussion provides measures to avoid, minimize, and mitigate Bailey Road Park impacts. Additionally coordination efforts with Town of Cornelius officials who exercise jurisdiction over the park are documented.

The authorities in charge of park and recreation resources for the Town of Cornelius are the Parks Commissioners. The executive arm of the Parks Commission is Mr. Paul Herbert, Director, Cornelius Parks and Recreation Department. On February 14, 2006 NCCR project team members met with Mr. Herbert, as well as Ms. Karen Floyd (Cornelius Planning Director) and Mr. Jason Abernathy (Cornelius Senior Planner). The Bailey Park issue was discussed with respect to Section 4(f) issues, the Norfolk Southern Right of Use and the proposed expansion of the existing trackage to accommodate commuter rail service. After reviewing the mapping and field conditions, Mr Herbert concluded that the proposed NCCR project impacts upon Bailey Park would not adversely affect the activities, features and attributes that qualify Bailey Park as a 4(f) resource. Later that day, Mr Herbert provided, in writing, the following statement, copying all members of the Parks Commission, the Town Manager (Anthony Roberts), Karen Floyd and Jason Abernathy:

> *"We discussed the proposed transit line and its impact upon Bailey Road Park. We understand that there will be another parallel rail line which will be 14 feet off the centerline of the existing track. We discussed your calculations that the track bed on the park side will be 40 feet from the existing park multi-purpose trail. We discussed the federal 4(f) requirements as they relate to parks, cultural amenities and historic properties and agreed that the impact upon the park is "de minimis" (minimal). We agreed that CATS would mitigate the proximity of rail line to the park by paying for appropriate fencing and landscaping from south of Bailey Road along portions of the park abutting the rail line as required to address safety and recreational concerns."*

3.11.6 Coordination and Mitigation

3.11.6.1 Coordination

During preparation of the environmental documentation, CATS representatives held the following coordination meetings with park and recreation area departments:

- Mecklenburg County Park and Recreation Department. A meeting with the Mecklenburg County Park and Recreation Department (Julie Clark and Joyce Figueroa) was held on August 22, 2005. The locations of existing and future parks and greenways in the vicinity of the NCCR project were identified. The design plans and potential impacts to the parks and greenways were discussed.

- Charlotte Department of Transportation. A meeting with CDOT Bicycle Coordinator, Ken Tippet was held on August 23, 2005. The locations of existing and future bike facilities in the vicinity of the NCCR project were identified. The design plans and potential impacts to the bike facilities were discussed.

- Town of Cornelius. A meeting with the Cornelius Director of Parks and Recreation, Paul Herbert was held on August 24, 2005. The locations of existing and future bike facilities in the vicinity of the NCCR project were identified. The design plans and potential impacts to the bike facilities were discussed. A second meeting with Mr Herbert was held on February 14, 2006 to review NCCR rail alignment options with respect to Bailey Road Park and potential Section 4(f) use of the park.

- Town of Huntersville. A meeting with the Huntersville Transportation Planner, Bill Coxe and Operations Manager of the Huntersville Parks and Recreation Department, Michael Jaycocks was held on August 25, 2005. The locations of existing and future bike facilities in the vicinity of the NCCR project were identified. The design plans and potential impacts to the bike facilities were discussed.

Coordination with park officials would continue during the preparation final design.

3.11.6.2 Mitigation

Park mitigation would include a security fence and landscaping for Bailey Road Park between the existing multi-use trail and the proposed passing siding to the east of the existing railroad tracks. Where feasible, bike lanes may be accommodated during grade crossing upgrades if provisions for bike facilities are called for in locally approved plans and the phasing of the roadway improvements is consistent with the improvements being implemented at the grade crossing. Additional facilities may be provided if feasible to link bike facilities to proposed stations.

3.12 Hazardous Materials/Underground Storage Tanks

3.12.1 Legal and Regulatory Framework

Several federal laws regulate the handling of hazardous materials and wastes. These include the Resource Conservation and Recovery Act of 1976, the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA or Superfund Act) of 1980, the Superfund Amendments and Reauthorization Act of 1986, Toxic Substances Control Act and Hazardous and Solid Waste Amendments of 1984. The EPA driven Brownfields Initiative, where cleanup and re-use of contaminated properties is funded through EPA, local and private incentives. The early detection, evaluation and remediation of hazardous waste to protect the environment and minimize project delay is encouraged.

3.12.2 Methodology

The analysis of hazardous materials and underground storage tanks (USTs) included the following activities:

- reviewing existing environmental data prepared for the MIS;
- gathering and interpreting information from the public record not addressed in previous reports of the proposed project;
- conducting interviews with environmental agency representatives, NS representatives and selected others;
- performing a visual reconnaissance of the right-of-way, proposed station sites, and VMF;
- preparation of a written report of findings, opinions and recommendations.

The project area includes a 100-foot wide buffer around the centerline of the existing tracks, and an area extending up to 600 feet beyond the limits of the 11 proposed stations north of the CGS. Hazardous materials and USTs associated with the CGS project are not included in this analysis. The CGS project is expected to be funded in part with federal appropriations through the FTA. Accordingly, a separate EA under NEPA is underway for the CGS.

The following federal and state databases for known sites of environmental contamination or generators of hazardous materials were reviewed:

- National Priority List
- Proposed National Priority List Sites
- Comprehensive Environmental Response, Compensation and Liability Information (CERCLIS).
- CERCLIS No Further Remedial Action Planned Sites
- Corrective Action Report (CORRACTS)
- Resource Conservation and Recovery Information System
- Emergency Response Notification System
- NC Inactive Hazardous Sites Inventory
- NC List of Solid Waste Facilities
- NC Leaking Underground Storage Tank (LUST) Sites
- NC Registered Underground Storage Tank Sites

- NC Old Landfill Inventory
- NC Responsible Party Voluntary Action Sites
- NC Brownfields Projects Inventory

The database search results were compared to those presented in the MIS technical report. In addition, city directories were reviewed to identify former occupants of selected addresses within the project area whose name may indicate an involvement with hazardous materials and Sanborn fire insurance maps to identify historical land uses that may have involved the use of hazardous materials or USTs.

Identified environmental conditions along the North Corridor were evaluated using the following criteria:

- Distance to the station and/or the rail line;
- Levels of documented soil and/or groundwater impact;
- Visual evidence of a release or suspected environmental condition;
- Suspected or documented groundwater and surface water flow direction;
- Suspected or documented depth to groundwater;
- Property/incident abuts the rail line and/or station; and
- Special circumstances, i.e. age of business, nature of business, prior history

Train station construction notwithstanding, most of the track improvements along the 30 mile corridor will take place on the existing NS track alignment and track bed. The construction technique is minimally invasive in terms of excavation, dust, noise and disturbance of natural and man-made features. The construction involves the use of rail mounted equipment and includes the replacement of existing ties and rail. In limited areas a portion of the existing railroad bed will be removed and/or replaced. There is little, if any, excavation of soils and no disturbance of groundwater anticipated. Subsequently, the descriptions provided in this section, where further investigation is suggested (e.g. soil or groundwater sampling), are provided for due diligence and do not necessarily signal that a problem with contaminated soils or groundwater actually exists or if proven to exist would be exacerbated by the proposed construction of the commuter rail facility and the accompanying stations. As not enough is known at this time regarding the actual conditions and a precise footprint for the train stations has yet to be developed, a Phase II hazardous material survey will be conducted where appropriate during the design phase to pinpoint actual conditions and determine appropriate mitigation strategies.

3.12.3 Existing Conditions and Resources

The results of the Hazardous Material and UST Study assessment indicated 31 Areas of Concern (AOCs) at eight of the stations: Derita (5), Hambright (1), Huntersville (1), Cornelius (4), Davidson (3), Mount Mourne (2), Mooresville (9) and Cascade/NC 150 (6). These AOCs represent either documented, apparent or potential releases of chemicals to soil or groundwater, on or near the stations that may affect construction activities. Sites and facilities determined not likely to impact the stations or rail line are summarized in Table II-1 and Table II-2, Appendix II of the Hazardous Waste/UST Study and Hydrocarbon Assessment.

Between the stations along the rail line, twelve AOCs were identified, based on documented, observed, or suspected environmental conditions along or nearby that have the potential for impacted soil to be encountered during repair or construction activities along the rail line. Sites with potential groundwater impact along or near the rail line were not considered AOCs in that the potential to encounter the groundwater during rail line repair/construction along the rail line is low.

3.12.4 Environmental Impacts and Benefits

The results of the Hazardous Materials and UST Study revealed AOCs along the rail line right-of-way and the vicinity of the proposed station locations which may adversely affect the construction of the proposed North Corridor project. The AOCs are discussed below, with locations indicated on Figure 3.12-1.

As the rail line is not expected to undergo major excavations, groundwater impact is not likely to be encountered. Exceptions may include bridge abutments and stormwater drainage areas.

3.12.4.1 Stations

As mentioned in Section 3.11.3, there are 31 AOCs at eight of the stations. These AOCs require additional environmental investigations, such as soil and/or groundwater sampling.

3.12.4.2 Rail Line

Along the rail line, twelve (12) AOCs were identified, based on documented, observed, or suspected environmental conditions along or nearby that have the potential for impacted soil to be encountered during repair or construction activities along the rail line. Additional environmental services, including soil sampling, are recommended to address these AOCs. Sites with potential groundwater impact along or near the rail line were not considered AOCs in that the potential to encounter the groundwater along the rail line is low.

3.12.4.3 Vehicle Maintenance Facilities

The two VMFs under study in the environmental documentation are located near Timber Road in Iredell County (Timber Road VMF) and near the CGS in Center City Charlotte (South End VMF). No AOCs were identified for the Timber Road VMF. The review of South End VMF site was documented under a separate technical report (*Phase I ESA, Norfolk Southern Property - Potential CATS Multimodal Site – West 4th Street, Hart & Hickman, April 25, 2005*). Six (6) recognized environmental conditions (RECs) and five (5) potential environmental concerns (PECs) were identified associated with the South End VMF. These environmental conditions and concerns are summarized in Table 3.12-4 at the end of this section.

3.12.4.4 Station and Rail Line AOC Summary

Below is a summary of the 43 AOCs identified within the station areas and along the rail line.

<u>North of Gateway</u>

HM 1 – Amtrak/Parking Lot: Releases at the site impacted soil and groundwater with petroleum and chromium. Chromium concentrations within 15 feet of the tank are elevated. Soils removed during line repairs/construction may require special handling and disposal at a licensed facility. Soil sampling would be recommended along this area of the line where soils would be removed or disturbed.

HM 2 – Multi Tenant Warehouse: Release at this site impacted soil and groundwater with petroleum and groundwater with chlorinated solvents. The location of the source of chlorinated solvent is not known. The petroleum release from was an orphan UST located approximately 50 feet from the rail line. Additional warehouse operations along the rail line could have impacted soil and groundwater along the rail line. Soil sampling is recommended.

HM 3 – First Restoration Services: Stormwater pipes are located beneath the rail line and open to the surface along the line. Paint was observed at the outfall. Soil sampling is recommended.

Graham Street

HM 4 – Eckerd Distribution: Along the rail line, there is a pile of unknown material, suspected to be lime or fertilizer, from a drum. Sampling of the material and underlying soil is recommended.

HM 5 – Old Rail Road Line/Ditch: Adjacent to and along the rail line, there are large quantities of household and construction debris, several 55-gallon drums of unknown material and one large aboveground storage tank (AST). Possible releases of chemicals from these items could impact soil and possibly groundwater at the site. The material may also require special handling and disposal. Removal of the items and soil sampling is recommended.

HM 6 – Baker Equipment: There is documented petroleum impact to soil and groundwater within the rail line ROW. Soil sampling is recommended.

HM 7 – Joey's Truck & Auto: There are several buckets of petroleum lubricant and one apparent waste oil AST near the rail line, with obvious petroleum stained soil. Soil sampling is recommended.

HM 8 – Auto World: Obvious petroleum stained soil was observed near the rail line. Soil sampling is recommended.

Derita Station Area

HM 9 – Landscaper Equipment Garage (#5); Photo S18 - Sheet 4: The site is located in the northwest corner of Gibbon and Nevin roads. There are no reported releases at this site. The site reconnaissance indicated the presence of two large above ground, presumed petroleum, storage tanks. Impact to the station and parking area is not likely since the site is downgradient from the proposed station and parking area.

HM 10 – Express Stop II: The site is located in the southwest corner of Gibbon and Nevin roads. There are no reported releases from this petroleum UST site. Impact to the station and parking area is not likely since the site is downgradient from the proposed station and parking area.

HM 11 – Unocal/Derita 66/Handy Pantry/Dwyer's Auto: The site is located southwest of the station, and is currently a petroleum UST site and auto repair facility with a documented historical release that impacted soil and groundwater with petroleum. Chlorinated solvents have also been reported in the groundwater at this site. Remediation activities were ceased after a variance to the state groundwater quality standards was granted by the NCDENR. Petroleum impacted soil and groundwater remain at the site from that release. In addition, the site reconnaissance indicated spillage of petroleum at various locations on the sites. Impacted groundwater from this site is not likely to impact the proposed station area.

HM 12 – Greasy's Truck Repair: The site is located in the northeast corner of Gibbon and Nevin roads. The site reconnaissance indicated the presence of several drums of gear oil near the rail line that could impact soil along the rail line. Impact to the proposed station and parking area is unlikely.

HM 13 – Delta Unit Rebuilders: The site is located in the northeast corner of Gibbon and Nevin roads. Although there are no reported releases at this site, the site reconnaissance indicated the presence of a large and apparent saddle for an above ground storage tank. The site is listed as a hazardous waste generator.

HM 14 – Derita Volunteer Fire Department: A documented release of petroleum from a UST remains near the rail line. Soil was excavated to the state cleanup levels, however, soil adjacent to or beneath the rail line may contain detectable levels of petroleum, which would required special handling and disposal if removed or disturbed. Soil sampling is recommended if repairs in this area are needed.

North of Derita

HM 15 – Viking Turf: Adjacent to and along the rail line, there are large quantities of construction and landscaping debris, including several 55-gallon drums and 2 ASTs. Apparent petroleum stained soils were observed at the toe of the rail line bed. Other types of contaminants may be present. Removal of these items and soil sampling is recommended.

Hambright Station Area

HM 16 – Drainage Feature: West of the station, construction and household debris was observed in a drainage feature during the site reconnaissance. The debris could be located outside the new rail line and station area, however, the actual location of the new line and station were not apparent during the site reconnaissance. The debris does not pose a likely environmental concern regarding the release of chemical, however, the removal and disposal of the debris may be necessary.

Huntersville Station Area

HM 17 – N. Main Auto Repair: The site is located in the northeast corner of the parking area immediately west of the station, and is currently an auto repair facility. There is no documented release from this site. However, releases of petroleum and metals are often associated with this type of facility. Soil and possible groundwater sampling is recommended at the station site.

Cornelius Station Area

HM 18 – Twinsboro Amoco Service Station: The site is located upgradient of the station and is currently an auto repair facility. There is no documented release from this site. However, releases of petroleum could impact groundwater at the station. Groundwater sampling is recommended at the station site.

HM 19 – Crowder Construction Site: The site is located within the parking area and is used for the temporary storage of construction equipment, including an above ground diesel tank, with apparent spillage of petroleum to the land surface observed during the site reconnaissance. Soil sampling is recommended for this site.

HM 20 – Cashion's Quick Stop 4: The site is located west of the station and has petroleum USTs, but no reported release. A release from those USTs could impact groundwater at the station site. Groundwater sampling would be recommended if groundwater is likely to be encountered during construction activities.

HM 21 – Cornelius Town Hall & Town Center Project: The site is located northwest of the station and has a reported petroleum release. Impact to the groundwater at the station site is possible, although remote. Groundwater sampling would be recommended if groundwater is likely to be encountered during construction activities.

Davidson Station Area

HM 22 – Cashion's BP Station: The site is located southeast and upgradient of the southern parking area. The USTs at this site have been removed. A petroleum release from those USTs impacted soil and groundwater, and residual contamination is reported to exist. Impacted groundwater from that site could impact the groundwater at the parking area. Groundwater sampling would be recommended if groundwater is likely to be encountered during construction activities.

HM 23 – Former Gas Tank: The site is located northeast and upgradient of the station. The UST at this site has been removed. A possible petroleum release from that UST could impact groundwater at the station site. Groundwater sampling would be recommended if groundwater is likely to be encountered during construction activities.

HM 24 – Guano Warehouse: The site is located at the proposed station site. Based on previous operations, there may be impacts to soil and groundwater from nitrates and phosphates. Soil sampling is recommended. Groundwater sampling would also be recommended if groundwater is likely to be encountered during construction activities.

HM 25 – Auto Electric: Tar and paint were observed along the rail line that may have impacted soil at this site. Soil sampling is recommended.

<u>Mount Mourne Station Area</u>
HM 26 – Ditch on Line ROW: There are several empty 55-gallon drums, one empty 5-gallon bucket and various household and construction debris along the rail line. There was not visible evidence of a release; however, removal of the debris is recommended. Soil sampling is recommended if repairs or construction activities are performed in the area.

HM 27 – Moser Brothers Truck & Auto: The site is located south and sidegradient of the parking area and possibly upgradient of the rail line. Several drums of unknown contents and a presumed waste oil AST are located on this site. Releases of chemicals at this site could impact soil and groundwater along the rail line. No surface releases were observed during the site reconnaissance. Groundwater sampling would be recommended if groundwater is likely to be encountered during construction activities.

HM 28 – Abandoned Gas Station: The site is located southeast and side gradient of the parking area and upgradient of the rail line. The USTs may remain at the site. A petroleum release from those USTs could impact groundwater at the parking area and rail line. Groundwater sampling would be recommended if groundwater is likely to be encountered during construction activities.

<u>Mooresville Station</u>
HM 29 – Nantz Garage & Repairs: The site is located east and level with of the rail line. There is no documented release at this site. However, prior operations could have impacted soil and groundwater. Groundwater sampling would be recommended if groundwater is likely to be encountered during construction activities.

HM 30 – Moor Service Station/Glaspy's Texaco: The site is located east and level with rail line, and has a documented petroleum UST release indicated to have impacted soil and groundwater. Free product is reported in the storm drains that could impact soil near the rail line. The site reconnaissance revealed a surface release from a waste oil AST. Soil and groundwater sampling would be recommended repairs to the rail line are necessary and if groundwater is likely to be encountered during construction activities.

HM 31 – Orkin Exterminating: The site is located southeast and upgradient of the station. There is no documented release at this site. However, previous operations could have impacted soil and groundwater with various chemicals. Soil sampling is recommended and groundwater sampling would be recommended if groundwater is likely to be encountered during construction activities.

HM 32 – Pike's Gulf/Citgo/BP: The site is located south and adjacent to the parking area, but downgradient of the rail line. The USTs installed in 1966 remain at the site. There is no documented release from the USTs, however, a release could impact soil and groundwater at the parking area. Soil sampling is recommended and groundwater sampling would be recommended if groundwater is likely to be encountered during construction activities.

HM 33 – Mayhew's Cleaners: The site is located east and upgradient of the parking area, and was once an Auto Service Station with petroleum USTs. There is no documented release at this site. However, previous operations could have impacted soil and groundwater with petroleum and dry cleaning solvents. Groundwater sampling would be recommended if groundwater is likely to be encountered during construction activities.

HM 34 – Former City Dry Cleaners: The site is located within the parking area that is currently covered with asphalt pavement. Possible releases of dry cleaning solvents could have impacted soil and groundwater beneath the site. Soil and groundwater sampling is recommended.

HM 35 – McNeely's Esso/Exxon Station/CVS Pharmacy: The site is located east and upgradient of the parking area, and has a documented petroleum UST release indicated to have impacted soil and groundwater. Historically, a fertilizer store was located at this site, with possible impact to soil and groundwater from various agricultural chemicals. Groundwater sampling would be recommended if groundwater is likely to be encountered during construction activities.

HM 36 – Mooresville Ford Mercury: The site is located north and adjacent to the parking area. A documented petroleum UST release was indicated to have impacted soil. Soil sampling is recommended and groundwater sampling would be recommended if groundwater is likely to be encountered during construction activities.

HM 37 – Lowe's Equipment/Mooresville Motors: The site is located northeast of the Mooresville Ford Mercury, and has a documented petroleum UST release indicated to have impacted soil and groundwater. Groundwater sampling would be recommended if groundwater is likely to be encountered during construction activities.

Cascade/NC 150 Station

HM 38 – Residence: The residence is located on the site. There are no documented releases at this residence. However, the residence could have used underground heating oil tanks for heating purposes, which may have released heating oil to the soil and groundwater. The presence of USTs could not be confirmed at the time of our site reconnaissance. Soil and possible groundwater sampling is recommended for those sites with existing or former heating oil USTs.

HM 39 – Tanning and Fitness Business: There was no city directory coverage for this area, and the historical use of the property could not be ascertained. Soil and possible groundwater sampling may be recommended if additional information regarding the historical and present use of chemicals and site operations is obtained.

HM 40 – Residence: The residence is located on the site. There are no documented releases at this residence. However, the residence could have used underground heating oil tanks for heating purposes, which may have released heating oil to the soil and groundwater. The presence of USTs could not be confirmed at the time of our site reconnaissance. Soil and possible groundwater sampling is recommended for those sites with existing or former heating oil USTs.

HM 41 – Glass Installation Business: There was no city directory coverage for this area, and the historical use of the property could not be ascertained. Present glass operations may include the use of chemical. Soil and possible groundwater sampling may be recommended if additional information regarding the historical and present use of chemicals and site operations is obtained.

HM 42 – Residence: The residence is located on the site. There are no documented releases at this residence. However, the residence could have used underground heating oil tanks for heating purposes, which may have released heating oil to the soil and groundwater. The presence of USTs could not be confirmed at the time of our site reconnaissance. Soil and possible groundwater sampling is recommended for those sites with existing or former heating oil USTs.

HM 43 – Residence: The residence is located on the site. There are no documented releases at this residence. However, the residence could have used underground heating oil tanks for heating purposes, which may have released heating oil to the soil and groundwater. The presence of USTs could not be confirmed at the time of our site reconnaissance. Soil and possible groundwater sampling is recommended for those sites with existing or former heating oil USTs.

Table 3.12-1 lists the potential hazardous material sites with a rating of known or possible impacts to soils and groundwater. Below describes the type of anticipated impact by rating value:

1: Offsite, not known, known or possible impacted soil remote from site, low possible contact.

   Offsite, side to downgradient possible but not known impacted groundwater, low possible contact.

2: Onsite, possible impacted soil or groundwater from possible but not confirmed source, and contact possible.

   Offsite, upgradient or adjacent possible or apparent impacted soil, and possible contact if site work performed.

   Offsite, upgradient or adjacent possible impacted groundwater, and possible contact if site work extends to groundwater.

3: Onsite, known or likely impacted groundwater, and contact if site work extends to groundwater.

   Onsite, apparent or possible impacted soil, and contact if site work performed.

   Offsite, known adjacent or upgradient impacted groundwater, and contact likely if site work extends to groundwater.

4: Onsite, known impacted soil and groundwater, and contact if site work performed.

Table 3.12-1. Potential Hazardous Material Sites

No.	Business Name/Location Type	Soil Impact	Ground-water Impact
HM 1	Amtrak/ Parking Lot	3	1
HM 2	Multi Tenant Warehouse	4	2
HM 3	First Restoration Svcs	3	1
HM 4	Eckerd Distribution Ctr	3	1
HM 5	Old RR Line/ Ditch	3	2
HM 6	Baker Equipment	3	2
HM 7	Joey's Truck & Auto	4	1
HM 8	Auto World	4	1
HM 9	Landscaper Equipment Garage	1	1
HM 10	Express Stop II	1	1
HM 11	Unocal/ Derita 66/ Handy Pantry/ Dwyer's Auto	1	1
HM 12	Greasy's Truck Repair	3	2
HM 13	Delta Unit Rebuilders	1	1
HM 14	Derita Vol. Fire Dept.	3	1
HM 15	Viking Turf	4	1
HM 16	Drainage feature	2	2
HM 17	N. Main Auto Repair	2	2
HM 18	Twinsboro Amoco Svc Station	2	2
HM 19	Crowder Construction	4	2
HM 20	Cashion's Quick Stop 4	1	2
HM 21	Cornelius Town Hall & Town Center Project	2	3
HM 22	Cashion's BP Station	1	3
HM 23	Former Gasoline Tanks	1	2
HM 24	Guano Warehouse	3	3
HM 25	Auto Electric	3	1
HM 26	Ditch on Line ROW	2	1
HM 27	Moser Brothers Truck & Auto	1	2
HM 28	Abandoned Gas Station	1	2
HM 29	Nantz Garage & Repair	1	2
HM 30	Moor Service Station/ Glaspy's Texaco	2	2

Table 3.12-1. Potential Hazardous Material Sites (continued)

No.	Business Name/Location Type	Soil Impact	Ground-water Impact
HM 31	Orkin Exterminating	2	2
HM 32	Pike's Gulf/ Citgo/ BP	2	2
HM 33	Mayhew's Cleaners	1	2
HM 34	Former City Dry Cleaners	3	3
HM 35	McNeely's Esso/ Exxon Station/ CVS Pharmacy	1	3
HM 36	Mooresville Ford Mercury	3	2
HM 37	Lowe's Equipment/ Mooresville Motors	1	2
HM 38	Residence	2	2
HM 39	Tanning and Fitness Business	1	1
HM 40	Residence	2	2
HM 41	Glass Installation Business	2	2
HM 42	Residence	2	2
HM 43	Residence	2	2

Source: S&ME, 2005

1: Offsite, not known, known or possible impacted soil remote from site, low possible contact.
Offsite, side to downgradient possible but not known impacted groundwater, low possible contact.

2: Onsite, possible impacted soil or groundwater from possible but not confirmed source, and contact possible.
Offsite, upgradient or adjacent possible or apparent impacted soil, and possible contact if site work performed.
Offsite, upgradient or adjacent possible impacted groundwater, and possible contact if site work extends to groundwater.

3: Onsite, known or likely impacted groundwater, and contact if site work extends to groundwater.
Onsite, apparent or possible impacted soil, and contact if site work performed.
Offsite, known adjacent or upgradient impacted groundwater, and contact likely if site work extends to groundwater.

4: Onsite, known impacted soil and groundwater, and contact if site work performed.

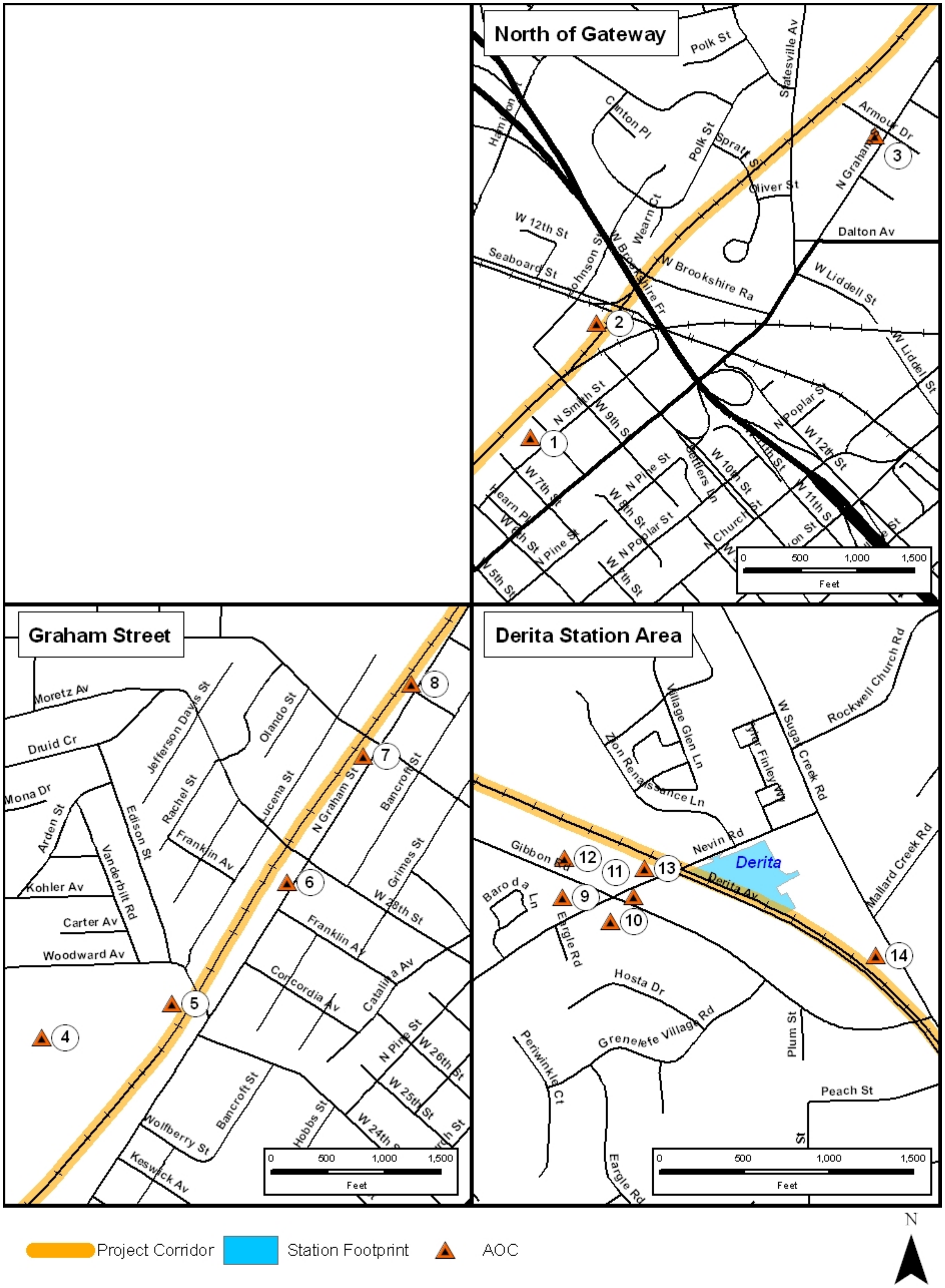

Figure 3.12-1a

HazMat AOC

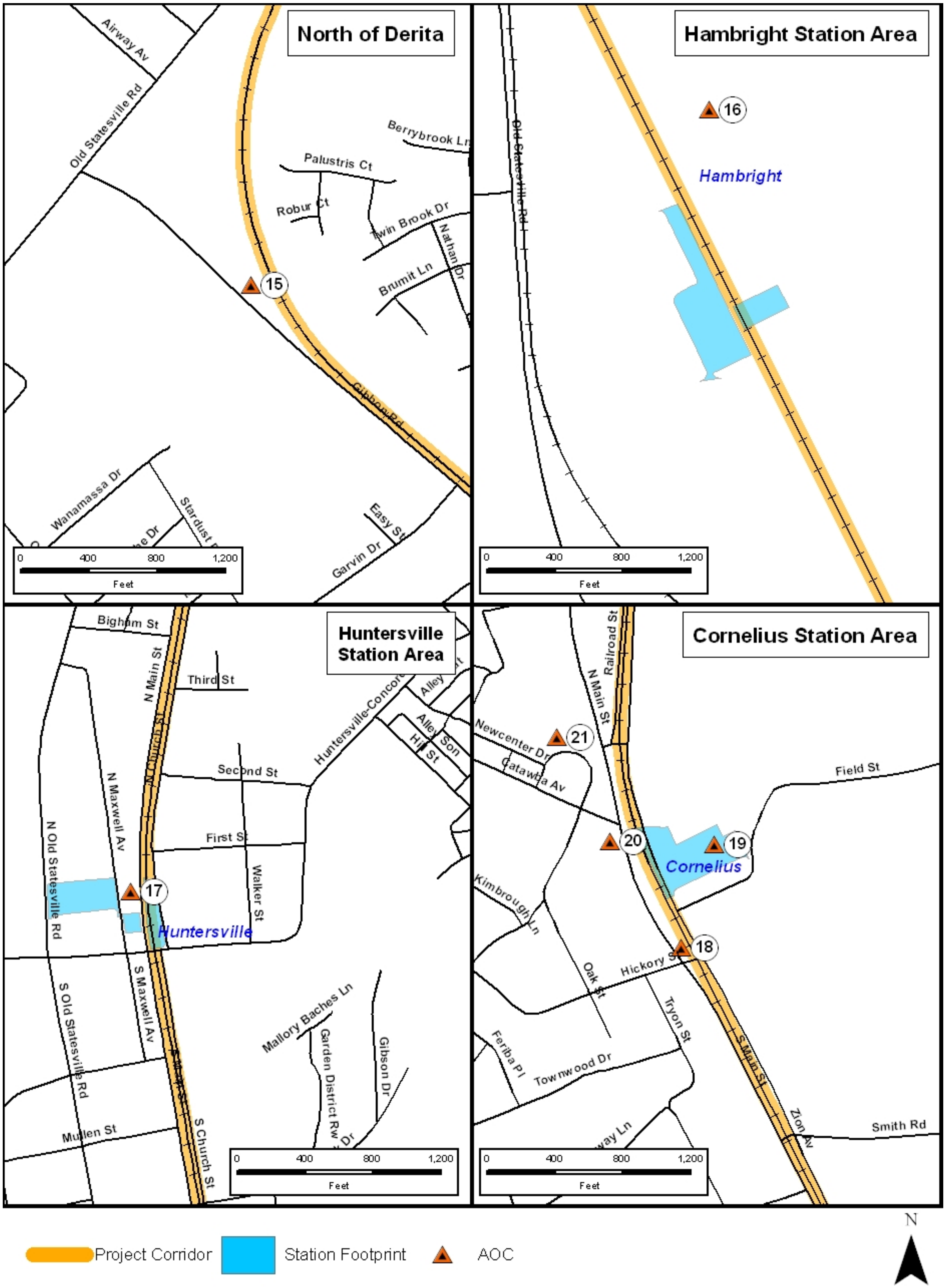

Figure 3.12-1b HazMat AOC

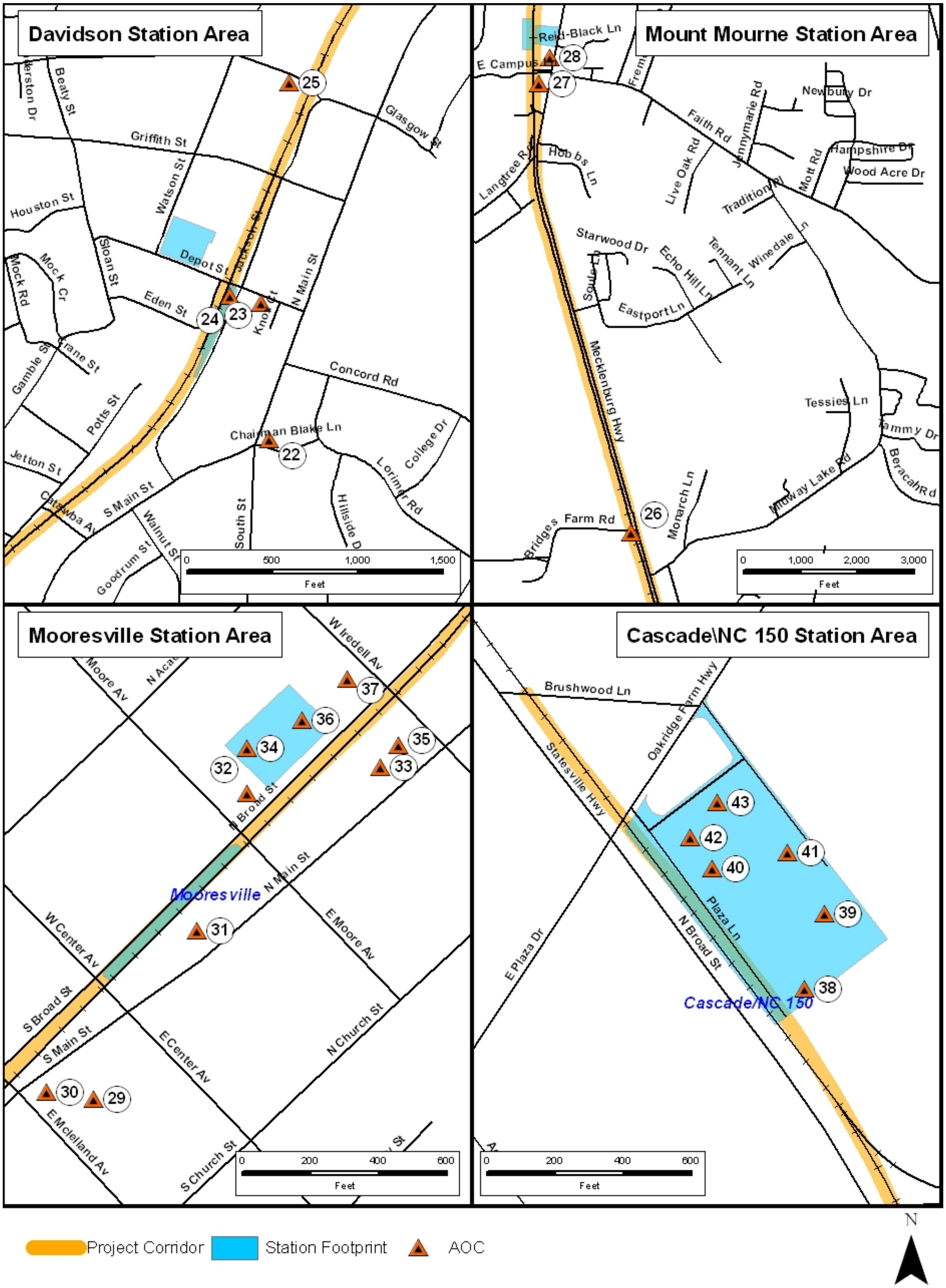

Figure 3.12-1c	HazMat AOC

3.12.4.5 AOC Summary by Station and Alternative

The number of sites within the 50-foot rail line right-of-way and an area extending up to 600 feet beyond the limits of the 11 proposed stations are illustrated by potential impact type in Table 3.12-2. These sites, plus the 12 sites associated with NCCR trackwork, are added together by alternative in Table 3.12-3. Sites associated with the VMF alternatives are described in Table 3.12-4.

The findings of the contamination screening and evaluation are based on preliminary information only and are not intended to replace more detailed studies, such as individual site assessments and subsurface soil and groundwater investigations. Rather, the screening is intended to be a guide for identifying potential contamination in the proposed NCCR corridor. Other technical studies may be required to determine the existence of site contamination prior to right-of-way acquisition, utility relocation, or stormwater pond construction. Potential contamination sites may extend beyond those identified in this report because of limited historical and regulatory information, illegal dumping practices, and a lack of compliance with storage tank registration and hazardous waste generator programs. Finally, the identification of a site in this report does not necessarily indicate that the site contains contamination, but only that there is the potential for contamination to occur.

Hazardous materials effects are discussed from the perspective of low-income and minority populations in Section 3.15 under Environmental Justice." The No-Action Alternative would have no effect on hazardous material or storage tank sites.

Table 3.12-2. Potential Hazardous Material Sites Near NCCR Stations

Station	Soil Impact				Groundwater Impact			
	(1) Low Possible Contact	(2) Possible Impacted	(3) Likely Impacted	(4) Known Impacted	(1) Low Possible Contact	(2) Possible Impacted	(3) Likely Impacted	(4) Known Impacted
Derita	4	0	1	0	4	1	0	0
Harris/ NC 115	0	0	0	0	0	0	0	0
Eastfield	0	0	0	0	0	0	0	0
Hambright	0	1	0	0	0	1	0	0
Huntersville	0	1	0	0	0	1	0	0
Sam Furr	0	0	0	0	0	0	0	0
Cornelius	1	2	0	1	0	3	1	0
Davidson	2	0	1	0	0	1	2	0
Mount Mourne	2	0	0	0	0	2	0	0
Mooresville	4	3	2	0	0	7	2	0
Cascade/ NC 150	1	5	0	0	1	5	0	0

Source: S&ME, 2005

1: Offsite, not known, known or possible impacted soil remote from site, low possible contact.
Offsite, side to downgradient possible but not known impacted groundwater, low possible contact.

2: Onsite, possible impacted soil or groundwater from possible but not confirmed source, and contact possible.
Offsite, upgradient or adjacent possible or apparent impacted soil, and possible contact if site work performed.
Offsite, upgradient or adjacent possible impacted groundwater, and possible contact if site work extends to groundwater.

3: Onsite, known or likely impacted groundwater, and contact if site work extends to groundwater.
Onsite, apparent or possible impacted soil, and contact if site work performed.
Offsite, known adjacent or upgradient impacted groundwater, and contact likely if site work extends to groundwater.

4: Onsite, known impacted soil and groundwater, and contact if site work performed.

Table 3.12-3. Potential Hazardous Material Sites by Alternative

Alternative	Soil Impact				Groundwater Impact			
	(1) Low Possible Contact	(2) Possible Impacted	(3) Likely Impacted	(4) Known Impacted	(1) Low Possible Contact	(2) Possible Impacted	(3) Likely Impacted	(4) Known Impacted
LPA	14	13	11	5	14	24	5	0
MOS	9	5	11	5	13	12	3	0

Source: S&ME, 2005

1: Offsite, not known, known or possible impacted soil remote from site, low possible contact.
Offsite, side to downgradient possible but not known impacted groundwater, low possible contact.

2: Onsite, possible impacted soil or groundwater from possible but not confirmed source, and contact possible.
Offsite, upgradient or adjacent possible or apparent impacted soil, and possible contact if site work performed.
Offsite, upgradient or adjacent possible impacted groundwater, and possible contact if site work extends to groundwater.

3: Onsite, known or likely impacted groundwater, and contact if site work extends to groundwater.
Onsite, apparent or possible impacted soil, and contact if site work performed.
Offsite, known adjacent or upgradient impacted groundwater, and contact likely if site work extends to groundwater.

4: Onsite, known impacted soil and groundwater, and contact if site work performed.

Table 3.12-4. Potential Hazardous Material Sites Near VMFs

VMF Site/ Type #	Description	Recommendation
South End		
REC 1	Former Smith Metal and Iron Hazardous Disposal Site. Metal and Polychlorinated biphenyl (PCB) impacted soil was removed prior to construction of Johnson and Wales University	Collection of soil samples from property to determine extent of site impact. Sample monitor well MW-A.
REC 2	Former railroad maintenance shop, roundhouse, turn table, and yard southwest of West 4th Street. Common sources of petroleum-related impacts and potential sources of metal, solvents, coal ash, and PCB impacts.	Collection of soil and ground water samples to evaluate potential impacts.
REC 3	Greyhound Bus Terminal. A leaking UST was removed. A UST and bus fuel area remain. Surface fuel spills have occurred. Soil impacts have been detected. No data found on ground water.	Collection of ground water samples if impacted ground water is a concern.
REC 4	Former Crowler textile mill, iron works, automobile shop, and machinery manufacturer. If ground water impacts have occurred they may extend beneath the property.	Collection of ground water samples if impacted ground water is a concern.
REC 5	Former Moffett Machinery elevator manufacturer and foundry between West 3rd Street and 4th Street. If ground water impacts have occurred they may extend beneath the property.	Collection of ground water samples if impacted ground water is a concern.
REC 6	Former Yarbrough and Bellinger scrap metal junkyard and foundry between West 2nd Street and West 3rd Street. If ground water impacts have occurred they may extend beneath the property.	Collection of ground water samples if impacted ground water is a concern.
PEC 1	713 W Trade Street ERNS spill site located downgradient but close to VMF site.	No recommended actions for a PEC
PEC 2	Former Southern Oil filling station on West Trade Street just east of railroad tract. If significant unreported release occurred there would be potential for impacted ground water to reach VMF site.	No recommended actions for a PEC
PEC 3 & 4	Proposed Arena Site "C" from Preliminary Environmental Study. Two USTs identified. If significant unreported release occurred from these USTs, there would be potential for impacted ground water to reach VMF site.	No recommended actions for a PEC
PEC 5	Textile Chemical and HM Wade Furniture Facilities located within and under the Bank of America Stadium complex. Presence of chlorinated volatile organic compounds in ground water near site. Proposed VMF is separated from ground water impacts by stream.	No recommended actions for a PEC
Timber Road	No Hazardous Materials Identified	

Source: S&ME, 2005

3.12.5 Mitigation

The analysis indicates that there are 43 AOC sites near or within the rail corridor and proposed station footprints and 5 REC sites near the proposed South End VMF. These sites provide potential sources of contamination that could have an adverse impact on both property acquisition and construction activities associated with the alternatives being considered for the NCCR.

These sites may require additional investigation during a Phase II Environmental Site Assessment. Recommended further investigations would occur prior to project right-of-way acquisition and construction to confirm and update information obtained from agency files and the public record. Select sampling of the soil and groundwater would be conducted at each site to help determine the absence or presence of contamination. If contamination is found, soil and groundwater investigations would be expanded to determine the actual extent of contamination. A preferred method of testing would be determined on a site-by-site basis closer to the time of right-of-way acquisition.

Accordingly, some sites may require some form of mitigation. The selection of mitigation measures for specific sites would consider avoidance, minimizing impacts through redesign or alignment shift, and remediation/closure. Any site remediation/closure would be performed in accordance with applicable state and federal laws. Performance of such measures would occur prior to or during the course of construction, depending on site conditions.

3.13 Secondary & Cumulative Impacts

3.13.1 Legal and Regulatory Framework

CEQ regulations (40 CFR §§ 1500-1508) define secondary impacts, which are synonymous with indirect impacts, as follows:

> caused by the action and are later in time or farther removed in distance, but are still reasonably foreseeable…[and] may include growth inducing effects and other effects related to potential changes in the pattern of land use, population density or growth rate, and related effects on air and water and other natural systems, including ecosystems (40 CFR § 1508.8).

CEQ regulations define cumulative effects as:

> the impact on the environment which results from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions (40 CFR § 1508.7).

3.13.2 Methodology

For the NCCR, secondary impacts were identified for areas within one-quarter mile (0.25 miles) from each proposed commuter rail station. The one-quarter mile constraint was felt to be the likely extent of development pressures that could be reasonably attributed to the stations. One-quarter mile also represents the 10 minute walking distance that walk-on commuters will attempt to get to the station platform.

Cumulative impact analysis was not confined to a geographic or spatial constraint. Rather than quantify cumulative effects they are qualitatively characterized in Section 3.13.5.

3.13.3 Description of Secondary Development

There would be potential for secondary development near the proposed NCCR stations. Such development is a primary goal of the project.

Table 3.13-1 lists the factors used to determine the potential for secondary development at each station site. In general, the potential for secondary development near the station sites can be summarized as follows:

- Comprehensive plans, small area plans, and zoning ordinances of the cities and towns that would host stations permit and encourage higher density, compact, and transit-oriented development around the station sites.
- Development is presently occurring around the station sites that support the effectiveness of NCCR.
- Combined with the comprehensive plan policies, zoning ordinance regulations, and incentive programs encouraging transit-oriented development, NCCR would likely act as a catalyst to support development and redevelopment around many of the proposed stations.

Table 3.13-1. Reasonably Foreseeable Development in the Project Area

Stations	Plans and Development Proposals at Station Areas						Incentives and Recent Development	
	Formal Comprehensive Plan	Compact Neighborhood/Small Area/Station Area Plans[1]	Station Concept Site Plan[2]	Site Specific Development/Redevelopment Proposals[2]	Plans include transit friendly/encourage compact development	Plans/Proposals assume presence of Commuter Rail	Zoning allow increased intensity	Recent (5 years) development [4]
Charlotte Gateway		✓	✓		✓	✓	✓	✓
Derita			✓			✓		
Harris/NC 115			✓	✓	✓	✓		
Eastfield			✓	✓	✓	✓		
Hambright	✓		✓	✓	✓	✓	✓	
Huntersville	✓	✓	✓			✓		
Sam Furr	✓		✓	✓	✓	✓		
Cornelius	✓		✓	✓	✓	✓		✓
Davidson		✓	✓	✓	✓	✓		
Mount Mourne		✓	✓	✓	✓	✓		✓
Mooresville (LPA only)			✓					
Cascade/NC 150 (LPA only)		✓	✓		✓	✓		

Source: Parsons Brinckerhoff, 2008

1 These include plans produced by municipal governments that describe land use of an area with the incorporation of a future transit station. These also include station area plans (i.e. Davidson) which are specific to the station area.

2 All stations have area conceptual site plans based on the *North Corridor Station Location Report (2005) and the Charlotte Gateway Station Concept Design Summary Technical Report (2006)*

3 These include plans produced by private developers. As reported in the CATS Newsletter *North Transitions (2005-06).*

4 Includes construction of any new transit-oriented development or development as part of a station area plan.

Note: area cities, towns, and developers provided the information in this table.

3.13.3.1 Comprehensive and Area Plans

All of the station areas are included in formal comprehensive plans. Some of the station areas also have specific area plans and site-specific development plans. All of the stations in Charlotte (Gateway, Derita, Harris/NC 115, Eastfield) are included in compact neighborhood plans and/or the *Intermediate Stations Design Criteria* (2005) prepared by the NCCR consultant on behalf of CATS. These plans encourage higher density, mixed-uses. The Hambright station is listed in an area zoned “Neighborhood Center,” where “town-scaled residential development” is located “within walking distance (generally ½ mile) of satellite village centers. Streets…must be interconnected… [and a] range of housing types is encouraged". Huntersville station is listed in the Town's *Downtown Master Plan*; which assume the station to be located in one of three locations, including its ultimate proposed location (Town of Huntersville). The Town of Cornelius has also incorporated the future Cornelius station in its master plan. The Town of Davidson has established a Station Area Planning Committee as a group of 19 citizen volunteers who advise the CATS team on the future Davidson station. The *Davidson Station Area Plan* is due to be completed in 2006. Downtown Davidson is presently a mixed-use urban village. Iredell County and the Town of Mooresville have incorporated the Mount Mourne station in the *Mount Mourne & South Iredell Master Plan.* The Cascade/NC 150 station is incorporated in the *Cascade Neighborhood Master Plan.*

Each of the formal comprehensive plans incorporated input from the public. The public generally supports the higher density compact neighborhood development that is recommended in many of the station areas.

3.13.3.2 Land Use and Transportation Planning

Beyond the current action described in this EA, CATS has programmed major rapid transit projects throughout the region. CATS's adopted 2025 Transit System Plan consists of multiple rapid transit improvements in five corridors, a series of improvements in Center City Charlotte, and bus service and facility improvements throughout the rest of the region. Rapid transit guideway services extend to Interstate 485 in order to intercept persons traveling into Mecklenburg County and to improve regional connectivity.

The primary purpose of the public transit system is to support the region's land use vision. Making Charlotte-Mecklenburg's future transit system successful will require developing land uses in a manner that enables decisions that encourage residents to use transit as an alternative for their daily and occasional travel. TOD around transit stations will help sustain economic growth and vitality within close proximity to the stations while contributing to the enrichment of Center City Charlotte and key activity centers. By focusing a mix of land uses with relatively high densities in proximity to transit corridors, there is less dependency on the automobile as residents are able to walk or ride public transit to meet their daily needs. This building momentum is an important aspect of the cumulative effects of CATS's overall Transit System Plan.

Local officials and citizens have been working together to develop and define transportation and land use plans for several years. In 1994, the City of Charlotte and Mecklenburg County approved the Centers and Corridors vision, a comprehensive guide for future land use and development in the region. The plan established that future development and redevelopment in the region would be focused along five major transportation corridors.

In support of the Centers and Corridors vision, the *2025 Integrated Transit/Land-Use Plan* for Charlotte-Mecklenburg was completed in 1998. A key element of this plan was the development of a regional rapid transit system that would improve mobility, encourage more compact development, and support the proposed land use initiatives in each of the above growth corridors.

When completed, the 2025 Transit System Plan will serve four times as many transit riders as the present system does. The adopted plan includes 28 miles of Bus Rapid Transit (BRT), 21 miles of Light Rail Transit (LRT), 11 miles of streetcar service, 30 miles of commuter rail and an expanded network of buses and other transportation services throughout the entire region.

Center City Charlotte improvements are designed not only to serve travel within the central business district but also to provide connectivity with surrounding communities and institutions. These improvements would benefit the entire region by enabling the individual corridors and local services to function as an integrated system.

3.13.3.3 Site-Specific Development

Several of the station areas specific development proposals exist, some of which are dependent on NCCR. *Intermediate Stations Design Criteria* (2005) were prepared by the consultant on behalf of CATS. The report outlines the criteria for parking, storm water, utilities, architecture, and lighting. More specific details about these developments are based on the *North Transitions* newsletter (Fall 2005 and Winter 2006), prepared by CATS.

Charlotte Gateway Station
Gateway Village is a mixed-use center in the vicinity of Johnson and Wales University and the proposed CGS. Johnson & Wales University is projecting a student body of 5,000 students within walking distance of the CGS by 2010. The CGS is three blocks from the Carolina Panthers professional football stadium, one block from a proposed Charlotte Knights AAA baseball stadium and four blocks from the epicenter of Center City Charlotte (Trade and Tryon Streets). The CGS will serve as a terminus for commuter rail and the West corridor transit system to the airport. The station will also serve as a transit center for the streetcar and bus systems and will provide a new Amtrak station for the Carolinian and Piedmont passenger rail lines.

Derita Station
The station is located on a triangular-shaped property bordered by Derita Avenue, Sugar Creek Road, and Nevin Road. The Derita Baptist Church is also located in this triangle next to the proposed station. Discussions with the church for sharing parking have taken place. CATS would construct a parking lot and use the church parking lot as overflow. The station is located near potential redevelopment parcels.

Harris/NC 115 Station
The Harris/NC 115 station site is located next to a large undeveloped parcel to the east. On the other side of the parcel is the existing Griffith Lakes Development. The Griffith Lakes Development is proposed within ¼ mile of the Harris/NC 115 station. The empty parcel has the potential to be a transit oriented extension of the Griffith Lakes Development.

Eastfield Station
There are strong transit-oriented development opportunities with the station site adjacent to the Twin Lakes Development and the Davis property. Twin Lakes is a mixed-use area in the vicinity of the Eastfield station. The station area is slated to for a 142-acre development with 970 residences (from townhouses to single-family homes), retail, and restaurants (CATS (2), 2). A joint parking opportunity is possible between the station, Twin Lakes, and/or the nearby Independence Hill Baptist Church (15). The new development, tentatively named Eastfield station, will contain 142 acres of residences, retail, and restaurants.

Hambright Station
The station would be the center piece for the new 450-acre Bryton transit-oriented development. The most dense land uses would be located within a quarter-mile radius of the station. Office land uses would be located directly north, west, and south of the station with some first-floor retail. There would over 2.3 million square feet of office and flex space within this area. Residential land uses (condominium, multi-family housing) would be located north and south of the Hambright Road Extension just east of the station. Commercial and retail areas would take up the remaining area within the quarter-mile radius. Just outside the denser transit-oriented core would be regional retail, flex office, traditional office, and single family housing.

Huntersville Station
The Huntersville station has been incorporated into the Huntersville Master Plan. The area surrounding the station is zoned "Town Center" to accommodate high density (two- and three-story buildings) development (Town of Huntersville). Adjacent to the Town Center is the "new urbanist" Vermillion planned community, with a "village square" and neighborhood restaurant. Set on 400 acres just east of the proposed Huntersville station, the community advertises pedestrian travel, public gathering places, and the values of urban planning (Bowman Development Group). In the future, Vermillion will introduce more mixed-uses.

Sam Furr Station
The Huntersville and Cornelius Land Use Plans have accommodated the Sam Furr station with transit-oriented land uses. Huntersville's Traditional Neighborhood Development Overlay district is for the creation or revitalization of areas "structured upon a fine network of interconnecting pedestrian oriented streets and other public spaces." This overlay is located west of Old Statesville Road across from the proposed station. Cornelius has a Medium Density/Mixed-Use Residential district located west of Old Statesville Road and a Transit-Oriented District zoning district east of the main highway. The residential district will ultimately have "tree-lined, pedestrian-scaled streets connecting various types of housing and some small neighborhood commercial activities" (Town of Cornelius). This Medium Density zoning permits up to three-story residences (Town of Cornelius, *Land Development Code,* 5-11). The Transit-Oriented District is reserved for higher-density residential and corporate offices in the Huntersville side. The Transit-Oriented District on the Cornelius side calls for densities as high as 20 dwelling units an acre and 1.2 floor-area ratio (Town of Cornelius, *Land Development Code,* 5-54). Both zones are within a half-mile of the station (CATS/ Charlotte-Mecklenburg Planning Commission, 17). One development taking advantage of the denser zoning is Caldwell Station, a 168 acre, mixed-use development. Upon completion, the development will contain approximately 1,300 residences (500 of them rental housing), 14,000 square feet of retail and 108,000 square feet of offices (Gandy Communities). The nearby Cornelius East planning area, with its recently adopted *Vision Plan,* will have transit-oriented development as well. Both Caldwell Station and Cornelius East are adjacent to the Sam Furr station.

Cornelius Station
The Cornelius station has been incorporated into the *Cornelius Land Use Plan.* The thoroughfares in this vicinity of the station, North Main Street and Catawba Avenue, will undergo design changes to make them tree-lined mixed-use corridors. Neighborhoods near the station will have traditional design, with "curb, planting strips, and sidewalks." New and infill development will contribute to the town center's density. A 20-30 acre public park, tentatively named the Cornelius Common will contain a multitude of amenities such as ball fields and an amphitheatre (Town of Cornelius). *Antiquity, The Village of Cornelius* is another transit-oriented developed located east of the future Cornelius station. The development will contain approximately 900 residences and 160,000 square feet of mixed office / retail. This project, as of 2006, is under construction.

Davidson Station
The proposed station location has multiple adjacent properties with redevelopment potential. The "town hall" parking lot, the Metrolina Warehouse, Sadler Square, the Sadler Property are located within a quarter-mile radius of the proposed station location. Underdeveloped land owned by Wachovia is located just outside this radius. All these properties are currently not transit-supportive and could be redeveloped as new development or joint parking. The proposed station location, south of the historic depot, could enter a joint/shared parking arrangement with Sadler Square. It is also adjacent to a joint parking opportunity to the southeast. The site is also close to other downtown locations such as the public library and the town hall. In a planning charette (a workshop where community members, government agencies, and a mediator discuss and make decisions on

development), attendees worked on pedestrian connectivity between the proposed transit station and development options for the "opportunity sites" located within a five-minute walk of the station. The result of the charette is the *Davidson Station Area Plan*.

Mount Mourne Station

The first station in Iredell County (and the terminus of the MOS and MOS-H alternatives) would be located southwest of the Fairview Methodist Church and due west of an area slated for the church's expansion. This area presents a joint parking opportunity with the proposed station. The joint parking area would be in addition to the proposed parking area located within the adjacent proposed transit oriented development site between Lowe's Road and the station. In this proposed development, commercial and office uses would be located to the north along Fairview Road while residential uses would be located in the south. Civic land uses would be in the east adjacent to the proposed station. Other existing civic areas, such as the Mount Mourne post office and Mount Mourne Elementary would be within a quarter-mile radius of the proposed station. Large employers, such a Lowe's Home Improvement and the Lake Normal Regional Medical Center, are outside of this radius but close enough to the station to potentially make use of it.

Mooresville Station (LPA only)

Located in downtown Mooresville, the proposed station locations are within walking distance of potential parking areas, civic land uses, and the John Moore Memorial Garden. The first option is located north of Moore Avenue south of East Iredell Avenue. The northern location is across North Broad Street from the former Ford dealership site, which would be used for station parking. The station would also be a short walk northwest from a potential joint parking opportunity near the Mooresville Citizen's Center. The southern location is south of Moore Avenue near the corner of Center Avenue and North Broad Street. This location is further from the Ford Dealership Site and the joint parking opportunity at the Mooresville Citizen's Center, but closer to the John Moore Memorial Garden, the historic train depot, and the center of downtown.

Cascade/ NC 150 Station (LPA only)

The terminus for the LPA is located between Statesville Avenue and Plaza Lane near the Cascade neighborhood and is compatible with the *Cascade Master Plan (2003)* (although the first option is integrated with the *Plan*). The Plan would include a new street grid connecting Statesville Avenue on the west side to Cascade Street on the east side. Both options are close to the historic Brawley Estate. There is limited development for the areas east of Statesville Avenues are blocked by Statesville Avenue.

3.13.4 Secondary Impacts and Benefits

The potential positive and negative secondary effects of the NCCR alternative are summarized in Table 3.13-2.

Table 3.13-2. NCCR Secondary Effects

<table>
<tr><th>Potential Positive Secondary Effects</th></tr>
<tr><td>

Transportation and Traffic

Improved mobility options and accessibility
Potential that some drivers would switch to transit
Reduced commute times

Quality of life

Reduced urban sprawl by concentrating growth around infrastructure
Options to avoid stress of commuting via personal auto

Economics

Increased sales tax revenues
Increased property values - increased tax base and revenues
Sustainable economic development
Increased efficiencies in service delivery due to increased concentration of development
Increased employment opportunities

Environmental Justice

Increased mobility for transit-dependent residents

Neighborhoods

Infill and redevelopment opportunities of underutilized properties
Improved access to parks, recreation centers, and entertainment venues

Air Quality

Reduced pollution

Natural Resources

Conservation of land and natural resources

</td></tr>
<tr><th>Potential Negative Secondary Effects</th></tr>
<tr><td>

Traffic and Transportation

Increased traffic from induced development

Quality of Life

Public opposition to dense development patterns near neighborhoods
Aesthetics of stations and station area development

Economics

Strain on infrastructure to support station area plans

Environmental Justice

Market demand for housing near transit may reduce affordable housing
Redevelopment could displace of low income persons

Historic Resources

Destruction/redevelopment of historic properties

Natural Resources

Loss of habitat for terrestrial natural communities
Between 3 and 5 acres of impacts to wetlands

</td></tr>
</table>

Source: Parsons Brinckerhoff, 2005

3.13.5 Secondary Impacts: Mitigation

Mitigation measures are recommended for the potential negative secondary effect identified for the project, as shown in Table 3.13-3. Measures available to local governments in order to offset anticipated negative effects outside the project are considered as “available mitigation”.

Table 3.13-3. Mitigation Measures for Secondary Impacts

Negative Secondary Effects	Project Mitigation	Available Mitigation
Non-transit supportive development	Station Area Plans	Continued adoption of transit-supportive land use policies
Increased traffic from induced development	Improvement of linkages between transit stations and popular destination	Traffic impact studies and mitigation for new development
Demolition and redevelopment of historic properties	Restoration and rehabilitation of historic properties underway by others	Stricter requirements (if not prohibition) for the demolition of historically significant buildings; adoption of rehabilitation code
Increased strain on infrastructure to support high-density development	Adequate infrastructure in place before development	Adequate public facility requirement in zoning; incorporate necessary improvements in Capital Improvement Plan
Loss of wetlands	Provision of 0.25 acre of forested wetland near proposed Hambright Station; Monetary compensation	Zoning requirements for provision of forested wetland

Source: Parsons Brinckerhoff, 2005

3.13.6 Description of Cumulative Effects of Regional Activities

The following paragraphs summarize substantial regional projects occurring or planned to occur that will provide a cumulative effect on the communities served by the project.

3.13.6.1 2025 Transit System Plan

The *2025 Transit System Plan* was adopted in November 2002 by the Metropolitan Transit Commission (MTC). Key elements of the plan are described below.

South Corridor

LRT was selected as the preferred alternative for rapid transit service in the South Corridor. The proposed LRT project is approximately 10 miles long, running south from Center City Charlotte to I-485. The line operates on separate tracks generally within an existing Norfolk Southern railroad right-of-way. Fifteen stations (14 full-time stations and one special events station) are provided. CATS inaugurated LRT service on the South Corridor in November 2007.

North Corridor

The North Corridor extends 30 miles from Center City Charlotte to Mooresville. The *2025 Transit System Plan* included commuter rail service in the North Corridor to take advantage of the little-used Norfolk Southern "O" line. By upgrading the existing rail line and implementing rail service as demand warrants, CATS will minimize capital and operating costs as well as the need for any additional property for right-of-way. Rail service supports the adopted land use regulations and policies of Charlotte, Huntersville, Cornelius, Davidson and Mooresville, focusing transit oriented development at stations along the "O" line. North Corridor commuter rail service would terminate in downtown Charlotte at the CGS.

Northeast Corridor

The Northeast Corridor extends 14 miles from Center City Charlotte to I-485. The Transit System Plan includes LRT service from Center City Charlotte to a terminal station near I-485. LRT service in the Northeast Corridor represents a logical extension of the South Corridor LRT line, improving the operational effectiveness and leveraging public investment in this line. LRT operation in this corridor supports the continuing re-development of the North Davidson Street (NoDa) area and areas along North Tryon Street. Both UNC-Charlotte and the University City area would be directly connected by LRT to the South Corridor.

Southeast Corridor

The Southeast Corridor extends approximately 13 miles from Center City Charlotte to Matthews and Mecklenburg County's border with Union County.

Rapid transit service, either LRT or BRT, would operate along Independence Boulevard and other roadways to I-485. It would terminate either west of I-485 or cross over the highway to the south campus of Central Piedmont Community College (CPCC). A rapid transit line along Independence Boulevard would be built in conjunction with NCDOT-funded work to convert Independence Boulevard/US 74 to a limited access road. The line will serve existing passenger generators such as the CPCC Central and South Campuses, Cricket Arena, Ovens Auditorium, and Presbyterian Hospital in Matthews while supporting TOD opportunities in Matthews.

West Corridor

The West Corridor extends approximately 12 miles from Center City Charlotte to the Catawba River, the boundary between Mecklenburg and Gaston counties.

Rapid transit alternatives under consideration include BRT or streetcar to be built along Wilkinson Boulevard. It would serve the Charlotte-Douglas International Airport, new developments west of the downtown, and the proposed CGS.

Streetcar

The *2025 Transit System Plan* also included the implementation of streetcar services:

The service includes an extension of streetcar service on Trade Street beyond Center City Charlotte along Elizabeth Avenue to Presbyterian Hospital and via Hawthorne Lane and Central Avenue to Eastland Mall. Implementation of streetcar operations from Center City Charlotte along Central Avenue to the Eastland area improves the efficiency of serving this corridor that already has a high demand for transit services. Serving Central Avenue with larger-capacity streetcars will reduce the number of buses traveling along this street, improving pedestrian safety and reinforcing redevelopment goals for the area.

The streetcar operation includes service along Trade Street and Beatties Ford Road to the proposed Beatties Ford Road transit center. This extension connects the Seversville, Biddleville, McCrory Heights, Washington Heights, Lincoln Heights, and University Park neighborhoods to Center City Charlotte.

3.13.6.2 Other Transportation Projects

Several large transportation projects promulgated through the MUMPO LRTP, the NCDOT, federal legislation and Norfolk Southern Corporation will affect overall travel and freight mobility in the region. Some of these projects are included in the No-Action analysis for all of the transit corridors and as such their impact is accounted for, however, not all of the projects are accounted for and because of their scope they are nevertheless mentioned here.

- Completion of the I-485 loop. Extension of I-485 from I-85 north to Oak Drive is anticipated in the summer of 2006. Further extension from Oak Drive to Old Statesville Road (NC 115) is anticipated in 2007 and completion of the loop from Old Statesville Road back to I-85 near Concord is anticipated in 2012.
- NCDOT and Norfolk Southern are expanding track capacity along the Atlanta-Greensboro main line, including relocation of Amtrak service to the CGS and development of an Intermodal facility at the Charlotte-Douglas International Airport
- North Carolina and Virginia have formed a bi-state commission to review and encourage development of high speed (110 mph) passenger service from Washington, DC to Charlotte, designated as the Southeast high Speed Rail Corridor in the federal Intermodial Surface Transportation Efficiency Act (ISTEA) legislation. A Tier II Environmental Impact Statement was prepared in October, 2002. Plans over a 20-year period call for an increase in passenger service between Atlanta, Charlotte, Raleigh, Richmond and Washington, and significant reductions in travel time through track upgrades and expansion.
- In December 2004, NCDOT opened the first HOV facility in the state along Interstate 77 between Charlotte and Huntersville. The southbound HOV lane is nearly 10 miles long while the northbound lane is approximately five miles. The LRTP includes an expansion of the HOV lanes along Interstate 77.
- The North Carolina Turnpike Authority (NCTA) was created in 2002 to study, develop, construct, operate and maintain toll roads in the state. The NCTA's charge is to determine if and where there are areas where toll roads may be developed to provide alternate access to heavily congested roadways. The Authority is considering two highway improvement projects in the Charlotte region for potential toll facilities:
  - The Gaston East-West Connector is a multi-lane road on new location connecting Interstate 85 west of Gastonia to Interstate 485 near the Charlotte/Douglas International Airport. The length of the proposed toll facility ranges from 21 to 24 miles depending on the final alignment and has an estimated cost of $600 million.
  - The Monroe Connector is a multi-lane roadway on new location which will link Interstate 485 in eastern Mecklenburg County with the proposed Monroe Bypass in Union County. The 11-mile facility has a preliminary cost of $179 million.

3.13.6.3 Center City Charlotte as Regional Transit Hub

Each of corridors that make up the *2025 System Plan* would serve Center City Charlotte, providing convenient public transportation for commuters, visitors and those living in the downtown. Charlotte would be served by:

- Two complementary major transit nodes, the existing Charlotte Transportation Center -- served by CATS buses, LRT service to the South and Northeast, LRT or BRT from the Southeast, and Center City Streetcar -- and the proposed CGS – served by commuter rail to the North, BRT or streetcar to the West, CATS buses, Amtrak, Greyhound and Center City Streetcar.
- Two transit spines, a north-south LRT spine along the trolley/railroad corridor and the Southwest and West rapid transit lines
- Center City Streetcar along Trade Street between Johnson C. Smith University and Presbyterian Hospital and connecting the two transit centers, minority neighborhoods, and private and civic institutions.

3.13.6.4 Related Development

Various substantive public and private development projects in the Charlotte metropolitan region are in the planning stages, currently underway or are anticipated to be in place within the next two decades. These projects are currently in the planning, design or construction stage of development and are not under the control or influence of CATS, the FRA or the proposed NCCR project.

- Minor League Baseball – planning is underway to relocate a Triple-A minor league baseball team from Fort Mill, SC, to a new stadium facility in downtown Charlotte within walking distance of the proposed CGS. If approved in 2008, the stadium could open in 2011, offering approximately 80 home baseball games and other possible entertainment events, annually.
- Center City Charlotte – the central business district of Charlotte continues to exhibit robust growth in commercial and residential high rise development. Approximately 10 residential high rise developments are under plan, design or construction in Charlotte's central business district. New construction by commercial interests includes new office towers by Wachovia Bank, Duke Energy, the Ritz Carlton Hotel and the NASCAR museum.
- Lowes Corporation corporate headquarters is located in the Mount Mourne area of Iredell County and is anticipated to be served by the NCCR. Corporate expansion plans currently forecast approximately 12,000 jobs in this complex by 2020
- Johnson & Wales University is projecting the current student body to double the current size to 5,000 students by 2008.
- Airport expansion – Charlotte-Douglas International Airport is directly and indirectly responsible for approximately 100,000 jobs and contributes approximately $10 billion to the regional economy. A new 3,000 space parking deck recently was completed. A new 24- gate concourse and a fourth 9,000 foot runway are in the design stage with construction expected to be underway on runway and concourse in 2007. Passenger demand increased 12% in 2005 with over 28.2 million passengers traveling through the airport.
- Water and Sewer Utility facility plans – the Charlotte Mecklenburg Utility Department (CMUD) provides long range facility planning for water and sewer service demand in Mecklenburg County. The current planning horizon year in CMUD's Capital Improvement Projects and Capital Needs Assessment extends out to 2016. The water projects budget includes just over $397 million of capital projects while the budget for sewer projects includes over $507 million. These projects include new facilities as well as expansion, replacement and upgrade of existing utility plant and equipment. The five largest water followed by the five largest sewer capital expenditures programmed for the next 10 years are illustrated in the following table. Most of the water and sewer capital budget is dedicated to rehabilitation and replacement of aging assets and not system expansion.

Table 3.13-4. Major Water and Sewer Projects, 2016 Capital Needs Assessment

Project ID #	Description	Capital Need - 2016
01W07	SW Water Supply	$60,000,000
99W04	Water Line Rehab/Replacement	$50,000,000
99W19	Street & Minor Main Extensions	$43,000,000
99W88	New Service Installation	$40,000,000
06W01	Dukes Treatment Plant Expansion	$38,500,000
99S30	Sewer Line Rehab	$88,000,000
99S04	Street & Minor Main Extensions	$58,000,000

Table 3.13-5. Major Water and Sewer Projects, 2016 Capital Needs Assessment

Project ID #	Description	Capital Need - 2016
06S13	McDowell Basin Trunk Sewers	$56,000,000
01S60	Briar Creek Relief Sewer	$51,200,000

Source: Charlotte Mecklenburg Utility Department (CMUD), 2006

3.13.7 Cumulative Impacts

The potential positive and negative cumulative impacts of the above referenced activities are discussed in the following paragraphs.

3.13.7.1 Transportation and Traffic

Implementation of the 2025 Transit System Plan and other associated transportation projects in the region will provide continuous growth in mobility options for residents of the metropolitan area. The increased availability of transit access will begin to reduce the negative cumulative effects of automobile-oriented growth and development in the Charlotte region that has occurred over the past fifty years.

3.13.7.2 Community

Accessing basic services and public facilities (such as schools, day care, and civil services) would be improved as more elements of the 2025 Transit System Plan are implemented. The new transit systems, along with the station planning, would encourage greater access to a range of development types. Access to services would be easier and would include non-automotive alternatives.

3.13.7.3 Environmental Justice

The impacts of the 2025 Transit System Plan are not expected to add to the impacts on low-income and minority communities beyond those described under "Environmental Justice" in the environmental documents for the individual corridors. Positively, it is anticipated that the combined effect of full implementation of the 2025 Transit System Plan will benefit low income and minority populations on several fronts:

- transit dependent populations will be better served
- more transportation choices in terms of mode, frequency and destination
- linkage of low income urban communities with suburban employment centers
- enhancement of property valuations along the transit corridor, particularly adjacent to station areas
- reduction in overall hydrocarbon emissions traditionally tied to VMT growth should reflect itself in overall improvement in the respiratory health of urban low income and minority inhabitants

3.13.7.4 Air Quality

The increase in automobile usage over the past half-century has decreased the air quality in the region. The implementation of a transit system would lead to a decrease of vehicular trips and therefore an increase of air quality. In addition, more stringent environmental legislation has lead to more fuel efficient automobiles and reductions in automobile-related emissions. Together, increased transit ridership (along with other non-motorized transportation), more fuel-efficient and cleaner-burning automobiles, and the reduction of automobile usage would lead to an overall increase of air quality.

3.13.7.5 Historic Resources

The cumulative impacts on the historic resources within the corridor have altered their setting with contemporary construction and development patterns. Implementation of the 2025 Transit System Plan will not likely halt this process; however, the application of historic preservation techniques may lessen the impact of these actions and help preserve the remaining historic resources.

Development by the private sector continues to challenge historic sites and districts in the center city area of Charlotte. Historic resources and districts are known to exist adjacent to the proposed Gateway Station and the commuter rail line in the central business district. The City is focused on salvaging the historic character of the neighborhood while simultaneously attracting the resources that create a livable and walkable urban district. This consequence of regional economic conditions which make the center city Charlotte a focal point for employers and a preferred residential location for many who desire the amenities of a walkable downtown environment.

3.13.7.6 Natural Resources

Cumulative impacts of other actions on natural resources have not created a significant adverse impact. The implementation of the 2025 Transit System Plan would not create any adverse reasonably foreseeable consequences.

Approximately 12 percent of the project area (just over 300 acres) contains suitable habitat for three federal-listed and state-listed endangered plant species (Schweinitz's sunflower, smooth coneflower, and Michaux's sumac). Although no individual organisms were observed within 0.25 mile of proposed station locations during field investigation, these species prefer open woodland and disturbed areas, and are capable of becoming established within similar habitats within the 0.25-mile radius. The ecosystems section of this chapter summarizes acreages of suitable habitat that would be potentially affected by induced development around proposed stations. No direct or indirect effects to known populations or individual organisms of a protected species will result from construction of the proposed NCCR. Given the lack of species occurrences along with the widespread presence of suitable habitat for threatened and endangered species, mitigation to preserve potential suitable habitat is considered unnecessary.

3.13.8 Cumulative Impacts: Mitigation

From the amount of reasonably foreseeable development in the NCCR corridor (see

Table 3.13-1) including the site-specific development, there would be a potential for increase in congestion (and a corresponding decrease in air quality), and a strain on public utilities and infrastructure (water, sewer, electricity) within the metropolitan Charlotte area. Implementation of commuter rail will lessen the dependence on the automobile and mitigate this affect. Additionally, such effects could be minimized by utilizing government regulations that require adequate public facilities prior to new development and by exercising land use control that requires mixed-use, transit-oriented, and pedestrian-friendly environments. Land use controls already in use are reflected in current and future land use and transportation plans.

Due the land use policies developed by Metropolitan Charlotte government agencies, wide-spread, low-density, automobile-oriented development patterns (also known as "sprawl") are discouraged (see Chapter Four). The NCCR build alternatives would encourage higher-density development that serves transit as well as automobiles. By integrating transit and land use, Metropolitan Charlotte policies would reduce reliance on the automobile by encouraging a mix of land uses and convenient access to public transit.

3.13.9 Relationship between Short-term Uses of the Environment and the Maintenance and Enhancement of Long-term Productivity

Short-term effects on the environment result from construction impacts. Long-term effects relate to the maintenance and enhancement of long-term productivity – in particular, the consistency of the project with long-term economic, social, regional and local planning objectives. Construction of the project would result in short-term impacts to the human environment. These impacts would include the acquisition of right-of-way and the conversion of land uses from one use to another. However, the project would address the need for improved transportation within a heavily-traveled corridor. The project would meet the desires of the City of Charlotte along with Mecklenburg and Iredell Counties that address the need to implement long-range plans that integrate land use and transportation policies.

The long-term effects of the project would be improved access to employment centers; improved transit accessibility within the North Corridor; and improved air quality in Metropolitan Charlotte. These long-term benefits offered by the project would offset the short-term inconveniences and adverse effects on the human environment.

3.13.10 Irreversible and Irretrievable Commitments of Resources

Construction of the project would result in commitments of natural and man-made resources such as construction materials, energy, labor, funds and land. Materials, energy supplies, and labor used to construct any of the alternatives are not in short supply, and their use would not have an adverse impact on their continued availability for other projects. Furthermore, labor expenditures are consistent with incentives to spur growth. Overall, the resources used to construct and operate the commuter rail line would be committed to benefit residents of and commuters to Charlotte and Mecklenburg County. The commitment of these resources would also benefit other residents of the state and region by an improved transportation system offering improved accessibility and savings in travel time, and additional mobility choices.

3.13.11 Conclusion

The project would have positive secondary and cumulative effects on the environment. Any negative secondary and cumulative effects could be mitigated (in whole or in part) by public education, public involvement, and the dedication of Charlotte-Mecklenburg to transit-supportive land use planning and infrastructure investment. Commuter rail transit in the North Corridor is a critical tool in enhancing the public health, safety, and welfare of Mecklenburg and Iredell Counties, in addition to the Metropolitan Charlotte region as a whole.

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3.14 Construction Impacts

Construction impacts are direct, generally extend slightly beyond the immediate spatial footprint of the proposed action and are short term in duration. This section describes construction impacts for all of the sensitive resources other than transportation related resources. Transportation and traffic construction impacts are detailed in Chapter 4. The purpose of this section is to summarize potential construction impacts of the NCCR Build and TSM alternatives.

3.14.1 Land Use

Land use along the NCCR alignments is very diverse. Outside the immediate urban influence of the City of Charlotte and the towns of Huntersville, Cornelius, Davidson, and Mooresville, the remaining corridor is a mix of suburban, low density and agricultural land uses. Construction impacts will be more visible around the proposed station locations because these locations are comparatively more developed than other areas along the corridor. Also, the NCCR alignments would require the use of some of these vacant or undeveloped parcels to be used as construction staging sites. These impacts are only temporary and the sites would be returned to their original condition once construction is complete. Also, since majority of construction includes upgrading of existing track, every attempt will be made to use existing railroad ROW to avoid inconveniencing adjacent land uses and minimize the impact. Where station construction is planned to occur, the adjacent land uses have been determined to be compatible and consistent with local station area plans and development policies.

3.14.2 Displacements

Construction of the NCCR system would displace from four to seven residential units and two to six businesses depending upon the build alternative selected. No institutional structures will be displaced. No institutional structures will be displaced. Some potential disturbances to businesses would result primarily because of loss of parking and other ancillary facilities where sidings are proposed or alteration of access due to proposed rail crossing closures. Further discussion of access disturbance is provided in Section 3.2.

In areas where ROW is constrained, construction easements may be required from adjacent properties for movement of construction equipments. However, these easements would be used only where no other alternatives are available and would attempt to minimize disruptions to adjacent properties to extent feasible. No displacements of residences or businesses will result from the need for temporary construction easements.

3.14.3 Neighborhood and Community

The existing railroad has been in operation since approximately 1855. Much of the commercial/ industrial uses along Graham Street in Charlotte as well as the neighborhoods, communities and commercial activity within the towns of Huntersville, Cornelius, Davidson and Mooresville developed around the railroad. As the build alternatives, including the new passing sidings will remain on existing NS ROW, re-construction of the rails and ties will have a little impact in the community.

There are 115 existing and/or newly proposed grade crossings in the study area. Forty four grade crossings are proposed to be closed or consolidated. Of the 44, 16 are permanent closings and 28 are consolidations. The consolidations consist of redirecting and/or clustering existing private or commercial crossings to an existing public street through the extension of existing or provision of new frontage roads.

The remaining 71 crossings consist of the following configurations:

- 10 low volume private crossings which will be equipped with new stop signs and cross bucks
- 61 crossings will be provided with new gates and flashers

Construction activities at these crossings will cause temporary inconvenience but provide a safer and more efficient access to and from neighborhoods and commercial centers in the long term.

3.14.4 Visual and Aesthetics

The railroad tracks and track bed are the dominant visual elements of the railroad within the project area, however these elements are located at ground level, and do not significantly affect the landscape. Other elements contributing to the character of the railroad corridor include railroad bridges and overpasses, crossing signals and gates, and existing signal system infrastructure.

In general visual impacts during the construction phase include activities related to temporary access roads, earth moving equipment such as graders, loaders and trucks at station locations, movement of construction machinery, small cranes, track laying machines construction of temporary fences and screens. These activities will only have a temporary impact on visual and aesthetics quality of the area. With the exception of station locations it will virtually impossible after construction to visually discern any differences between the old rail alignment and the new rail alignment.

3.14.5 Air Quality

The project is located within the Metrolina non-attainment area for O_3 and the Charlotte non-attainment area for CO as defined by EPA. However, due to improved monitoring data, these areas were re-designated as moderate non-attainment for O_3 under the eight-hour ozone standard effective June 15, 2004 and designated maintenance mode for CO on September 18, 1995.

Construction of the NCCR will require disturbance of soil which produces fugitive dust and/or particulate pollution. The amount of airborne dust and particulate matter depends on various factors including geography (soil type, exposure, moisture) and weather (temperature, wind speed and direction). Air quality will also temporarily degrade due to emissions from construction equipment and emissions from vehicle queuing due to detouring and slower travel conditions. Section 3.14.13 discusses mitigation steps that could be taken to minimize these impacts.

3.14.6 Noise and Vibration

3.14.6.1 Noise

Currently the principal sources of noise within most of the study area are motor vehicles and freight trains. Airplanes also contribute to the study area's noise levels near the southern end of the study area where planes approach the Charlotte-Douglas International Airport. The study area itself lies well outside the generally acceptable limit of 65 L_{dn} airport noise contour. Since the proposed project follows existing rail and street routes, most of the community areas directly adjacent to the alignment are already exposed to moderate noise levels.

During construction of the NCCR noise levels would increase as a result of construction equipments and vehicles. The use of especially noisy equipment, such as saw, jackhammer, scrapers, and pneumatic tools, would be common throughout the alignment. Pile drivers, the noisiest type of equipment, will be used in areas where bridges would be constructed.

3.14.6.2 Vibration

Major sources of existing vibration in the study area are automobiles, trucks, buses and the daily freight train which currently travels along the existing corridor.

Vibration during construction would result from the use of construction equipment such as a pile driver, a bulldozer, or a jackhammer. The vibration is generally intermittent and temporary, and therefore, does not result in a significant impact to receivers along the corridor with exception of properties in close proximity to construction activities.

Mitigation for construction related noise and vibration impacts is discussed in section 3.14.13.

3.14.7 Ecosystems

Section 3.7 describes in detail the ecosystem in the NCCR project area. Ecological resources identified within and near the project area include terrestrial plant communities and associated wildlife habitat, wildlife corridors, waters of the United States (including wetlands), threatened and endangered species, and unique natural areas.

The majority of the project area is located along watershed divides which are characterized by relatively high elevations, well-drained soils, presence of ephemeral or intermittent stream courses, and scarcity of perennial streams. Due to their position in the landscape, no fish or aquatic mollusks were observed within streams in areas likely to be affected by project construction - nor were any observed at the time of investigation within the short segment of a perennial stream (an unnamed tributary to Cane Creek) which could be affected by construction of a station near Hambright.

Construction of the NCCR would have minimal, if any, impact on the ecosystem along the corridor as the existing rail alignment is located along the ridge line with no river crossings, no perennial stream crossing and only a handful of intermittent stream crossings.

3.14.8 Water Resources

3.14.8.1 Surface Water

No surface waters are directly impacted by the build or No-Action/TSM alternatives. Mitigation for surface as well as groundwater, floodplain and wetlands is provided in section 3.14.13.

3.14.8.2 Groundwater

No groundwater supply wells, wellhead protection zones, treatment/storage facilities, or groundwater recharge or discharge areas would be directly affected by construction of the NCCR.

Since the construction process would not involve extensive excavation; impacts to groundwater are not anticipated. However, precautionary measures will be taken during construction by developing proper erosion and sediment control plan in accordance with state and local sediment and erosion guidelines.

3.14.8.3 Floodplain

Based upon a review of the FEMA maps, no 100-year floodplains or regulatory floodways would be directly affected by the proposed NCCR project. Therefore, construction of the NCCR would not impact floodplains or regulated floodways.

3.14.8.4 Wetlands

Wetland impacts are less than 0.20 acre for the two build alternatives that relocate through the Bryton development. Dependent upon the design of the stream crossings in the Bryton development construction impacts could have a minimal to no impact upon these wetland systems.

3.14.9 Energy Use

Energy is consumed both directly and indirectly during construction. Direct energy consumption includes the energy used to operate construction machinery, provide construction lighting, and produce materials such as asphalt. Indirect energy consumption includes such activities as manufacturing and maintenance of the construction equipment, and energy consumed by workers commuting to the project site. Energy consumption to complete a project is proportional to the cost or size of the project.

Energy use during construction is temporary. Measures to reduce energy consumption will be in place during the construction period to reduce energy demand.

3.14.10 Historic and Cultural Resources

Construction of the NCCR project is not expected have a direct impact upon historic or archaeological resources. Construction activity at the stations may have temporary and indirect effects on historic resources (access, noise, dust and visual). Temporary and indirect effects of construction on historic resources would be kept to a minimum by applying the mitigation measures addressed in section 3.14.13 to assure maintenance of traffic and to reduce air quality, noise and vibration, and visual impacts.

3.14.11 Parks

There are two public parks and one public golf course located within 300 feet of the NCCR. Construction activities related to the NCCR alternatives would not have long term adverse impact on parklands, greenways, or recreation centers. Due to proximity of several stations to existing park and recreational facilities, it is expected that the project would provide enhanced access; access would be diverted but not interrupted during construction activities.

3.14.12 Hazardous Materials

Analysis indicates that there are 43 AOC sites near or within the rail corridor and proposed station footprints and 5 REC sites near the proposed South End VMF (see Section 3.12 for detail documentation). These sites provide potential sources of contamination that could have an adverse impact on both property acquisition and construction activities associated with the alternatives being considered for the NCCR.

These sites would require additional investigation during a Phase II Environmental Site Assessment. Recommended further investigations would occur prior to project construction to confirm and update information obtained from agency files and the public record. Select sampling of the soil and groundwater would be conducted at each site to help determine the absence or presence of contamination. If contamination is found, soil and groundwater investigations would be expanded to determine the actual extent of contamination. A preferred method of testing would be determined on a site-by-site basis closer to the time of ROW acquisition.

Accordingly, some sites may require some form of mitigation measures which may influence the construction technique or standard for that area. The effect these sites may have upon construction will have to be determined in the Final EA and design phase of project development. Performance of such measures would occur prior to or during the course of construction, depending on site conditions.

3.14.13 Construction Mitigation

The NCCR alternative includes upgrading of existing track and building new stations. Unlike, building a new track in a new ROW, construction of the NCCR is within the existing rail road's ROW. Therefore, it is expected that construction impacts of the NCCR to the natural and built environment will be minor and only temporary in nature. However, adherence to applicable construction regulations would be enforced for areas of potential impacts and use of new and efficient equipments and construction techniques would be used to the extent feasible, to minimize impacts.

A menu of mitigation measures can be deployed during construction include:

- Covering open body trucks which transport materials to/ from construction sites.
- Watering areas of exposed soil to control dust.
- Removing soil and other materials from paved streets.
- Repaving/ replanting exposed areas as soon as practical after completion of construction.
- Minimizing idling of construction vehicles and equipment.
- Using appropriate truck routing, enclosures around construction activities.
- Combining noisy activities to reduce total length of noise and avoiding such activities during nighttime.
- Use of quieter drill pile instead of impact piles.
- In order to minimize impact during construction, the project would apply the City of Charlotte's "Best Management Practices for the Protection of Surface Waters". Temporary sediment traps or hazardous spill basins would be constructed at various points along the project to prevent sedimentation runoff during rain events and erosion control fencing to reduce erosion. The minimization of vegetation disturbance near the corridor would help to trap contaminants and sediments. Temporary stream crossings could be built to allow some construction traffic to cross streams during the construction of the rail system, thereby reducing the potential for erosion.
- Other erosion control measures that would be deployed during construction include the standards of the Erosion and Sediment Control Planning and Design Manual by NCDENR, revised 1998 as well as the NCDOT Roadway Standard Drawings, July 2006 and the NCDOT Standard 2006 Specifications for Erosion Control and Roadside Development.
- Control and maintenance of traffic measures would be implemented to decrease energy consumption during construction. Contractor resources deployed during construction will be balanced across the site and over the duration of the construction schedule such that equipment, machinery and construction practices reduce energy consumption to the maximum extent possible.

- Fugitive emissions associated with construction would be limited by adherence to special construction techniques such as watering areas of exposed soil to control fugitive dust, covering open body trucks that transport materials, removing soil and other materials from paved streets. As much as possible, emissions from construction equipment would be limited during off-peak hours and idling of equipments would be minimized.
- Effort to reduce noise and vibration during construction would be made and would be conducted in accordance with applicable state and local ordinances.
- To the extent that economic and operational constraints allow, consideration of restricted hours for construction may be attempted.
- The use of sound dampened equipment, where proven effective, may be implemented.

3.15 Environmental Justice

This section describes the concentrations of minority and low-income populations in the project area in order to identify and address any disproportionate health or environmental impacts of the project on these populations.

3.15.1 Legal and Regulatory Framework

Executive Order 12898, issued in February 1994, requires federal agencies to identify and address any disproportionate health or environmental impacts of their programs, policies, and activities on minority or low-income communities. It also calls for the meaningful involvement of these populations in project planning.

Executive Order 12898 states that “to the greatest extent practicable and permitted by law, and consistent with the principles set forth in the report on the National Performance Review, each Federal agency shall make achieving environmental justice part of its mission by identifying and addressing, as appropriate, disproportionately high and adverse human health or environmental effects of its programs, policies, and activities on minority populations and low-income populations in the United States . . ..”

3.15.2 Methodology

Minority, as specified in the order, is defined as Black/African-American, Hispanic, Asian and Pacific Islander, American Indian, Eskimo, Aleut, and other non-white persons. A concentration of minority population exists if the percentage of minorities in the affected area is greater than 50 percent or “meaningfully greater” than the minority population percentage in the general area. Data from the 2000 Census was used to identify the percent minority population by block group within the study area. The main focus of the analysis involved those block groups that are within 1 mile of the proposed NCCR alignment. A sensitivity test was made to see if the use of a 40 percent threshold revealed additional minority areas. Seven additional block groups were found to be within 1 mile of the NCCR alignment and most are near or adjacent to areas with greater concentrations of minorities. These additional block groups are included as a concentration of minorities in the project corridor.

Low-income populations were identified based on the 2000 Census definition of persons below poverty level. The 2000 Census definition of persons below poverty ranges by household size from $8,501 for one person with no children to $32,208 for households with nine or more persons. Poverty status was determined for all people except institutionalized people, people in military group quarters, people in college dormitories, and unrelated individuals under 15 years old. These groups are considered neither "poor" nor "nonpoor." The main focus of the analysis involved those block groups that are within 1 mile of the proposed NCCR alignment. Similar to the identification of minority populations, a sensitivity test was made to see if the use of a 40 percent threshold revealed additional areas with high concentrations of below poverty populations. There are only five block groups within 1 mile of the NCCR alignment that have poverty populations above 40 percent. Thus, it was decided that the 40 percent threshold provided a reasonable indicator of the areas with concentrations of poverty populations in the project corridor.

3.15.3 Existing Conditions and Resources

3.15.3.1 Concentrations of Minority Populations

Figure 3.15-1 shows concentrations of minority populations within NCCR Study Area. These maps are based on 2000 Census data and do not reflect more recent developments in the area. Base on the 2000 Census, Minority populations are most heavily concentrated

(70 percent or more) along the NCCR corridor south of I-85 and to the west of the corridor near Center City Charlotte. Communities in this area include Third Ward, Greenville, Lockwood, Druid Hills South, Druid Hills, Tryon Hills, and Sugaw Creek/Ritch Avenue. The Derita community, north of I-85, also has a high concentration of minorities with block groups ranging from 50 percent to 70 percent minority population. The remaining communities between I-85 and WT Harris Boulevard have minority population of 40 to 49 percent. Communities in this area include Mineral Springs/Rumble Road, Nevin, Rockwell/Hemphill Heights, Sugaw Creek West/WT Harris, and Henderson Circle.

From WT Harris Boulevard to Mooresville the minority population in the NCCR corridor is below 40 percent with one exception. In Davidson there is a block group that has 40 to 49 percent minority population. The highest concentration of minority population in this block group is south of Griffith Street, west of the NCCR corridor.

In Mooresville, there are two block groups with minority populations of 40 to 49 percent and 50 to 59 percent. The McLelland and West Iredell neighborhoods represent the block group with 40 to 49 percent minority population and the Cascade neighborhood represent the block group with 50 to 59 percent minority population.

Block level data from the 2000 Census was used to determine if any concentrations of Hispanic populations exist along the NCCR project corridor. Two areas were found within 1 mile of the rail corridor with multiple blocks of high concentrations of Hispanic population. In the City of Charlotte a concentration of Hispanic population was identified in the Tryon Hills community. The other concentration of Hispanic population is located in Huntersville, east of the rail corridor between Huntersville-Concord Road and Ramah Church Road.

3.15.3.2 Concentrations of Low-Income Populations

Figure 3.15-2 shows block groups consisting of high concentrations of below poverty populations. There were no areas identified in the study area with concentrations of below poverty populations greater than 50 percent. A few block groups between proposed CGS and I-85 to the north have below poverty populations in the range of 40 to 49 percent. Communities representing these areas include Third Ward, Oaklawn, and Druid Hills.

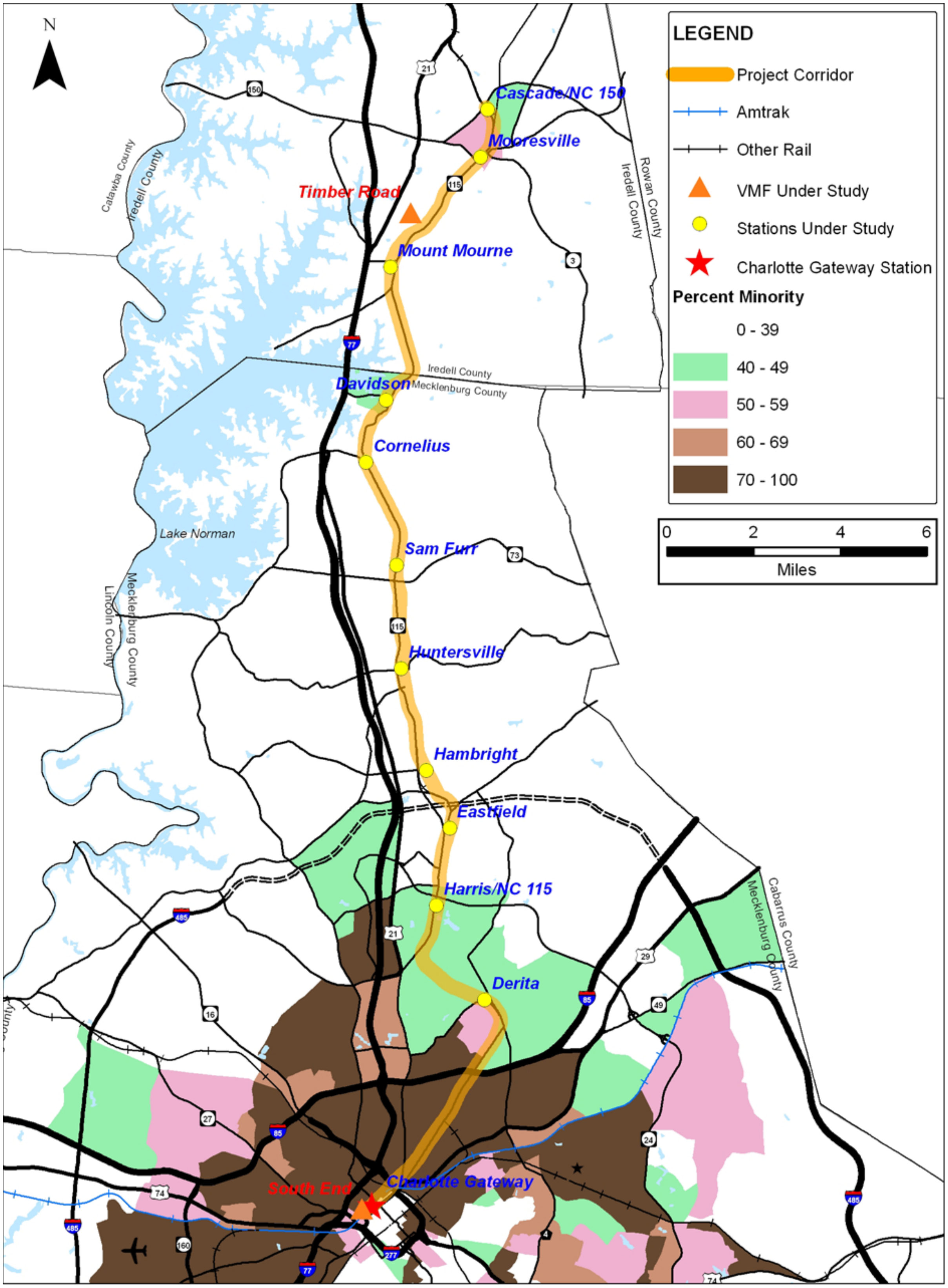


Figure 3.15-1	Percent Minority Population

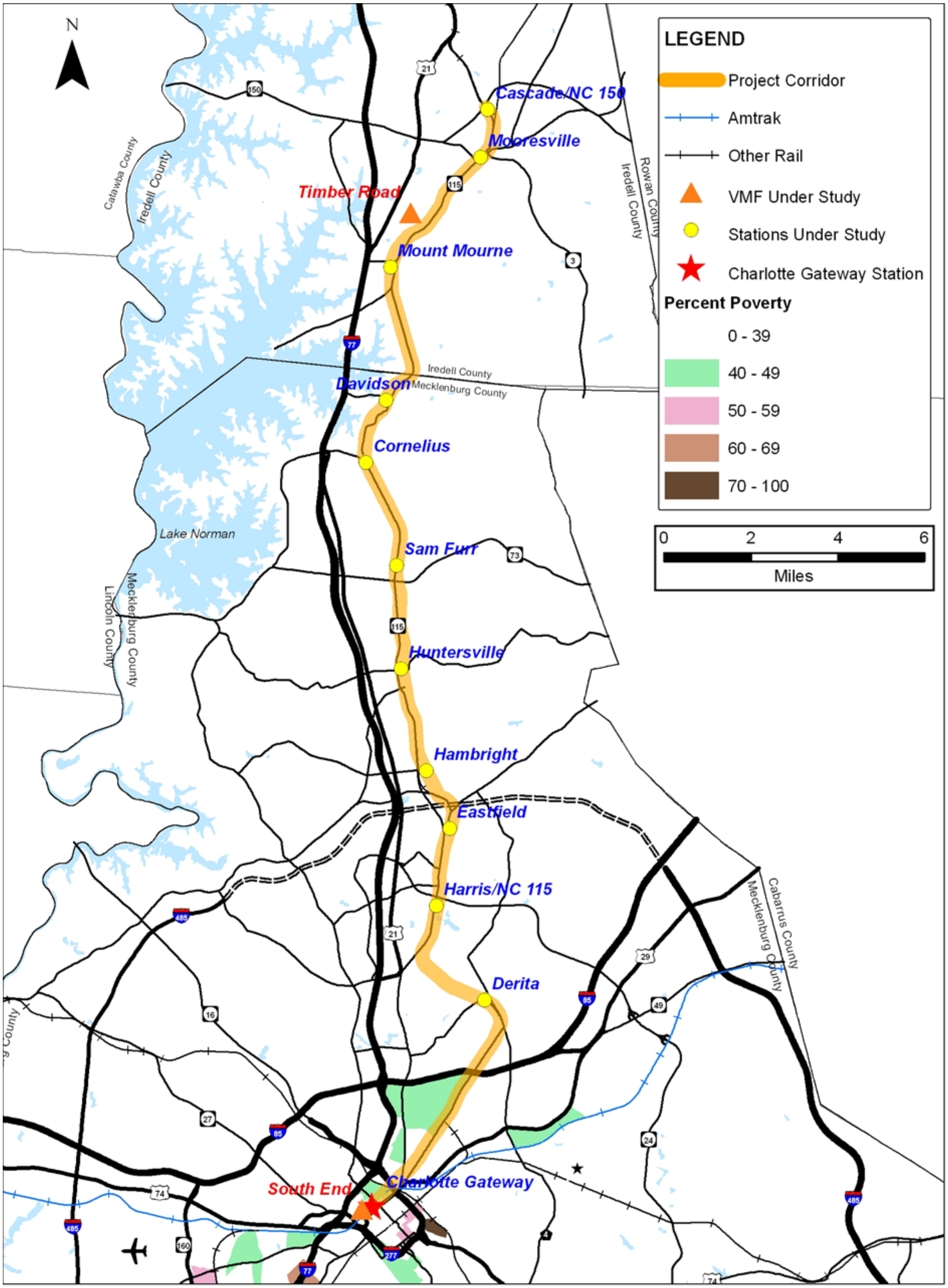


Figure 3.15-2 | Percent Population Below Poverty

3.15.4 Environmental Impacts and Benefits

This section describes potential impacts to minority and low-income communities in the NCCR study area. Executive Order 12898 requires evaluation of the potential for the NCCR to create disproportionately high and adverse impacts on minority and low-income populations with respect to human health and the environment.

CATS has planned a transit network system that would provide transit service equity throughout the proposed NCCR service area (see Chapter 2). In selecting station locations, consideration was given to those areas that are transit dependent and low-income. Introduction of a new transit service would provide a new transportation option for citizens to access employment, schools, and other facilities. Not all minority and low-income communities that requested service would be provided rail service and a rail station; however, bus transit connections from their communities to the nearest rail station are included in the NCCR service plan.

A few low-income and/or minority communities may be affected by the NCCR alternatives. Many of these communities are adjacent to the existing railroad corridor. This proximity would expose homes and businesses that abut the railroad corridor to potential impacts. The primary potential impacts would be related to increased noise and vibration levels between stations along the corridor.

CATS conducted several public meetings throughout the development of this EA that provided opportunities for minority and low-income communities and/or their representatives to address any concerns regarding the NCCR project. Generally, attendees were supportive of the NCCR and saw the project as providing a needed impetus to investment in their neighborhoods. Individuals and some neighborhoods expressed concerns with specific elements of the project.

In general, the NCCR project would not result in disproportionately adverse impacts on low-income and minority communities and businesses. As with any major transportation project, it is likely that residents within the project area will endure some impacts because of the construction and operation of the NCCR project. These impacts, however, would not be disproportionately high and adverse for residents of the area. Among the positive effects of the project for these residents are enhanced mobility options, greater access to regional jobs and non-job opportunities such as educational, shopping and entertainment activities, and potential economic development in communities along the project corridor.

3.15.4.1 Environmental Justice Considerations

In assessing compliance of the NCCR project with the intent of the Executive Order, there are three major considerations:

Whether the project provides transit service equity;

Whether any potential adverse impacts would be disproportionately borne by low-income and minority communities; and

Whether low-income and minority communities have had opportunities to actively participate in the planning of the project.

Environmental Justice analyses include addressing a project’s potential for creating adverse impacts to human health, adverse environmental impacts to natural resources, and impacts that would adversely impact the stability and economic and social functioning of a community or neighborhood. This analysis must ask whether any disproportionate adverse project impacts would affect minority or low-income areas relative to areas not so designated. There are several potential adverse effects that could result from a new transportation project that are of interest to the question of environmental justice. These are divided into the following 17 categories:

1. Air pollution
2. Noise
3. Vibration
4. Water pollution
5. Soils contamination
6. Destruction of man-made resources
7. Destruction of natural resources
8. Diminution of aesthetic values
9. Detriment to community cohesion
10. Diminution of economic viability
11. Detriment to private and public facilities access
12. Detriment to private and public services access
13. Traffic congestion and impairment to mobility
14. Diminution of employment opportunities
15. Displacement
16. Exclusion, isolation or separation
17. Diminution of Department of Transportation benefits

Potential for adverse impacts to human health could result from all of the above categories with the exception of diminution of Department of Transportation benefits. The following sections address environmental justice in terms of transit services equity and the 17 impact issues listed above.

3.15.4.2 Transit Service Equity

Table 3.15-1 provides the percentage of minority communities and low-income communities that are within 1/2 mile of a proposed station based on 2000 Census data. Derita would have the highest percent minority population served by the NCCR project and Harris/NC 115 would serve the highest percentage of persons below poverty. CGS and Derita would serve approximately the same number of minorities (1,054 and 1077 respectively) according to the 2000 Census data. The proposed CGS would serve the greatest number of persons below poverty (537 in 2000). Under the LPA and LPA-H alternative, the Mooresville and Cascade/NC 150 stations would serve a higher percentage of minorities compared to most of the intermediate stations.

Many areas within the study area would have new or expanded bus service as part of the NCCR Build Alternatives. The proposed transit network would include modifications to existing routes as well as some new routes to provide access to the NCCR system and help balance the demand between the commuter rail and local/express bus service. The transit network for the Build Alternatives would provide increased mobility options and access within the study area as well as to and from low-income and minority communities.

Table 3.15-1. Access to Stations for Minority and Low-Income Communities

Station	Population within 1/2 mile of Station	Percent Minority Population	Percent Low-Income Population
Charlotte Gateway	2,368	45%	23%
Derita	1,687	64%	10%
Harris/NC 115	591	24%	32%
Eastfield	161	23%	1%
Hambright	45	11%	4%
Huntersville	1,165	24%	7%
Sam Furr	505	10%	5%
Cornelius	981	14%	6%
Davidson	2,658	22%	5%
Mount Mourne	203	6%	5%
Mooresville	1,428	37%	14%
Cascade/NC 150	1,291	50%	7%

Source: 2000 Census

3.15.4.3 Impact Issues

This section addresses the 17 issues previously listed. They are discussed under the headings: human health issues, environmental issues, social and community issues, and diminution of Department of Transportation benefits. The No-Action and TSM alternatives would not cause impacts related to human health, natural resources, social and community issues for any community.

Human Health Issues

The NCCR project would not result in adverse impacts related to air pollution, water quality, or exposure to soils contamination. The project would have adverse noise impacts but would not be disproportionate to either low-income or minority populations. Further information on noise impacts is provided in the Noise and Vibration description below.

Air Pollution. Overall, regional air quality would not be adversely affected, for the region as a whole or for specific communities or neighborhoods. Maximum one-hour and eight-hour carbon monoxide levels at analyzed intersections near the project would be higher in the Build Alternative compared to the No-Action Alternative but less than National Ambient Air Quality Standards.

Noise and Vibration. For noise impacts classified under the "severe" impact category, the largest number of residential structures impacted range from 1,105 (MOS Alternative) to 1,329 (LPA Alternative) with the use of a train horn at grade crossings. By placing horns at the grade crossings rather than on the train creating a quite zone and using lower noise emission locomotives, the number of sites falling under the severe impact category would be zero for both the MOS and LPA Alternative. Thus, the NCCR project is not expected to create inequitable noise impacts.

The vibration impact assessment identified 96 potentially affected residential properties along the NCCR project. No potentially affected structures were located in areas considered having a high concentration of low-income populations. In areas considered having a high concentration of minorities, 19 structures were identified. Thus, the NCCR project is not expected to create inequitable vibration impacts.

Water Pollution. The NCCR would cross perennial and intermittent streams at the same general locations where existing freight rail tracks cross. All crossings are at existing railroad crossings of these streams. These crossings are disbursed throughout the corridor and are not concentrated within any minority or low-income areas. Water quality for surface waters and ground waters would be protected in accordance with the approvals required by NCDENR DWQ, and in using best management practices for storm water management and, during construction, sediment control. Thus, the NCCR project is not expected to adversely affect water quality.

Soils Contamination. Locations of existing contaminated sites within the railroad ROW and of known sources of potential contaminants outside the ROW are disbursed throughout the NCCR corridor and are not concentrated in low-income and minority neighborhoods. Sites would be investigated further and appropriate mitigation to prevent exposure of workers or adjacent properties to potential contaminants implemented. Federal and state disposal requirements would be applied to all pre-existing contaminants affected by the NCCR. Thus, the project is not expected to expose communities along the rail line to soil contaminants.

3.15.4.4 Environmental Issues –Destruction of Natural Resources

Because the NCCR would be constructed primarily in the railroad ROW and in urbanized areas, impacts to wetlands, vegetation, and threatened and endangered species would be minor. Approximately 0.145 acres of wetlands would be used over the 30-mile-long corridor; none are concentrated in minority or low-income areas. Wetlands mitigation would be in accordance with Section 404 of the Clean Water Act and would be developed in the next phase of this project.

Within a combined 300 foot buffer along the rail line and 0.25-mile buffer around each proposed station, a range of 881 to 1,021 acres of terrestrial plant communities and associated wildlife habitat was identified. Of this, only 4.6 acres would be directly affected by new construction. The amount of terrestrial plant communities and associated wildlife habitat acreage directly impacted by new construction is dispersed sporadically along the entire project and not concentrated in minority or low-income areas.

Potential habitat for three federal-listed and state-listed endangered plant species (Schweinitz's sunflower, smooth coneflower, and Michaux's sumac) is disbursed throughout the corridor. Construction of the NCCR would not result in any substantial adverse impact on natural and beneficial floodplain values of the floodplains or encroachments on floodways. No areas of unique habitat are in the project area. Given the extent and character of natural resources affected by the entire project, it can be concluded that NCCR impacts on natural resources would not adversely or disproportionately impact low-income or minority communities.

3.15.4.5 Social and Community Issues

Destruction of Man-Made Resources. The major impact to man-made resources would be the residential and business displacements discussed below. The railroad corridor itself would be the most substantial man-made resource affected by the NCCR project. CATS has worked, and will continue to work, with the NS and the ROW owners, to integrate the NCCR project into their rights-of-way. Impacts to the railroad will be corridor-wide and not associated with low-income or minority populations and, thus, would not disproportionately affect low-income or minority populations.

Destruction of Aesthetic Values. The NCCR would affect visual quality only at selected station locations and trackwork areas and not along the entire project. These impacts would result from removal of, or reduction in, existing vegetative screens of the existing railroad corridor, from new trackwork, and from construction of station or parking lot infrastructure adjacent to residential areas or historic resources. NCCR passengers would have views into backyards, normally private spaces, at some locations. Such effects occur in a variety of community settings and are not exclusive to low-income or minority areas. Thus, such impacts would not be disproportionate. Changes in aesthetic values within low-income and minority areas are discussed by community in the next section.

<u>Diminished Community Cohesion; Reduced Access to Public and Private Facilities and Services; and Exclusion, Isolation or Separation</u>. The integrity of the communities along the existing railroad corridor would not be adversely affected by the NCCR. The NCCR would follow existing railroad rights-of-way with the exception of alternatives MOS-H and LPA-H, which will follow a new rail alignment in an area that is mostly vacant land. Since the existing rail corridor from Charlotte to Mooresville is an active freight rail facility and has been operating in this location for decades, communities and businesses have historically developed around the railroad corridor. Except for site specific displacements, the basic structure of the business and residential communities throughout the project corridor would remain intact and could be enhanced by the transportation benefits of the NCCR. Thus, implementation of the rail project would not adversely impact community cohesion.

The project would not result in new separation, isolation or exclusion of portions of low-income and minority communities from the larger community. Access to public and private facilities and services (schools, churches, shopping, emergency services) would not be adversely affected since these have generally developed around a pre-existing railroad corridor. The NCCR project would result in increased regional accessibility, such that improved access to regional services for communities could result.

<u>Diminished Economic Viability and Diminished Employment Opportunities</u>. Employment opportunities for minority and low-income communities would not be adversely affected by the NCCR. None of the businesses that would be displaced by any of the Build Alternatives are within low-income neighborhoods. None of the two businesses that would be displaced under the MOS Alternative are within minority neighborhoods. Four of the six businesses that would be displaced under the LPA Alternative are in areas considered having a high concentration of minorities. All four businesses are associated with the proposed Cascade/NC 150 station site in Mooresville. Of these businesses displaced, none indicated having a minority employment greater than 50 percent of the work force. The total number of employees at these businesses generally ranges from 38 to 68. There are no businesses affected by trackwork

Interviews were conducted with owners of most of the businesses displaced. These interviews found that none of the business owners believed they would close operations rather than relocate. All businesses anticipated relocating. CATS relocation program would give special attention to facilitating the relocation of businesses with high minority and low-income employment.

Improved transportation options would increase access to potential employment. The project would provide employment opportunities that could be reached via transit by all communities within or near the project corridor. The economic and employment benefits and disbenefits of the project would not be disproportionate since there will be additional employment access benefits, the project's business displacements would not inequitably focus on businesses with high minority employment, and the owners of most displaced businesses have indicated that they can relocate.

<u>Traffic Congestion and Impairment to Mobility</u>. The NCCR would increase regional mobility in general and in low-income and minority areas. As noted above under "Diminished Community Cohesion; Reduced Access to Public and Private Facilities and Services; and Exclusion, Isolation or Separation," the project would not affect community cohesion and access. Thus, it would not impair mobility. The project would affect traffic at grade crossings. Near proposed stations, certain locations would experience changes in

local traffic circulation and increased feeder bus activity. These effects, however, would occur for all communities that are adjacent to the railroad throughout the project length. No disproportionate traffic or mobility impacts would occur with the NCCR project.

Displacement. Business displacements were discussed above under, "Diminished Economic Viability and Diminished Employment Opportunities." Three to seven households would be displaced by the NCCR, depending on the alternative selected and the location of the VMF. Four dwellings potentially displaced are within the proposed Cascade/NC 150 station site in areas of high minority populations. There are no dwellings displaced in areas of low-income concentrations.

These displacements would not adversely impact the stability of the associated low-income or minority neighborhood but would require special attention to ensure that the housing needs of the households displaced are adequately met. Comparable housing is available. CATS would develop and adopt a Relocation and Assistance Plan, in accordance with the Federal Uniform Relocation Assistance and Real Property Acquisitions Act of 1970 and North Carolina Relocation Assistance Act.

The NCCR could result in a disproportionate displacement impact on minority neighborhoods, relative to displacements elsewhere along the project corridor. Although those displaced would be relocated, the total displacements would be small given the size of the project, and they would not be concentrated in any single neighborhood.

3.15.4.6 Diminution of Department of Transportation Benefits

Implementation of NCCR would enhance transit service sponsored in part by USDOT programs. No USDOT programs, policies, or activities would be eliminated, reduced in scope, or delayed as a part of implementation of the NCCR project.

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

4.0 TRANSPORTATION

This chapter describes the transportation impacts of the North Corridor Commuter Rail (NCCR) alternatives. It also compares the NCCR alternatives to the No-Action and Transportation Systems Management (TSM) alternatives. The chapter begins with a description of the existing and future trip making in the area. The remaining sections in the chapter are organized by mode: public transportation (transit), highway and street network (automobile), other modes, bike routes and pedestrian walkways, parking, and compatibility to other plans.

4.1 Travel Patterns

Travel purpose and travel distribution for existing (Year 2003) and forecast (Year 2030) trip purposes between major origins and destinations in the NCCR corridor and throughout the region provide a basis for understanding and identifying system and corridor deficiencies in the Charlotte transportation network.

The primary source of data for trip making is based on the Charlotte Department of Transportation's (CDOT) travel demand model (Metrolina Regional Model). The travel demand model, which was completed in 2006, uses 2003 as the current year and 2030 as the forecast year. The model was developed to describe existing and future travel patterns in the region. It describes trips by mode between traffic analysis zones in a seven-county region, including: Mecklenburg, Gaston, Lincoln, Iredell, Cabarrus, and Union counties in North Carolina and York County in South Carolina. The ability to model 2030 trips was created by combining year 2003 travel desires with 2030 forecasts of population and employment. The trips are distributed to zones and allocated to the transportation network while accounting for current and programmed transportation improvements as adopted in the regional long range transportation plan. A mode-choice model distributes forecast trips among various modes of travel.

Person trips, as the basic unit of trip making are analyzed for two major trip making purposes: home-based and non-home based trips. Home based trips include home based work trips and home based other trips. Figure 4.1-1 shows the area included in the Metrolina Regional Model divided into major destinations (districts). For analysis purposes, the North Corridor Study Area is defined by districts 1-7. Districts were defined to include trips from the study area to Center City Charlotte (area inside I-277 loop), cross-town trips, and trips within the corridor study area or internal trips. Cross-town trips for the North Corridor include trips traveling between the Northwest wedge (the area between the West and North Corridors) and the Northeast wedge (located between the North and Northeast Corridors) and areas in between. Table 4.1-1 and Table 4.1-2 summarize total daily person trips and the trip interaction between districts for Years 2003 and 2030. Table 4.1-3 aggregates districts and summarizes the total daily person trips by types of trips.

The following conclusions about travel patterns can be drawn based on trip origins and destinations found in Table 4.1-1 through Table 4.1-3. Trips referred to in the following discussion/ conclusions represent daily person trips (not vehicle trips or time-of-day trips).

4.1.1 Total Daily Person Trips

From the year 2003 to 2030, total trips are expected to increase by 80 percent from 5.5 million to 10.1 million trips per day (an almost 3 percent increase per year). Trips destined for the study area more than doubled (134 percent) and trips going to Center City Charlotte increased by 67 percent.

Home based trips account for almost two-thirds of the total daily trips. Home-based-work (HBW) accounts for 19 percent and home-based-other (HBO) accounts for 44 percent of the daily trips. Analysis indicates that HBW, HBO, and non-home-based (NHB) trips are all expected to increase 80 percent between 2003 and 2030.

In 2003, nine (9) percent of the trips were going to the North Corridor study area and four (4) percent were destined for Center City Charlotte. By 2030, 12 percent of the trips will be destined for the North Corridor study area and only three (3) percent to Center City Charlotte.

4.1.2 Daily Trips Originating from Study Area

By 2030, total person trips originating from the North Corridor study area will more than double (124% increase). The home-based-work trip is expected to increase by 116 percent. Trips originating in the study area and destined for within the study area is expected to increase by 138 percent. Trips destined for Center City Charlotte, are expected to increase by 92 percent by 2030.

In 2003, eight (8) percent of HBW trips are destined for Center City Charlotte and 41 percent remain within the study area. In 2030 seven (7) percent are destined for Center City Charlotte and 47 percent remain within the study area. The overall growth of employment in the North Corridor study area and other districts illustrate the dynamic distribution and growth of the Charlotte economy. Hence, the central business district (CBD) as the job engine is still growing; it represents a smaller piece of the job market in 2030.

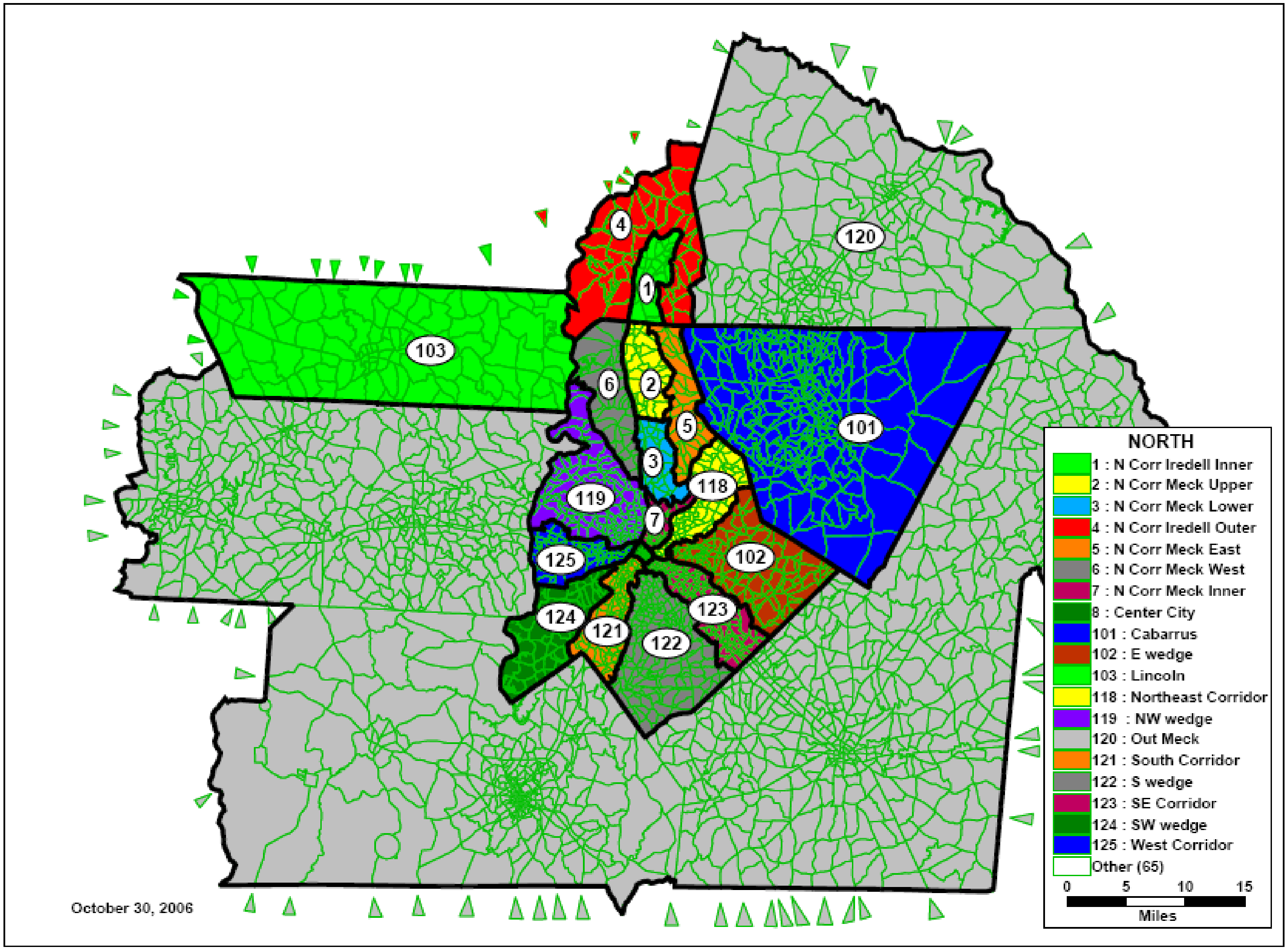
Excluding Center City Charlotte, total trips originating from the North Corridor and destined to other parts of the North Corridor grow 108 percent in the 2003 to 2030 year period.

Of the entire home based work trips going to Center City Charlotte (77,032), in 2003, 12 percent are originating from the North Corridor. In 2030 this becomes 13 percent.

4.1.3 Daily Trips Originating Outside the Study Area

The North Corridor is projected to dominate as an attractive area for jobs, retail, residential and recreation. Without funding in transportation infrastructure, the ensuing vehicular congestion will likely parallel the growth in total trips originating from other areas and destined for the North Corridor. From 2003 to 2030 HBW trips originating in other areas and destined to the North Corridor increased 125 percent. For HBO trips, the year 2003 to 2030 increase is 134% and for NHB trips, the increase is 122%.

Figure 4.1-1: Trip Origin and Destination Districts



Source: Metrolina 2005 Travel Demand Model, TransCAD file from CDOT

Table 4.1-1. Year 2003 All District Trips

Districts FROM TO	To Study Area	Center City	Cabarrus	East Wedge	Lincoln	NE Corridor	NW Wedge	Outside Meck	South Corridor	South Wedge	SE Corridor	SW Wedge	West Corridor	TOTAL
N Corr Iredell Inner	37,802	327	2,767	78	667	488	488	3,958	236	172	212	65	140	47,399
N Corr Meck Upper	49,049	2,278	7,128	711	1,502	3,844	4,229	2,124	1,828	1,537	1,900	451	1,084	77,667
N Corr Meck Lower	18,903	4,132	3,769	2,750	209	9,531	5,485	1,839	3,709	3,478	4,382	913	2,067	61,166
N Corr Iredell Outer	79,990	659	4,381	146	2,043	914	906	7,191	453	316	403	127	270	97,799
N Corr Meck East	29,682	3,136	11,421	3,326	257	14,207	4,487	2,161	2,581	2,359	3,518	644	1,563	79,342
N Corr Meck West	65,591	4,745	4,963	1,283	2,763	5,548	8,638	3,156	3,898	3,310	3,798	958	2,278	110,929
N Corr Meck Inner	10,853	6,234	2,461	3,637	71	8,276	4,809	2,266	5,663	5,875	6,974	1,358	2,537	61,013
Center City	7,103	20,517	1,157	4,175	66	5,732	5,613	3,223	11,511	13,218	14,523	2,535	4,030	93,403
Cabarrus	40,502	5,637	250,724	17,511	278	40,478	5,339	54,660	4,364	5,309	11,273	1,168	2,713	439,954
East wedge	17,075	18,457	14,937	60,892	73	34,912	7,485	16,489	14,703	43,132	75,978	2,848	5,146	312,124
Lincoln	19,243	1,153	589	160	92,397	786	4,131	43,338	871	637	731	403	1,126	165,565
Northeast Corridor	29,955	13,533	23,065	22,190	140	56,274	10,929	6,177	11,050	17,008	27,240	2,583	5,595	225,739
NW wedge	28,613	17,355	3,935	5,654	1,468	14,193	27,146	18,275	19,163	18,609	17,596	6,008	12,602	190,617
Outside Meck	41,614	23,918	79,143	22,958	29,933	17,687	29,483	1,673,904	58,845	99,559	60,208	32,062	26,139	2,195,452
South Corridor	9,831	18,899	1,491	5,652	92	7,289	9,259	18,326	62,680	72,196	23,623	16,095	9,881	255,315
South wedge	12,447	28,711	2,305	23,764	93	13,568	10,610	48,585	86,988	272,491	98,513	20,790	11,577	630,443
Southeast Corridor	13,943	26,670	4,501	40,124	100	20,311	9,708	23,222	25,534	86,050	108,584	4,914	7,159	370,821
SW wedge	2,525	5,006	366	1,029	40	1,804	3,201	14,431	20,703	19,817	5,064	15,166	4,679	93,831
West Corridor	5,628	7,541	1,089	2,191	166	4,275	7,151	8,963	12,148	11,890	7,994	4,723	6,636	80,395
TOTAL	520,349	208,909	420,192	218,230	132,357	260,116	159,097	1,952,286	346,928	676,964	472,512	113,811	107,222	5,588,973
From Study Area Only	291,870	21,512	36,890	11,931	7,512	42,808	29,042	22,695	18,368	17,048	21,186	4,515	9,938	535,314
Outside Study Area	228,479	187,397	383,302	206,299	124,845	217,309	130,055	1,929,591	328,560	659,916	451,326	109,296	97,284	5,053,659

Source: Metrolina 2005 Travel Demand Model, TransCAD file from CDOT

Table 4.1-2. Year 2030 All District Trips

Districts FROM TO	To Study Area	Center City	Cabarrus	East Wedge	Lincoln	NE Corridor	NW Wedge	Outside Meck	South Corridor	South Wedge	SE Corridor	SW Wedge	West Corridor	TOTAL
N Corr Iredell Inner	87,319	676	6,189	225	1,496	1,231	1,375	5,965	409	309	395	156	340	106,084
N Corr Meck Upper	124,505	5,197	21,739	2,043	4,897	9,773	10,675	5,025	3,375	2,718	3,323	1,151	2,684	197,106
N Corr Meck Lower	47,781	7,539	10,524	5,182	938	18,222	11,885	3,803	5,458	4,770	6,101	1,609	3,963	127,772
N Corr Iredell Outer	205,555	1,507	11,939	554	5,393	3,023	2,753	14,064	885	655	856	365	751	248,299
N Corr Meck East	78,367	5,612	31,882	6,394	1,247	26,063	9,811	5,416	3,737	3,225	4,651	1,236	2,953	180,594
N Corr Meck West	129,136	8,869	13,165	3,196	8,742	13,111	20,415	6,665	6,111	4,963	5,690	2,085	4,914	227,063
N Corr Meck Inner	22,640	11,968	5,446	7,295	212	15,376	9,006	3,718	8,704	9,033	11,028	2,049	4,724	111,199
Center City	19,420	43,287	3,200	10,000	252	13,313	13,664	7,258	24,233	26,486	27,468	5,198	10,469	204,248
Cabarrus	107,739	11,379	538,525	45,254	1,150	79,636	13,148	98,402	7,480	10,007	19,475	2,569	5,844	940,608
East wedge	37,426	28,331	39,311	134,884	254	63,263	11,970	46,424	19,654	57,332	106,453	3,881	8,153	557,334
Lincoln	46,514	1,610	2,232	418	209,789	2,104	11,910	60,569	1,597	1,175	966	1,315	2,469	342,666
Northeast Corridor	70,585	21,404	53,727	40,584	590	103,275	19,075	11,339	14,257	20,439	33,246	3,694	9,166	401,381
NW wedge	75,796	29,532	11,861	9,764	6,833	26,024	67,016	33,829	28,716	24,949	22,365	12,413	26,373	375,471
Outside Meck	83,410	37,172	147,095	64,725	67,160	33,430	57,540	2,904,753	103,892	188,924	99,811	79,526	50,958	3,918,397
South Corridor	18,413	32,983	2,959	10,082	316	11,521	16,154	31,971	101,711	102,034	32,671	25,731	18,782	405,329
South wedge	18,360	39,167	4,193	35,489	288	17,004	14,799	88,497	108,680	347,523	112,550	26,213	17,249	830,015
Southeast Corridor	21,996	37,669	7,741	63,770	222	26,749	13,339	42,987	31,792	102,927	136,122	6,002	10,626	501,942
SW wedge	6,325	9,907	1,000	2,132	312	3,552	8,783	37,816	40,489	34,392	8,123	45,106	12,463	210,400
West Corridor	14,095	15,432	2,656	4,430	748	8,249	18,179	21,197	24,269	20,703	12,797	11,591	20,580	174,925
TOTAL	1,215,381	349,242	915,382	446,420	310,835	474,919	331,497	3,429,696	535,451	962,566	644,091	231,890	213,460	10,060,831
From Study Area Only	695,303	41,368	100,883	24,888	22,924	86,799	65,919	44,655	28,680	25,673	32,043	8,651	20,328	1,198,116
Outside Study Area	520,078	307,875	814,500	421,532	287,912	388,120	265,578	3,385,041	506,771	936,892	612,048	223,239	193,132	8,862,716

Source: Metrolina 2005 Travel Demand Model, TransCAD file from CDOT

Table 4.1-3. Trips Originating in North Corridor Study Area

Trip Destination	2003 HBW	2003 HBO	2003 NHB	2003 Total	2030 HBW	2030 HBO	2030 NHB	2030 Total
Trips Originating From Within North Corridor Study Area								
Study Area	44,323	136,377	111,170	**291,870**	108,261	318,711	268,331	**695,303**
Center City	8,867	6,721	5,923	**21,512**	15,422	14,362	11,584	**41,368**
East	17,500	34,063	24,363	**75,925**	34,669	58,298	50,763	**143,731**
West	10,583	18,644	14,268	**43,496**	22,473	38,586	33,840	**94,898**
South	10,574	15,091	9,751	**35,415**	16,304	22,291	15,758	**54,354**
Other	15,440	25,793	25,863	**67,096**	34,939	69,782	63,741	**168,462**
Total	**107,287**	**236,688**	**191,339**	**535,314**	**232,068**	**522,031**	**444,017**	**1,198,116**
Trips Originating From Outside of North Corridor Study Area								
Study Area	58,028	91,123	79,329	**228,479**	130,435	213,609	176,033	**520,078**
Center City	68,165	47,480	71,752	**187,397**	100,986	93,524	113,365	**307,875**
East	160,131	381,269	333,533	**874,933**	266,997	606,850	547,853	**1,421,699**
West	88,763	126,938	120,934	**336,635**	169,600	271,566	240,783	**681,949**
South	182,739	426,857	378,880	**988,476**	271,332	613,263	559,068	**1,443,663**
Other	413,573	1,127,173	896,993	**2,437,739**	767,101	2,064,562	1,655,789	**4,487,452**
Total	**971,398**	**2,200,840**	**1,881,420**	**5,053,659**	**1,706,450**	**3,863,375**	**3,292,890**	**8,862,716**
Total Trips								
Study Area	102,351	227,500	190,499	**520,349**	238,696	532,320	444,364	**1,215,381**
Center City	77,032	54,202	77,675	**208,909**	116,408	107,886	124,948	**349,242**
East	177,631	415,332	357,896	**950,858**	301,666	665,148	598,616	**1,565,430**
West	99,346	145,582	135,202	**380,131**	192,072	310,152	274,622	**776,847**
South	193,313	441,948	388,630	**1,023,891**	287,636	635,554	574,826	**1,498,017**
Other	429,013	1,152,966	922,857	**2,504,835**	802,039	2,134,345	1,719,530	**4,655,914**
Total	**1,078,686**	**2,437,528**	**2,072,759**	**5,588,973**	**1,938,518**	**4,385,406**	**3,736,907**	**10,060,831**

Source: Metrolina 2005 Travel Demand Model, TransCAD file from CDOT

4.2 Transit

4.2.1 Existing System Level of Service

Existing public transportation service within the NCCR study area is provided by Charlotte Area Transit System (CATS). CATS currently operates a regional fixed-route bus system with circulator routes in the towns along the corridor. CATS also provides ridesharing services, including a vanpool program and a computerized matching service for vanpools and carpools. A light rail transit service (Lynx Blue Line) initiated service in November of 2007 and is currently serving approximately 12,000 riders per day. The light rail service was formerly known as the South Corridor and and has been currently branded as the Lynx Blue Line. The Lynx blue Line provides light rail transit service to a nine mile corridor paralleling South Boulevard with a southern terminus at I-485 and the northern terminus at the 7th Street Station, just north of the existing Charlotte Transportation Center (CTC) in Center City Charlotte.

4.2.1.1 Bus Fleet Characteristics

CATS currently operates a fleet of 423 buses, which includes 270 forty-foot buses, 71 thirty-foot buses and 82 shuttle buses. Additonally, CATS provides 76 pool vans. CATS outsources transit services, for an additional forty foot bus and nine shuttle buses, to a private provider. The system operates primarily from its major transit passenger terminal, the CTC in Center City Charlotte. The bus system includes two vehicle maintenance facilities (VMFs): the primary garage located at 3145 South Tryon Street, which opened in spring 2005, and a second site at 901 North Davidson Street, which served as CATS primary VMF until 2005.

4.2.1.2 Geographic Coverage

The North Corridor study area is currently being provided with both local and express bus service. The three express bus routes (North Mecklenburg, Mooresville and Northlake) provide limited stop service from the northern communities of Huntersville, Cornelius, Davidson, and Mooresville to Center City Charlotte. Local bus routes in the North Corridor study area operate only within the City of Charlotte with no service available to or between the northern communities. The two local routes along the NCCR line are the Route 13 (Nevin Road) and Route 22 (Graham Street). Other local routes, such as Route 7 (Beatties Ford Road), Route 21 (Double Oak), Route 26 (Oaklawn), and Route 202 (Washington-Lincoln Heights), serve areas close to Center City Charlotte and on the west-side of I-77. These local routes would not serve the proposed NCCR ridership market. The Village Rider currently provides service to the local communities in North Mecklenburg County, but is not designed to connect with the local bus route system.

The following paragraphs describe the bus routes that currently serve the ridership market area of the NCCR corridor.

Route 13 – Nevin Road. This route originates in Center City Charlotte and provides service along Statesville Avenue between Norris Avenue and Nevin Road in Charlotte. The Nevin Center, a facility providing employment training for the disabled, is a major destination for Route 13.

Route 22 – Graham Street. The local route runs from Center City Charlotte to University Research Park in northeast Charlotte with service along Graham Street and Sugar Creek Road to the Derita community.

Route 96 – Village Rider (Davidson). This community circulator connects key destinations in Davidson, Cornelius, and Huntersville east of I-77. The service can deviate up to a quarter of a mile from the fixed route if CATS receives a telephone call for transportation from a citizen. Timepoints on the route include the North County Library in Huntersville, Cornelius Town Hall, and the Ada Jenkins Center in Davidson.

Route 97 – Village Rider (Cornelius). This community circulator, serving portions of Huntersville and Cornelius west of I-77, operates along Sam Furr Road and Catawba Avenue. Timepoints on the route include the North County Library in Huntersville and Cornelius Elementary School. The bus can deviate from the route to serve telephone requests for service.

Route 98 – Village Rider (McCoy Road). This community circulator operates along US 21, Gilead Road, and McCoy Road in Huntersville. Timepoints include the intersection of McCoy and Toronto Roads, Food Lion on US 21 at Exit 23 on I-77, and the North County Library on Sam Furr Road near Exit 25.

Route 99 – Village Rider (Huntersville). This circulator serves locations in Huntersville located east of I-77. The route operates along Sam Furr Road, NC 115, Gilead Road, US 21, Mt. Holly-Huntersville Road, and Verhoeff Drive. Timepoints are North County Library, Huntersville Town Hall, and Huntersville Athletic Park.

Route 53X – Northlake Express. This express route is CATS newest, beginning operations on October 3, 2005. It runs between Center City Charlotte and the CATS park-and-ride (PNR) lot at Huntersville Gateway near Exit 23. The route also serves a PNR lot at the new Northlake Mall located on Harris Boulevard just west of Exit 18 on I-77. The route provides local service along US 21 between Sunset and Gilead Roads in the off-peak direction in order to serve persons with jobs along Statesville Road in north Charlotte and Huntersville.

Route 77X – North Mecklenburg Express. This express route operates between Center City Charlotte and a PNR facility at Sadler Square Shopping Center located on Griffin Street in Davidson. The route serves three more PNR lots: Cornelius Town Hall, Target near Exit 25, and Huntersville Gateway near Exit 23. Buses travel along US 21 between Exit 23 in Huntersville and Exit 28 in Cornelius and use I-77 between Exit 23 and Center City Charlotte.

Route 83X – Mooresville Express. This regional express route operates between Center City Charlotte and a PNR lot in Mooresville near Exit 36 on I-77. Route 83X also serves two more Mooresville PNR lots located at Brawley Commons and Watermark Shopping Centers. The express route travels along I-77 between Exit 33 in Iredell County and downtown Charlotte.

4.2.1.3 Operating Characteristics

CATS operates a full schedule during weekdays and slightly reduced schedules on Saturdays and Sundays. The frequency of service varies throughout the day so an average headway was determined for peak and off-peak periods, and this information is summarized in Table 4.2-1, for the relevant transit routes serving the markets of the proposed commuter rail service corridor.

Table 4.2-1. Operating Characteristics for Routes Serving the North Corridor (2005)*

Operating Characteristics	Local Routes	Express Routes	Total
Number of weekday routes	6	3	9
Number of weekend routes	6	0	6
Headway Range (min)Peak weekday	40-60	10-30	NA
Average Speed (MPH)	14.1	20.3	15.6
Number of Peak Hour Buses	9	17	26
Revenue Hours (daily/annual)	241/72,642	89/22,628	330/95,270
Revenue Miles (daily/annual)	3,439/1,027,506	1,809/459,518	5,248/1,487,023
Passenger Boardings (daily/annual)	1,907/566,820	902/229,032	2,809/795,852
2005 Operating Costs (daily/annual)	$13,231/$3,969,421	$11,591/$2,944,174	$24,823/$6,913,595

Source: CATS, Operating Statistics 2005
* Only includes major routes serving markets along the NCCR; does not include every route in the study area.

The number of buses used to operate the service on these routes during peak periods is a function of the headways, route length, and average operating speeds.

Table 4.2-2 depicts the fares for different categories of users. CATS also offers multiple-ride ticket books and monthly passes at a discounted cost. Transfers are free between the same services (i.e., local to local) with an extra charge for transferring from a local or community shuttle to a premium route (Express or Express Plus).

Table 4.2-2. 2008 CATS Fare Structure

Passenger Category	Lynx Blue Line & Local Bus	Express Bus	Express Bus Plus	Community Shuttle
Adult	$1.30	$1.75	$2.60	$0.60
Senior Citizens & Disabled	$0.65	$0.85	$1.30	$0.60
Children (46 inches and under)	Free	Free	Free	Free
Students	$0.65	$0.85	$2.60	$0.60

Source: CATS, Operating Statistics 2005; CATS website as of 04/22/08
http://www.charmeck.org/Departments/CATS/Riding+CATS/Passes-Fares.htm

4.2.1.4 Ridership

Annual ridership for the CATS routes operating in the North Corridor is summarized in Table 4.2-3. In fiscal year 2005, boardings on public transit services in the North Corridor totaled 796,000 passengers.

Table 4.2-3. 2005 CATS Route Operating Status in North Corridor

CATS Routes[1]	Vehicle Hours Daily/ Annual	Revenue Miles Daily/ Annual	Passenger Boarding Daily/ Annual	Operating Cost Daily/ Annual
13 – Nevin	40/12,107	457/136,685	698/207,573	$2, 351/$705,387
22 – Graham	39/11,769	516/154,045	912/270,963	$2,735/$820,501
53X – North Lake Express[2]	17/4,362	353/89,567	111/28,299	$2,109/$535,601
96 – Davidson Village Rider	35/10,593	546/163,076	50/14,854	$1,824/$547,292
97 – Cornelius Village Rider	32/9,528	500/149,264	87/25,854	$1,685/$505,603
98 – McCoy Village Rider	57/17,108	820/244,973	88/26,185	$2,679/$803,734
99 – Huntersville Village Rider	38/11,536	601/179,463	72/21,391	$1,956/$586,904
77x – North Mecklenburg Express	56/14,339	1,119/284,174	646/164,020	$7,437/$1,888,916
83x – Mooresville Express	15/3,927	338/85,777	145/36,713	$2,046/$519,657
Total	330/95,270	5,248/1,487,023	2,809/795,852	$24,823/$6,913,595

Source: CATS, Operating Statistics 2005

[1] Only includes major routes serving markets along the NCCR; does not include every route in the study area.

[2] Route 53X was not operational in 2005; FY 2005 ridership is estimated.

4.2.1.5 Short-Range Plans

In summer 2005, CATS began an update of the agency's *Countywide Transit Services Plan* (CTSP), which was approved in 2001. The update of the five-year CTSP could recommend improved transit services in the North Corridor when it is completed in mid-2006. CATS' *2007-2011 Capital Improvement Program* includes the following improvements (expanded services or capital projects in the North Corridor are highlighted):

4.2.1.6 Long-Range Plan

Federal law requires that projects in the long-range transportation plan (LRTP) be categorized in financially constrained horizon years for air quality analysis. The 2030 Mecklenburg-Union Metropolitan Planning Organization (MUMPO) LRTP includes three horizon years for air quality analysis: 2010, 2020, and 2030.

In the South Corridor's Major Investment Study (MIS), Light Rail Transit (LRT) was selected as the "Locally Preferred Alternative" (LPA). This LRT project is presently operating as the Lynx Blue Line. Recommendations from MISs for the North, Northeast, Southeast, and West Corridors were consolidated in an overall Corridor System Plan approved by local officials in September 2002. In 2004, the Rock Hill-Fort Mill Metropolitan Planning Organization, with support from CATS, began an Alternatives Analysis for rapid transit service between Rock Hill, South Carolina and Charlotte. This planning study recommends the use of US 21 corridor and suggest a phased-in approach; starting with a simple Bus Rapid Transit (BRT) operation to a full-blown system that would complement the South Corridor LRT and one that could eventually be converted to a rail system in the long term.

The following long-range transit improvements are based on the individual MISs and the Corridor System Plan and are organized to match the horizon years of the MUMPO 2030 LRTP.

2010 Transit Improvements

North Corridor – Commuter Rail service would use the Norfolk Southern (NS) "O" line from the proposed Charlotte Gateway Station (CGS) on West Trade Street in Center City Charlotte to a station north of Mooresville, NC. Enhanced Bus Service would use the newly constructed High Occupancy Vehicle (HOV) lanes on I-77 to connect north Charlotte, Huntersville, Cornelius, Davidson and Mooresville with Center City Charlotte.

South Corridor – the nine mile LRT (Lynx Blue Line) has been in service since November 2007 and operates parallel to South Boulevard from Seventh Street in Center City Charlotte to a large PNR lot adjacent to I-485 near Pineville, NC.

Northeast Corridor – LRT service would be extended from Seventh Street in Center City Charlotte to the North Davidson Street area (NoDa) of North Charlotte.

Bus Fleet Expansion – CATS will continue to expand and optimize fixed route bus transit service throughout the region. Current schedules and planning call for the 2010 bus fleet to reach 375 revenue vehicles and 103 paratransit vehicles.

2020 Transit Improvements

Northeast Corridor – The Northeast Corridor is an extension of the LYNX Blue Line light rail service. The 11-mile alignment extends from 9th Street in Center City through the North Davidson (NoDa) and University areas to I-485 north of UNC Charlotte.

Southeast Corridor – The Southeast Corridor extends approximately 13.5 miles from Charlotte's Center City to the border of Mecklenburg and Union Counties, terminating at Central Piedmont Community College's Levine Campus. During the DEIS, two modes of transportation were evaluated for the Southeast Corridor, Bus Rapid Transit (BRT) and Light Rail Transit (LRT).

Although BRT was selected as the Locally Preferred Alternative in the SE Corridor, implementation of BRT is delayed for at least five years to allow for the future consideration of Light Rail (LRT) in the SE Corridor and to take the necessary steps in design and engineering with NCDOT on the Highway Project (Independence Boulevard) so that light rail could be considered in the future

West Corridor – The proposed West Corridor project is a 6.4 mile alignment that will operate Streetcar from Trade St to Cedar St to West Morehead St, then along Wilkinson Blvd to Harlee Ave, terminating at the airport employee parking lot on Harlee Ave. The Streetcar will travel in mixed traffic in the curb lanes. Streetcar was selected as the Locally Preferred Alternative for the West Corridor.

Streetcar – A "Portland"-type streetcar service is proposed eastward along Central Avenue to Eastland Mall, westward to Johnson C. Smith University and then north along Beatties Ford Road to I-85. The proposed streetcar route would extend along Trade Street through the center of Center City Charlotte and would provide another transit link between the proposed CGS and the existing CTC in Center City Charlotte.

The Center City Streetcar project is a key recommendation of the 2025 Corridor System Plan. The alignment will serve the central business district(CBD) and provide connectivity to surrounding communities and institutions. The proposed streetcar line will run 10 miles along Beatties Ford Road near I-85 through Center City (CBD) along Trade Street, traveling up Elizabeth Avenue by Central Piedmont Community College(CPCC), and out to Central Avenue at Eastland Mall.

The streetcar is also a key component to implementing the Center City 2010 Vision Plan, helping to create "a livable and memorable Center City." Further, the streetcar will be critical in creating a transit focused and pedestrian oriented center city through developing an integrated transportation system of pedestrians, bikes, motor vehicles, transit, parking, and land development.

Bus Fleet Expansion – CATS will continue to expand and optimize fixed route bus transit service throughout the region. Current service planning assumptions for the 2020 bus fleet would yield 569 revenue vehicles and 128 paratransit vehicles.

2030 Transit Improvements

Northeast – BRT/Enhanced Bus Service would connect University City to University Research Park and Speedway Boulevard in Cabarrus County. The Enhanced Bus service would use the I-85 and I-77 Interstates to connect to the proposed CGS in Center City Charlotte.

West Corridor – Enhanced Bus service would extend from the Airport on Wilkinson Boulevard to I-485 and allow for local service extensions into neighboring Gaston County. Gaston County recently completed a Transit Alternatives Study that recommended further detail study of BRT or LRT alternative to complement CATS West Corridor.

Streetcar – A Streetcar loop of Center City Charlotte is proposed to complement the expansion of rapid transit and provide a link with Center City Charlotte's four historic residential wards.

South Corridor Extension – A recently completed planning study (2006) recommends the use of US 21 corridor between Rock Hill and Charlotte. The study suggest a phased-in transit plan; starting with a simple BRT operation to a full-blown system that would complement the South Corridor LRT and one that could eventually be converted to a rail system in the Future.

Bus Fleet Expansion – CATS will continue to expand and optimize fixed route bus transit service throughout the region. Current service planning calls for the 2030 bus fleet to reach 787 revenue vehicles and 153 paratransit vehicles.

4.2.2 Future System Level of Service

The public transportation impacts of alternatives are measured by their projected effect on transit levels of service and ridership. The level of service measures include geographic coverage, number of route miles, hours and frequency of service, changes in transit travel times, effects on transit transfers, and system reliability and safety. The ridership measures include total and new transit ridership, ridership by mode, peak-period ridership, and daily station volumes. The NCCR alternatives are contrasted with the No-Action and TSM alternatives as described below:

No-Action Alternative – The transit component of the No-Action Alternative includes existing and committed transit services plus bus service enhancements required to serve developed areas in 2030.

TSM Alternative – This alternative begins with the No-Action network and adds TSM actions to improve transit service to address transportation problems without major capital intensive improvements/ construction.

NCCR Build Alternatives – As discussed earlier in Chapter 2, the two (2) NCCR alternatives are differentiated by the location of the terminus point. Detailed discussion of the NCCR Alternatives can be found in Chapter 2 which is summarized as follow:

- LPA= locally preferred alternative (between CGS in Center City Charlotte and Cascade/NC 150 in Mooresville, including Hambright realignment)
- MOS= Minimum Operable Segment (same as LPA except northern terminus at Mount Mourne, immediately north of Mecklenburg/ Iredell county line, including Hambright realignment).

The CGS project is expected to be funded in part with federal appropriations through the FTA. Accordingly, a separate federal EA under NEPA is underway for the CGS. The CGS EA includes a Base Build Alternative, which represents the minimum investment at the CGS site to provide platforms to facilitate NCCR service. The Full Build Alternative would add retail, office and future air rights development, integrated to provide scale, functional connectivity with the public transportation facilities, and a critical mass of activities and markets to support a dynamic, vibrant urban setting. Only summary information related to the CGS is provided in this section. Variations in impacts between the CGS Base Build and Full Build will be noted.

4.2.2.1 Geographic Coverage

Under the NCCR alternatives, the type and quality of transit service available within the corridor would be improved by providing a faster and substantially more reliable transit service to Metrolina area residents. The NCCR alternatives would provide this service by shared use of existing track with NS. The service would be available throughout most of the day. In addition, PNR facilities and an extensive feeder bus service would expand the area from which people can easily reach the service.

Route descriptions and mapping illustrating transit services operated under the No-Action network can be found in Chapter 2, Section 2.2.1. Route descriptions and mapping illustrating the transit services operated under the TSM are provided in Chapter 2, Section 2.2.2.

4.2.2.2 Bus Route Miles of Travel

The number of total bus route miles (calculated as the sum of each individual bus route's round-trip mileage per day) would increase 13,296 miles of travel per day under the No-Action Alternative to 13,703 miles under the TSM Alternative. All NCCR alternatives are assumed to have essentially the same feeder bus network. The NCCR alternatives would have fewer bus route miles (12,576) per day than the TSM Alternative because the NCCR service would replace segments of express bus service (77X) currently serving Cornelius and Davidson.

4.2.2.3 Hours of Operation and Frequency of Service

The NCCR alternatives would operate approximately 14 hours per day from 6:00 a.m. 7:30 p.m. during week days. Connecting bus services would operate approximately the same span of service on weekdays. Hours of bus service on weekends would be shorter and reduced frequency. The build alternatives (LPA and MOS) have a total of 36 fewer hours of service/ travel per day as compared to No-Action or TSM because some of the bus services (Beatties Ford and Northlake Mall) was adjusted to account for the proposed commuter rail service.

Under the NCCR Build and TSM alternatives, service frequencies on most bus routes would increase over the No-Action Alternative to match the 20-30 minute peak headways and 60-minute off-peak headways proposed for NCCR alternatives.

4.2.2.4 Transit Travel Times

The travel demand model estimates that due to congestion, travel on I-77 between NC 150 in Mooresville and CGS takes approximately 41 minutes instead of 24 minutes. **Table 4.2-4** shows that congestion increases travel time on I-77 by 17 minutes, an increase of 71 percent. These are conservative numbers because these times calculated only between I-77 interchanges and CGS. It does not account for the travel time delays on arterial streets from residence to I-77 interchange. Therefore, it could be concluded that highway travel times, especially single-occupancy-vehicles, would be unpredictable and unreliable in the future.

Transit vehicles will be able to utilize the HOV lanes on I-77 to avoid some congestion. However, travel time on the NCCR would not be impacted by highway congestion. The travel demand model estimates that the NCCR would take 47 minutes between Mooresville station and CGS. Although the NCCR travel time is slightly longer than the highway travel time, it is more reliable than highway travel.

Table 4.2-4. 2030 Cumulative Travel Time Comparison (in Minutes)

Interchange Location Along I-77	Free Flow	Congested	Increase
NC150, Mooresville	0.0	0.0	
Langtree Rd., Mount Mourne	3.95	4.04	0.09
Griffin St., Davidson	5.99	8.00	2.01
Catawba Ave., Cornelius	7.25	9.85	2.60
Sam Furr Rd., Huntersville	9.60	13.01	3.41
Gilead Rd.	11.53	16.81	5.28
WT. Harris Blvd	13.84	22.35	8.51
I-485	14.74	23.84	9.10
CGS	24.09	41.22	17.13

NOTE: Travel times are cumulative starting at NC150 (Mooresville) and driving south on I-77 to CGS.

4.2.2.5 Transfers

Transfers would occur as appropriate – from local bus to local bus, between local bus and express bus, and under the NCCR Alternative, between bus and rail. Transfers are considered to be a disincentive to transit use, since they add time to the total trip, increase uncertainties as to whether the transit connection would occur on time, and generally increase the complexity of trip-making. However, facilitating transfers between routes and modes also expands the transit travel opportunities for passengers. Efforts to seamlessly coordinate the multimodal transit network would improve transit access throughout the region while mitigating the disincentives of transit transfers.

Under the No-Action and TSM alternatives, bus to bus transfers would be available, focused on the existing transit hubs and the CTC.

The inconveniences of transferring would be lessened under the NCCR alternatives as compared to the No-Action and TSM alternatives because of the reliability of the NCCR's schedule. This allows timed-transfers between buses and trains at multiple locations (e.g., downtown Mooresville, Davidson, Cornelius, Huntersville and Center City Charlotte), which is very difficult when the regional bus routes operate in mixed traffic, as they would under the No-Action and TSM alternatives.

4.2.2.6 Reliability

Reliability is a function of the exclusivity of a transit mode's operating environment. Exclusive right-of-way (ROW) removes transit operations from interference that occurs with operation in mixed traffic, such as traffic congestion, traffic signals, accidents, and pedestrian crossings. Operation of the NCCR service on exclusive tracks in a railroad ROW would increase the reliability of regional transit service in the corridor as compared to the No-Action and TSM alternatives. Although the TSM Alternative would serve the same transit markets, operation of local, regional, and even express buses on mixed-traffic streets and highways makes travel times less reliable, and thus coordinated transfers more uncertain. Although, the NCCR alternatives include one-track, it includes passing sidings at key locations. This allows for trains to maintain their schedule and reliability.

4.2.2.7 Safety

Railroad/Highway Grade Crossings, At Grade: Currently, one hundred and eleven (111) at-grade crossings are under evaluation within the NCCR corridor. Only 32 of these grade crossings are protected today with gates and/or flashers (including cantilevers). Chapter 2, Table 2-6 lists existing grade crossings, proposed grade crossings and grade crossings recommended for closure. Certain crossings are being recommended for closure as part of North Carolina Department of Transportation's (NCDOT's) on-going sealed corridor program. Other crossings could be consolidated by creating a new crossing that is designed for safer and more efficient operation.

With all alternatives, grade crossings would be improved with four-quadrant gates, median divided barriers and/or long gate arms that block all lanes and prevent driving around the gates. Gates would block the sidewalk (if present), as well as the street.

Grade Separated Crossings: Existing grade separated crossings occur at I-277, I-85, WT Harris Boulevard, and NC 115 at Cornelius/ Davidson corporate limits. The Town of Huntersville is in the planning and design stage for a grade separation of future Verhoeff Drive extension. Additionally, Huntersville is in preliminary discussion with NCDOT regarding a proposed grade separation for the Sam Furr Road (NC 73) crossing.

Pedestrian Crossings at Stations: With the exception of Mount Mourne, none of the station users would be required to cross freight/ passenger tracks at-grade except at an already existing highway crossing.

Derita, Hambright, Huntersville, Cornelius, Davidson, Mooresville and Cascade/NC 150 stations include a passenger crossing of freight/passenger tracks at an existing highway crossing. The crossings would be appropriately signed and/or signaled to notify pedestrians of approaching trains. This is a standard transit approach that is used nationwide. Each crossing would be evaluated to determine the need for "second train coming" variable message signing and the need for separate pedestrian crossing gates. A System Safety Program Plan, developed by CATS and approved by the Federal Transit Administration (FTA) and/ or Federal Railroad Administration (FRA), will address all pedestrian/passenger station safety issues.

Passengers coming from park and ride lots or short-term passenger drop-off parking would cross freight/ passenger tracks at Huntersville, Davidson, Mount Mourne and Mooresville. Passengers would cross a street when moving between parking lots and the platform at Mooresville and Huntersville. Passenger crossings of NCCR tracks are included at many stations. This is a common practice on commuter rail and light rail systems at designated locations. NCCR trains would stop at all stations and thus, would be traveling at slow speeds entering and leaving stations. Train operators would be familiar with these designated crossings and operate cautiously. Bells on the trains would be used to warn passengers that a NCCR train is approaching and to clear the crossing.

4.2.3 Market/ Ridership/ User Benefits

Ridership impact measures provide an indication of how attractive the new transit service is to the traveling public. The proposed investment in transit improvements in the corridor would not be worthwhile unless it results in an increase in ridership. Measures used to assess ridership impacts include:

Total number of work and non-work transit trips under each alternative and change in number of transit trips from the No-Action and TSM alternatives;

- Daily number of transit riders by mode (i.e., bus and rail);
- Peak hour NCCR riders at peak loading points; and
- Total number of daily boardings by station.
- Total and New Transit Trips

Total transit trips are the number of linked transit trips in the region. A linked trip represents the total trip from origin to destination regardless of the number of transfers and mode changes required. A home to work trip in the morning that starts with an auto ride to the express bus park and ride lot, an express bus downtown, a three block streetcar ride to the coffee shop and a one block walk to the office is considered a single linked trip. All four steps (auto, express bus, streetcar and walk) were linked together as one home to work trip. New transit trips represent the change in total transit trips from the No-Action and TSM alternatives.

Table 4.2-5 presents a summary of total and new daily transit trips by trip purpose under each alternative in 2030 and the change from the No-Action and TSM alternatives. Under the No-Action Alternative, transit trips are projected to total 106,414. These trips include 31,740 work trips and 74,674 non-work trips.

Under the TSM and NCCR alternatives, the number of transit trips would increase over the No-Action. The TSM Alternative would increase the number of transit trips by 7,578 to 113,992. The increase in transit trips, however, would be greater for each of the NCCR alternatives than for the TSM. The increase in trips between the build alternative and TSM Alternative would range from 2,038 to 2,528 trips daily. The MOS alternatives would produce the fewest trips, and the LPA alternatives would produce the most trips.

Table 4.2-5. Comparison of 2030 Total and New Daily Transit Trips

Alternative	Work	Non-Work	Total	Change From	
				No-Action	TSM
No-Action	31,740	74,674	106,414	n/a	n/a
TSM	34,009	79,983	113,992	7,578	n/a
NCCR Alternatives					
LPA	35,685	80,835	116,520	10,106	2,528
MOS	35,522	80,508	116,030	9,616	2,038

Source: Metrolina 2030 Travel Demand Model, TransCAD Result, CDOT

4.2.3.1 Ridership by Mode

Transit riders represent unlinked transit trips and are frequently described as boardings. An unlinked trip is a single mode or link in the chain. In the morning home to work trip described above, each step is an unlinked trip (the auto to the park and ride lot, the express bus, the streetcar and the walk to the office). Transfers are included in the boarding measure. The number of transit boardings are reported by mode. The transit modes include bus and NCCR. Under the No-Action and TSM alternatives, total transit riders include bus boarding only. For the NCCR alternatives, this measure includes both bus and NCCR boarding. Table 4.2-6 and Table 4.2-7 summarize daily boarding by mode for each alternative in 2030.

Under the No-Action Alternative, the number of daily transit boarding in the North corridor study area is projected to total 8,750. The expanded bus services under the TSM Alternative would increase the number of daily bus boarding by 407. Under the NCCR alternatives, the highest number of boardings would be under the LPA alternative (11,837) which is 2,678 over the TSM Alternative. Daily boardings under MOS alternatives would be 11,586 (2,427 increase over the TSM Alternative. The LPA alternative has 250 more boarding than MOS because MOS stops at Mount Mourne station and LPA continues into Mooresville. Transit boarding would be higher than the No-Action and TSM alternatives in all cases.

Table 4.2-6. 2030 Daily Transit Boardings by Mode – North Corridor Only

Alternative	Rail	Bus	Total	Change From	
				No-Action	TSM
No-Action	NA	8,752	8,752	NA	NA
TSM	NA	9,159	9,159	407	NA
North Corridor Commuter Rail Alternatives					
LPA	3,126	8,711	11,837	3,085	2,678
MOS	2,867	8,719	11,586	2,834	2,427

Source: Metrolina 2030 Travel Demand Model, TransCAD Result, CDOT
Notes:
Boardings includes total CATS and non-CATS boardings
Buses include all modes other than commuter rail
Excludes Beatties Ford and BEAFORD SUNSET Routes (keys 701 to 708)

Table 4.2-7. 2030 Daily Transit Boardings by Mode – System-Wide

Alternative	Rail	Bus	Total	Change From	
				No Action	TSM
No Action	NA	140,918	140,918	NA	NA
TSM	NA	148,496	148,496	7,578	NA
North Corridor Commuter Rail Alternatives					
LPA	3,126	148,065	151,191	10,273	2,695
MOS	2,867	148,017	150,884	9,966	2,388

Source: Metrolina 2030 Travel Demand Model, TransCAD Result, CDOT
Notes:
All Routes
CATS and non-CATS
Buses include all modes other than commuter rail

4.2.3.2 Rail Ridership

"Rail riders" refers to boarding on the rail system portion of the NCCR alternatives. Rail ridership includes those passengers who drive or walk directly to stations and those passengers who transfer to rail from buses. Rail ridership is a measure used to identify peak loading points and to ensure that adequate line capacity is provided to serve the forecasted number of trips. All of the ridership numbers are reported for the forecast year 2030.

Table 4.2-8 identifies the number of daily boardings and alightings by station for each of the NCCR alternatives. Under both alternatives, the terminus at CGS would have the highest number of boardings of all stations. The station with the second highest number of boardings under most alternatives would be at Davidson station.

Table 4.2-8. 2030 Daily Boardings by Station

STATIONS	LPA	MOS
Cascade/NC 150	65	-
Mooresville	172	-
Mount Mourne	192	244
Davidson	324	308
Cornelius	152	140
Sam Furr	194	187
Huntersville	173	168
Hambright	206	202
Eastfield	145	143
Harris/NC 115	139	138
Derita	257	255
Charlotte Gateway Station	1,107	1,082
Total	**3,126**	**2,867**

4.3 Highway Network

This section documents the procedures, findings, and recommendations of a traffic analysis study for the proposed NCCR project. The main purpose of the traffic analysis is to assess the impacts of the proposed NCCR project on several aspects of the existing highway network including parallel corridors that may have reduced trips due to traffic diversions, arterial corridors adjacent to the proposed rail line(s) that would interact with rail traffic at grade crossings, and the roadway network in the vicinity of proposed rail stations.

This section summarizes the analysis by presenting a summary of the existing street network. This is followed by a discussion of the methodology and traffic capacity analysis for major parallel routes. After the parallel roadway capacity discussion, the arterial and traffic signal operations on the adjacent roadway corridor are assessed. The final elements of this section address parking as well as transit, pedestrian, and bicycle operations issues.

4.3.1 Existing Streets, Highways, and Traffic

The existing street network is divided into three features for this analysis including (1) major routes paralleling the proposed rail corridor, (2) the arterial immediately adjacent to the rail tracks, and (3) the local roadway network for station areas.

4.3.1.1 Major Parallel Routes

Major north-south routes located parallel to the proposed NCCR include those major roadways that are expected to have reduced traffic volumes resulting from diversions of automobiles to the proposed transit system. The primary roadways fitting these categories are I-77 and Statesville Road (US 21 and SR 2691).

I-77 is the primary north-south freeway paralleling the North Corridor rail transit line. The section south of I-85 has been recently expanded from two lanes in each direction to three lanes plus an HOV lane in each direction on. The section between I-85 and the future I-485 (under construction) is currently six general purpose lanes and two lanes of HOV. This section has moderate levels of congestion. From I-485 north to the Gilead Road interchange, I-77 transitions to four general purpose lanes and remains four lanes through Mecklenburg and Iredell counties. Both southbound AM and northbound PM congestion range from heavy to severe in the lane transition area. Minor incidents or weather conditions can produce lengthy delays as traffic queues build in the southbound AM or northbound PM direction. These queues can extend for miles and are not limited to commuter conditions as weekend demand on I-77 is generally near or over capacity. In summary, significant congestion occurs on I-77, particularly as traffic volumes increase near Center City Charlotte. In addition, the corridor is always subject to high levels of delay resulting from non-recurring congestion related to incidents on I-77 or nearby roads.

Statesville Road is an arterial with intermittent traffic signals running immediately east of I-77 for a significant portion of the project length. Beginning as a four lane roadway just north of downtown at Graham Street, the facility transitions to a two lane facility north of I-85 where it serves significant development in north Charlotte, Huntersville, and Cornelius. The roadway terminates to the north at Catawba Avenue just south of Lake Davidson. The roadway is subject to moderate to extreme congestion, particularly on the two lane sections north of I-85.

In the case of the NCCR, the north-south road system relied upon for travel to and from Charlotte is severely constrained during the morning and afternoon peak periods. With the near doubling of population and employment projected over the next 25 years, this congestion will worsen. No additional north-south roadway connections are planned between the four towns and Charlotte within the 2030 horizon period.

4.3.1.2 Adjacent Corridor

The proposed NCCR immediately parallels several roadways traveling north-south through the corridor area. In general, the corridor follows two north-south roads, (1) Graham Street south of the proposed Derita station and (2) NC 115 north of Derita. For the purpose of the analysis, the roadways were divided into segments with similar characteristics and include:

Graham Street (Trade Street to Sugar Creek Road) – This 5.3 mile section of Graham Street is a four lane section originating in Center City Charlotte and traveling north through interchanges with I-277 and I-85. The section has 18 existing signals (approximately one every 1500 feet). Through the Center City Charlotte area, the roadway crosses through an urban central business district and transitions into an industrial area on the northern parts of the roadway. Along significant portions of the roadway, ROW is restricted by the adjacent railroad line limiting the provision of left turn lanes.

Sugar Creek Road (Graham Street to Gibbon Road) – This 0.5 mile section of Sugar Creek Road is located in Derita. The section has two traffic signals and congestion under existing conditions. A proposed connector between North Graham Road and Mallard Creek Road would divert future traffic and reduce turning movements on this section of roadway.

Gibbon Road (Sugar Creek Road to NC 115 Old Statesville Road) - This 2.3 mile section of two lane road has only two existing traffic signals. The east-west roadway serves as link between the two major north-south roads adjacent to the corridor – Graham Street and NC 115.

NC 115 Old Statesville Road (Gibbon Road to future I-485) – This 3.8 mile section of roadway is divided into a five lane section south of WT Harris Boulevard and a two lane section north of WT Harris Boulevard. The roadway transitions from an industrial roadway into a more rural type section to the north and has four existing signals. This section is located primarily in the City of Charlotte before approaching the future I-485 that is now under construction. A half-clover interchange is being constructed providing access to I-485. As part of the interchange construction, NC 115 is being widened to a four lane divided section through the interchange area.

NC 115 Old Statesville Road (Future I-485 to Bailey Road) – This 6.5 mile section of two lane roadway passes through the town of Huntersville which is experiencing rapid growth and increasing traffic volumes. At the southern end of this section a major development is planned near Hambright Road including a relocated rail alignment and a transit station. To the north, the road passes through the downtown area of Huntersville.

NC 115 Old Statesville Road (Bailey Road to Beatty Street) – This 3.6 mile section of a two lane roadway passes through the towns of Cornelius, and Davidson. Each of these towns are experiencing rapid growth and increasing traffic volumes. In addition, both towns have a planned transit stop that would attract additional development focused toward the NCCR.

NC 115 Lassiter Highway (Iredell County line to Mooresville) – This 4.0 mile section of two lane rural roadway serves increasing development as well as providing close access to I-77. Planned corporate development is transforming this section into a more suburban area.

NC 115 Main Street (within Mooresville) – This 2.0 mile section of two lane roadway passes through the Mooresville central business district and is located within 20 feet of the existing railroad tracks. Main Street is located to the east of the tracks and Broad Street, a similar two lane roadway parallels the railroad tracks in a similar fashion on the west side of the tracks. The combination of these closely spaced parallel roadways adjacent to the railroad has resulted in a series of railroad pre-empted traffic signals on both Broad Street and Main Street.

It is anticipated that improvements will occur on the roadway network to address capacity issues arising over the next 25 years. Table 4.3-1 identifies projects included in the MUMPO 2030 LRTP dated summer of 2005. Iredell County projects in the study area are identified in Table 4.3-2. Projects listed in both tables are separated by 2010, 2020 and 2030 horizon years.

Table 4.3-1. NCCR Study Area Highway Improvements

Horizon Year/Project	From	To	Existing Lanes	Improvement Type
2010-Mecklenburg				
Cindy Ln Ext.	Statesville Rd	Nevin Rd	n/a	New (2)
City Blvd	US 29 (N. Tryon St)	I-85	n/a	New (4)
WT Harris Blvd	I-77	I-485	2	Widen (4-6)
I-485	Oakdale Rd	NC 115 (Old Statesville Rd)	n/a	New Freeway (6)
I-77	I-485	Gilead Rd	4	Widen (1) **NB Lane
Mallard Creek Rd	Sugar Creek Rd	WT Harris Blvd	2	Widen & Reloc. (4)
Nevin Rd	Sugar Creek Rd	Mallard Creek Rd	n/a	New (2)
US 29/NC 49 (Graham St)	I-277 (Brookshire Frwy)	Dalton Ave	4	Widen (6)
W. Catawba Ave	Torrence Chapel Rd	Jetton Rd	2	Widen (5)
2020-Mecklenburg				
Alexanderana Rd	Mt. Holly-Huntersville Rd	Eastfield Rd	2	New/Widen (4)
Church St Ext.	Eastfield Rd	Mayes Rd	n/a	New/Improve (2)
City Blvd	Neal Rd	Mallard Creek Rd Ext.	n/a	New (4)
City Blvd Ext.	US 29 (N. Tryon St)	I-85	n/a	New (4)
Fred D. Alexander Blvd	NC 16 (Brookshire Blvd)	Sunset Rd	n/a	New (4)
Hambright Rd	Mt. Holly-Huntersville Rd	NC 115 (Old Statesville Rd)	2	Widen (4)
I-485	NC 115 (Old Statesville Rd)	I-85	n/a	New Freeway (8)
I-77 HOV Project	I-277 (Belk Frwy)	I-85	6, 8	HOV Lanes
I-77 Widening (North)	I-485	Langtree Rd	4	Widen (6) & HOV
Mallard Creek Rd	Prosperity Church Rd	I-485	2	Widen (4)
NC 115 (Old Statesville Rd)	McCord Rd	Bailey Rd	2	Widen (4)
NC 115 (Old Statesville Rd)	WT Harris Blvd	Verhoeff Dr	2	Widen (4)
NC 73 (Sam Furr Rd) West	Northcross Dr	Davidson-Concord Rd	2, 4	Widen (4-6)
Prosperity Ridge Rd	South of Panthersville Dr	Prosperity Church Rd	n/a	New (2)

Horizon Year/Project	From	To	Existing Lanes	Improvement Type
Prosperity Ridge Rd (northern leg)	Prosperity Church Rd	Eastfield Rd	2	Widen (4)
Ridge Rd	Eastfield Rd	Beard Rd	0, 2	New/Widen (4)
Thirty Sixth St	Atando Ave	N. Tryon St	n/a	New (2)
Statesville Rd	Starita Rd	Keith Dr	2	Widen (4)
US 21 (Statesville Rd)	Sunset Rd	Catawba Ave	2	Widen (4)
Westmoreland Rd	US 21 (Statesville Rd)	Washam-Potts Rd	2	Widen (4)
Zion Ave Ext./Improve	Mayes Rd	South Main St	2	New/Widen (2)

Table 4.3-1. NCCR Study Area Highway Improvements (continued)

Horizon Year/Project	From	To	Existing Lanes	Improvement Type
2030-Mecklenburg				
Bailey Rd Ext.	Northcross Dr	US 21 (Statesville Rd)	n/a	New (2)
Bailey Rd	NC 115 (Old Statesville Rd)	Davidson-Concord Rd	2	New/Widen (2)
Brevard St	Eleventh St	Seventh St	2	Widen (3)
Caldwell St	I-277 (Belk Frwy)	E. 4th St	4	Widen (4)
Church St	Stonewall St	I-277 WB Ramp	3	Widen (4)
Davidson Eastside Connector	Davidson-Concord Rd	NC 115 (Old Statesville Rd)	n/a	New (2)
Eastfield Rd	Alexanderana Rd	Cabarrus County Line	2	Widen (4)
Gilead Rd	McCoy Rd	Boren St	2	Widen (4)
Gilead Rd	US 21 (Statesville Rd)	NC 115 (Old Statesville Rd)	2	Widen (4)
Hambright Rd	McCoy Rd	Mt. Holly-Huntersville Rd	2	Widen (2)
Hambright Rd Ext.	NC 115 (Old Statesville Rd)	Eastfield Rd	n/a	New (4)
WT Harris Blvd	Reames Rd	Mt Holly-Huntersville Rd	2	Widen (4-6)
Hucks Rd Ext.	Prosperity Church Rd	US 21 (Statesville Rd)	0, 2	New/Widen (4)
Hugh Torance Pkwy Ext.	Wynfield Creek Pkwy	Beatties Ford Rd	n/a	New (2)
Huntersville-Concord Rd	NC 115 (Old Statesville Rd)	Trails End Ext.	2	Widen (2)
Johnston-Oehler Rd	Prosperity Ridge Rd	Mallard Creek Rd	2	Widen (2)
Mt. Holly-Huntersville Rd	US 21 (Statesville Rd)	Alexanderana Rd	2	Improve/Widen (2-4)
NC 73 West	Catawba River	Northcross Dr	2, 4	Widen (4-6)
NC 73 East	Davidson-Concord Rd	Cabarrus County Line	2	Widen (4)

Nevin Rd	Sugar Creek Rd	Gibbon Rd	2	Improve (2)
Nevin Rd Ext.	Black Walnut Ln	IBM Dr	n/a	New (2)
Northcross Dr	Bailey Rd Ext.	W. Catawba Ave	n/a	New (2-3)
Odell School Rd	I-485	Cabarrus County Line	2	Widen (6)
Prosperity Church Rd	I-485	Prosperity Ridge Rd	2	New/Widen (2)
Stumptown Rd	Hugh Torance Pkwy	Ramah Church Rd	0, 2	New/Widen (2)
US 29/NC 49 (N. Tryon St)	US 29/NC 49 (Dalton Ave)	32nd St	4	Widen (5)
Vance Rd Ext.	Mt. Holly-Huntersville Rd	NC 73	n/a	New (4)

Table 4.3-1. NCCR Study Area Highway Improvements (continued)

Horizon Year/Project	From	To	Existing Lanes	Improvement Type
Verhoeff Dr West	Mt. Holly-Huntersville Rd	NC 115 (Old Statesville Rd)	0, 2	New/Improve (2)
W. Catawba Ave	Jetton Rd	NC 73 (Sam Furr Rd)	2	Widen (4)
Washam-Potts Rd	Westmoreland Rd	NC 115 (Old Statesville Rd)	2	Widen (4)
Westmoreland Rd	W. Catawba Ave	US 21 (Statesville Rd)	2	Widen (4)

Source: Based on MUMPO 2030 LRTP and CDOT, NCDOT staff recommendations.

Table 4.3-2. NCCR Study Area Highway Improvements, Iredell County

Horizon Year/Project	From	To	Existing Lanes	Improvement Type
2010-Iredell (None)				
2020-Iredell				
I-77	Langtree Rd	North of Exit 36	4	Widen (8)
I-77	North of Exit 36	North of Exit 42	4	Widen (8)
2030-Iredell				
NC 150	I-77	Catawba County Line	2	Widen (4)
Connector	Langtree Rd	Fairview Rd	n/a	New (2)
US 21	NC 115	I-77	2	Widen (4)
NC 152	East of Mooresville	Rowan County Line	2	Widen (4)

Source: Centralina Council of Governments

Table 4.3-3 provides a recap of MUMPO LRTP improvements that involve Old Statesville Road or projects that cross Old Statesville Road and the NCCR. Old Statesville Road (NC 115) closely parallels much of the NCCR alignment and in many cases the two share a common ROW boundary.

Table 4.3-3. Roadway Improvements Along Old Statesville Road (NC 115)

Project	Project Limits	Type
Intersecting Roads		
NC 115 (Old Statesville Rd)	WT Harris Blvd to Verhoeff Dr	Widening (4) Median, Bike Lanes
NC 115 (Old Statesville Rd)	Concord Rd to Bailey Rd	Widening (4) Median, Bike Lanes
Hucks Rd	Sugar Creek Rd to US 21 (Statesville Rd)	Widening (4) Median, Bike Lanes
Gilead Rd	US 21 to NC 115	Widening (4) Median, Bike Lanes
Alexanderana Rd	Mt. Holly-Huntersville Rd to Eastfield Rd	Widening (4) Median, Bike Lanes
Hambright Rd	Mt. Holly-Huntersville Rd to NC 115	Widening (4) Median, Bike Lanes
NC 73 (Sam Furr Rd)	NC 73 (US 21 to Davidson-Concord Rd)	Widening 4) Median, Bike Lanes
Washington Potts Rd	Westmoreland Rd to NC 115	Widening (4), Bike Lanes

Source: MUMPO 2030 LRTP and CDOT, NCDOT staff recommendations.

4.3.1.3 Local Roadway Network for Station Areas

As part of the next phase of this study traffic impacts will be examined for each of the planned station areas. The planned station areas are:

- Charlotte Gateway Station
- Derita
- Harris/NC 115
- Eastfield
- Hambright
- Huntersville
- Sam Furr
- Cornelius
- Davidson
- Mount Mourne
- Mooresville
- Cascade/NC 150

4.3.2 System Performance and Congestion

The primary purpose of this traffic analysis is to provide a comparison of roadway system performance in existing and future periods both with and without the proposed NCCR project. The following sections outline congestion findings for major parallel routes, the adjacent corridor, and the station areas.

Note that the traffic analysis is based on the forecasted volumes from the No-Action Alternative. In the analysis of the major parallel routes (see Section 4.3.1.1), the capacity analysis presents expected capacity in the No-Action Alternative and demonstrates the expected congestion on parallel corridors. The Build Alternative will be analyzed in the next phase of the study and would be expected to reduce volumes on these corridors.

For the adjacent corridor analysis (see Section 4.3.1.2), the No-Action projections were also utilized. For this analysis, however, the operational differences between the Build and No-Action alternatives (specifically, new traffic signal locations and the implementation of railroad pre-emption along the corridor) was analyzed since these operational differences would impact overall capacity to a greater degree than changes in volumes. Note that the Build Alternative is expected to have only a minor impact on traffic volumes for the immediately adjacent corridor to the rail line. In addition, the future traffic volume may be lower or greater than the No-Action projections, depending upon the specific locations along the corridor and how much traffic is attracted by the station area and associated development.

4.3.2.1 Major Parallel Routes

The main transportation system in the North Corridor consists of a north-south interstate (I-77), with a parallel US highway (US 21), and a state highway (NC 115). This section on major parallel routes focuses on the I-77 freeway and US 21 arterial. Both of these sections are anticipated to be influenced by the proposed NCCR project as a result of trip diversions to the rail. NC 115 is analyzed in greater detail to take into account the impact that rail operations may have upon traffic signals along the corridor. The review of major parallel routes includes an examination of existing and future traffic operations.

To perform the analysis on I-77 and US 21, NCDOT Average Annual Daily Traffic (AADT) numbers for 2005 were utilized. Level of Service (LOS) is a measure of performance often used to evaluate the mix of a roadway's capacity, volume and speed conditions. The measures are graded similar to a report card with LOS A reflecting optimum conditions and LOS F reflecting deficient conditions. (For a generic discussion of LOS see Section 4.2.1.1.2) To determine LOS and identify capacity constraints, a volume to capacity (V/C) ratio was utilized, which is an indication of how close to or how much over design capacity that the roadway facility is operating. For this analysis, LOS F capacity was determined and utilized as the basis for comparison. The V/C ratios below 1.00 represent LOS E or better operations while V/C ratios higher than 1.00 represent LOS F congestion which reflects high to overwhelming congestion.

I-77 Freeway Operations: For the analysis of I-77, freeway LOS was estimated using Highway Capacity Software methods. This methodology estimates LOS based upon a number of factors such as traffic volumes, splits in directional flows, peak hour traffic characteristics, the mix of trucks and other large vehicles in traffic stream, and the terrain. Table 4.3-4 illustrates the 2005 and 2030 No-Action LOS on 11 segments of I-77 between Center City Charlotte and Iredell County.

Starting from the north in Iredell County, the existing 2005 traffic volumes range from 57,000 to 86,000 vpd north of the future I-485, between 76,000 and 96,000 vpd between I-485 and I-85, and more than 145,000 vpd between I-85 and I-277 at Center City Charlotte. These three sections are served by four, six, and eight lanes, respectively. As shown Table 4.3-4 the existing LOS is D or better for all links except for the section between Gilead Road and Fairview. These four lane sections (two lanes per direction) operate at LOS E in the peak direction during the peak period. Note that this analysis reflects typical conditions and does not examine the impact of traffic incidences (e.g. accidents, lane closures, etc.) or other special circumstances on traffic flow which would result in further deterioration in LOS.

By 2030, a significant increase in traffic is anticipated as well as increase in congestion and delays, despite the widening of key section of I-77. The 2030 traffic volumes are forecast to increase to between 161,800 and 188,500 vpd north of the future I-485, between 159,700 and 182,000 vpd between I-485 and I-85, and more than 221,000 vpd between I-85 and I-

277 at Center City Charlotte. This reflects a projected doubling of traffic for all sections north of the I-85 interchange with I-77. Widening of I-77 to six and eight lanes is anticipated along the existing four lane section north of Gilead Road. The increase in traffic results in all sections south of Griffith Road operating at LOS F in the peak periods. The two sections north of Griffith Road are anticipated to operate at LOS E during the same period, primarily due to a widening that is anticipated to increase the number of lanes from four to eight.

Table 4.3-4. I-77 Capacity and Operation Analysis – 2005 and 2030 No-Action

Segment	2005				2030			
	AADT	N	v/c[1]	LOS	AADT	N	v/c	LOS
I-277 to LaSalle St	152,000	8	0.84	D	221,100	8	1.22	F
LaSalle St to I-85	145,000	8	0.80	D	232,600	8	1.28	F
I-85 to Sunset Rd	96,000	6	0.71	D	182,000	6	1.34	F
Sunset Rd to WT Harris Blvd	76,000	6	0.56	C	159,700	6	1.17	F
WT Harris Blvd to I-485	84,000	6	0.62	C	163,500	6	1.20	F
I-485 to Gilead Rd	85,000	6	0.62	C	188,500	6	1.39	F
Gilead Rd to Sam Furr Rd	86,000	4	0.95	E	178,900	6	1.32	F
Sam Furr Rd to Cawtaba Ave	82,000	4	0.90	E	160,600	6	1.18	F
Cawtaba Ave to Griffith Rd	85,000	4	0.94	E	185,800	6	1.37	F
Griffith Rd to Fairview Rd	77,000	4	0.85	E	177,400	8	0.98	E
Fairview Rd to NC152	57,000	4	0.63	C	161,800	8	0.89	E

Source:
1. AADT is based on Metrolina Travel Demand Mode, CDOT
2. LOS based on Highway Capacity Software methodology, Parsons Brinckerhoff

Note:
1. N – Number of freeway lanes per direction.
2. V/C – Volume to capacity ratio (V/C = 1.0 indicates threshold for LOS F operations)
3. Traffic volumes and number of lanes do not include traffic that utilizes HOV lanes.

US 21 Arterial Operations: For the analysis of US 21, arterial operations had to be evaluated to determine capacity. Since traditional Highway Capacity Manual (HCM) methods require extensive peak hour turning movement data and signal analysis, another method was utilized to estimate arterial capacity. Florida DOT's Arterial LOS spreadsheet and tables, which are based upon empirical data and the 1994 HCM, were utilized to estimate LOS. This methodology factors in traffic volumes, directional splits, the mix of heavy vehicles as well as typical signal spacing and other geometric characteristics. Table 4.3-5 illustrates the 2005 and 2030 No-Action LOS on 10 segments of US 21 north of Center City Charlotte. Note that the LOS operations for NC 115 and North Graham Street are summarized using a different analysis methodology as outlined in the discussion of arterial operations.

As shown, 2005 traffic volumes range between 17,000 and 28,000 vpd on the southernmost 4-lane section of Statesville Avenue south of I-85. Along the two lane segments north of I-85, the volumes range from 19,000 near I-85 to as low as 9,000 vpd. In general, existing operations are LOS C or better with the exception of the two lane section between WT Harris Boulevard and Alexanderana Road (LOS D) and the two lane section between Mt. Holly-Huntersville Road and Gilead Road (LOS E).

A significant increase in traffic volumes is anticipated by 2030 with volumes doubling or more on almost all links. Widening of the corridor to four lanes is anticipated for most links in Mecklenburg County except the stations through Huntersville, Cornelius, and Davidson. Despite the widening, LOS E and F operations are forecast on several links. The primary exception is US 21 between Starita Road and WT Harris Boulevard which operates at LOS C/D. Note that between Catawba Avenue and Charlotte Highway in Mooresville, US 21 shares a freeway alignment with I-77 and is not subject to arterial operations.

Table 4.3-5. US 21 Arterial Operations & Level of Service, 2005 & 2030 No-Action

Highway/Segment	Year 2005				Year 2030 No-Action			
	AADT	Lane	v/c Ratio	LOS	AADT	Lane	v/c Ratio	LOS
Statesville Ave								
N. Graham St to LaSalle St	17,000	4	0.47	B	53,200	4	1.46	F
LaSalle St to I-85	28,000	4	0.77	C	42,500	4	1.17	F
Statesville Rd								
I-85 to Starita Rd	19,000	4	0.52	C	52,000	4	1.43	F
Starita Rd to Sunset Rd	14,000	2	0.77	C	33,000	4	0.91	D
US 21 (Statesville Rd)								
Sunset Rd to Lake View Ave	14,000	2	0.77	C	26,400	4	0.72	C
Lake View Ave to WT Harris Blvd	9,000	2	0.53	C	28,100	4	0.81	C
WT Harris Blvd to Alexanderana Rd	15,000	2	0.88	D	41,300	4	1.19	F
Alexanderana Rd to Hambright Rd	13,000	2	0.76	C	42,300	4	1.21	F
Hambright Rd to Mt. Holly Huntersville Rd	12,000	2	0.70	C	37,100	4	1.07	F
Mt. Holly Huntersville Rd to Gilead Rd	16,000	2	0.93	E	57,200	4	1.64	F
Gilead Rd to Sam Furr Rd to Westmoreland Rd	13,000	2	0.76	C	40,000	4	1.15	F
Sam Furr Rd to Westmoreland Rd	15,000	2	0.83	C	30,000	4	0.82	C
Westmoreland Rd to Cawtaba Ave	10,000	2	0.55	C	19,900	4	0.55	C
US 21 and I-77								
US 21 follows I-77 Catawba Ave to Charlotte Hwy in Mooresville	See Table 4.3-4 for I-77 Freeway Operations				See Table 4.3-4 for I-77 Freeway Operations			
US 21 (Charlotte Highway)								
McLelland Ave to Wilson Ave	14,000	2	0.78	C	16,700	2	0.93	D
Wilson Ave to Fairview Rd	13,000	2	0.72	C	17,800	2	0.99	E

Source:
1. AADT is based on Metrolina Travel Demand Mode, CDOT
2. Lanes from aerial mapping (Deld Data) and field survey, Parsons Brinckerhoff
3. LOS based on Highway Capacity Software methodology and Florida DOT Arterial LOS Spreadsheet, Parsons Brinckerhoff

4.3.2.2 Adjacent Corridor Analysis

The most extensive analysis prepared for this study is on the corridor immediately adjacent to the proposed rail line. To provide a measure of congestion impacts along the corridor, a Synchro traffic model was developed. The entire 28.6 mile roadway corridor paralleling the project railroad line was coded in with existing geometric data, traffic counts, and traffic signals. This model served as the basis for the adjacent corridor analysis.

The traffic model included both existing and future traffic signals. The existing corridor includes 39 signals. The number of signals is anticipated to increase to 49 signals in the No-Action Alternative to address increasing traffic volumes and new development locations on the corridor. In the Build Alternative, the total number of signals is anticipated to increase to 59 signals to allow for railroad preemption for most intersections of public roadways located near the railroad tracks. The preemption of traffic signals at railroad grade crossings is driven by safety and is a prominent policy position for both railroad operators and State DOT's. NCDOT provides design guidelines for preempted signals at railroad crossings. These design guidelines would be incorporated for the signalized intersections adjacent to the NCCR. Note that the increase in traffic signals as well as increases in rail crossings can be anticipated to increase overall delays on the corridor and reduce average travel times on the corridor during peak periods.

The traffic volumes were increased for the future No-Action and Build alternatives to address anticipated growth in the corridor. Note that for this analysis, the future growth rates were taken from the regional model. It was anticipated that traffic volumes on NC 115 would remain approximately the same for the Build and No-Action since traffic diverted to the rail line would be offset by traffic attracted to the stations along the rail line. As part of the final design, a more detailed examination of each station area will be provided.

For this analysis, the adjacent corridor was examined using two methodologies. The LOS for each traffic signal on the corridor was determined for each of the alternatives. In addition, an arterial analysis was conducted for 13 segments making up the 28.6 mile corridor paralleling the rail transit corridor.

Traffic Signals – Capacity Analysis: Traffic signal operations were evaluated along the corridor paralleling the proposed rail line. For each signal, the average delay per vehicle was determined and used to quantify the LOS for each intersection. A comparison was developed for the existing operations, 2010 operations under the Build and No-Action alternatives for the project, as well as 2030 operations under the Build and No-Action alternatives. Note that the 2010 operations were selected to represent the year of opening for the project and to set a base year for defining required intersection improvements and mitigation for impacts caused by the project.

Traffic Signals – Analysis Methodology: The Synchro model addresses the 28.6 mile section of roadway paralleling the railroad. The model included 40 existing signals, 9 proposed signals being constructed as part of other projects, and 9 signals that are being constructed as part of the proposed transit project. In addition, isolated unsignalized intersections were included depending upon available data or intersection spacing. See Table 4.3-6 for a listing of the specific signalized intersections included in the corridor analysis.

Table 4.3-6. Intersections Included in Adjacent Corridor Analysis

Intersection	Signalized? (Y/N)		
	2005 Existing	2030 No-Action	2030 Build
Trade St & N Graham St	Y	Y	Y
5th St & N Graham St	Y	Y	Y
6th St & N Graham St	Y	Y	Y
10th St & N Graham St	Y	Y	Y
12th St & N Graham St	Y	Y	Y
N Graham St & Statesville Ave	Y	Y	Y
Dalton Ave & N Graham St	Y	Y	Y
24th St & N Graham St	Y	Y	Y
Woodward Ave & N Graham St	Y	Y	Y (with Railroad Pre-emption)
Moretz Ave & N Graham St	Y	Y	Y (with Railroad Pre-emption)
Norris Ave & N Graham St	Y	Y	Y (with Railroad Pre-emption)
Atando Ave & N Graham St	Y	Y	Y (with Railroad Pre-emption)
Johnson Rd & N Graham St	Y	Y	Y
Starita Rd & N Graham St	Y	Y	Y (with Railroad Pre-emption)
W Craighead Rd & N Graham St	Y	Y	Y
Cottonwood St & N Graham St	Y	Y	Y (with Railroad Pre-emption)
I 85 / Jeff Adams Rd & N Graham St	Y	Y	Y (with Railroad Pre-emption)
I-85 SB Ramp & N Graham St	Y	Y	Y (with Railroad Pre-emption)
S Allen St & N Graham St	N	N	Y (with Railroad Pre-emption)
Racine St & N Graham St	N	N	Y (with Railroad Pre-emption)
N Graham ST & W Sugar Creek Rd	Y	Y	Y
Rumple Rd & W Sugar Creek Rd	Y	Y	Y
Maple St & W Sugar St	N	N	Y (with Railroad Pre-emption)
Gibbon Rd & W Sugar St	N	N	Y (with Railroad Pre-emption)
Nevin Rd & Gibbon Rd	Y	Y	Y
Christenbury Rd & Gibbon Rd	N	N	Y (with Railroad Pre-emption)
Gibbon Rd & Old Statesville Rd	Y	Y	Y
Henderson Rd & Old Statesville Rd	N	N	Y (with Railroad Pre-emption)
Twin Dr & Old Statesville Rd	N	N	N
WT Harris Blvd & Old Statesville Rd	Y	Y	Y
Lakeview Rd & Old Statesville Rd	N	N	Y (with Railroad Pre-emption)
Reams Rd & Old Statesville Rd	Y	Y	Y (with Railroad Pre-emption)
Hucks Rd & Old Statesville Rd	N	**Y**	Y
Old Statesville Rd & Eastfield Rd	N	**Y**	Y
Old Statesville Rd & Future I-485 EB Ramp	Under construction	**Y**	Y

Table 4.3-6. Intersections Included in Adjacent Corridor Analysis (continued)

Intersection	Signalized? (Y/N)		
	2005 Existing	2030 No-Action	2030 Build
Future I-485 WB Ramp & Old Statesville Rd	Under construction	**Y**	Y
Alexanderana Rd & Old Statesville Rd	Y	Y	Y
Hambright Rd & Old Statesville Rd	N	**Y**	Y
Verhoeff Dr & Old Statesville Rd	N	**Y**	Y (with Railroad Pre-emption)
Holbrooks Rd & Old Statesville Rd	N	N	N
Mt. Holly Huntersville Rd & Old Statesville	N	Proposed Roundabout	Proposed Roundabout
Gilead Rd & Old Statesville Rd	Y	Y	Y
Fourth St & Old Statesville Rd	N	Proposed Roundabout	Proposed Roundabout
Stumptown Rd & Old Statesville Rd	N	**Y**	Y (with Railroad Pre-emption)
Sam Furr Rd & Old Statesville Rd	Y	Y	Y (with Railroad Pre-emption)
Caldwell Station Rd & Old Statesville Rd	N	N	N
Bailey Rd & Old Statesville Rd	N	**Y**	Y (with Railroad Pre-emption)
Hickory St & S Main St	N	**Y**	Y (with Railroad Pre-emption)
Catawba Ave & S Main St	Y	Y	Y (with Railroad Pre-emption)
South Dr/Chairman Blake Rd & S Main St	Y	Y	Y
Concord Rd & S Main St	Y	Y	Y
Griffith St & S Main St	Y	Y	Y
Beaty St & Main St	N	N	**Y** (with Railroad Pre-emption)
Bridge Farm Rd & Landis Hwy	N	N	**Y** (with Railroad Pre-emption)
Hobbs Ln/Langtree Rd & Landis Hwy	N	**Y**	Y (with Railroad Pre-emption)
Faith Rd/Campus Ln & Landis Hwy	Y	Y	Y (with Railroad Pre-emption)
Fairview Rd & Landis Hwy	N	N	N
Waterlynn Rd & Landis Hwy	Y	Y	Y
Brawley Ave & N Main St	Y	Y	Y (with Railroad Pre-emption)
E Wilson Ave & N Main St	Y	Y	Y (with Railroad Pre-emption)
McLelland Ave & N Main St	Y	Y	Y (with Railroad Pre-emption)
Center Ave & N Main St	Y	Y	Y (with Railroad Pre-emption)
Moore Ave & N Main St	Y	Y	Y (with Railroad Pre-emption
Iredell Ave & N Main St	Y	Y	Y (with Railroad Pre-emption)

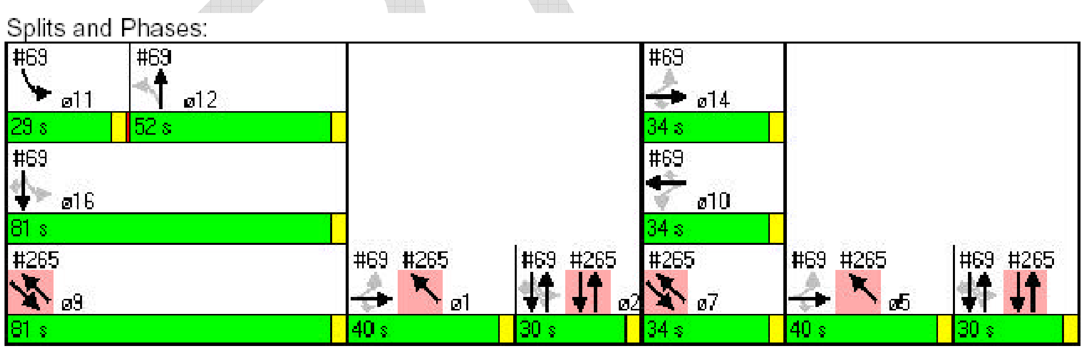
Source: Deld Data aerial maps and field survey, Parsons Brinckerhoff
Legend:
N – unsignalized
Y – signalized
Y – signalized as part of this alternative

For most corridor studies of this type, a Synchro analysis would be adequate for estimating capacity, queuing, and LOS. The presence of the transit project and the impact of trains through the corridor every 10 to 15 minutes during peak AM and PM periods resulted in the need to utilize a simulation tool to more accurately estimate the delays to roadway traffic as a result of railroad preemption in the Build condition. In addition, simulation provides a better tool for analyzing locations with closely spaced intersections or inadequate turning bays that could result in queuing. In order to provide consistency for comparing the results of the No-Action and Build alternatives, the simulation model was applied to all alternatives.

The simulation tool utilized for the analysis was SimTraffic. This tool works seamlessly with Synchro, allowing for easier utilization, modification and management of the input values. As part of the Build model, an additional 28.6 mile “roadway” was added to the network to simulate the presence of a train track traveling through the corridor. Three trains per hour were estimated to use the train tracks in each direction. Note that the model has been developed for the comparison of delays under Build and No-Action alternatives. Although an improvement over Synchro and other methods, the model itself is intended for analysis purposes and will require modification for design level analysis.

The introduction of multiple trains in peak periods would result in decreased efficiency at each traffic signal since a preemption cycle would need to be included in the final design. This timing process would clear the grade crossing and result in extended red indications for those approaches with a railroad crossing. The traffic signal timing was adjusted using a ring and barrier phasing that coordinated traffic between the signalized intersection and the adjacent roadway/railroad signalized intersection. At the roadway/railroad intersection, the roadway maintains a continuous green except when a transit vehicle is detected. At that time, the railroad is given the green for 70 seconds. In addition, the timing at the adjacent roadway is modified during the railroad passage. See Figure 4.3-1 for an example of the signal phasing used for a sample intersection.

Figure 4.3-1. Sample Traffic Signal Phasing Diagram with Railroad Pre-emption



Source: Synchro software, Parsons Brinckerhoff

Railroad preemption analysis was only conducted for the Build alternatives. Although some locations currently have railroad preemption, for this analysis it was assumed that freight train traffic would not occur during the typical peak periods. As a result, the railroad preemption would not be engaged during the peak period.

<u>Traffic Signals – Volume to Capacity Ratios</u>: As evidenced in the analysis, high levels of congestion are expected to occur along the corridor by 2030. To distinguish the impacts resulting from increase in traffic volumes over time versus the impacts that additional railroad traffic may have on traffic signal timing, a review of V/C ratios was conducted.

The V/C ratio analysis was conducted for the existing, 2010 No-Action, and 2030 No-Action alternatives only. The Build alternatives were not analyzed because the arrival of trains is not included within the methodology employed by Synchro for calculating V/C ratios. Similarly, the SimTraffic simulation focuses on delays and queuing and does not look at macroscopic measures of congestion such as V/C ratio. For these reasons, the comparison of V/C ratios should be used as an indication of increasing congestion and need for corridor improvements with or without the North Corridor rail project. In fact, based on the severe congestion, it can be concluded that growth is the critical component that would result in future congestion on the corridor. Note that only existing intersections and intersections added as part of other projects are included in the analysis. New intersections are not included in the No-Action analysis.

Table 4.3-7 presents a tiered breakdown of the number of intersections with V/C ratios exceeding 1.8, 1.4, and 1.0 in the years 2005, 2010, and 2030. The tiered breakdown of V/C ratios was chosen to represent intersections with very severe congestion likely requiring widening of the major roadway and possibly the side street (V/C > 1.8), intersections with severe congestion possibly requiring widening of the major roadway and additional turn bays (V/C > 1.4), and intersections with demand exceeding capacity that probably require additional turning bays (V/C > 1.0). Note that in all cases, a V/C ratio exceeding 1.0 indicates that roadway volumes and demand exceed the intersection capacity and improvements are required to prevent recurring congestion and delays.

Observations from Table 4.3-7 include:

Only 6 intersections (15 percent) have a V/C ratio exceeding 1.0 in 2005. This increases to 11 intersections in 2010 (22 percent) and to 23 intersections (47 percent) in 2030.

By 2030, the number of severely congested intersections increases significantly on the NC 115 corridor. Specifically, 1 intersection is projected to have a V/C ratio exceeding 1.8 (2 percent), 4 intersections will exceed 1.4 (8 percent), and 18 intersections will exceed 1.0 (37 percent). This leaves 26 intersections (53 percent) on the corridor projected to operate with less vehicular demand than capacity.

The specific intersections that operate at a deficient V/C ratio are identified and categorized by the tier of projected V/C ratios for 2005, 2010, and 2030.

Table 4.3-7. V/C Ratios for Signalized Intersections (PM Peak)

	2005 Existing	2010 No-Action	2030 No-Action
V/C > 1.8	**1** Rumple Rd & W Sugar Creek Rd	**0**	**1** 5th St at N. Graham St
V/C > 1.4	**1** Gilead Rd & Old Statesville Rd	**1** Sam Furr Rd at Old Statesville Rd	**4** WT Harris Blvd at Old Statesville Rd Gilead Rd at Old Statesville Rd Sam Furr Rd at Old Statesville Rd Campus Ln/ Faith Rd at Landis Hwy
V/C > 1.0	**4** 5th St & N. Graham St W. Craighead & N. Graham St I-85 SB Ramp & N. Graham St Sam Furr Rd & Old Statesville Rd	**10** Trade St & N. Graham St 5th St & N. Graham St 6th St at N. Graham St I-85 / Jeff Adams Rd & N Graham St I-85 SB Ramp & N. Graham St Reams Rd & Old Statesville Rd Hucks Rd at Old Statesville Rd Eastfield Rd & Old Statesville Rd Alexanderana Rd at Old Statesville Gilead Rd & Old Statesville Rd	**18** Trade St at N. Graham St 6th St at N. Graham St 10th St at N. Graham St 12th St at N. Graham St W. Craighead at N. Graham St Cottonwood St at N. Graham St I-85 / Jeff Adams Rd & N Graham St I-85 SB Ramp at N. Graham St W. Sugar Creek Rd at N. Graham St Gibbon Rd at Old Statesville Rd Hucks Rd at Old Statesville Rd Future I-485 WB Ramp at Old Statesville Rd Alexanderana Rd at Old Statesville Rd Stumptown Rd at Old Statesville Rd Concord Rd at S. Main St Griffith St at S. Main St Waterlynn Rd & Landis Hwy Iredell Ave & N Main St
V/C < 1.0	**34**	**38**	**26**
Total Signalized Intersections (No-Action)	**40**	**49**	**49**

Source: Parsons Brinckerhoff

<u>Traffic Signals – Level of Service Criteria</u>: Congestion is measured using a qualitative scale known as LOS. LOS is measured utilizing a letter scale ranging from LOS A representing very few delays to LOS F representing extreme delays and high levels of congestion. For traffic signals, the criterion used to estimate LOS is the average delay for each vehicle passing through a signal. The delay is measured in seconds of delay per vehicle. Table 4.3-8 indicates the delay thresholds used to determine LOS. Note that in urban areas, LOS D is typically considered acceptable with LOS C the goal in most rural areas.

Table 4.3-8. Level of Service Criteria for Signalized Intersections

LOS	Control Delay per Vehicle (sec/veh)
A	**< 10**
B	**10 – 20**
C	**20 – 35**
D	**35 – 55**
E	**55 – 80**
F	**> 80**

Source: Exhibit 16-2 from HCM 2000

Traffic Signals – Level of Service Analysis: A simulation analysis was conducted to estimate LOS for each of the signalized intersections on the adjacent corridor. The simulation analysis allows for a comparison of intersection operations between Build and No-Action alternatives in addition to changes over time. The analysis required the implementation of ten models to analyze existing, 2010 No-Action and Build, and 2030 No-Action and Build in the AM and PM peaks. The analysis included all signalized intersections along the corridor. For the Build alternatives, new intersections were added to the analysis at locations that rail operations require railroad pre-emption.

Table 4.3-9 provides a detailed summary of the LOS at each intersection on the corridor under each of the ten alternatives. While Table 4.3-9 is useful in focusing on a specific intersection, the Table 4.3-10 summary chart presents a breakdown of the number of intersections operating at different LOS criteria. Specific tiers included LOS D or better, LOS E, and LOS F. Observations from the summary in Table 4.3-9 and Table 4.3-10 include:

- With some exceptions at specific intersections, the PM peak was generally the critical time period during the day with more traffic signals operating at a poor LOS. For this reason, PM operations will be used in summarizing the observations from Table 4.3-10 in the following bullets.
    - As anticipated, LOS operations get worse with growth through the year 2030. For the 49 signals in the No-Action PM peak scenario (both with and without railroad pre-emption), the number of intersections operating at LOS F increases from 1 intersection in 2010 to 9 intersections in 2030. A similar increase is noted for the 58 intersections in the Build PM peak scenario, with an increase from 5 LOS F intersections in 2010 to 14 LOS F intersections in 2030.
    - A comparison of the 2010 No-Action to 2010 Build indicates that the number of LOS F intersections increases from 1 intersections to 5 intersections with the North Corridor project. In 2030, the number of LOS F intersections increases from 9 intersections in the No-Action to 14 intersections in the Build Alternative. The Build Alternative has 58 signalized intersections as opposed to 49 intersections in the No-Action, which accounts for the majority of the increase in LOS F intersections.
    - Those intersections located close to a rail crossing and requiring rail preemption are anticipated to account for the highest increase in intersections operating at LOS F. In 2010, the number of LOS F intersections with railroad preemption increases from 1 in the No-Action Alternative to 5 in the Build

Alternative (increase of 4 signals). In 2030 a similar trend is observed with an increase from 5 LOS F intersections to 9 LOS F intersections at locations with railroad preemption (increase of 4 signals). In reviewing the increases, note that the total number of signals with railroad preemption increased from 23 signals in the No-Action to 32 signals in the Build (increase of 9 signals). As a comparison, the LOS F signals without railroad preemption only increase slightly between No-Action and Build alternatives.

Table 4.3-11 and Table 4.3-12 identify the specific intersections that operate at a poor LOS and provide under which alternatives operations become deficient for 2005, 2010, and 2030. For this analysis, intersections at LOS F were identified as critical. The intersections in bold are those intersections which have LOS F operations resulting from the Build Alternative (as compared with the No-Action analysis which had LOS E or no signal was installed). Of the intersections reaching LOS F in the 2030 Build Alternative, only five have railroad preemption and none are without railroad preemption. For clarity, Table 4.3-11 and

Table 4.3-12 focus on the PM peak period although some intersections that operate at LOS F in the AM period only are identified.

Table 4.3-9. Traffic Signal Operations – AM and PM Peak Hour LOS

Intersection	Future Improvements	RR Pre-emption ?	2005 Existing		2010 No-Action		2010 Build		2030 No-Action		2030 LPA Build	
			AM	PM	AM	PM	AM	PM	AM	PM	AM	PM
Trade St & N Graham St		None	B	C	C	E	C	E	E	F	E	F
5th St & N Graham St		None	B	B	D	C	C	C	E	F	E	F
6th St & N Graham St		None	C	B	D	C	C	C	E	E	E	E
10th St & N Graham St		None	B	B	B	B	B	B	B	B	C	B
12th St & N Graham St		None	B	B	B	B	B	B	B	B	B	B
Statesville Ave & N Graham St		None	B	B	B	B	B	B	B	B	B	B
Dalton Ave & N Graham St		None	F	B	F	B	F	B	F	C	F	C
24th St & N Graham St		None	A	B	A	B	A	C	A	C	A	C
Woodward Ave & N Graham St		Build Only	B	A	B	A	C (RR)	B (RR)	B	A	C (RR)	B (RR)
Moretz Ave & N Graham St		Build Only	B	B	B	B	B (RR)	C (RR)	B	C	B (RR)	D (RR)
Norris Ave & N Graham St		Build Only	B	B	B	C	B (RR)	C (RR)	C	D	C (RR)	D (RR)
Atando Ave & N Graham St		Build Only	A	B	A	B	B (RR)	C (RR)	A	C	B (RR)	C (RR)
Johnson Rd & N Graham St		None	A	A	A	A	A	A	B	B	B	B
Starita Rd & N Graham St		Build Only	B	A	B	A	B (RR)	D (RR)	C	C	C (RR)	D (RR)
W Craighead Rd & N Graham St	Proposed SB LT in 2010	None	C	B	C	C	C	D	C	D	C	C
Cottonwood St & N Graham St		Build Only	B	B	B	D	C (RR)	F (RR)	B	E	C (RR)	F (RR)
I-85 SB Ramp & N Graham St		Build Only	C	D	C	D	D (RR)	F (RR)	E	F	F (RR)	F (RR)
S Allen St & N Graham St		Build Only	Unsig.	Unsig.	Unsig.	Unsig.	B (RR)	B (RR)	Unsig.	Unsig.	D (RR)	C (RR)

Table 4.3-9. Traffic Signal Operations – AM and PM Peak Hour LOS (continued)

Intersection	Future Improvements	RR Pre-emption ?	2005 Existing		2010 No-Action		2010 Build		2030 No-Action		2030 LPA Build	
			AM	PM	AM	PM	AM	PM	AM	PM	AM	PM
Racine St & N Graham St		Build Only	Unsig.	Unsig.	Unsig.	Unsig.	A (RR)	A (RR)	Unsig.	Unsig.	A (RR)	A (RR)
W Sugar Creek Rd & N Graham St	Scheduled realignment in 2010 will result in traffic pattern change	None	B	F	B	C	B	C	B	F	B	F
Rumple Rd & W Sugar Creek Rd	Scheduled realignment in 2010 will resulted in traffic pattern change	None	B	F	B	B	B	B	A	B	A	B
Maple St & W Sugar Creek Rd	Scheduled realignment in 2010 will resulted in traffic pattern change	Build Only	Unsig.	Unsig.	Unsig.	Unsig.	B (RR)	A (RR)	Unsig.	Unsig.	A (RR)	A (RR)
Gibbon Rd & W Sugar Creek Rd		Build Only	Unsig.	Unsig.	Unsig.	Unsig.	C (RR)	B (RR)	Unsig.	Unsig.	C (RR)	B (RR)
Nevin Rd & Gibbon Rd	Proposed Nevin Rd lane improvements in 2010	None	F	F	C	B	C	B	C	B	C	D
Christenbury Rd & Gibbon Rd		Build Only	Unsig.	Unsig.	Unsig.	Unsig.	B (RR)	B (RR)	Unsig.	Unsig.	C (RR)	B (RR)
Gibbon Rd & Old Statesville Rd		None	C	C	C	C	C	C	D	D	D	D
Henderson Rd & Old Statesville Rd		Build Only	Unsig.	Unsig.	Unsig.	Unsig.	B (RR)	B (RR)	Unsig.	Unsig.	B (RR)	B (RR)
Twin Dr & Old Statesville Rd		None	Unsig.	Unsig.	Unsig.	Unsig.	Unsig.	Unsig.	Unsig.	Unsig.	Unsig.	Unsig.
WT Harris Blvd & Old Statesville Rd		None	C	C	C	C	C	C	F	E	F	F
Lakeview Rd /David Cox Rd & Old Statesville Rd	NC 115 Widening in 2030	Build Only	Unsig.	Unsig.	Unsig.	Unsig.	F(RR)	F(RR)	Unsig.	Unsig.	F(RR)	F(RR)

Table 4.3-9. Traffic Signal Operations – AM and PM Peak Hour LOS (continued)

Intersection	Future Improvements	RR Pre-emption ?	2005 Existing		2010 No-Action		2010 Build		2030 No-Action		2030 LPA Build	
			AM	PM	AM	PM	AM	PM	AM	PM	AM	PM
Reams Rd & Old Statesville Rd	NC 115 Widening in 2030	Build Only	B	B	C	E	C (RR)	E (RR)	B	C	C (RR)	C (RR)
Bob Beatty Rd & Old Statesville Rd	NC 115 Widening in 2030	None	B	F	Unsig.	Unsig.	Unsig.	Unsig.	Unsig.	Unsig.	Unsig.	Unsig.
Hucks Rd & Old Statesville Rd	• NC 115 Widening in 2030 • Hucks Rd Widening in 2030	None	Unsig.	Unsig.	C	D	C	E	E	D	E	D
Eastfield Rd & Old Statesville Rd	• NC 115 Widening in 2030 • Proposed Dual WB LT in 2030	None	Unsig.	Unsig.	C	C	C	C	E	E	E	E
Future I-485 EB Ramp & Old Statesville Rd	NC 115 Widening in 2030	None	Future	Future	B	B	B	B	E	D	E	D
Future I-485 WB Ramp & Old Statesville Rd	NC 115 Widening in 2030	None	Future	Future	B	B	B	B	C	C	C	C
Alexanderana Rd & Old Statesville Rd	• Proposed Lane improvements in 2010 • NC 115 Widening in 2030 • Alexanderana Rd Widening in 2030	None	D	C	C	E	C	E	C	E	C	E
Hambright Rd & Old Statesville Rd	NC 115 Widening in 2030 Hambright Rd Widening in 2030	None	Unsig.	Unsig.	E	C	E	C	E	B	E	B
Verhoeff Dr & Old Statesville Rd	NC 115 Widening in 2030	Build Only	Unsig.	Unsig.	B	C	B (RR)	D (RR)	B	F	B (RR)	F (RR)
Mt. Holly-Huntersville Rd & Old Statesville Rd		None	Unsig.	Unsig.	Prop. Round about	Prop. Round about	Prop. Round about	Prop. Round about	Prop. Round about	Prop. Round about	Prop. Round about	Prop. Round about

Table 4.3-9. Traffic Signal Operations – AM and PM Peak Hour LOS (continued)

Intersection	Future Improvements	RR Pre-emption ?	2005 Existing		2010 No-Action		2010 Build		2030 No-Action		2030 LPA Build	
			AM	PM	AM	PM	AM	PM	AM	PM	AM	PM
Gilead Rd & Old Statesville Rd	• Proposed NB LT • Gilead Rd Widening in 2030	None	C	F	C	D	C	D	D	F	D	F
Fourth ST & Old Statesville Rd		None	Unsig.	Unsig.	Prop. Round about	Prop. Round about	Prop. Round about	Prop. Round about	Prop. Round about	Prop. Round about	Prop. Round about	Prop. Round about
Stumptown Rd & Old Statesville Rd		Build Only	Unsig.	Unsig.	B	B	B (RR)	B (RR)	F	F	F (RR)	F (RR)
Sam Furr Rd & Old Statesville Rd	• NC 115 Widening in 2030 • Sam Furr Rd Widening in 2030	Build Only	F	F	F	F	F (RR)	F (RR)	F	F	F (RR)	F (RR)
Caldwell Station Rd & Old Statesville Rd	NC 115 Widening in 2030	None	Unsig.	Unsig.	Unsig.	Unsig.	Unsig.	Unsig.	Unsig.	Unsig.	Unsig.	Unsig.
Bailey Rd & Old Statesville Rd	NC 115 Widening in 2030	Build Only	Unsig.	Unsig.	B	B	B (RR)	B (RR)	B	B	B (RR)	B (RR)
Hickory St & S Main St		Build Only	Unsig.	Unsig.	A	A	A (RR)	B (RR)	A	A	B (RR)	C (RR)
Catawba Ave & S Main St		Build Only	B	C	B	C	B (RR)	D (RR)	B	C	B (RR)	D (RR)
South St/Chairman Blake Rd & S Main St		None	B	B	B	B	B	B	B	B	B	B
Concord Rd & S Main St		None	C	C	D	C	D	C	F	D	F	D
Griffith St & S Main St		None	B	B	C	B	C	B	F	C	F	C
Beaty St & Main St		Build Only	Unsig.	Unsig.	Unsig.	Unsig.	B (RR)	B (RR)	Unsig.	Unsig.	B (RR)	E (RR)
Bridge Farm Rd & Landis Hwy		Build Only	Unsig.	Unsig.	Unsig.	Unsig.	B (RR)	B (RR)	Unsig.	Unsig.	B (RR)	B (RR)
Hobbs Ln /Langtree Rd & Landis Hwy		Build Only	Unsig.	Unsig.	B	B	B (RR)	C (RR)	C	C	F (RR)	E (RR)

Table 4.3-9. Traffic Signal Operations – AM and PM Peak Hour LOS (continued)

Intersection	Future Improvements	RR Pre-emption ?	2005 Existing		2010 No-Action		2010 Build		2030 No-Action		2030 LPA Build	
			AM	PM	AM	PM	AM	PM	AM	PM	AM	PM
Faith Ln/ Langtree Rd & Lands Hwy		Build Only	Unsig.	Unsig.	B	B	B (RR)	B (RR)	F	F	F (RR)	F (RR)
Fairview Rd & Landis Highway		None	Unsig.	Unsig.	Unsig.	Unsig.	Unsig.	Unsig.	Unsig.	Unsig.	Unsig.	Unsig.
Waterlynn Rd & Landis Hwy	• Proposed NB LT in 2010 • Proposed SB RT to Railroad intersection in 2030	None	C	C	B	B	B	B	C	D	C	D
Brawley Ave & N Main St		Build Only	B	B	B	B	B (RR)	E (RR)	B	C	B (RR)	C (RR)
E Wilson Ave & N Main St		Build Only	B	B	B	B	B (RR)	C (RR)	B	C	B (RR)	C (RR)
McLelland Ave & N Main St		Build Only	B	B	B	C	C (RR)	C (RR)	C	C	C (RR)	C (RR)
Center Ave & N Main St		Existing, No-Action, & Build	A	A	A	A	A (RR)	B (RR)	A	A	A (RR)	B (RR)
Moore Ave & N Main St		Build Only	A	A	A	A	B (RR)	A (RR)	B	A	B (RR)	A (RR)
Iredell Ave & N Main St		Build Only	B	B	B	C	B (RR)	C (RR)	C	E	C (RR)	F (RR)

Source: Parsons Brinckerhoff

Legend:

1. Unsig. – Unsignalized intersection
2. (RR) – Signal analyzed with railroad pre-emption.
3. Proposed Roundabout – Roundabout being considered as part of separate project.

Table 4.3-10. Summary of Signalized Intersection LOS Analysis

Intersection	2005 Existing		2010 No-Action		2010 Build		2030 No-Action		2030 LPA Build	
	AM	PM	AM	PM	AM	PM	AM	PM	AM	PM
Signal with Preemption	**18**	**18**	**23**	**23**	**32**	**32**	**23**	**23**	**32**	**32**
LOS F	1	1	1	1	2	5	3	5	6	9
LOS E	0	0	0	1	1	2	1	3	1	2
LOS D or better	17	17	22	21	29	25	19	15	25	21
Signal with No Preemption	**22**	**22**	**26**	**26**	**26**	**26**	**26**	**26**	**26**	**26**
LOS F	2	5	1	0	1	0	4	4	4	5
LOS E	0	0	1	2	1	3	7	4	7	3
LOS D or better	20	17	24	24	24	23	15	18	15	18
Unsignalized	**22**		**13**		**4**		**13**		**4**	
Under Construction	**2**		**0**		**0**		**0**		**0**	
Proposed Roundabouts	**0**		**2**		**2**		**2**		**2**	
TOTAL INTERSECTIONS	64		64		64		64		64	

Source: Parsons Brinckerhoff

Table 4.3-11. Summary of Critical Signalized Intersections with Railroad Preemption in Build Scenario (PM Peak Period)

Intersection Operations	2010 No-Action	2010 Build	2030 No-Action	2030 LPA Build
LOS F	1. Sam Furr Rd & Old Statesville Rd	1. Cottonwood St & N Graham St 2. I-85 / Jeff Adams Rd & N Graham St 3. I-85 SB Ramp & N Graham St 4. Lakeview Rd/David Cox Rd & Old Statesville Rd 5. Sam Furr Rd & Old Statesville Rd	1. I-85 SB Ramp & N Graham St 2. Verhoeff Dr & Old Statesville Rd 3. Stumptown Rd & Old Statesville Rd 4. Sam Furr Rd & Old Statesville Rd 5. Campus Ln/Faith Rd & Landis Hwy	1. Cottonwood St & N Graham St 2. I-85 / Jeff Adams Rd & N Graham St 3. I-85 SB Ramp & N Graham St 4. Lakeview Rd/David Cox Rd & Old Statesville Rd 5. Verhoeff Dr & Old Statesville Rd 6. Stumptown Rd & Old Statesville Rd 7. Sam Furr Rd & Old Statesville Rd 8. Campus Ln/Faith Rd & Landis Hwy 9. Iredell Ave & N Main St **AM Only** 10. Langtree Rd & Landis Hwy

Table 4.3-12. Summary of Critical Signalized Intersections without Railroad Preemption in Build Scenario (PM Peak Period)

Signal without RR Pre-emption	2010 No-Action	2010 Build	2030 No-Action	2030 LPA Build
LOS F	**AM Only** 1. Dalton Ave & N Graham St	**AM Only** 1. Dalton Ave & N Graham St	1. Trade St & N Graham St 2. 5th St & N Graham St 3. W Sugar Creek Rd & N Graham St 4. Gilead Rd & Old Statesville Rd **AM Only** 5. Dalton Ave & N Graham St 6. WT Harris Blvd & Old Statesville Rd 7. Concord Rd & S Main St 8. Griffith St & S Main St	1. Trade St & N Graham St 2. 5th St & N Graham St 3. W Sugar Creek Rd & N Graham St 4. WT Harris Blvd & Old Statesville Rd 5. Gilead Rd & Old Statesville Rd **AM Only** 6. Dalton Ave & N Graham St 7. Concord Rd & S Main St 8. Griffith St & S Main St

Source: Parsons Brinckerhof
Notes:
(1) Intersection in bold, italics are intersections which operate at LOS F under the Build Alternative only for 2010 or 2030.
(2) LOS shown for PM peak operations except in cases where LOS F occurs only during the AM peak. These intersections are called out separately for clarity.
f

<u>Arterials – Capacity Analysis</u>: Arterial operations were reviewed to identify the impacts to vehicles traveling along the 28.6 mile roadway corridor roughly paralleling the North Corridor rail line. Arterial operations measure the average travel time along a corridor factoring in both the travel time on the roadway links as well as delays encountered at traffic signals. This measure has advantages in terms of providing a reflection of operations not just at isolated intersections, but also demonstrating overall flow impacts.

For this analysis, the 28.6 mile corridor was divided into 13 segments representing sections with different roadways characteristics (number of lanes or speed limits), area types (urban, suburban, or rural), and/or by jurisdiction. The segments included segments in Charlotte, downtown segments in Huntersville, Cornelius, Davidson, and Mooresville, as well as suburban/rural sections connecting these segments.

<u>Arterials – Analysis Methodology</u>: In general, LOS on an arterial is measured based on the average travel speed through a corridor taking into account both the travel time between intersections and delays at traffic signals. The analysis was conducted using a spreadsheet methodology utilizing the running time from Synchro and the signal delays from SimTraffic. Since free flow speed data was not available, running time was computed using 90 percent of the posted speed limit to reflect friction delays from driveways and minor roadways. For this analysis the southbound travel time was investigated for the AM peak and the northbound travel time was investigated for the PM peak focusing the analysis on the critical direction of traffic flow. This method requires more data and is more analysis intensive than the volume to capacity ratio method used in Table 4.3-5 for US 21.

Note that at some intersections, the simulation analysis resulted in very high average delays. This type of observation can occur at isolated intersections during a simulation analysis when very high volumes exceed the capacity of an intersection significantly. With an arterial analysis, these isolated delays can significantly impact the average travel time on a section of roadway more than is likely to happen in real operations. For this reason an adjustment of maximum delays to through traffic was utilized in the determination of travel times. The maximum intersection time utilized in this analysis was between 180 and 360 seconds dependant upon the analysis year and alternative analyzed.

<u>Arterials – Level of Service Criteria</u>: As with traffic signals, arterial LOS is measured utilizing a letter scale ranging from LOS A representing very few delays to LOS F representing extreme delays and high levels of congestion. Unlike signals, the methodology examines a segment of roadway which includes multiple signals. Within a particular segment, there may be a specific location or traffic signal with high delays, but overall operations on the segment may still be acceptable. Note that in urban areas, LOS D is typically considered acceptable with LOS C the goal in most rural areas.

To estimate LOS, the arterial class of the specific segment of roadway must be defined. In general, urban street class is identified by examining the estimated free flow speed (FFS) on a roadway and the street's functional and design classifications. In general, Class I arterials are higher speed facilities with increased spacing between traffic signals. Class IV arterials serve lower speed facilities with closer traffic signal spacing.

Different travel speed criteria are used to estimate LOS for different class arterials. As shown in Table 4.3-13, a Class I arterial requires higher travel speeds to maintain a similar LOS than a Class IV arterial. This difference takes into account that the higher class arterial should maintain a higher travel speed between intersections. A more subtle factor, however, is that drivers expect higher performance and fewer delays on roads with a higher functional classification, but are typically more tolerant and accepting of delays on roads with slower speeds and more traffic signals. In examining Table 4.3-13, the signal delay on a corridor can reduce average travel speeds to less than half of the posted speed limits while still maintaining LOS C.

Table 4.3-13. Arterial Level of Service by Urban Street Class

Urban Street Class	I	II	III	IV
Range of FFS	55 to 45 mph	45 to 35 mph	35 to 30 mph	35 to 25 mph
Typical FFS	50 mph	40 mph	35 mph	30 mph
LOS	Average Travel Speed (mph)			
A	> 42	> 35	> 30	> 25
B	34 – 42	28 – 35	24 – 30	19 – 25
C	27 – 34	22 – 28	18 – 24	13 – 19
D	21 – 27	17 – 22	14 – 18	9 – 13
E	16 – 21	13 – 17	10 – 4	7 – 9
F	< 16	< 13	< 10	< 7

Source: Exhibit 15-2 from HCM 2000

Arterials – Level of Service Analysis: The arterial analysis for the corridor is summarized in Table 4.3-14 for the southbound flow during the AM peak and in Table 4.3-15 for the northbound flow during the PM peak hour. A summary of findings about projected traffic flows along the corridor include:

In general, the PM peak hour operation is more congested with a lower average speed than the AM peak hour.

Between 2010 and 2030, arterial average travel speeds and LOS are expected to degrade along the corridor. For the No-Action Alternative, the PM average travel speed is expected to fall from 24.0 mph to 20.9 mph between 2010 and 2030, corresponding to a fall from LOS C to LOS D. For the Build Alternative, the PM average travel speed is expected to fall slightly from 19.6 mph to 18.0 mph, with the LOS D under both alternatives. Note that a direct comparison is difficult because of the offsetting impacts of widening roadways and increasing traffic volumes.

Arterial travel speeds and LOS decline when comparing No-Action and Build operations. For 2010, the PM average travel speed is expected to fall from 24.0 mph to 19.6 mph, corresponding to a reduction from LOS C to LOS D. A similar comparison between No-Action and Build operations in 2030 indicates that the PM average travel speed is expected to fall from 20.9 mph to 18.0 mph, a slight reduction in speed that result in LOS D under both alternatives.

A review of the specific segments on the corridor indicates a similar trend as the average arterial speed and LOS. Between the 2010 and 2030 No-Action alternatives (PM peak period used for comparison), the number of segments operating at LOS E or F increases from one segment to three segments. Between the Build alternatives, both 2010 and 2030 Build alternatives has three segments operating at LOS E or F, with two LOS F segments in the 2030 Build Alternative compared with one LOS F segment in the 2010 Build Alternative. The primary reason for this observation is the overall growth and increases in traffic projected for the area.

A comparison of operations of specific segments under No-Action and Build conditions shows an increase in congestion. In 2010, the number of LOS E or F segments is anticipated to increase from one segment to three segments with the Build project in place.

In 2030, the number of LOS E or F segments is three segments with or without the Build project in place. With the Build Alternative, two LOS F segments are compared with zero LOS F segment in the No-Action Alternative. There are two reasons for this observation. First, the introduction of increased train travel requires the use of railroad preemption at 23 No-Action signals. This introduces additional red signal time to the roadway traffic. The primary reason for reduced flow on the corridor, however, is the introduction of 9 additional signals on the corridor at intersections that are currently unsignalized but require traffic signals with railroad preemption to provide safe operations in the Build Alternative.

As with typical arterials, the majority of delays on the corridor occur at traffic signals. For this corridor, delays are especially acute at some intersections with very high delays. Focusing potential improvements at these locations would provide short term and long term benefits. Even along sections of roadway that may ultimately require widening, focusing improvements as part of a phased approach may provide some additional time before larger scale improvements are needed.

Although the arterial analysis identifies specific segments with poor LOS and reduced travel times, a review of the more detailed analysis indicates specific intersections that are serving as bottlenecks. While more detailed analysis will be conducted in the next phase of project development, the listing of congested intersections previously presented in Table 4.3-9 through Table 4.3-12 provides specific locations where capacity improvements could be considered. Note that in many cases, the LOS is impacted primarily by growth between 2010 and 2030 instead of the impact between the No-Action and Build alternatives. Indeed, the primary impact of the Build Alternative will be to force the provision of safety features and additional traffic signals at intersections which in the long run would fail due to the pressure of on-going development. Other intersection improvements would be required as part of the traffic signal design, thus improving the overall capacity and safety of the intersections. The ultimate impact of intersection pre-emption and signalization upon the Old Statesville Road (NC 115) roadway corridor would be to foster a more efficient use of Old Statesville Road as an arterial road for local travel, reduce it's function as a commuter route (for which it was never designed) and insure the safety of local users and commuter rail passengers.

Table 4.3-14. Arterial Level of Service (AM Peak, Southbound Movement)

			Existing		2010 No-Action		2010 Build		2030 No-Action		2030 LPA Build	
	Arterial Class	Dist (mi)	Speed (mph)	Arterial LOS	Speed (mph)	Arterial LOS	Speed (mph)	Arterial LOS	Speed (mph)	Arterial LOS	Speed (mph)	Arterial LOS
SB Main St in Mooresville	IV	1.41	18.0	C	16.7	C	16.2	C	15.0	C	14.6	C
SB Landis Hwy near Mount Mourne station	I	4.99	40.3	B	40.1	B	37.4	B	33.8	C	32.0	C
SB Main St in Davidson	IV	1.43	17.6	C	16.1	C	15.6	C	9.9	D	9.8	D
SB Main St in Cornelius	III	2.09	29.4	B	27.3	B	26.2	B	27.2	B	26.5	B
SB Old Statesville Rd near Sam Furr station	II	2.74	25.1	C	22.6	C	19.8	D	20.5	D	20.5	D
SB Old Statesville Rd near Huntersville station	III	1.99	21.8	C	21.4	C	21.1	C	21.3	C	50.9	A
SB Old Statesville Rd near Hambright station	II	2.32	31.3	B	23.0	C	22.7	C	23.9	C	23.4	C
SB Old Statesville Rd near Eastfield station	II	2.00	35.3	A	26.3	C	20.8	D	13.9	E	10.7	F
SB Old Statesville Rd near Harris/NC 115 station	II	1.74	28.0	C	28.5	B	26.4	C	25.5	C	23.2	C
SB Gibbon Rd between Harris/NC 115 & Derita	II	2.22	22.8	C	34.5	B	28.8	B	34.6	B	14.6	E
SB Sugar Creek Rd near Derita station	III	0.52	21.6	C	21.9	C	19.8	C	22.3	C	21.0	C
SB N Graham St between Derita & Center City Charlotte	I	4.35	24.2	D	22.7	D	18.7	E	22.2	D	14.7	F
SB N Graham St - Center City Charlotte	II	0.82	18.7	D	14.8	E	14.8	E	13.8	E	7.2	F
TOTAL	**II**	**28.6**	**26.2**	**C**	**24.6**	**C**	**22.3**	**C**	**21.3**	**D**	**17.9**	**D**

Source: Parsons Brinckerhoff

Table 4.3-15. Arterial Level of Service (PM Peak, Northbound Movement)

			Existing		2010 No-Action		2010 Build		2030 No-Action		2030 LPA Build	
	Arterial Class	Dist (mi)	Speed (mph)	Arterial LOS	Speed (mph)	Arterial LOS	Speed (mph)	Arterial LOS	Speed (mph)	Arterial LOS	Speed (mph)	Arterial LOS
NB N Graham St - Center City Charlotte	II	0.82	18.5	D	14.2	E	13.7	E	16.2	E	16.1	E
NB N Graham St - between Center City Charlotte & Derita	I	4.35	17.5	E	23.4	D	15.8	F	16.7	E	11.9	F
NB W Sugar Creek Rd near Derita station	III	0.52	9.0	F	24.7	B	20.9	C	25.5	B	19.9	C
Total: NB Gibbon Rd between Derita & Harris/NC 115 stations	II	2.22	30.3	B	33.5	B	23.0	C	31.2	B	23.2	C
NB Old Statesville Rd near Harris/NC 115 station	II	1.74	30.5	B	31.5	B	13.4	E	26.5	C	18.8	D
NB Old Statesville Rd near Eastfield station	II	2.00	35.7	A	20.7	D	20.3	D	20.3	D	19.9	D
NB Old Statesville Rd near Hambright station	II	2.32	33.0	B	24.5	C	24.5	C	14.2	E	11.4	F
NB Old Statesville Rd near Huntersville station	III	1.99	15.3	D	19.7	C	18.3	C	18.0	C	17.8	D
NB Old Statesville Rd near Sam Furr station	II	2.74	25.1	C	22.6	C	19.9	D	27.0	C	26.9	C
NB Main St in Cornelius	III	2.09	28.3	B	26.2	B	26.1	B	28.6	B	28.0	B
NB Main St in Davidson	IV	1.43	16.6	C	16.0	C	14.3	C	16.0	C	14.7	C
NB Landis Hwy near Mount Mourne station	I	4.99	38.6	B	37.2	B	30.7	C	30.3	C	29.4	C
NB Main St in Mooresville	IV	1.41	16.2	C	16.0	C	15.5	C	14.0	C	13.7	C
TOTAL	**II**	**28.6**	**23.4**	**C**	**24.0**	**C**	**19.6**	**D**	**20.9**	**D**	**18.0**	**D**

Source: Parsons Brinckerhoff

4.3.3 Parking

4.3.3.1 Existing Parking Inventory

There is existing parking, both public and commercial, near many of the proposed station sites. Table 4.3-16 identifies the number of existing public and commercial parking spaces located within an approximate one quarter mile radius of each of the proposed station sites. The column entitled Available Parking represents an average percentage of non-residential and on street parking spaces available during normal business hours of the work week. For example, in Derita an average of 50% of the 1,315 existing non-residential and on street parking spaces are available during the week day.

Table 4.3-16. Inventory of Available Parking Near Station Area

Station	Residential	Non-Residential	On Street Parking [1]	Available Parking [2]
Charlotte Gateway Center	137	9857	75	15 %
Derita	575	1315	0	50 %
Harris/NC 115	35	319	0	80 %
Eastfield	6	200	0	80 %
Hambright [3]	5	0	0	None
Huntersville	228	752	28	30 %
Sam Furr [3]	24	0	0	None
Cornelius	330	924	30	60 %
Davidson	105	999	120	20 %
Mount Mourne	30	578	0	80 %
Mooresville	104	2346	147	40 %
Cascade/NC 150	18	1680	0	40 %

Source: Parsons Brinckerhoff
Note:
1 All on street parking numbers are approximate.
2 Based on site review of existing parking usage.
3 Currently undeveloped area.

4.3.3.2 Parking Consequences

Parking impacts related to the NCCR may involve changes in parking demand at employment centers, the removal of existing parking as required for construction of NCCR rail and support facilities, and the potential for spillover parking at stations with PNR lots.

Parking Demand in Employment Centers: The No-Action Alternative would have no impact on parking demand. However, operation of the NCCR is expected to increase employment opportunity within the project corridor in the future. This impact would in turn increase the demand for parking.

Removal of Parking: The No-Action Alternative would not require the removal of any parking. Under the Build Scenarios, on-street parking spaces and off-street parking spaces may be displaced at some station areas and alongside the corridor. Table 4.3-17 provides a listing of the parking spaces removed with the Build Alternatives. CATS would work with individual property owners in instances where off-street parking may be displaced by the NCCR project to develop an appropriate mitigation strategy.

Table 4.3-17. Impact of Project on Station Area Parking

Parking Location and Characteristics	Parking Removed	Parking Added	Net Parking	Parking Removal Affected By
Charlotte Gateway Center (Full Build Alternative)	650	450	-200	Charlotte Gateway Station and associated development
Derita	115	100	-15	Station plan
Harris/NC 115	0	300	+300	
Eastfield	0	250	+250	
Hambright	0	200	+200	
Huntersville	16	150	+134	Station plan
Sam Furr	0	360	+360	
Cornelius	0	100	+100	
Davidson	5	150	+145	Station plan
Mount Mourne	0	400	+400	
Mooresville	160	100	-60	Station plan
Cascade/NC 150	200	200	0	
Totals	1,146	2,760	1,629	

Source: Parsons Brinckerhoff

Spillover Parking Impacts on Neighborhoods Near Stations: Spillover parking impacts in station areas occur when the demand for parking exceeds the parking supply. If adequate parking supply is not available, potential transit riders could either park on street, or not choose transit or feeder bus. Parking requirements, at various NCCR stations were designed to accommodate the demand estimated by the travel demand model.

The CGS Base Build Alternative would result in no reduction in parking spaces. The CGS Full Build Alternative results in a total reduction of 200 parking spaces. However, there is adequate surface parking within walking distance from the CGS to accommodate any additional demand. The primary users of the CGS would be pedestrians who would replace formerly auto dependent commuters. Hence, the demand for parking by commuters should diminish, theoretically.

Note that parking for additional development and employment attracted as a result of the NCCR would need to be provided separately as part of the design plans for each development. Current policy and historic precedent within Center City Charlotte's zoning district requires the developer to provide off-street (parking lot or deck) parking for residential and office development.

4.3.4 Impacts on Grade Crossings, Intersections and Roadways

The NCCR corridor has a total of 111 existing at-grade crossings between the proposed CGS and Williams Street, north of the Town of Mooresville. To provide safe and efficient operations for the NCCR System, many of the existing crossings would be closed and/or consolidated. This section of the report summarizes the viability of each of these crossings and provides recommendations for closing, modification, or further analysis.

4.3.4.1 Characteristics of Existing At-Grade Crossings

The following identify the specific characteristics of each existing at-grade rail crossing location within the project study area. In addition, an examination of specific characteristics including the jurisdiction in which crossings are located, the type of access at each crossing, the type of protection equipment, and sight distance issues are itemized.

Table 4.3-18 provides a detailed listing of the 111 existing public and private crossings of the NCRR within the North Corridor study area plus proposed future crossings. Data provided at each crossing includes the milepost (MP) location, jurisdiction, street crossing, system type, classification, crossing protection and average daily traffic (ADT) volumes for 2005 and 2030.

Table 4.3-18. Existing At-Grade Highway/Railroad Grade

MP	Jurisdiction	Street Name	System	Class	Crossing Protection	2005 ADT	2030 ADT
0.83	Charlotte	9th St	Municipal	Industrial	Gates & Cants	Est 500	1,000
0.99	Charlotte	Seaboard St	Municipal	Industrial	None	Est 1,000	1,900
1.30	Charlotte	Spratt St	Municipal	Residential	None	972	1,500
1.40	Charlotte	Statesville Ave	State	Maj. Thor.	Gates & Cants	11,200	17,700
2.00	Charlotte	Woodward Ave	Municipal	Industrial	Flashers	3,941	6,200
2.30	Charlotte	Moretz Ave	Municipal	Mixed	Crossbucks	4,627	7,300
2.50	Charlotte	Norris Ave	Municipal	Mixed	Crossbucks	4,282	15,500
2.70	Charlotte	Private (Blythe Ind.)	Ind. Access	No info	Crossbucks	Est <200	200
2.71	Charlotte	Private (Closed Plant)	Ind. Access	No info	Crossbucks	Est <200	200
3.00	Charlotte	Atando Ave	Municipal	Industrial	Cantilevers	4,600	11,400
3.10	Charlotte	Toal St	Municipal	Industrial	Cantilevers	1,765	2,800
3.30	Charlotte	Private (NC Equip Co.)	Ind. Access	No info	Crossbucks	Est <200	200
3.40	Charlotte	Starita Rd	Municipal	Industrial	Gates	4,300	6,800
3.80	Charlotte	Cottonwood St	Municipal	Industrial	Cantilevers	5,202	8,200
4.00	Charlotte	I-85 Service Rd (S)	State	Industrial	Cantilevers	4,141	6,500
4.10	Charlotte	I-85 Service Rd (N)	State	Industrial	Cantilevers	3,043	4,800
4.47	Charlotte	Oneida Rd	Municipal	Industrial	Gates	2,512	4,000
4.67	Charlotte	Allan Rd	Municipal	Mixed	Gates	1,697	2,700
4.99	Charlotte	Racine Ave	Municipal	Mixed	Crossbucks	518	800
5.11	Charlotte	Private (Bonded Warehouse)	Ind. Access	No info	Crossbucks	Est <200	200
5.29	Charlotte	Private	Res. Access	No info	Crossbucks	Est <200	200
5.52	Charlotte	Maple St	Municipal	Commercial	Gates	3,038	4,200
5.68	Charlotte	Gibbon Rd	Municipal	Commercial	Gates	14,948	20,900
6.00	Charlotte	Nevin Rd	Municipal	Mixed	Cantilevers	7,245	17,100
6.40	Charlotte	Private	Res. Access	No info	None	Est <200	200
7.01	Charlotte	Christenbury Rd	Municipal	Residential	Crossbucks	2,364	3,300
7.18	Charlotte	Private	Farm Access	No info	None	Est <200	200
8.06	Charlotte	Oak Dr	Municipal	Mixed	Crossbucks	Est <200	200
8.28	Charlotte	Pete Brown Rd	Municipal	Mixed	Crossbucks	Est <200	200

Table 4.3-18. Existing At-Grade Highway/Railroad Grade (continued)

MP	Jurisdiction	Street Name	System	Class	Crossing Protection	2005 ADT	2030 ADT
8.45	Charlotte	Henderson Rd	Municipal	Future Min Th.	Crossbucks	330	500
9.45	Charlotte	David Cox Rd	State	Ind./Res.	Flashers	4,364	6,100
9.80	Charlotte	Bob Beatty S	State	Commercial	Crossbucks	Est <200	300
10.20	Charlotte	Bob Beatty N	State	Commercial	Crossbucks	Est <200	300
10.46	Charlotte	Hucks Rd	State	Com/Ind/Res	Crossbucks	2,700	6,000
10.82	Charlotte	Private	Farm Access	No info	None	Est <200	200
11.05	Charlotte	Private	Farm Access	No info	None	Est <200	200
11.25	Charlotte	Eastfield Rd	State	Rural/Res.	Flashers	17,145	37,900
11.65	Huntersville	Everette Keith Rd	State	Ind./Res.	Crossbucks	497	1,100
12.45	Huntersville	Private	Res. Access	No info	None	Est <200	200
12.56	Huntersville	Private (Future Hambright)	Farm Access	No info	None	Est <200	35,600
12.71	Huntersville	Private	Res. Access	No info	None	Est <200	200
12.87	Huntersville	Private	Farm Access	No info	None	Est <200	200
12.93	Huntersville	Private	Res. Access	No info	None	Est <200	200
13.02	Huntersville	Private	Substation Acc.	No info	None	Est <200	200
13.10	Huntersville	Private (Future Damson)	Res. Access	No info	None	Est <200	200
13.28	Huntersville	Private	Res. Access	No info	Crossbucks	Est <200	200
13.77	Huntersville	Church St (S)	Municipal	Institutional	Crossbucks	Est <200	400
14.04	Huntersville	Holbrooks Rd	State	Ind./ Res.	Gates	1,727	5,700
14.47	Huntersville	Dellwood Rd	Municipal	Residential	Crossbucks	641	2,100
14.62	Huntersville	Gibson Park Rd	Municipal	Residential	Crossbucks	651	2,100
14.90	Huntersville	Hntrsville/Concord Rd	State	Min. Thor.	Gates	5,577	18,400
15.37	Huntersville	Church St (N)	Municipal	No info	Crossbucks	288	900
15.42	Huntersville	4th St	Municipal	Min. Thor.	Crossbucks	1,002	3,300
15.59	Huntersville	Ramah Ch. Rd	State	No info	Gates	3,709	12,200
15.94	Huntersville	Private	Res. Access	No info	None	Est <200	200
16.04	Huntersville	Private	Res. Access	No info	None	Est <200	200
16.12	Huntersville	Private	Res. Access	No info	None	Est <200	200
16.19	Huntersville	Private	Res. Access	No info	None	Est <200	200
16.29	Huntersville	Private	Res. Access	No info	Crossbucks	Est <200	200
16.59	Huntersville	McCord Rd	State	Comm./Res.	Flashers	4,984	16,400
17.00	Huntersville	NC 73/Sam Furr Rd	State	Maj. Thor.	Cantilevers	16,852	55,600
17.12	Huntersville	Private	Res. Access	No info	None	Est <200	200
17.27	Huntersville	Private	Res. Access	No info	None	Est <200	200

Table 4.3-18. Existing At-Grade Highway/Railroad Grade (continued)

MP	Jurisdiction	Street Name	System	Class	Crossing Protection	2005 ADT	2030 ADT
17.65	Huntersville	Caldwell Sta. Rd	State	Residential	Crossbucks	Est <200	700
17.91	Huntersville	Mayes Rd	State	Rural/Res.	Crossbucks	1,511	5,000
18.22	Cornelius	Private	Res. Access	No info	None	Est <200	200
18.29	Cornelius	Private	Res. Access	No info	None	Est <200	200
18.76	Cornelius	Bailey Rd	State	Rural/Res.	Crossbucks	1,000	3,300
18.80	Cornelius	Private	Res. Access	No info	None	Est <200	200
18.83	Cornelius	Private	Res. Access	No info	None	Est <200	200
19.01	Cornelius	Private	Res. Access	No info	None	Est <200	200
19.27	Cornelius	Private	Res. Access	No info	None	Est <200	200
19.62	Cornelius	Smith Rd	State	Com/Res/ Inst	Crossbucks	1,007	200
19.84	Cornelius	Hickory (Zion S) St	Municipal	Com/Res/ Inst	Crossbucks	674	1,100
20.03	Cornelius	Zion St (N)	Municipal	Comm/Ind.	None	287	500
20.45	Cornelius	Private	Res. Access	No info	None	Est <200	200
21.15	Davidson	Catawba Ave	Municipal	Residential	Crossbucks	3,459	5,800
21.48	Davidson	Depot St	Municipal	Comm/Ind.	Crossbucks	960	1,600
21.61	Davidson	Griffith St	State	Maj. Thor.	Gates & Cants	7,900	13,300
21.71	Davidson	Delburg St	Municipal	Residential	Crossbucks	Est <200	300
22.23	Davidson	Beatty Rd	State	Maj. Thor.	Crossbucks	2,851	4,800
22.56	Iredell County	Private	Ind. Access	No info	None	Est <200	200
23.02	Iredell County	Private	Res. Access	No info	None	Est <200	200
23.18	Iredell County	Bridges Farm Rd	State	Rural/Res.	Crossbucks	Est <200	200
23.41	Iredell County	Private	Farm Access	No info	None	Est <200	200
23.78	Iredell County	Private	Res. Access	Mixed	None	Est <200	200
24.02	Iredell County	Private	Res. Access	No info	None	Est <200	200
24.68	Iredell County	Langtree Rd	State	Residential	Gates	3,200	21,000
24.63	Iredell County	Private/Quality Lane	Ind. Access	Industrial	None	Est <200	400
24.70	Iredell County	Private/Campus Dr	Ind. Access	Industrial	None	Est <200	400
25.07	Iredell County	Fairview Rd	State	Institutional	Gates & Cants	2,817	20,100
25.37	Iredell County	Crossrail Rd	State	Residential	Crossbucks	581	1,200
25.70	Iredell County	Waterlynn Dr	State	Rural/Res.	Gates	6,182	12,400
26.02	Iredell County	Private	Res. Access	No info	None	Est <200	200
26.09	Iredell County	Private	Res. Access	No info	None	Est <200	200
26.31	Iredell County	Foursquare Rd	State	Residential	Crossbucks	338	700
26.62	Iredell County	Private	Farm Access	No info	None	Est <200	200
27.27	Mooresville	Doster Ave (Norman)	Municipal	Mixed	Crossbucks	4,929	9,800
27.45	Mooresville	Brawley Ave	Municipal	Mixed	Flashers	4,749	9,500

Table 4.3-18. Existing At-Grade Highway/Railroad Grade (continued)

MP	Jurisdiction	Street Name	System	Class	Crossing Protection	2005 ADT	2030 ADT
27.62	Mooresville	Mills Ave	Municipal	Mixed	Crossbucks	1,429	2,900
27.83	Mooresville	Wilson Ave	Municipal	Commercial	Gates	7,783	15,600
27.97	Mooresville	Catawba Ave	Municipal	Mixed	Crossbucks	1,860	3,700
28.16	Mooresville	McLelland Ave	State	Commercial	Gates	6,991	20,300
28.26	Mooresville	Center St	Municipal	Commercial	Cantilevers	6,780	19,700
28.37	Mooresville	Moore Ave	Municipal	Commercial	Flashers	1,590	4,600
28.49	Mooresville	Iredell Ave	State	Thoroughfare	Gates	9,078	26,300
28.75	Mooresville	Oak St	Municipal	Comm/Res	Gates	1,631	4,700
28.89	Mooresville	Walnut St	Municipal	Residential	Crossbucks	126	500
28.98	Mooresville	Patterson St	Municipal	Industrial	Gates	1,127	3,300
29.20	Mooresville	Statesville Ave	Municipal	Mixed	Flashers	8,005	23,200
29.38	Mooresville	Williams St	Municipal	Mixed	Crossbucks	Est 1,000	2,900

Source:
1. 2005 ADT is based on factoring of traffic counts done between 2001 and 2005, CDOT, Parsons Brinckerhoff.
2. 2030 ADT is based on Metrolina model's growth estimate between existing and future traffic assignment for highways coded in the network. Highway links not in the network is assigned average traffic growth rate in the surrounding area. CDOT, Parsons Brinckerhoff.
Legend:
Ind=Industrial; Com=Commercial; Res=Residential; Th'fare=Thoroughfare; Ext=Extension; Cant=Cantilever(s); CSD Rnk = Crossing Sight Distance Rank, xxx=crossings not analyzed in 2030 due to closing or low volume.

<u>Jurisdiction</u>: Table 4.3-19 summarizes the location of the existing 111 at-grade crossings. The majority of the crossings (81) are in Mecklenburg County (City of Charlotte and Towns of Huntersville, Cornelius and Davidson) and 30 crossings are in Iredell County (includes Town of Mooresville).

Table 4.3-19. At-Grade Crossing Jurisdiction

Jurisdiction	Existing Number of Grade Crossings		
	Private	**Public**	**Total**
City of Charlotte	9	28	37
Town of Huntersville	15	13	28
Town of Cornelius	7	4	11
Town Davidson	None	5	5
Iredell County	10	6	16
Town of Mooresville	None	14	14
Total	**41**	**70**	**111**

Source: Railroad Highway At-Grade Crossing Report, 2000, CDOT and CATS; data compiled by Parsons Brinckerhoff.

System Access: Table 4.3-20 illustrates 63% of the crossings (70) are public crossings on state or municipal street systems. The remaining crossings (41) are private residential, industrial or farm access crossings.

Table 4.3-20. At-Grade Crossing System Access Type

System Access to	Number of Crossings
Municipal	42
State	28
Farm (private)	7
Industrial (private)	7
Residential (private)	26
Substation (private)	1
Total	**111**

Source: Railroad Highway At-Grade Crossing Report, 2000, CDOT and CATS; data compiled by Parsons Brinckerhoff.

Crossing Protection: Table 4.3-21 summarizes the types of crossing protection currently in use at the grade crossings. There are 37 crossings that do not have any type of protection – all but three are private crossings. Two unprotected public streets (Seaboard Street and Spratt Street) cross a potion of the "O" line in the City of Charlotte that is inactive. The third unprotected public crossing is Zion Street North in Cornelius. Only 19 crossings currently have gates and none of these have full 4-quadrant gates.

Table 4.3-21. At-Grade Crossing Protection Types

	Existing Number of Grade Crossings		
Protection Type	**Private**	**Public**	**Total**
No protection	34	3	37
Crossbucks	7	33	40
Flashers	None	7	7
Cantilevers	None	8	8
Gates	None	15	15
Gates and cantilevers	None	4	4
Total	**41**	**70**	**111**

Source: Railroad Highway At-Grade Crossing Report, 2000, CDOT and CATS; data compiled by Parsons Brinckerhoff.

Existing Crossing Sight Distance: Adequate sight distance is critical to motorist crossing safety, particularly where no warning gates are present. NCDOT's Rail Division conducted field visits in 2003 and 2004 to provide inventory records at most (and all major) of the crossings along the NCCR study corridor. Field inspectors rated sight distance adequacy at each crossing according to the scale in Table 4.3-22. It is important to note that the evaluation of sight distance was based on existing freight speed conditions and not the higher speed anticipated for commuter rail.

Table 4.3-22 shows that there is adequate or more than adequate sight distance in all quadrants at 47 of 111 crossings (score = 0, 1 or 2). There are 56 crossings that have below average or poor sight distance in least one quadrant (score = 3 or 4).

Table 4.3-22. At-Grade Crossing Sight-Distance Evaluation, Existing Conditions

Score	Evaluation	Existing Number of Grade Crossings		
		Private	Public	Total
0	Sight distance not a factor	14	22	36
1	Above average sight distance	None	None	None
2	Average sight distance	9	2	11
3	Below average sight distance	6	4	10
4	Poor sight distance	12	34	46
-	No data available	None	8	8
Total		**41**	**70**	**111**

Source: Railroad Highway At-Grade Crossing Report, 2000, CDOT and CATS; data compiled by Parsons Brinckerhoff.

4.3.4.2 Closure Recommendations for Crossings

To achieve efficient and safe operation along the NCCR, some of the existing crossings would need to be closed or modified, and others would be consolidated to a better location. A few new crossings would also be provided at strategic locations. The study team reviewed crossing data to review current and future traffic volumes, and conducted field reviews at all current at-grade crossings to evaluate current conditions. The *"Traffic Separation Study for the Norfolk Southern 'O' Line Corridor"* 2001 report was also reviewed for previous recommendations made to consolidate and remove crossings along the corridor.

Closing recommendations were made based on how each crossing would operate with the NCCR operating, with the goal of providing sufficient roadway network mobility and access to adjacent land use while minimizing the number of crossings and safety concerns.

Private Crossings: As shown in Table 4.3-22, 41 of the 111 crossings are private, at-grade crossings and are prime candidates for closure through consolidation, primarily because a majority of the 41 private crossings serve only a small number of daily trips (often a single residence or farm or business). New and/or improved access would be provided by consolidating one or more of these less frequently used at-grade crossings and relocating access to a more central location (or by tying into the public street network). Consolidation would provide fewer vehicle/train conflict points along the corridor and allow greater funding allocations and protection treatments at the fewer crossings that remain.

Under the NCCR LPA Build alternative, 24 of the 41 private at-grade crossings are recommended for closure (see Table 4.3-23). Each crossing recommended for closure is provided reasonable alternative access to the public street system from which the crossing is severed, either though the construction of parallel frontage road access and centralized crossings (consolidation) and/or alternative direct access to the public street system. With the exception of the Blythe industrial crossing (MP 2.70), each of the closed crossings is estimated to carry less than 50 trips per day. These low numbers of diverted trips would have virtually no impact to operations at the consolidated crossings that remain open.

Table 4.3-23. Private Grade Crossings (24) Recommended for Closure

	MP	Jurisdiction	Street Name	System
1	2.70	Charlotte	Private (Blythe Ind)	Industrial
2	2.71	Charlotte	Private (Closed Plant)	Industrial
3	5.29	Charlotte	Private	Residential
4	6.40	Charlotte	Private	Residential
5	7.18	Charlotte	Private	Farm Access
6	10.82	Charlotte	Private	Farm Access
7	12.71	Huntersville	Private	Residential
8	12.87	Huntersville	Private	Farm Access
9	12.93	Huntersville	Private	Residential
10	13.02	Huntersville	Private	Substation
11	13.28	Huntersville	Private	Residential
12	15.94	Huntersville	Private	Residential
13	16.04	Huntersville	Private	Residential
14	16.12	Huntersville	Private	Residential
15	16.19	Huntersville	Private	Residential
16	16.29	Huntersville	Private	Residential
17	17.12	Huntersville	Private	Residential
18	17.27	Huntersville	Private	Residential
19	18.22	Cornelius	Private	Residential
20	18.80	Cornelius	Private	Residential
21	19.01	Cornelius	Private	Residential
22	19.27	Cornelius	Private	Residential
23	26.02	Iredell County	Private	Residential
24	26.09	Iredell County	Private	Residential

Source: Railroad Highway At-Grade Crossing Report, 2000, CDOT and CATS; data compiled by Parsons Brinckerhoff.
Note: All crossings recommended for closure would be provided with alternate access location.

Of the remaining 17 private crossings, 14 would remain open as private crossings. Following three remaining crossings would be converted to public crossings and remain open:

- the private crossing at MP 5.11, from the Bonded Warehouse to Graham Street
- the private crossing at MP 12.56 (future Hambright Road extension)
- the private crossing at MP 13.10 (future Damson Road extension)

Public Crossings: Several of the 70 public at-grade crossings are used infrequently, as indicated by low existing traffic volumes and relatively low estimates of future traffic volumes. Several other crossings with some marginal level of daily traffic crossings are recommended for closure because a reasonable alternative or consolidated access can be provided. Table 4.3-24 identifies recommendations for closure of 20 municipal or state (public) at-grade crossings.

Table 4.3-24. Public Grade Crossings (20) Recommended for Closure

	MP	Jurisdiction	Street Name	System	Class	ADT	Reason for Closing
1	0.83	Charlotte	9th St	Municipal	Industrial	300	Low volume
2	1.30	Charlotte	Spratt St	Municipal	Residential	972^{+}	Low volume
3	3.10	Charlotte	Toal St	Municipal	Industrial	$1{,}765^{+}$	Low volume
4	3.80	Charlotte	Cottonwood St	Municipal	Industrial	$5{,}202^{+}$	Additional issues to be considered, See Table 4.3-25
5	4.99	Charlotte	Racine Ave	Municipal	Mixed	518^{+}	Low volume
6	5.52	Charlotte	Maple St	Municipal	Commercial	$3{,}832^{+}$	Poor sight distance
7	8.06	Charlotte	Oak Dr	Municipal	Mixed	$<200^{**}$	Low volume
8	9.80	Charlotte	Bob Beatty (S)	State	Commercial	$<100^{**}$	Low volume
9	10.20	Charlotte	Bob Beatty N	State	Commercial	$<100^{**}$	Low volume
10	13.77	Huntersville	Church St (S)	Municipal	Institutional	$<200^{**}$	Low volume
11	14.47	Huntersville	Dellwood Rd	Municipal	Residential	641^{+}	Low volume
12	15.37	Huntersville	Church St (N)	Municipal	Unknown	288^{+}	Low volume
13	17.65	Huntersville	Caldwell Station	State	Residential	$<100^{**}$	Low volume
14	17.91	Huntersville	Mayes Rd	State	Rural/Res	$1{,}551^{+}$	Low volume
15	19.62	Cornelius	Smith Rd	State	Com/Res/Ind	$1{,}007^{+}$	Low volume
16	20.03	Cornelius	Zion St (N)	Municipal	Com/Res/Ind	287^{+}	Low volume
17	21.71	Davidson	Delburg St	Municipal	Residential	$<200^{**}$	Low volume
18	27.27	Mooresville	Doster Ave	Municipal	Mixed	$4{,}929^{+}$	Multiple adjacent alternatives
19	27.62	Mooresville	Mills Ave	Municipal	Mixed	$1{,}429^{+}$	Low volume
20	28.89	Mooresville	Walnut St	Municipal	Residential	126^{+}	Low volume

Source: Railroad Highway At-Grade Crossing Report, 2000, CDOT and CATS; data compiled by Parsons Brinckerhoff.
LEGEND: + = 2001 ADT Collected; ++ = 2005 ADT Collected; * = Estimated 2005 ADT based on intersection turning movement counts; **=Estimated based on surrounding land use access served
Note: All crossings recommended for closure would be provided with alternate access location.

Additional Crossing Studies / Other Project Coordination: Table 4.3-25 identifies several crossings that require additional study to resolve specific issues and consider alternatives. These crossings warrant further attention to factors such as access, traffic signalization, safety and public policy. These crossings would be studied, in detail, during the next phase of the study.

Table 4.3-25. Grade Crossing (8) Recommended for Additional Study and Operational Analysis

	MP	Crossing	Initial Recommendation	Issues to be resolved
1	3.80	Cottonwood St	Closed	Higher volume crossing (5,200 ADT) that serves regional UPS facility; difficult to provide safety gates and desirable to consolidate with I-85 Service Rd crossing.
2	4.47	Oneida Rd	Public (open)	Oneida and Allen Rd crossings are less than ¼ mile apart but both would require a traffic signal for crossing safety. Preferred solution is to eliminate <u>one</u> of these crossings (and signal) by constructing a parallel frontage road.
3	4.67	Allan Rd	Public	
4	12.56	Hambright Rd Extension	Public	Currently, Hambright Rd is a private crossing. There is a plan to extend Hambright which would provide connection between Statesville and Eastfield and provide access into the Brighton development. Metrolina model estimates over 30,000 ADT at the crossing which results in potential queuing and LOS D/E in 2030. Therefore, a detail traffic study is recommended at this location
5	14.47	Dellwood Rd	Closed	Dellwood Rd and Gibson Park Rd are low volume crossings; initial recommendation was to close Dellwood but Town plans to upgrade parallel road (Main St) which may make it advantageous to close Gibson Park and leave Dellwood open (eliminating signal requirements on Main St). Town improvement plan and crossing grade issues to be resolved.
6	14.62	Gibson Park Rd	Public (open)	
7	17.00	NC 73/ Sam Furr Rd	Public (open)	High volume crossing (17,000 vpd in 2005 and 33,000 in 2030); Currently being evaluated as an at-grade crossing although grade separation may be desirable.
8	17.91	Mayes Rd	Public	Initially targeted for closure. Mayes Rd is becoming a principal arterial. With additional rail undercutting and roadway grade adjustment, Mayes Rd may remain open.

Source: CDOT and CATS; data compiled by Parsons Brinckerhoff.

Note: These crossings are recommended for detail study during the next phase, following this study.

<u>Summary of Closures</u>. Figure 4.3-2 a-c provides an illustration of the location of crossings recommended to be closed, remain open, and crossings requiring further study. Of the 111 existing at-grade crossings on the NCCR, 24 private and 20 public crossings are recommended for closure, and 5 new at-grade crossings are planned. This would result in a total of 72 public and private crossings to be in operation at the start of the NCCR service. Over the 28.6 mile corridor under study, this would correspond to approximately 2.5 crossings per mile.

As more detailed information becomes available during the next phase of the study, a detailed operational analysis would be conducted at each of the crossings to ensure efficient and safe operation of the NCCR and the crossings. The analysis would include recommendations for gates, traffic signal preemption and/or other safety protection measures.

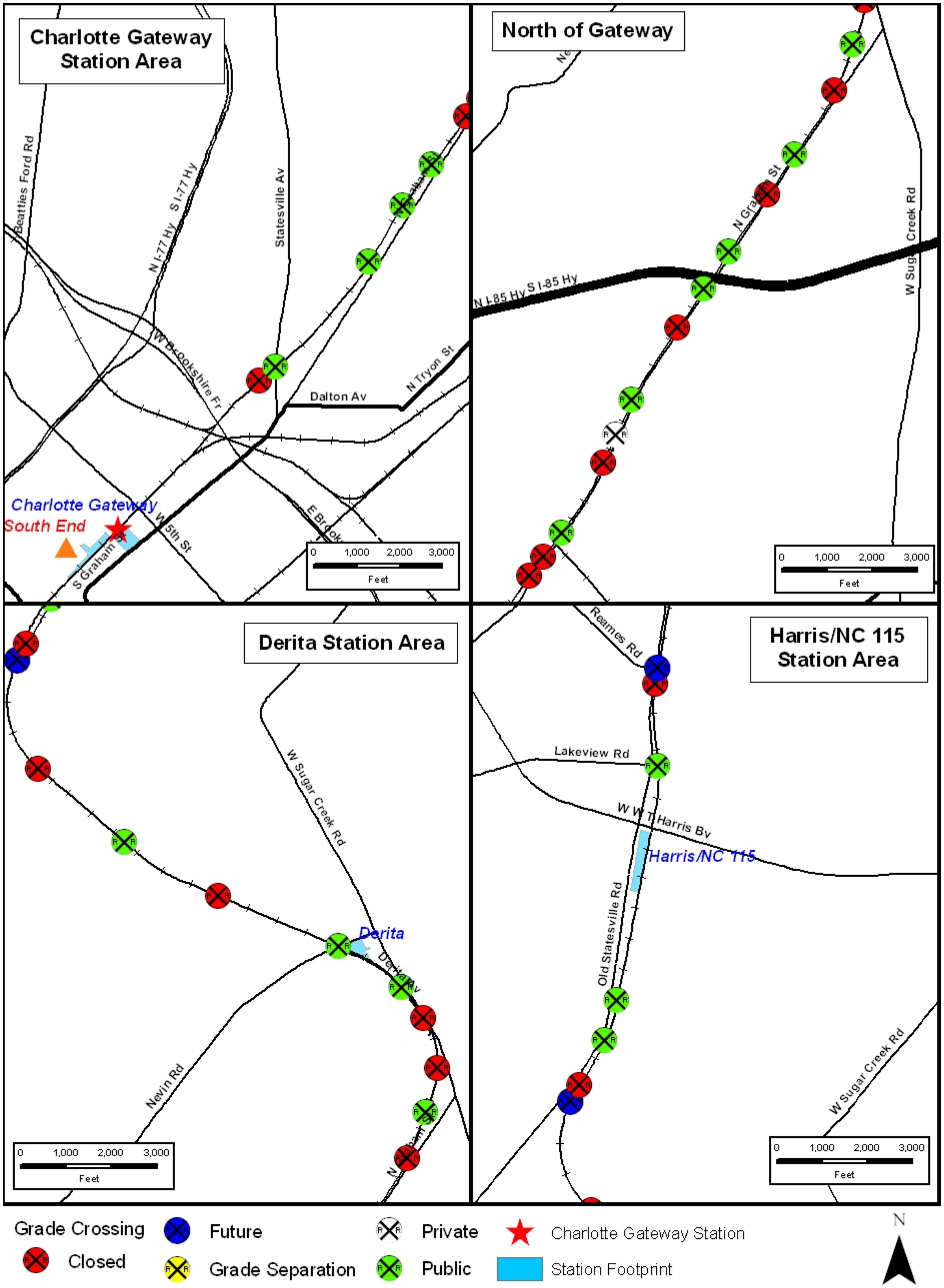


Figure 4.3-2a

Grade Crossing

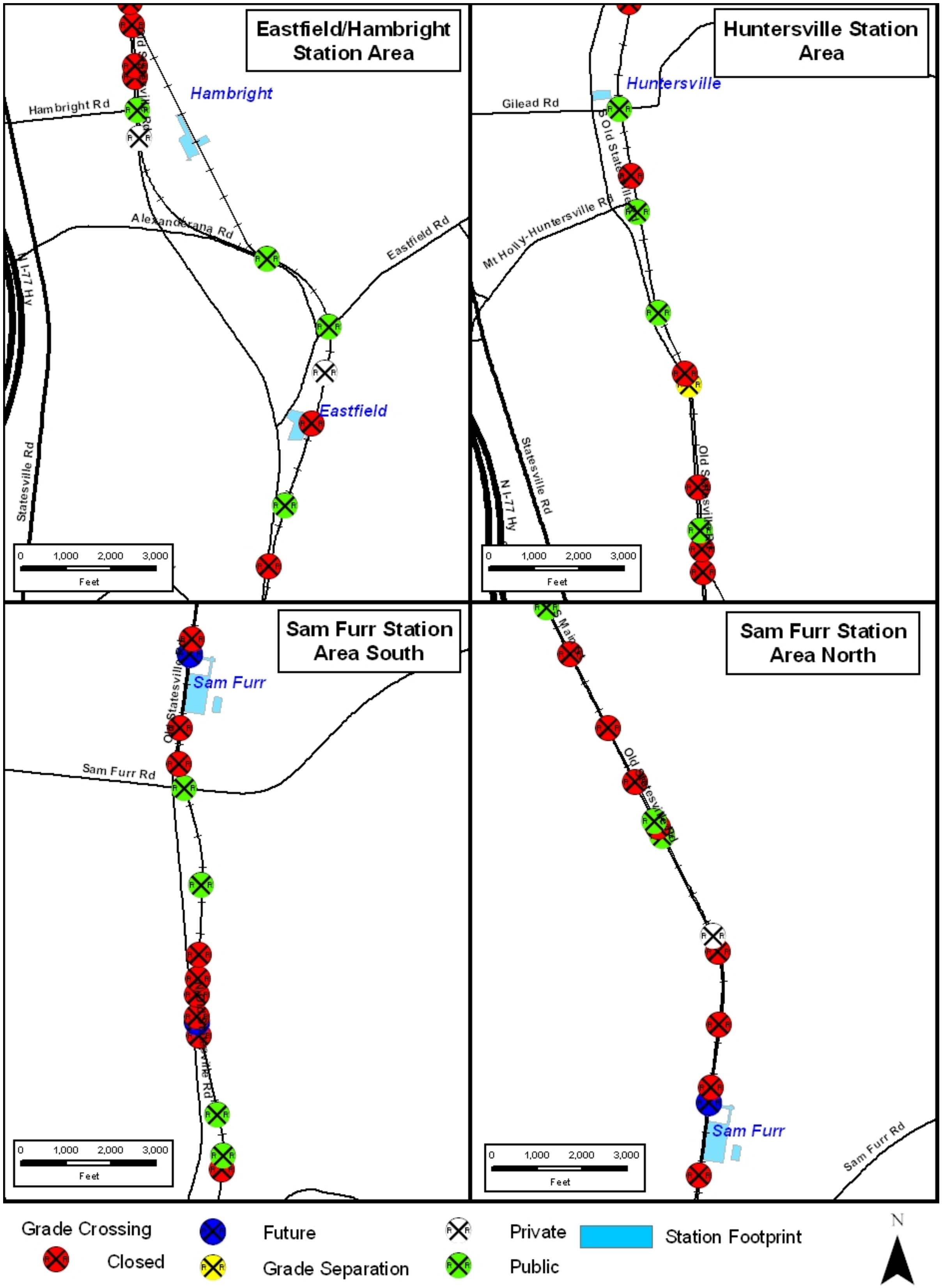


Figure 4.3-2b Grade Crossing

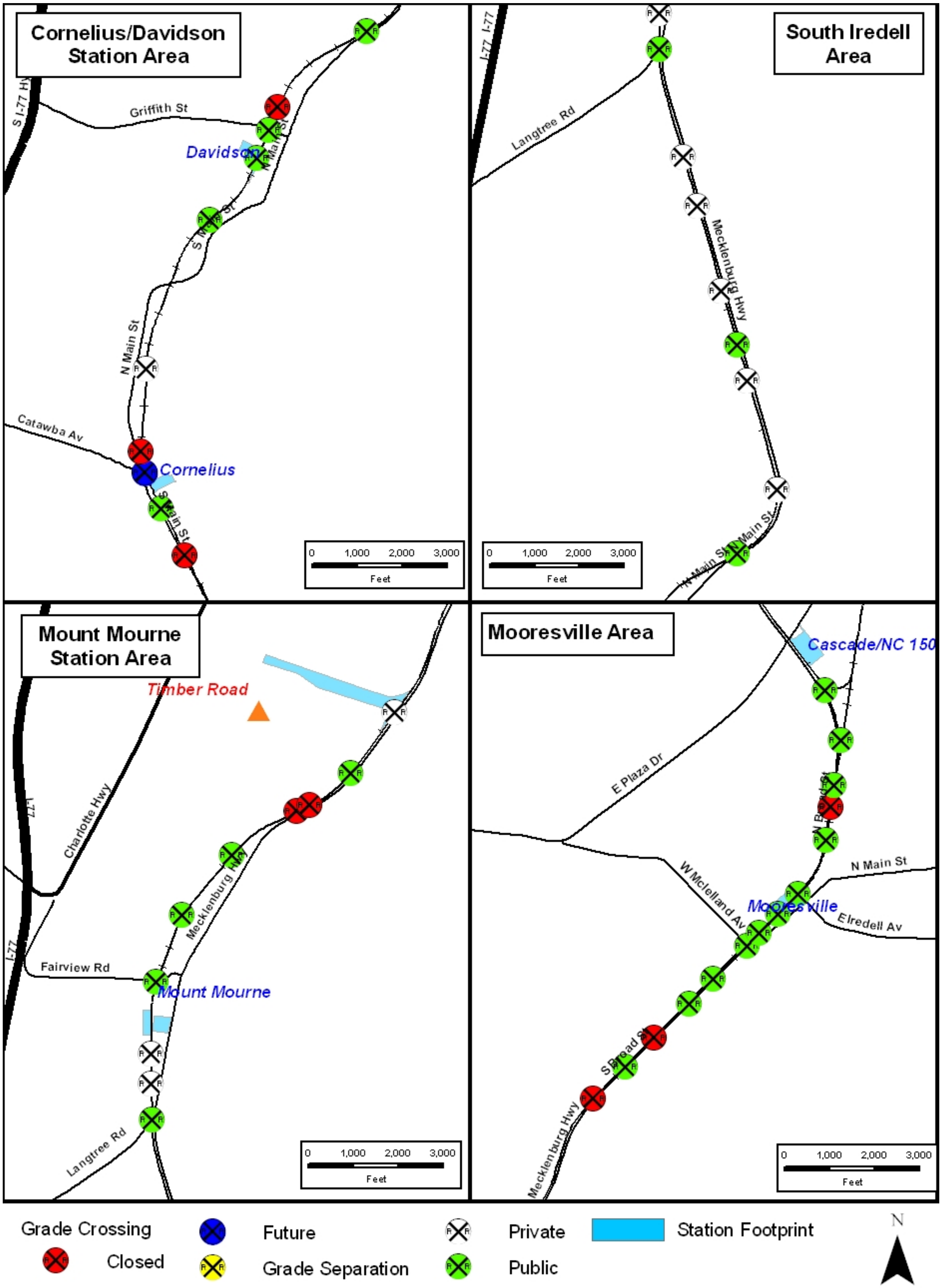


Figure 4.3-2c	Grade Crossing

Future At-Grade Crossings: Improvements to the roadway network related to the 2005 LRTP and/or current (April 2006) developer proposals anticipate new at-grade crossings at the following locations:

- Henderson Circle @ MP 8.00 – Charlotte
- Reames Road (extension) @ MP 9.90 – Charlotte
- Stumptown Road (extension) @ MP 16.0 – Huntersville
- Caldwell Station (relocated) @ MP 17.50 – Huntersville
- Catawba Avenue (extension) @ MP 19.90 – Cornelius

Grade Separated Crossings – Existing and Future: Existing and future grade separated crossings of the NCCR are shown in Table 4.3-26. Alexanderana Road currently does not cross the NS "O" line but will be realigned as part of the I-485 construction project. The design for the realignment includes bridging over the rail line and then joining Eastfield Road. The extension of Verhoeff Drive is under study to access the developing North Mecklenburg Industrial Park. The plan is to realign Verhoeff Drive and cross over the rail line into the industrial park.

Table 4.3-26. Existing/Future Grade Separated Highway/Railroad Locations

MP	Jurisdiction	Street Name	Status	Type
1.03	Charlotte	I-277	Existing	Road Overpass
1.06	Charlotte	I-277 Ramp	Existing	Road Overpass
4.05	Charlotte	I-85	Existing	Rail Overpass
9.19	Charlotte	WT Harris Blvd	Existing	Rail Overpass
11.78	Charlotte	I-485	Future	Road Overpass
11.86	Huntersville	Alexanderana Rd	Future	Road Overpass
13.73	Huntersville	Verhoeff Dr	Future	Road Overpass
20.83	Cornelius/ Davidson	Main St	Existing	Rail Overpass

Huntersville is in preliminary discussion with NCDOT regarding a proposed grade separation for the Sam Furr Road (NC 73) crossing.

4.3.5 Operational Impacts of Trains at Grade Crossings

Of the 111 existing highway/railroad at-grade crossings, only 67 at-grade crossings will remain in operation and five new ones constructed for a total of 72 total at-grade crossings between CGS, in Charlotte and Williams Street in Mooresville. In accordance with CATS proposed improvements, all public crossings not closed or not grade separated would be upgraded with gates and where possible, median divided barriers. Under the NCCR alternatives, all crossing devices would be repositioned as necessary to encompass the NCCR tracks. At these crossings, an approaching train (railroad or NCCR) would activate the flashing signals and automatic gates, which would close the roadway until the train has traversed the crossing.

The NCCR trains would operate through the crossings at 20 minute headways in the peak direction and 25-30 minute headways in the non-peak direction during the peak periods. For the remainder of the day, trains would travel in both directions on 60 minute headways. In general, when a single train passes through a crossing, the gates would be closed for approximately 70 seconds at most crossings. This includes a combination of 40 seconds of clearance time to clear the tracks of vehicles and 30 seconds for passing time of the train. Note that these times would be adjusted as part of the final design for each individual crossing. Depending on the signal pre-emption and scheduling, the gate closure time could rise to as much as 95 seconds. There may be a rare situation when a train from one direction would be required to pull-off to a side track while a train in the peak direction traverses the crossings. In this situation, the gate would remain closed as the train that pulled-off onto the side track resumes its travel across the crossing.

These train crossings can increase vehicular traffic delay and result in queuing of vehicles, which could impact adjacent intersections. The impact of NCCR was analyzed at each crossing that would be in operation. A detailed discussion of the methodology and results of the analysis of the crossings would be presented as a separate stand alone technical report.

Impacts of NCCR operations at rail/highway crossings were determined by measuring the change in LOS and vehicular delay on the roadway network because of passing NCCR trains. The analysis assumed that one freight train passes through the grade crossing during the peak hour analyzed. This assumption was used for both existing condition and 2030 No-Action Alternative. The 2030 Build Alternative assumes that only the NCCR would impact the highway/grade crossings because the freight train would not operate during the peak hour. Note that the LOS referred to in this analysis is based on vehicle delays only due to the train operation itself, and does not take into account the signalized intersection analysis outlined in Section 4.2.2. Roadway traffic volumes used in this analysis are consistent with the traffic capacity analysis.

4.3.5.1 Level of Service Analysis Methodology – Grade Crossings

The Transportation Research Board's 1994 HCM provides methods for determining LOS at intersections. LOS is based on the average time that motorists are delayed as they pass through an intersection. It is ranked into six grades, each represented by a letter of the alphabet (i.e., A through F). LOS A represents the least delay and LOS F represents substantial delay. LOS A to D is considered desirable/ acceptable during the peak travel hours in urban areas.

In determining impacts of trains on LOS at rail/highway crossings, it was assumed that LOS at railroad crossings would be measured in a similar manner as signalized intersections. A spreadsheet model was developed to calculate delays based on the methodology developed by the Surface Transportation Board's Section of Environmental Analysis (SEA) and HCM's methodology for signalized intersections. Table 4.3-27 shows the criteria used to determine the LOS. The analysis takes into account blocked crossing time per train, even time, number of vehicles delayed, queues, average delays, and LOS, among other factors.

Table 4.3-27. Level of Service Criteria for Signalized Intersections

LOS	Control Delay per Vehicle (sec/veh)
A	< 10
B	10 – 20
C	20 -35
D	35 – 55
E	55 – 80
F	> 80

Source: Exhibit 16-2 from HCM 2000

4.3.5.2 Existing Levels of Service - Grade Crossings

Table 4.3-28 summarizes the result of LOS analysis. At the current time, only NS freight trains use the corridor. Although, freight operation along this corridor is infrequent, for analysis purposes, it was assumed that one freight train travels the corridor during the peak hour. The LOS analysis indicates that, if a NS freight train operated during the peak hour, the LOS at the majority of the grade crossings would not deteriorate and would not have any adverse traffic impacts, including queuing.

4.3.5.3 Future Levels of Service – Grade Crossings

Grade crossing analysis for future year (2030) includes only crossings that are recommended to be in operation with the NCCR. Grade crossings recommended for closing are not included in this analysis. Future roadway traffic volume estimates were based on the growth rate derived from the Metrolina Travel Demand model and applied to existing traffic counts. The two alternatives are as follows:

1. Under the future No-Action Alternative, it is assumed that one freight train would be passing through the corridor during the peak hour.

2. Under the Build Alternative, it is assumed that NS freight trains would not operate during the peak hour. Therefore, the Build Alternative impact analysis includes only the NCCR trains operating during the peak hour.

Table 4.3-28 summarizes the LOS analysis for the No-Action and Build alternatives. It lists the delays and LOS at the 66 grade crossings during the peak hour traffic. Following are key summary points from the analysis:

In general, operation of the NCCR has more impact on LOS as compared to the No-Action Alternative. This is explained by the assumption that grade crossings are assumed to be closed six times during the peak hour for the NCCR transit as compared to only one time closing during the peak hour for the NS freight train.

Due to significant increase in traffic volume at grade crossings Eastfield Road and NC 73/ Sam Furr Road, the crossings would already be operating at LOS F regardless of any types of train operations. The train operation would add to the delay and worsen traffic flow at these crossings.

- Due to the widening of Gibbon Road (two lanes to three lanes) in the Build Alternative, the LOS improves from C to A.
- Iredell Avenue would operate at LOS F under both No-Action and Build Alternative.
- Due to the extension of Hambright Road and future development in the area, Hambright Extension is expected to operate at LOS D/E in 2030.
- Statesville Avenue in Iredell County would be operating at LOS D and LOS F under No-Action and Build alternatives respectively.
- Langtree Road would operate at LOS D under the Build Alternative.
- Fairview, McClelland, and Center St would operate at LOS C/D.

Table 4.3-28. Train Operations LOS Impacts at the 66 Remaining Highway/Railroad At-Grade Crossings[1]

	Intersecting Roadway	2005 Existing		2030 No-Action		2030 Build	
		Delay	LOS	Delay	LOS	Delay	LOS
1	Statesville Ave	2.3	A	2.9	A	4.3	A
2	Woodward Ave	2.1	A	2.6	A	3.9	A
3	Moretz Ave	0.7	A	0.8	A	4.3	A
4	Norris Ave	0.6	A	2.3	A	11.7	B
5	Atando Ave	2.0	A	3.0	A	3.7	A
6	Private (NC Equip Co.)	0.5	A	0.5	A	2.4	A
7	Starita Rd	2.2	A	2.8	A	4.1	A
8	I-85 Service Rd (S)	2.0	A	2.2	A	3.3	A
9	I-85 Service Rd (N)	1.8	A	2.0	A	3.0	A
10	Oneida Rd	1.9	A	2.2	A	3.2	A
11	Allan Rd	1.8	A	2.0	A	3.0	A
12	Private (Bonded Warehouse)	0.5	A	0.5	A	2.5	A
13	Gibbon Rd	7.3	A	24.8	C	9.9	A
14	Nevin Rd	2.9	A	10.5	B	16.8	B
15	Christenbury Rd	0.5	A	0.6	A	3.1	A
16	Pete Brown Rd	0.5	A	0.5	A	2.4	A
17	Henderson Rd	0.5	A	0.5	A	2.5	A
18	David Cox Rd	2.2	A	2.6	A	4.2	A
19	Hucks Rd	0.6	A	0.7	A	3.8	A
20	Private	0.5	A	0.5	A	0.4	A
21	Eastfield Rd	10.5	B	12.7	B	27.8	C
22	Everette Keith Rd	0.5	A	0.5	A	2.7	A
23	Holbrooks Rd	1.8	A	2.5	A	3.8	A
24	Gibson Park Rd	0.5	A	0.5	A	2.8	A
25	Hntrsville/Concord Rd	2.5	A	13.5	B	20.5	C
26	4th St	0.5	A	0.6	A	3.1	A
27	Ramah Ch. Rd	2.1	A	5.0	A	7.6	A
28	McCord Rd	2.4	A	9.3	A	14.3	B
29	NC 73/Sam Furr Rd	10.1	B	1.6	A	2.6	A
30	Bailey Rd	0.5	A	0.6	A	2.8	A
31	Hickory (Zion S) St	0.5	A	0.5	A	2.7	A
32	Private	0.5	A	0.5	A	0.0	A
33	Catawba Ave	0.6	A	0.7	A	4.2	A
34	Depot St	0.5	A	0.5	A	2.9	A
35	Griffith St	3.1	A	5.8	A	9.1	A

Table 4.3-28. Train Operations LOS Impacts at the 66 Remaining Highway/Railroad At-Grade Crossings[1] (continued)

	Intersecting Roadway	2005 Existing		2030 No-Action		2030 Build	
		Delay	LOS	Delay	LOS	Delay	LOS
36	Beatty Rd	0.6	A	0.7	A	3.6	A
37	Private	0.5	A	0.5	A	0.0	A
38	Private	0.5	A	0.5	A	0.0	A
39	Bridges Farm Rd	0.5	A	0.5	A	2.4	A
40	Private	0.5	A	0.5	A	0.0	A
41	Private	0.5	A	0.5	A	0.0	A
42	Langtree Rd	2.0	A	25.5	C	49.4	D
43	Private/Quality Lane	0.5	A	0.5	A	0.1	A
44	Private/Campus Dr	0.5	A	0.5	A	3.2	A
45	Fairview Rd	2.0	A	20.0	B	36.0	D
46	Crossrail Rd	0.5	A	0.5	A	3.1	A
47	Waterlynn Dr	2.6	A	5.1	A	9.2	A
48	Foursquare Rd	0.5	A	0.5	A	2.9	A
49	Brawley Ave	2.3	A	3.6	A	6.0	A
50	Wilson Ave	3.1	A	8.1	A	13.0	B
51	Catawba Ave	0.5	A	0.6	A	3.4	A
52	McLelland Ave	2.8	A	21.1	C	33.7	C
53	Center St	2.8	A	18.1	B	29.0	C
54	Moore Ave	1.8	A	2.3	A	3.7	A
55	Iredell Ave	3.5	A	432.0	F	692.3	F
56	Oak St	1.8	A	2.3	A	3.8	A
57	Patterson St	1.7	A	2.0	A	3.5	A
58	Statesville Ave	3.1	A	54.2	D	97.6	F
59	Henderson Circle	na	na	1.6	A	2.5	A
60	Reames Rd	na	na	3.9	A	4.1	A
61	Private (Future Hambright)	na	na	49.9	D	75.72	E
62	Private (Future Damson)	na	na	1.93	A	2.90	A
63	Verhoeff Dr (Future)	na	na	2.8	A	0.0	A
64	Stumptown Rd Ext.	na	na	2.9	A	0.0	A
65	New Public Crossing	na	na	1.6	A	2.4	A
66	Prop Catawba Ave Ext.	na	na	1.6	A	2.4	A

Source: Parsons Brinckerhoff
Notes:
[1]The analysis assumed that one freight train passed through the grade crossing during the peak hour analyzed.
[2]Delay = seconds per vehicle as a result of crossing closure, it does NOT include normal traffic/ traffic signal related delays.

4.3.5.4 Queuing Analysis – Grade Crossings

In addition to LOS, maximum queuing was used as a measure of effectiveness at the railroad grade crossings. The maximum queue represents the longest (worst case) queues that would form at the crossing during peak hour travel conditions. The maximum peak hour queue is the appropriate measure for evaluating potential impacts. The queue length was then compared with the distance to the closest adjacent intersection to determine whether the queue would extend from the railroad crossing back into the intersection. Queues would be much shorter with crossing closures for NCCR trains than freight trains because NCCR trains are shorter and would typically close the crossing for approximately one minute.

Because hourly volume data for crossing traffic were unavailable, peak hour and directional split percentages were assumed. The queue is based on the assumption that traffic would be distributed equally among all lanes available and the traffic arrival and departure rate remains constant during the peak hour. Therefore, queuing represented in Table 4.3-29 is only due to the train operation itself and does not represent queuing due to signals at adjacent intersections. A more comprehensive explanation on the methodology and the equations will be detailed under a separate technical report. Following are key summaries from the analysis.

Rail operations, under existing traffic conditions, would not produce excessive queuing that would adversely impact LOS at these highway/ grade crossings.

Because the crossing is estimated to remain closed longer under the No-Action Alternative as compared to the Build Alternative, it is expected to generate longer queues than under Build Alternative.

Queuing analysis under No-Action and Build alternatives indicate that if no new improvements are planned, majority of the crossings would generate queues long enough to spill over to adjacent intersections because of the distance between the railroad track and adjacent intersections. However, locations where distance between track and adjacent intersection is less than 250’, there would be signal preemption to restrict queue buildup.

Table 4.3-29. Train Operations Queuing Impacts at the 66 Remaining Highway/Railroad At-Grade Crossings[1]

		Max. Vehicles in Queue [2]			Available Storage[3]		
	Intersecting Roadway	**2005 Existing**	**2030 No-Action**	**2030 Build**	**Feet**	**Vehicle**	**Nearest Intersection/ Comments**
1	Statesville Ave	9.5	16.9	8.4	1,200	120	Liddell Ave
2	Woodward Ave	8.2	**14.2**	7.0	300	12	Graham St
3	Moretz Ave	5.3	9.4	8.7	250	10	Graham St
4	Norris Ave	4.8	**33.1**	**30.6**	160	6	Graham St
5	Atando Ave	**6.1**	**18.6**	**6.3**	70	6	Graham St
6	Private (NC Equip Co.)	**0.1**	**0.2**	**0.2**	0	0	Graham St
7	Starita Rd	**9.1**	**16.0**	**7.9**	60	2	Graham St
8	I-85 Service Rd (S)	**5.5**	**9.1**	**4.5**	50	3	Graham St
9	I-85 Service Rd (N)	**3.9**	**6.4**	**3.2**	50	3	Graham St
10	Oneida Rd	**4.9**	**8.3**	**4.1**	40	2	Graham St
11	Allan Rd	**3.2**	**5.3**	**2.7**	40	2	Graham St
12	Private (Bonded Warehouse)	**0.1**	**0.2**	**0.2**	0	0	
13	Gibbon Rd	**57.0**	**147.1**	**25.3**	70	4	Sugar Creek Rd
14	Nevin Rd	**17.4**	**78.4**	**40.5**	420	17	Gibbon St
15	Christenbury Rd	**2.5**	**3.6**	**3.3**	40	2	Gibbon St
16	Pete Brown Rd	0.1	0.2	0.2	110	4	Old Statesville Rd
17	Henderson Rd	0.3	0.5	0.5	150	6	Old Statesville Rd
18	David Cox Rd	**9.2**	**13.9**	**7.2**	130	5	Old Statesville Rd
19	Hucks Rd	2.9	7.3	6.7	240	10	Old Statesville Rd (Arthur Davis Rd)
20	Private	**0.2**	**0.4**	**0.1**	0	0	
21	Eastfield Rd	**78.6**	na [4]	na [4]	330	13	Alexanderana St
22	Everette Keith Rd	0.5	1.1	1.0	50	2	Keith Hill/ Alexanderana
23	Holbrooks Rd	3.3	**12.8**	**6.4**	140	6	Old Statesville Rd (Church St)

NOTES:

[1] The analysis assumed that one freight train passed through the grade crossing during the peak hour analyzed.

[2] Max. queue is conservative number. Simulation model will provide a more realistic 95th percentile queue length and vehicles in queue. Alternatives where max. queue forecasted to exceed available queue length are shown in bold italics.

[3] The available storage is the distance between the railroad/ highway grade crossing to the nearest major signalized intersection. It takes into account number of lanes available for storage (e.g. if distance between track and intersection is 200', but it has 2 lanes in one direction, then vehicle storage capacity is estimated by using 400').

[4] Due to excessive future traffic volume growth; estimated arrival rate is greater than departure rate. This results in unrealistic queue length. Crossings at Eastfield Road and NC 73 recommended for detail study during the next phase.

Source: Parsons Brinckerhoff

Table 4.3-29. Train Operations Queuing Impacts at the 66 Remaining Highway/Railroad At-Grade Crossings[1] (continued)

	Intersecting Roadway	Max. Vehicles in Queue [2]			Available Storage[3]		
		2005 Existing	2030 No-Action	2030 Build	Feet	Vehicle	Nearest Intersection/ Comments
24	Gibson Park Rd	0.6	**2.2**	**2.0**	40	2	Old Statesville Rd (Church St)
25	Hntrsville/Concord Rd	**12.4**	**95.8**	**48.1**	40	2	Old Statesville Rd (Church St)
26	4th St	1.0	**3.6**	**3.4**	40	2	Main St (200 ft to Seagal)
27	Ramah Ch. Rd	7.6	**38.6**	**19.4**	400	16	Old Statesville Rd (260 ft to Seagal)
28	McCord Rd	10.8	**70.6**	**35.8**	460	18	Old Statesville Rd
29	NC 73/Sam Furr Rd	**75.9**	na [4]	na [4]	280	11	Old Statesville Rd
30	Bailey Rd	1.0	**3.6**	**2.1**	40	2	Old Statesville Rd
31	Hickory (Zion S) St	0.7	1.1	1.0	40	2	Old Statesville Rd
32	Private	**0.2**	**0.4**	**0.0**	0	0	
33	Catawba Ave	**3.8**	**7.0**	**6.8**	80	3	Potts (240 ft to Main)
34	Depot St	1.0	1.6	1.6	70	3	Jackson
35	Griffith St	**19.6**	**45.2**	**23.1**	50	2	Jackson
36	Beatty Rd	**3.0**	**5.5**	**5.3**	40	2	Main
37	Private	**0.1**	**0.4**	**0.0**	0	0	
38	Private	**0.1**	**0.4**	**0.0**	0	0	
39	Bridges Farm Rd	0.1	0.2	0.2	60	2	Mecklenburg
40	Private	**0.2**	**0.4**	**0.0**	0	0	
41	Private	**0.2**	**0.4**	**0.0**	0	0	
42	Langtree Rd	**6.4**	**149.9**	**85.2**	60	2	Mecklenburg
43	Private/Quality Lane	**0.1**	**0.4**	**0.1**	0	0	
44	Private/Campus Dr	**0.1**	**0.4**	**0.4**	0	0	

NOTES:
[1] The analysis assumed that one freight train passed through the grade crossing during the peak hour analyzed.
[2] Max. queue is conservative number. Simulation model will provide a more realistic 95th percentile queue length and vehicles in queue. Alternatives where max. queue forecasted to exceed available queue length are shown in bold italics.
[3] The available storage is the distance between the railroad/ highway grade crossing to the nearest major signalized intersection. It takes into account number of lanes available for storage (e.g. if distance between track and intersection is 200', but it has 2 lanes in one direction, then vehicle storage capacity is estimated by using 400').
[4] Due to excessive future traffic volume growth; estimated arrival rate is greater than departure rate. This results in unrealistic queue length. Crossings at Eastfield Road and NC 73 recommended for detail study during the next phase.
Source: Parsons Brinckerhoff

Table 4.3-29. Train Operations Queuing Impacts at the 66 Remaining Highway/Railroad At-Grade Crossings[1] (continued)

	Intersecting Roadway	Max. Vehicles in Queue [2]			Available Storage[3]		
		2005 Existing	**2030 No-Action**	**2030 Build**	**Feet**	**Vehicle**	**Nearest Intersection/ Comments**
45	Fairview Rd	5.6	**127.1**	**69.7**	600	24	Mecklenburg
46	Crossrail Rd	0.6	1.2	1.2	510	20	Leslie
47	Waterlynn Dr	**14.2**	**39.7**	**21.8**	340	14	Mecklenburg
48	Foursquare Rd	0.3	0.7	0.7	40	2	Keller Ridge (60 ft to Mecklenburg)
49	Brawley Ave	**10.2**	**25.7**	**13.5**	30	1	Broad St, Main St
50	Wilson Ave	**19.3**	**62.9**	**32.5**	40	2	Broad St, Main St
51	Catawba Ave	1.9	**4.1**	**3.9**	50	2	Broad St, Main St
52	McLelland Ave	**16.6**	**131.7**	**68.1**	50	2	Broad St, Main St
53	Center St	**16.0**	**118.6**	**61.3**	40	2	Broad St (100 ft to Main ST)
54	Moore Ave	**3.0**	**9.8**	**5.1**	40	2	Broad St (170 ft to Main St)
55	Iredell Ave	**24.0**	**773.0**	**399.5**	30	1	Broad St (210 ft to Main St)
56	Oak St	**3.1**	**10.1**	**5.3**	30	1	Broad St
57	Patterson St	**2.1**	**6.7**	**3.6**	30	1	Broad St
58	Statesville Ave	**20.0**	**241.5**	**132.3**	70	3	Cascade
59	Henderson Cir	**na**	0.4	0.2	230	9	Old Statesville Rd
60	Reames Rd	**na**	**27.8**	**7.8**	50	3	Old Statesville Rd
61	Private (Future Hambright)	**na**	na [4]	na [4]	50	2	Old Statesville Rd
62	Private (Future Damson)	**na**	5.11	2.6	50	2	Old Statesville Rd
63	Verhoeff Dr (Future)	**na**	**16.7**	0.6	60	2	Old Statesville Rd
64	Stumptown Rd Ext.	**na**	**17.9**	0.6	120	5	Old Statesville Rd
65	New Public Crossing	**na**	**0.4**	**0.2**	0	0	
66	Prop Catawba Ave Ext.	**na**	0.4	0.1	100	8	Main St

NOTES:
[1] The analysis assumed that one freight train passed through the grade crossing during the peak hour analyzed.
[2] Max. queue is conservative number. Simulation model will provide a more realistic 95th percentile queue length and vehicles in queue. Alternatives where max. queue forecasted to exceed available queue length are shown in bold italics.
[3] The available storage is the distance between the railroad/ highway grade crossing to the nearest major signalized intersection. It takes into account number of lanes available for storage (e.g. if distance between track and intersection is 200', but it has 2 lanes in one direction, then vehicle storage capacity is estimated by using 400').
[4] Due to excessive future traffic volume growth; estimated arrival rate is greater than departure rate. This results in unrealistic queue length. Crossings at Eastfield Road and NC 73 recommended for detail study during the next phase.
Source: Parsons Brinckerhoff

4.3.6 Charlotte Gateway Station, Traffic Impact Assessment

As discussed in the earlier sections of this report, the CGS is the southern terminus point of the NCCR in Center City Charlotte to be located between Trade and Third Streets west of Graham Street. A separate report detailing the CGS impact on traffic was completed and submitted to CDOT and CATS on March 2006. The analysis was conducted under the assumption of a CGS Full Build Alternative. Some of the key highlights from that report are outlined below.

1. The CGS would serve as a hub facility for several transit modes including the future NCCR line, West Corridor Rapid Transit line, Streetcar Service, CATS bus service, Greyhound bus service, Amtrak passenger train service and inter-city passenger rail service between Charlotte and Raleigh. A new Greyhound Bus Terminal would also be constructed adjacent to the new facility, including ancillary 450-space parking deck.
2. The Center would attract few new automobile trips, as its function is to serve mostly in the transfer of people between various transit services. The CGS is expected to be completed by 2010, before NCCR service begins.
3. Existing LOS analyses were performed at the study area intersections for both AM and PM commuter peak hours of travel. The result shows that the study area intersections are operating at LOS C or better during both peak periods under existing conditions.
4. The CGS includes a new parking deck which would replace some but not all the parking that is currently available in the proposed CGS site. There is adequate parking in nearby lots/ garages to accommodate displaced parking.
5. A preliminary bus routing/ circulation pattern has been established to minimize the impacts of bus operations on the adjacent street network and reduce bus delays leaving the site.
6. The new street system layout for the proposed traffic circulation patterns allows access to the parking deck and Greyhound Terminal from Fourth Street and Graham Street via Third Street.
7. The 2010 build-out scenario was developed to determine future intersection conditions at the year of expected full-build out of the CGS *including* site traffic impacts. Analysis of the 2010 Build Year analysis shows that overall intersections would continue to operate at LOS C or better in the 2010 build year.
8. The 2030 horizon year scenario was developed to project future intersection and roadway operations in the study area. Due to significant growth forecast in the 2030 Transportation Model, most of the intersections in the study area are forecast to operate at LOS F.
9. As traffic growth increases in the downtown, more commuters would desire the transit service that this facility seeks to provide, without adding additional traffic on the downtown streets. The CGS facility can be accommodated by the current roadway network surrounding the site. The proposed site reduces the amount of current surface parking, a desired outcome of transit oriented policy. The additional transit vehicles would utilize the network in a circulatory pattern that minimizes the impact to street and intersection capacity (right-in/right-out of the facility) and the addition of bus drop-off lanes on the Fourth and Trade Street frontages would further reduce impacts.

4.4 Other Modes

4.4.1 Impacts to Freight

The railroad corridor proposed for use by the NCCR project, NS "O" Line, is currently operated as a limited freight service. Freight service to less than a dozen local customers is provided by a single, daily switch engine move from Charlotte. NS does not own the ROW, but occupies the ROW under an historical provision known as a "Charter Right" granted by the state legislature in the mid 19^{th} century. For the last half mile to the CGS, from the CSX crossing, the NCCR service would operate over a dedicated track, parallel to the NS Main Line.

It is proposed that all freight service would be restricted to the nighttime hours, when there would be no conflict with the NCCR service peak or midday hours of operation.

4.4.2 Physical Impact

Table 4.4-1 lists roads and jurisdictions that are located adjacent and parallel to the existing track. NCCR alternatives involve upgrading of the existing track with the exception of the Bryton transit oriented development (TOD) project. The Bryton development includes track realignment on new location.

Table 4.4-1. Locations Parallel to Existing Track

Roads	Jurisdiction
Graham St	Charlotte
Gibbon Rd	Charlotte
Henderson Rd	Charlotte
Old Statesville Rd (NC 115)	Charlotte, Mecklenburg, Huntersville
Bob Beatty Rd	Charlotte
Arthur Davis Rd	Mecklenburg
Alexanderana Rd	Mecklenburg
Main St	Huntersville
Church St	Huntersville
Zion St	Cornelius
Jackson St	Davidson
Broad St	Mooresville
Main St	Mooresville
Iredell-Mecklenburg Hwy (NC 115)	Iredell, Mecklenburg

Source:
1. NC State Transportation Map, 2006.
2. ADC Greater Charlotte Map Book, 4^{th} edition.
3. Parsons Brinckerhoff.

Minor track shifts within the existing ROW would be implemented to accommodate the upgrading of grade crossing protection.

Existing freight sidings, to the extent they are still in service, would be preserved. Four new passing sidings would be constructed to facilitate NCCR two way service. The passing sidings would be required under each of the four build alternatives under consideration.

None of the sidings would adversely affect freight operations. The passing sidings would provide increased operating capacity and flexibility primarily to the commuter system with secondary benefits accruing to the freight system as well. Table 4.4-2 identifies the approximate passing siding locations. These MP designations for the passing sidings would be further refined during the design phase of the project.

Table 4.4-2. Passing Siding Locations

Siding Location	South End MP	North End MP
Derita	4.2	5.5
Hambright	11.6	13.6
Sam Furr	17.7	18.7
Mount Mourne	23.5	24.76

Source:
1. DELD Mapping, Mecklenburg County, 2005.
2. Parsons Brinckerhoff.

4.4.3 Operational Impacts

Freight train operations on the NS “O” Line would be affected during construction of NCCR alternatives. The impacts would consist of speed restrictions on operations through the construction zone and short durations of track closure to allow for construction of connections back to existing freight sidings and the new passing sidings. The only potentially adverse impact on rail operations during construction would be associated with access to shippers. The most likely construction alternative is to take the “O” Line out of service during the day for construction and make freight deliveries at night. Shifting freight operations to the nighttime is consistent with the freight/passenger service operational separation to be used with implementation of the NCCR service.

There has not been any concern expressed by NS about their ability to establish new customers along the corridor as a result of NCCR. For the most part, the impact of additional freight customers is minimal as long as freight operations are conducted in the evening outside the peak hour operations of the commuter rail service. Further, because of the current and anticipated types of future development of this corridor, there are limited tracts of land that provide sufficient space (acreage) for the typical freight customer. Finally, if a new freight customer were to locate in this area, it would be subject to the limitations to deliveries during off-peak or non-revenue service hours of NCCR.

A new freight shipper, Prairie Packaging Company has submitted an application for an industrial railroad siding and industrial site plan for review by NS railroad and the Town of Huntersville. The facility, a plastic manufacturing plant, will be located on the southeast quadrant of Verhoeff Drive and Old Statesville Road.

4.4.4 Trucking and Deliveries

Although track construction would affect access to existing freight customers, there is sufficient existing siding capacity to reduce the frequency of deliveries, to allow more carloads than normal to mitigate any shortage of materials.

To accelerate the track upgrade process and reduce the overall disruption period, it may be desirable to take the “O” Line out of service for the duration of the track construction and provide service to NS freight customers by locally transferring the shipments to truck and deliver by highway during the construction period.

4.4.5 Amtrak Service

While it is planned to relocate the intercity passenger rail service (Amtrak) from the existing North Tryon Street station to the new CGS (Full Build Alternative), Amtrak would access the new station over the NS Main Line, completely separated from and independent of the "O" Line used by the NCCR.

Charlotte is currently served by three daily Amtrak routes:

- The Crescent – daily service between New York City and New Orleans;
- The Carolinian – daily service between Charlotte and New York City;
- The Piedmont – daily service between Charlotte and Raleigh, with connections at Raleigh to the Northeast Corridor and Florida, via Amtrak's Silver Star.

Two intercity passenger Amtrak trains terminate in Charlotte each day and must be turned around for the return trip north; the *Carolinian* and the *Piedmont.* Currently, these trains are turned using a triangular set of tracks connections, called a "wye," that connects with the NS "O" line at Atando Avenue. Trains operate locomotive last from the Amtrak station at North Tryon Street backing up to the "O" line, where they use either the north or south leg of the wye and then reverse through the interlocking and come out on the other leg, pointed in the other direction. It then operates backward to the Amtrak station and awaits passenger boarding for the next destination, Raleigh.

Currently, the *Carolinian* uses the "O" line for turning between 5:30 am and 5:50 am. The *Piedmont* turns between 10:30 am and 10:50 am. NCDOT hopes to add a second Piedmont frequency within the next five years, which would use the "O" line for turning between 3:30 pm and 3:50 pm. These turning moves could potentially interfere with reliable operation of NCCR trains, particularly given the historic poor on-time performance of many intercity passenger trains. For this reason, NCDOT intends to build a new "wye" along the NS mainline tracks south of CGS as part of the CRISP program of improvements that would facilitate relocation of the Amtrak station to the CGS. Construction of the new "wye" would eliminate any use of the "O" line for turning Amtrak trains, avoiding any interference with reliable NCCR service.

4.4.6 Bike Routes and Greenways

Several bicycle and greenway plans have been documented in the region. Each plan was reviewed to identify whether the proposed facilities would be compatible with the NCCR project. In the few cases where conflicts did exist, alternatives were recommended to ensure that the integrity of the plan remained intact. There were also recommendations to add or modify planned facilities to better serve the proposed transit stations. Below is a list of plans that have been developed and adopted in the study area.

- *Mecklenburg County Greenway Master Plan* – Mecklenburg County Park and Recreation Department (May 1999).
- Charlotte-Mecklenburg Bicycle Transportation Plan – Charlotte/Mecklenburg County (July 1999).
- *2030 Long-Range Transportation Plan* – Mecklenburg-Union MPO (Summer 2005).
- Huntersville Greenway, Trails, and Bikeway Master Plan – Town of Huntersville (Fall 2006).
- Cornelius Greenway/Bikeway Master Plan – Town of Cornelius (December 2002).
- Davidson Bicycle Circulation Network – Town of Davidson (November 2005).

- Mooresville Parks and Greenways Master Plan – Town of Mooresville (March 2003).
- *Downtown Mooresville Master Plan* – Town of Mooresville (November 2001).

There are numerous existing and proposed bikeways and major pedestrian/bicyclist greenways within the NCCR study area. These facilities are illustrated Figure 4.4-1. A majority of bikeways, both existing and proposed, are exclusive to bicycles using designated bike lanes. In addition, a comprehensive system of greenways in Mecklenburg County will serve bicyclist and pedestrians. There are 22 miles of developed and 158 miles of undeveloped greenways in Mecklenburg County. Table 4.4-3 lists the bikeways that are within ½ mile of each NCCR station. Every transit station would be served by at least one future bikeway or greenway. Many of the proposed bikeways are bicycle improvements on existing roads. Such improvements can include signed bicycle routes or provisions for bicycles on new roads, such as wide shoulder lanes. In most areas, however, bicycle lanes are proposed. Striped bicycle lanes are the recommended bikeway type for proposed bikeways within most of the areas near the proposed stations.

NCCR stations would have provisions for bicycles, including bicycle racks (or other appropriate bicycle storage facilities) to secure bicycles at stations while using the NCCR system. CATS intends to develop a policy allowing bicyclists to bring their bicycles on the train. CATS already provides buses that have front loading bicycle racks. There likely would be one train car in each train set that would allow on board bicycles. These measures would provide bicyclists with additional mobility around the region. Accommodating bicycles also would provide the Charlotte Region's travelers with an additional way to move around the Region without driving an automobile.

Table 4.4-3. Existing and Proposed Bikeways and Greenways Near Stations

Stations	Facility Type	Location	Status
Charlotte Gateway Station	Bike lane	3rd St	Existing
	Bike lane	4th St	Existing
	Greenway	Irwin Creek	Existing
	Bike lane	5th St	Proposed
	Bike lane	6th St	Proposed
	Bike lane	Mint St	Proposed
	Bike lane	Pine St	Proposed
	Bike lane	Poplar St	Proposed
Derita	Bike lane	Nevin Rd	Proposed
	Bike lane	W Sugar Creek Rd	Proposed
	Greenway	Mallard Creek Tributary	Proposed
Harris/NC 115	Bike lane	Old Statesville Rd	Existing
	Greenway	Long Creek	Proposed
Eastfield	Bike lane	Old Statesville Rd	Proposed
	Bike lane	Hucks Rd	Proposed

Table 4.4-3. Existing and Proposed Bikeways and Greenways Near Stations (continued)

Stations	Facility Type	Location	Status
Hambright	Bike lane Bike lane	Old Statesville Rd Hambright Rd	Proposed Proposed
Huntersville	Bike route Bike route Bike lane Bike lane Bike lane Greenway	Gilead Rd Huntersville-Concord Rd Old Statesville Rd Gilead Rd Huntersville-Concord Rd South Prong Clarke Creek	Existing Existing Proposed Proposed Proposed Proposed
Sam Furr	Bike lane Bike lane	Old Statesville Rd Sam Furr Rd	Proposed Proposed
Cornelius	Bike lane Bike lane Greenway	Catawba Ave Old Statesville Rd South Prong Rocky River Connector	Existing Proposed Proposed
Davidson	Bike Lane Bike Lane Bike Lane Bike Route Bike Route Bike Route Bike Route Bike Route Greenway	Concord Rd Griffith St Main St Chairman Blake Ln College Dr Lorimer Rd South St Lake Norman Loop Southeast	Existing Proposed Proposed Proposed Proposed Proposed Proposed Proposed Proposed
Mount Mourne	Bike Lane	Fairview Rd	Proposed
Mooresville	Bike Lane Bike Lane Bike Lane Greenway Greenway Greenway	Center St Church St Wilson Ave Dye Creek South of Mclelland Ave North of Mclelland Ave	Proposed Proposed Proposed Proposed Proposed Proposed
Cascade/NC 150	Bike Lane	Statesville Ave	Proposed

Source:
1. CDOT Countywide Bike Plan,
2. Mecklenburg County Park and Recreation Plan, 1999.
3. Compiled by Parsons Brinckerhoff.

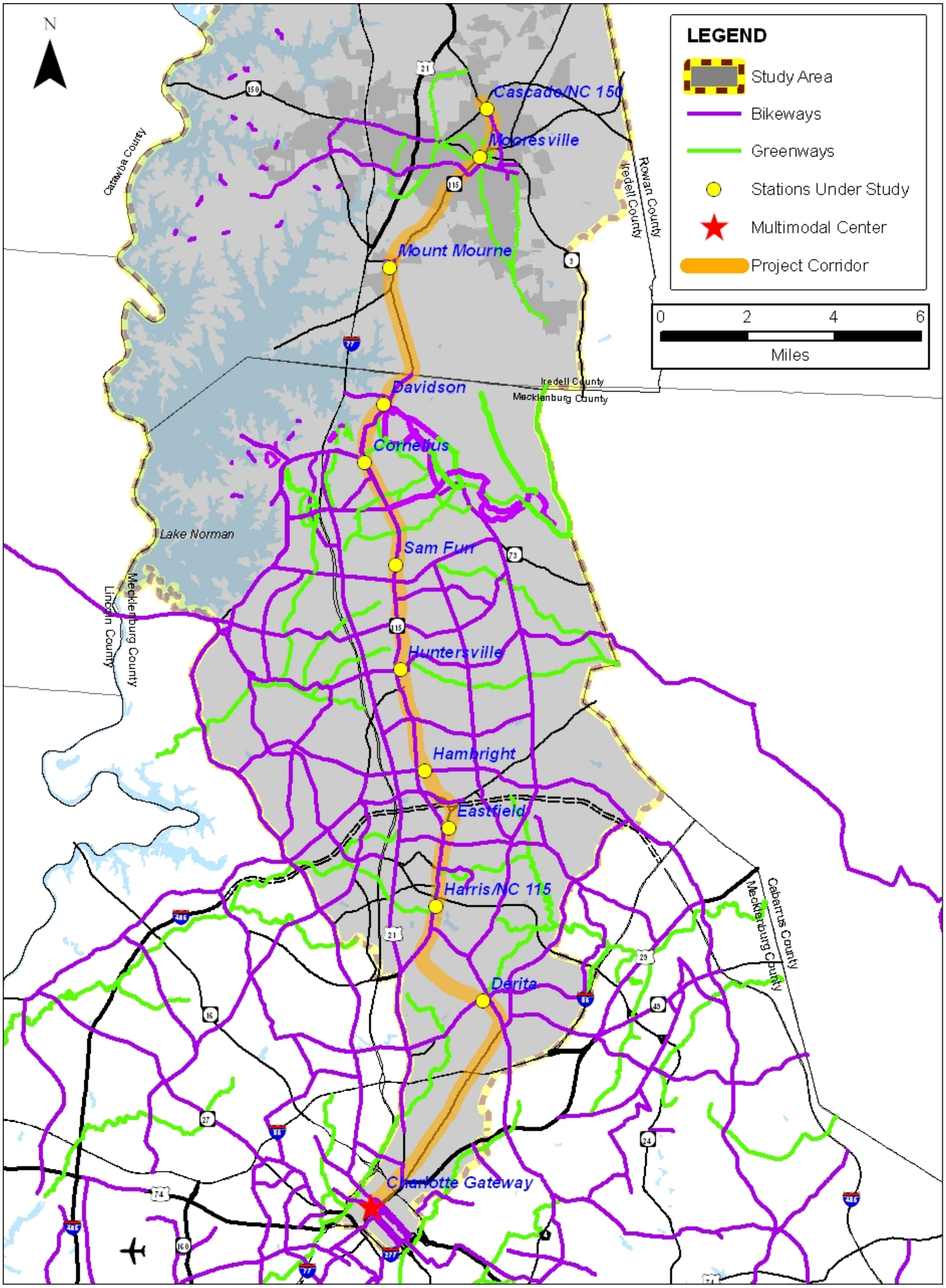


Figure 4.4-1	Bikeway/Greenway Plans

Table 4.4-4 provides the bikeways, both existing and proposed that cross the rail corridor. Most of the crossings of the NCCR line would be at grade. Connections between greenways from one side of the corridor to the other will be served by an overland connector. These overland connectors will share existing or proposed street crossings. Four-quadrant gates would be installed at the grade crossings that would help discourage bicyclists from going around the gates.

Table 4.4-4. Bikeway Rail Crossings

Bikeway Crossing Location	Jurisdiction	Crossing Type	Status
3rd St	Charlotte	Grade Separated	Existing
4th St	Charlotte	Grade Separated	Existing
5th St	Charlotte	Grade Separated *	Proposed
6th St	Charlotte	Grade Separated *	Proposed
Nevin Rd	Charlotte	At-grade	Proposed
Reames Rd	Charlotte	At-grade	Proposed
Hucks Rd	Charlotte	At-grade	Proposed
Eastfield Rd	Charlotte	At-grade	Proposed
Alexanderana Rd (Future)	Charlotte	Grade Separated	Proposed
Hambright Rd (Future)	Huntersville	At-grade	Proposed
Verhoeff Drive (Future)	Huntersville	Grade Separated	Proposed
Huntersville-Concord Rd	Huntersville	At-grade	Proposed
Stumptown Rd Extension	Huntersville	At-grade	Proposed
Sam Furr Rd	Huntersville	At-grade	Proposed
New Rd at Sam Furr station	Huntersville	At-grade	Proposed
Bailey Rd	Cornelius	At-grade	Proposed
Catawba Avenue Extension	Cornelius	At-grade	Proposed
Griffith St	Davidson	At-grade	Proposed
Fairview Rd	Mooresville	At-grade	Proposed
Wilson Ave	Mooresville	At-grade	Proposed
W Center Ave	Mooresville	At-grade	Proposed
Statesville Ave	Mooresville	At-grade	Proposed

Source: Compiled by Parsons Brinckerhoff from CDOT, Mecklenburg County, and Department of Parks and Recreation.
* The railroad is currently grade separated at these locations

4.4.7 Charlotte-Douglas International Airport

Charlotte-Douglas International is located near I-85 west of Charlotte. Owned and operated by the City of Charlotte, Charlotte-Douglas averages 524 daily departures and over 23 million passengers annually. The airport is ranked among the nation's top airports and serves commercial, cargo, corporate, private, military and trucking operations.

Regardless of alternative, there would be no impact on airport service, under Build or No-Action conditions.

4.4.8 Intercity Bus Service

Greyhound Lines Inc. provides scheduled intercity bus service to the Center City Charlotte terminal located at 601 W. Trade Street. Greyhound provides motorcoach connections to cities throughout the United States, with daily departures to all major cities. Carolina Transportation Airport Express provides shared ride service to and from Charlotte Douglas International Airport.

Plans are being developed by NCDOT to relocate the Greyhound terminal adjacent to the CGS under the CGS Full Build Alternative. An enclosed pedestrian walkway over 4th Street would connect the new Greyhound station to the CGS.

4.5 Compatibility

There are multiple and overlapping transportation plans developed for the Charlotte region. Previous chapters provide more detailed chronology of the transportation planning process and the cooperative, comprehensive and coordinated nature of that process. Highlights of that planning process include:

- December 2001 – Traffic Separation Study for North Corridor grade crossings, 2001 study becomes springboard for re-evaluation of all existing and future grade crossings along the North Corridor
- September 2002 – Metropolitan Transit Commission (MTC) adopts North Corridor MIS
- November 2002 – MTC adopts 2025 Corridor System Plan identifying the locally preferred transit alternative for five transit corridors under consideration
- April 2005 - 2030 LRTP adopted by MUMPO
- April 2005 – North Corridor Station Location Refinement Report adopted by MTC.
- July 2005 and September 2005 - Statewide Transportation Improvement Plan (STIP) for 2006 – 2012 adopted by NC Board of Transportation and MUMPO respectively

At the regional level, the 2030 LRTP is the basis for long range planning as well as conformity with Environmental Protection Agency (EPA) air quality emission standards. NCDOT deploys the STIP and local input to fund and advance the development of highway, transit, bicycle and pedestrian projects which are drawn from the LRTP. Some of the local towns in the area have also developed their own transportation plans. The remainder of this section discusses these relevant local and regional transportation plans as it relates to the NCCR alternatives.

4.5.1 Compatibility with MPO Transportation Plans

LRTP – MUMPO has adopted a 2030 LRTP. This LRTP describes the programs that carry out MUMPO's mission. To determine the projects that make up the plan, MUMPO is guided by a set of goals and objectives. The plan is based on an assessment of future travel conditions and a variety of land development and environmental factors.

The mission, goals, and objectives for all of modes of travel are included in the plan, which incorporates highway and vehicular systems, public transportation systems, bicycle and pedestrian systems, and the overall transportation system is as follows:

> *"The mission of the Mecklenburg-Union Metropolitan Planning Organization (MUMPO) is to plan for transportation options that assure mobility, respect the natural and built environment, and strengthen the economic prosperity of MUMPO's planning area. Four surface transportation modes – roadway, transit, bicycle and pedestrian – comprise a system designed to foster the*

safe and efficient movement of people and support the growth and development objectives of the Mecklenburg-Union MPO. Rail lines, intermodal terminals and Charlotte/Douglas International Airport provide connections for people traveling and goods shipped to and from this area."

The MUMPO's LRTP includes a section indicating the need to *"…provide funds for the protective purchase of future transit corridors, the lease or purchase of existing rail rights-of-way, and participation in public-private joint developments…"*. The LRTP also states that *"…the terminus of the North Transit Corridor project in Charlotte is the planned site of joint-use multimodal facility …"*. It further includes NCCR service using the NS "O" line between Charlotte and Mooresville in the 2010 Transit Improvement horizon.

Therefore the NCCR alternatives are in-line with MUMPO's LRTP and will be instrumental in meeting their goals and objectives. A complete document could be located at http://www.mumpo.org/2030_LRTP.htm.

4.5.2 Compatibility with Railroad Improvement Plans

The NCDOT Rail Division is working with several railroad providers, including NS in upgrading existing rail corridors to improve safety, efficiency and capacity for freight and passenger train services. The first phase if the improvements are scheduled along the North Carolina Rail Road between Charlotte, Greensboro and Raleigh. The NCDOT has recently installed gates and improved the flashing crossing signals at the intersection of David Cox Road (SR 2485) and the NS railroad tracks near Charlotte. Also, an upgrade to crossing signals and gates at the intersection of Nevin Road and the NS tracks in Charlotte have been completed. As reported in the NCDOT Rail Division website "*…Improvements include additional electrical hardware for the four-quadrant gates to accommodate Charlotte Area Transit System's future needs….".*

The NCCR project improvements are in line with the type of improvements being considered by NCDOT Rail Division, such as four-quadrant gates, longer gate arms and median where feasible.

4.5.3 Compatibility with Multimodal and Intermodal Center Plans

The NCDOT began acquiring property for downtown station development, in Charlotte, in 1998. Property acquisition totaling 27 acres was completed in February 2004. The City of Charlotte and CATS proposes to build a multimodal center in downtown Charlotte "Charlotte Gateway Station". As discussed in the earlier sections of this report, the CGS would include under the Full Build Alternative: existing or expanded CATS bus service; existing or expanded intercity bus operations (Greyhound/Carolina Trailways); existing or expanded intercity rail passenger service (Amtrak/NCDOT operations); proposed NCCR service; and proposed high-speed rail service; proposed parking and auto drop-off service; existing or expanded private taxi/limousine/shuttle service; and pedestrian access.

The CGS site, selected by the City of Charlotte/ CATS, is located at the corner of Graham Street, 3rd Street, and Trade Street in Center City Charlotte. NCCR is included as an integral part of the plan for the multimodal center and therefore, is compatible with the multimodal center plans.

4.5.4 Compatibility with Bike Routes and Greenways

All alternatives of the NCCR station would have provisions for bicycle. Bicycle racks (or other appropriate bicycle storage facilities) would be provided at stations so that bicyclists could secure their bicycles at stations while using the NCCR system.

The CATS already provides buses that have on board bicycle racks and they also intend to develop a policy allowing bicyclists to bring their bicycles on the train. There likely would be one train car in each train set that would allow on board bicycles. These policies and other similar plans in the NCCR support the objectives of Greenways and Bike Plan's of providing mobility choices for residents in Charlotte and the surrounding region.

4.5.5 Compatibility with Other Local Transportation Plans

There are several other transportation plans that have been completed by various governmental entities in the region. Some of the plans relevant to the NCCR alternatives are discussed below.

Town of Huntersville - On of the development philosophies spelled out by Town of Huntersville states *"...Huntersville will generally concentrate higher-density development where existing highways and future rail lines are located…"* also *"...Huntersville will work to design communities that are transit-supportive wherever possible. The Town cannot rely solely on the private automobile forever and must constantly study the important link between land use and transportation. It is impossible to build one's way out of congestion by constructing more and more roads while ignoring land use patterns. Other transportation alternatives will be pursued (buses, rail service, paratransit) that can be used to mitigate congestion and offer alternatives to residents that are unable to depend on the private automobile…"*.

Huntersville is also embarking on a traffic separation design for the downtown area that would split through traffic between Statesville Road and Main Street with a roundabout at each end of downtown. This plan currently in the design phase would facilitate Huntersville transit supportive development and would enhance access and mobility around the Huntersville commuter rail station.

Town of Cornelius is on of the three northern towns located in the north corridor that is aggressively positioning itself and planning for the future with rail transit. There are two sections in their land use code directly related to the NCCR project (see link http://www.corneliusplanning.org/page2.html). One of their land use code calls for a Transit District-Overlay stating that *"… The intent of the Transit District-Overlay is to produce compact areas of higher-density, mixed-use area that define focal points throughout the community and unifying surrounding neighborhoods within walking distance of a proposed transit station…."*. The Rail Corridor-Overlay section states that the intent *"… is to protect and preserve existing and proposed rights-of-way for future mass transit and elimination of existing private at-grade crossings…"*.

Town of Davidson – The town created a Transit Area Planning Committee, as early as December 2004 for the purpose of providing guidance to the CATS consultant team charged with determining exact station location, commuter parking sites, and appropriate street improvements and land development around the proposed Davidson station.

Town of Mooresville – Mooresville is planning to include a TOD overlay zoning district in their next zoning ordinance update. The zoning ordinance would be updated as soon as a funding source is identified. The new requirements would apply to proposed station locations in Mount Mourne, downtown Mooresville and at the proposed NCCR terminus at Cascades/NC 150.

4.6 Construction Impacts

This section provides a summary of potential short term construction impacts related specifically to existing automotive, truck freight and rail freight access and mobility capability. General mitigation measures are provided. As the design is advanced more specific construction mitigation measures can be determined.

4.6.1 Vehicular/ Passenger Traffic Impacts

Construction of the rail tracks, transit stations and associated facilities would likely affect local roads and modify traffic patterns. Potential transportation and circulation impacts from construction activity could result from temporary road narrowing or closings, causing traffic to detour around or slow down near a construction site. Slow-moving construction vehicles on the roadways near a construction site would also affect levels of service on the roadways. The highest potential traffic delay and mobility impact would occur where it occurs currently, on east west movements at cross streets near the proposed commuter rail stations. Mainline track replacement is anticipated to have a minimal impact upon existing traffic movements on the adjacent street and highway network.

The construction would also have impacts on bus routes in the region because of temporary and permanent street closings. Although rerouting could be necessary, none of the NCCR alternatives would cause severe, long-term service inconveniences. The construction of the proposed NCCR alternatives would not have any substantial long-term impact on local public facilities or services, such as fire, police, and emergency medical services.

4.6.2 Freight Rail Impacts

Freight operations that utilize the existing tracks would be affected during construction of the NCCR alternatives. The existing freight services can be provided from the north or the south on the ‘O’ line so that isolated closures would not adversely impact the delivery of goods and services to local businesses.

The NCCR project potentially impacts operations on the NS main line, at least during the construction period. The proposed access to the CGS requires construction of an additional track, just to the west of the NS main line tracks, to carry the commuter trains to and from the CGS. A retaining wall and several structures for crossing over streets would have to be constructed in very close proximity to the NS main line. Once in operation, however, there would be no impact on NS operations, except possibly in setting off/picking up cars at the Archer Daniels Midland (ADM) plant. This would depend on how the ADM trackage is ultimately reconfigured.

CATS is exploring the option of truck freight shipping in lieu of rail freight during the eight months to one year period it would take to replace the existing rails, ties and provide passing sidings.

4.6.3 Construction Impact Mitigation

Maintenance of traffic and the sequence of construction would be planned and scheduled to minimize traffic delays and rail operations. Warning signs would be used as appropriate to provide notice of road hazards and other pertinent information to the traveling public. The local news media would be notified in advance of road closures, diversion, and other construction. As an extension of the public involvement efforts, local businesses and residents would be kept apprised of activities prior to and during construction. A telephone hotline, where additional traffic information could be obtained, would be available. Access to all businesses and residences would be maintained to the extent practical through controlled construction scheduling and/or provisions of alternate routes of entry.

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