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1 PURPOSE AND NEED

Chapter Summary

This chapter documents the roles and needs for integrated land use/transit improvements in the corridor and outlines the purposes that the improvements are intended to serve.

The Charlotte-Mecklenburg region is thriving, with people and jobs coming to the area in record numbers. In order to encourage that growth in a way that will enhance rather than detract from the region’s economy and appeal, land use decisions and transportation improvements must be carefully evaluated and planned.

In the past decade local elected officials in both the City and County have been focused on encouraging development in ways that sustain the economic growth and vitality of the region. Based on a vision of “Centers and Corridors,” a comprehensive guide for development, the 2025 Integrated Transit/Land Use Plan, was completed in 1998. As shown in Figure 1-1, five specific corridors in the area were identified under the Centers and Corridors vision as warranting further study regarding investments in rapid transit:

- North Corridor
- Northeast (University) Corridor
- South Corridor
- Southeast (Independence) Corridor
- West (Airport) Corridor

Building on the 2025 Integrated Transit/Land-Use Plan, Major Investment Studies (MISs) are being prepared for the North, Northeast (University), Southeast (Independence) and West (Airport) corridors according to Federal Transit Administration (FTA) regulations. The purpose of each corridor MIS is to evaluate possible transit improvements and select a Locally-Preferred Alternative (LPA) for implementation. In 1999, an MIS was conducted for the South Corridor that resulted in selection of a light rail transit project for that corridor.

This report summarizes the analysis and findings of the North Corridor MIS.
Figure 1-1. Map of Centers and Corridors Concept for Charlotte-Mecklenburg Region
1.1 Study Purpose and Background

The Charlotte Area Transit System (CATS) and the Charlotte-Mecklenburg Planning Commission are undertaking this study to define the need for and the nature of transit improvements in the corridor, and the associated land use policies that support the investment.

In the corridor studies there are five specific goals that are linked to the 2025 Integrated Transit/Land-Use Plan and the Centers and Corridors vision. These goals form the basis of the comprehensive approach to both transit investments and land use policies.

<table>
<thead>
<tr>
<th>MIS Goals</th>
</tr>
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<tbody>
<tr>
<td>• Land Use: Locate stations to sustain local neighborhoods and maximize development opportunities.</td>
</tr>
<tr>
<td>• Land Use: Help implement the Centers and Corridors vision by coordinating growth and transportation</td>
</tr>
<tr>
<td>• Operations: Improve access and mobility in the corridor and throughout the region.</td>
</tr>
<tr>
<td>• Environment: Preserve and protect the environment</td>
</tr>
<tr>
<td>• Financial: Provide effective and efficient transit operations.</td>
</tr>
</tbody>
</table>

This MIS report is the culmination of a process that included technical analysis, stakeholder and public input, and evaluation of the alternatives. A number of technical memoranda and other reports support the various parts of this MIS of the North Corridor.

1.1.1 Public Involvement Process

A comprehensive public involvement plan was developed as part of the North Corridor MIS process. The purpose of the public involvement plan was to educate, inform, and gain input from the public to create a regional transit system and associated land use plan for the North Corridor. As described in Chapter 2, comments from meetings with the public and public officials in September and October 2000 were incorporated into the formulation of the long list of technology and alignment alternatives. Additional sessions with members of the public, elected officials and decision-makers held in January 2001 provided further opportunities for comment and assisted in the development of the short list of refined alternatives.

The goals of the public involvement plan were to:

• Define issues or concerns surrounding transit and land use in the Charlotte-Mecklenburg community.
• Inform and educate citizens in a factual and objective manner about the transit and land use plan and its associated opportunities and challenges.
• Proactively seek the participation and views of the broader community so that transit and land use improvements reflect the needs of the community.
• Incorporate citizen feedback and input at all levels of the decision-making process.
• Ensure that all public involvement activities identify and address the needs of area minority, low-income and transit dependent populations.

Stakeholders for the entire corridor, including the northern towns of Mooresville, Davidson, Cornelius and Huntersville, all fully participated in the process. Stakeholders representing corridor residents, neighborhood associations, businesses, and other interest groups more specific to the North Corridor were also included as part of the public involvement process for the project.

To date, more than 500 people have attended 11 public meetings. More than 700 people from neighborhood associations, social organizations and business groups met with the North Corridor team members during presentations and dialogues. The mailing list used to send Transitions newsletters and invitations to public meetings increased to more than 4,900 names over the duration of the study. There was a 13-fold increase in hits to the transit planning webpage of CATS. The Transitions newsletter and direct mail list for the corridor tripled in size.

Outreach Efforts
Specific outreach efforts in the project included a variety of participation techniques, including:

• Stakeholder interviews.
• Corridor study public meetings.
• Presentations to neighborhood associations in the Corridor.
• Presentations to local clubs, business organizations and other interest groups.
• One public hearing, scheduled for discussion on the Corridor’s choice of preferred alternative.
• Information booth events, “Wheels of Change” kiosks, and comment boxes displayed at various key local sites.
• Database and direct mailings to inform and correspond.
• A Transitions newsletter sent out quarterly to all stakeholders on the public outreach database.
• A web site (www.ridetransit.org) to publicize project information or activities regarding the project.
• Media tools such as television, radio and newspaper articles.
• City/County phone number with recorded messages that summarized the North Corridor MIS.
• Transit Talk panel discussions.
1.2 Planning Context

The North Corridor MIS is one part of an overall regional strategy that integrates land use and transportation planning to improve regional mobility. As an important step in the planning process, the North Corridor MIS fulfills a major requirement of the FTA’s project development process. It is through this process that the MTC may receive capital funding from the FTA for transit improvement as part of the New Starts Program.

1.2.1 Previous and Related Studies

From 1977 to 1993 a number of studies examined the potential for future transit ways and corridors in Charlotte and the surrounding areas. The approval of the Centers and Corridors vision in 1994 marked the beginning of the current regional transportation and land use planning program. A chronology of the major events and reports leading to this North Corridor MIS are provided in the following paragraphs.

City of Charlotte Historic Trolley Project

In June 1998, Charlotte City Council approved a $19.7 million project to implement vintage trolley service in the portion of the South Corridor between the South End/ Wilmore areas and Center City Charlotte. In April 2000, the MTC approved adding $8.2 million to the historic trolley project to construct elements such as track work, partial unfitting of the Charlotte Convention Center, pedestrian safety improvements, and grading of the right-of-way required for the South Corridor LRT line. Advanced construction of these items will minimize future costs and disruption of trolley service for South Corridor LRT work. Trolley construction began in Fall 2000 and should be completed by early 2003.

2025 Integrated Transit/Land-Use Plan

Culminating a ten-year planning process, the 2025 Integrated Transit/Land-Use Plan for Charlotte-Mecklenburg was the result of an intensive six-month planning effort completed in October 1998. The plan proposes a rapid transit system as a means of supporting land use initiatives to attain the vision of the Centers and Corridors vision established in 1994. The Plan identifies five major transportation and development corridors [North, Northeast (University), South, Southeast (Independence), and West (Airport)] extending from the Center City of Charlotte to the county’s border and beyond. The Plan incorporates technical analysis, public education, outreach, and hands-on public involvement. It puts forth recommendations for improving the transportation system in the region by introducing rapid transit as an alternative method to improve the travel opportunities in Charlotte-Mecklenburg. The individual MISs of the five corridors were initiated as a direct result of this 2025 Integrated Transit/Land-Use Plan.

Center City 2010 Vision Plan

The City of Charlotte, Mecklenburg County, and Charlotte Center City Partners completed the Center City 2010 Vision Plan in 2000. It represents a collective effort of Charlotte residents, government staff, developers, landowners, public officials, and national planning experts to set a determined and visionary path for the future. The plan’s vision statement was to create a livable and memorable Center City of distinct neighborhoods connected by unique infrastructure. In the area of transportation, the Center City 2010 Vision Plan recommends development of a system of transportation modes and services offering alternatives to commuters. The plan also stresses development of urban design solutions to maximize the livability, beauty, and
distinctiveness of each transportation element. Although the vision plan was completed in 1999, numerous small area planning studies for the Center City have been initiated from the 2010 Plan and are being carried out concurrently with the MISs.

**South Corridor Preliminary Engineering/Environmental Impact Statement**

In September 2000, CATS received approval from the FTA to initiate Preliminary Engineering (PE) and preparation of the Draft and Final Environmental Impact Statements (EISs) for the South Corridor. During this phase CATS will refine the design of the LPA, an 11.5-mile Light Rail Transit (LRT) line extending from Center City Charlotte to the Town of Pineville. This project involves the first LRT line in the Charlotte region, it includes establishment of LRT design criteria and preparation of selected technical documents required by the FTA.

**Countywide Transit Services Study**

From February 2000 to August 2001, CATS performed the Countywide Transit Services Study to provide a “blueprint” for the year-by-year expansion of CATS transit services throughout Mecklenburg County over the next five years. The study identified hub and mini-hub locations and regional transit opportunities. The study includes an analysis of service delivery options for the elderly and disabled in Charlotte-Mecklenburg and opportunities for improved coordination. The study further addresses standards for evaluating and monitoring transit performance, and resulted in a new fare policy for CATS. As part of this study, CATS staff conducted over 80 public meetings between Fall 2000 and Spring 2001 to obtain citizen input on service design and development. In August 2001, the MTC approved the study and adopted the five-year development program.

**Urban Land Institute Corridor Panels**

The Business Committee for Regional Transportation Solutions (BCRTS), a consortium of chambers of commerce and civic officials from the 13 counties in the Charlotte region, sponsored panel members from the Urban Land Institute (ULI) to review land use planning in the five corridors from the Centers and Corridors vision. BCRTS received funding from NCDOT to convene these panels. For each corridor, the ULI panel focused on one to two development nodes in each county, resulting in six to eight nodes in all.

**Long Range Transportation Plan Update**

MUMPO recently updated the urban area's LRTP to a horizon year of 2025. The U.S. Department of Transportation approved the Mecklenburg – Union 2025 LRTP and air quality determination on April 15, 2002. The LRTP includes a financially-constrained transit improvement plan based on the recommendations of the 2025 Integrated Transit/Land-Use Plan.

**Charlotte Multi-Modal Station Project**

In July 2002, NCDOT completed an engineering feasibility study of an improved rail and transportation center located on West Trade Street in Center City Charlotte. The study included an analysis of the number of tracks serving the station, the location of grade separations and whether these separations are feasible, and the right-of-way needs for the station. The study also assessed the preliminary space needs for intercity rail, intercity bus, commuter rail, local
bus, and other uses. It includes a cost analysis, determination of the project's timeframe, and potential environmental impacts resulting from multi-modal station construction. NCDOT will begin preliminary engineering for the multi-modal station in early 2003.

### Chronology of Events and Studies

<table>
<thead>
<tr>
<th>Year</th>
<th>Event</th>
</tr>
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<tbody>
<tr>
<td>1994</td>
<td>City of Charlotte and Mecklenburg County approve <em>Centers and Corridors</em> vision. Committee of 100, a cross-section of representatives from 30 communities in the region, appointed. Committee of 100 recommends five high-capacity transit corridors.</td>
</tr>
<tr>
<td>1996</td>
<td>Committee of 10 appointed and reaffirms <em>Centers and Corridors</em> vision, and recommends sales tax funding.</td>
</tr>
<tr>
<td>1998</td>
<td>Completion of 2025 Integrated Transit/Land-Use Plan in support of <em>Centers and Corridors</em> vision. Citizens approve ½ percent sales and use tax to support the plan.</td>
</tr>
<tr>
<td>1999</td>
<td>Creation of Transit Governance Interlocal Agreement and formation of MTC.</td>
</tr>
<tr>
<td>1999/2000</td>
<td>City of Charlotte carries out South Corridor MIS and selects light rail transit for South Corridor.</td>
</tr>
<tr>
<td>2000</td>
<td>CATS initiates studies for remaining four corridors: North, Northeast, West and Southeast; begins preliminary engineering in South Corridor.</td>
</tr>
</tbody>
</table>

### 1.2.2 Role of MIS in Decision Making and Next Steps

In Fall 2000, CATS and Charlotte-Mecklenburg Planning Commission initiated four MISs including the North Corridor MIS. The results of the technical analysis and evaluation as presented in this document, along with the MIS documents for the Northeast, Southeast and West corridors, will be submitted to the communities and local leaders for consideration and comment. The MISs evaluate land use, mobility, and environmental benefits, costs and impacts of the land use and transportation alternatives. The expected outcome of the MISs will be the definition of a system plan by the MTC. The selection of the system plan will be based on both how each corridor investment addresses corridor-level needs and how they work together as part of the overall regional system.

The MIS phase of the project development process is a prerequisite to the selection by elected officials of LPAs for implementation. The MIS defines and evaluates alternative investments and transit improvements in each corridor and compares their performance with an established baseline system. The baseline system includes all reasonable and programmed transit improvements that do not involve major investments in capital facilities such as a light rail or bus rapid transit system. The definition of the system plan, which will include the selection of a LPA for each corridor by the MTC, will be the result of this MIS process. After the system plan is chosen, the MTC will determine the order in which the four corridors will be implemented.

The LPAs then must be included in MUMPO's Transportation Improvement Program (TIP) that will allow specific transit development projects to move forward as part of MUMPO's overall strategy for mobility and air quality improvements. The actions by MUMPO will represent major
milestones in the FTA’s process for project funding. Only after MUMPO’s TIP is amended by including each LPA will the FTA consider a request to begin the environmental phase. Upon completion of the Draft Environmental Impact Statement (DEIS), an application will be submitted to FTA to proceed into PE. In PE, precise route alignments and station locations are confirmed, detailed cost estimates are made, financial plans are approved, and the final environmental impact documents are prepared. Throughout the PE/FEIS stage, there is continued dialogue with residents and businesses in the corridor, and with elected officials.

Final design and construction, the last two stages in the project development process, are authorized by FTA with the approval of a Full Funding Grant Agreement.

1.2.3 Policies, Tools, and Other Initiatives

Numerous policies, tools and initiatives have been adopted or proposed by the City of Charlotte and the participating towns that further the goals of the 2025 Integrated Transit/Land-Use Plan. These efforts promote concentrations of development around existing development centers, in regional transit corridors, and at proposed station areas. These are briefly described and are followed by specific zoning regulations and initiatives that are in process to begin the implementation of the plans and policies.

City of Charlotte

- **2025 Integrated Transit/Land-Use Plan Recommendations**

  The 2025 Integrated Transit/Land-Use Plan is the primary guidance document for the required changes in the policy structures for the City of Charlotte and the participating communities. Among the recommendations are the land use changes, early land use actions and a new series of regulatory tools for implementing station area plans and promoting transit-oriented development.

  - The Plan recommended as a series of land use changes:
    - Office. Concentrate major office development at stations, along the alignments and in Center City, to serve as a key land use strategy supporting transit to enable more people to ride transit as an alternative to driving.
    - Multi-Family Residential. Focus multi-family residential development at stations along the alignments and Center City rather than dispersing it throughout Mecklenburg County.

  - The Plan also set forth a set of early land use actions:
    - Revise land use plans/ordinances.
    - Encourage continued jobs and housing growth in Center City Charlotte and other key corridor locations.
    - Create incentive packages for station development.
    - Acquire key parcels around selected stations.
    - Initiate development of priority sites.

- **Progress Since the 2025 Integrated Transit/Land-Use Plan**
Numerous plans and policies have been adopted that further the goals of the 2025 Integrated Transit/Land-Use Plan and promote concentrations of development around existing development centers, in regional transit corridors, and at proposed station areas. These are briefly described below and are followed by specific zoning regulations and actions that have begun to implement these policies. These are followed by some of the funding available for the implementation of transit-supportive plans.

- **Transit-Supportive Plans and Policies**

  Updated and Revised General Development Policies (GDP). The GDP provide the policy framework that is used to guide future growth and development in Charlotte-Mecklenburg. The GDP were adopted in 1990 and are being updated to reflect new policy direction, particularly as provided in Centers and Corridors (1994), the 2025 Integrated Transit/Land-Use Plan, and the Smart Growth Principles. The current update of the GDP will, among other items, revise current policies that allow the dispersal of multi-family development, redirecting much of this development to major activity centers and transit corridors. The update effort has resulted in the adoption of general policies for station area development that serve as the basis for station area planning such as establishing minimum densities of 15 dwelling units per acre in the one-quarter- to one-half-mile area and 20 dwelling units per acre within the one-quarter-mile area. One of the main purposes of the updated GDP is to provide guidance for managing growth according to smart growth principles by focusing development where infrastructure can best support it. Four key policy areas area currently being developed:

  o Transit Station Area Principles (completed and adopted in 2001). These call for minimum densities, and a range of higher intensity uses, including residential, office, service-oriented and civic uses that are transit-supportive.
  
  o Residential Location and Design Policies
  
  o Mixed/Multi-Use Retail-Oriented Centers Policies
  
  o Plan Amendment Process

- **Smart Growth Principles**

  The City of Charlotte’s Smart Growth Principles, adopted by the City Council in February 2001, strongly support infill development and redevelopment, especially in Center City and along the transit corridors. The Principles are:

  o Maintain land use planning capacity,
  
  o Sustain effective land use decisions,
  
  o Strengthen community through healthy neighborhoods,
  
  o Build a competitive economic edge,
  
  o Design for livability,
  
  o Safeguard the environment,
  
  o Expand transportation choices, and
  
  o Advance public investment as a catalyst.

- **Joint Development Principles (JDP)**
The purpose of these Principles is to provide a framework to be used by local governments to promote and support development at transit stations. These principles will help achieve selected public policy objectives and priorities in a manner consistent with the Centers and Corridors vision and the 2025 Integrated Transit/Land-Use Plan, and will further support pedestrian-oriented urban design. The MTC, Charlotte City Council, Mecklenburg County Board of Commissioners and the Town Boards of Davidson, Cornelius, Huntersville and Matthews have adopted the JDP listed below. The City of Charlotte is currently working on joint development policies that will adhere to these Principles, and the expectation is that other jurisdictions will prepare parallel policies. The JDPs cover:

- Maintain land use planning capacity,
- Public Facilities. Encourage complementary public facilities (such as schools, parks/open space, libraries and social service organizations) at or near transit stations to serve both transit users and surrounding neighborhoods.
- Public Infrastructure. Provide the basic public infrastructure within available jurisdiction resources in station areas (such as water and sewer and sidewalk facilities) needed to serve transit-supportive development. At selected stations or in selected portions of the station areas, prioritize and provide for additional infrastructure improvements to serve as a catalyst for new transit-supportive development.
- Housing. Support the development of housing which is affordable to a broad cross-section of the workforce and community, providing a variety of housing choices near transit stations.
- Joint Public/Private Development. Develop public/private partnerships aimed at promoting TOD, zoning, and land use in transit station areas to enhance transit system ridership and provide services for those living and working around transit stations.
- Private Sector Development Incentives. Provide incentives, establish partnerships with the private sector, encourage targeting of incentives to promote significant demonstration projects, and remove barriers to allow for appropriate TOD in station areas.
- Market Place Venues. Encourage the location and retention of a healthy mix of private transit-supportive businesses in stations.

- Street Design Guidelines
The City is developing a new hierarchy of streets that will be overlaid on the City’s existing, and more traditional, street classification. Two street types that will be utilized heavily in the transit station areas are “main streets” and “local access streets”. These categories of streets will have street design that is strongly oriented toward easy pedestrian circulation and low automobile speeds. In addition, pedestrian amenities such as street trees and pedestrian scale lighting will be emphasized.
Zoning/Implementation

Zoning is fundamental to implementing station area plans and promoting compact, walkable, transit-oriented development. The following existing and proposed zoning districts provide the City with a strong array of implementation tools.

- **Uptown Mixed Use District (UMUD).** It is the most intensive of Charlotte’s zoning districts and is applied primarily to the Uptown area. The main purpose of this district is “to strengthen the high density core of the central city”. This district has no maximum Floor Area Ratio (FAR) or height, allows a range of transit-supportive uses, and has resulted in the construction of numerous mid-rise and high-rise structures. All of the properties located along the portion of the South Transit Corridor that runs through Uptown are zoned UMUD.

- **Mixed Use Development District (MUDD).** This is also a transit-supportive district, similar to UMUD. As with UMUD, the MUDD district has no FAR limitation and permits a range of transit-oriented uses. Building heights are limited to 120 feet. Many property owners along the rail line in the South End area have requested and received MUDD zoning for their properties.

- **Pedestrian Overlay District (PED).** In March 2000, the Charlotte City Council approved this new zoning district. This district is designed to allow a mixture of transit-supportive uses developed in a pedestrian-friendly manner. The development standards for this district allow a significant increase over the amount of development that is feasible under the more suburban zoning districts. For example, there is no maximum FAR for this district and, under certain conditions, building heights can be up to 100 feet.

- **Transit Overlay Zoning District (TOD).** New zoning districts designed specifically for transit station areas are being developed. These new districts will be adopted and applied around the South Corridor station areas in 2003. These districts will be one of the implementing regulations for the South Corridor station area plans and eventually the station plans for all the transit corridors. These zoning districts will be based on specific station area plans, as well as the Transit Station Area Principles. In most cases, these new districts will designate minimum densities/intensities. Existing urban zoning districts, such as MUDD and PED, which encourages more intense development are available to be used until transit overlay zoning is implemented.

- **Interim Transit Overlay Zoning District.** An Interim Transit Overlay District (ITOD) is being developed, and adoption of this district is expected in 2003. This proposed zoning district disallows a number of automobile-oriented uses that are not transit-supportive, sets minimum densities/intensities, significantly reduces building setbacks, and requires transit and pedestrian-friendly design. The City of Charlotte will apply this zoning district at key station areas along the four MIS transit corridors while station area planning is underway. When station area plans are completed, it is expected that the station areas will be rezoned to the specific TOD that best implement station area plans.

Funding to Support Plans and Policies

*Capital Improvement Budget for Transit-Supportive Infrastructure.* The City's FY2003 Capital Improvement budget includes over $20 million for implementation of infrastructure improvements outlined in the seven draft transit station plans for the South
Corridor. This is a model that the city expects to implement for the other transit corridors as they move toward implementation. These improvements are in addition to the improvements that will be made by CATS as part of the construction of the transit system. This funding will be finalized through a November 2002 bond vote. The intent is to consider another $30 million bond vote to complete the improvements. This approach is a model for future corridors. These funds will finance:

- Infrastructure improvements that will increase sewer, water and storm water capacity to support TOD.
- Sidewalk improvements and bicycle facilities to enhance the pedestrian-friendly character of these areas.
- Intersection improvements that facilitate pedestrian movement.
- Streetscape improvements.
- Roadway realignments or extensions, and new street connections.

Additional Funding. The City of Charlotte has identified $2 million annually for pedestrian enhancements. Economic Development funding has been approved for joint development projects at transit stations. The Charlotte City Council approved the creation of a revolving fund that will provide $2 million per year for the next five years to be used for joint development projects around stations.

The Four Towns

Each of the four towns in the corridor—Mooresville, Davidson, Cornelius and Huntersville—is implementing plans or regulations that support or require transit-friendly development. These efforts have emerged from each of the town’s desire to make transit a supporting element in its effort to guide future development in accord with Smart Growth, neo-traditional planning or other counter models to auto-dependent highway, oriented suburbanization. Each town stresses pedestrian oriented amenities in its developments and high quality urban design for its town centers and often other areas within its planning and zoning jurisdiction.

- The Town of Mooresville has adopted transit-friendly master plans for both the town center area and the Mount Mourne area. The town also sponsored a special charrette in June 2001 to begin adapting the Mount Mourne plan to accommodate the planned Lowe’s corporate campus south of Fairview Road. These plans call for mixed use, highly pedestrian-oriented development treatments. For example, the town center plan calls for much infill residential development or mixed use to supercede large surface parking lots.

- In Davidson, the town has already implemented much of its town center plan that calls for fine-grained mixed use and orients facilities such as a proposed parking deck and pedestrian connections to a potential transit station. Davidson also requires provision for transit—e.g., designated stops or shelters—in all new developments.

- Cornelius has adopted specific transit district zoning with minimum density requirements as on overlay for its emerging new town center. Cornelius also purchased and is sponsoring TOD mixed use development on a large tract of land east of the railroad right-of-way east of a potential station opposite Catawba Avenue.

- Huntersville has also adopted transit district overlay zoning and has sponsored re-conversion of the former Anchor Mills site into a transit-oriented mixed-use neo-traditional
like the other towns it has adopted zoning and subdivision regulations that
are highly compatible with TOD principles.

1.3 Goals and Objectives

Goals and objectives for the transit system improvements and land use policies form the
foundation for the development, selection and evaluation of alternatives. They also provide
context for understanding the various trade-offs among the factors that are considered. These
goals began with the goals developed during the preparation of the 2025 Integrated
Transit/Land-Use Plan and continued with the study goals for this MIS process. During the MIS,
more specific land use goals, CATS goals and corridor related transit and land use goals were
used to guide the definition and evaluation of alternatives. The following sections describe the
origin and development of the goals and objectives for this MIS in the North Corridor.

1.3.1 Overview of Transit Planning and Land Use Vision and Growth Patterns

To ensure the continued economic vitality of Charlotte’s core areas, while accommodating
growth throughout the region, Charlotte-Mecklenburg established a Centers and Corridors
vision as its preferred land use and development pattern. This vision, adopted by the Charlotte
City Council and Mecklenburg County Board of Commissioners in 1994, identified five major
transportation and development corridors extending from Center City Charlotte to Mecklenburg
County’s border and beyond. This vision was re-affirmed by the Mecklenburg-Union
Metropolitan Planning Organization (MUMPO) and included in the 2025 Transportation Plan
for the region.

In support of the Centers and Corridor vision, the 2025 Integrated Transit/Land-Use Plan was
completed in 1998. The plan calls for the development of a regional rapid transit system that
would improve mobility, redistribute growth, and support the proposed land use initiatives and
land use scenarios in each of the region’s five growth corridors. A range of alternative transit
options and land use scenarios was evaluated for each of the five major corridors (South, North,
Northeast, Southeast and West).

In addition to its support for the Centers and Corridors vision, the 2025 Integrated Transit/Land-
Use Plan includes two overarching goals. They are

- To sustain the economic growth and vitality of Charlotte-Mecklenburg, and
- To build a transit system that, in the long run, supports the region beyond Charlotte-
  Mecklenburg.

The 2025 Integrated Transit/Land-Use Plan has six specific goals to accomplish the first goal of
sustained economic growth:

- To concentrate development in downtown Charlotte and at station sites in the five
corridors;
- To introduce rapid transit technology and enhance the existing transit system;
- To link key employment and regional centers;
- To combine transit and roadway investment strategies;
• To phase implementation to provide an impact in each corridor in each five year period; and
• To involve the citizens of the region.

Figure 1-1 illustrates the five growth corridors in which rapid transit and land use initiatives are to be implemented.

On April 1, 1999, a half-cent sales tax became effective in Mecklenburg County. The tax increase, approved by Mecklenburg County voters in November 1998, provides funding to implement the 2025 Integrated Transit/Land-Use Plan.

Building on the 2025 Integrated Transit/Land-Use Plan, MISs are being prepared for the North, Northeast (University), Southeast (Independence), and West (Airport) corridors. A previously prepared MIS for the South Corridor resulted in a light rail transit project for that corridor. These projects are being implemented in accordance with the project development process outlined by the FTA for major transit capital investments and in accordance with EPA rules and regulations specified under the National Environmental Policy Act (NEPA). This process requires that a full range of alternatives be reviewed during the scoping phase to ensure that all reasonable alternatives are evaluated with respect to relative costs, impacts, benefits and trade-offs, and according to requirements of FTA and the Transportation Equity Act of 21st Century (TEA-21).

1.3.2 Land Use Goals and Objectives
Land use and development patterns are essential components in creating a successful transit system. Charlotte-Mecklenburg’s adopted Centers and Corridors vision, which identified five major transportation and development corridors, and the 2025 Integrated Transit/Land-Use Plan provide the policy framework for promoting more compact development of Charlotte-Mecklenburg. In support of the Centers and Corridors vision, the 2025 Integrated Transit/Land-Use Plan identified three key changes in existing transit corridor land use patterns that must be achieved in order for any corridor improvements to work effectively:

• Promote more compact, pedestrian-friendly developments
• Encourage a mix of multi- and single-family residential development
• Develop areas that include a mix of residential, shopping, and employment opportunities in close proximity

Enhanced accessibility, environmental quality, pedestrian friendliness and public safety are vital to successful transit systems and to the long-term health of Charlotte-Mecklenburg. 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.

Transit-Oriented Development
One of the ways that local governments and agencies in Charlotte-Mecklenburg are working together is to create attractive and vibrant mixed-use, pedestrian-oriented built environments that are conducive to transit ridership and also provide an alternative to dispersed low-density development. This concept is commonly known as transit-oriented development (TOD). While increased transit ridership is one of the primary objectives of TOD, it is not the sole objective.
Also important are the formation or reinforcement of strong community ties, the promotion of affordable housing, increased social interaction and cultural diversity, and the creation of new economic opportunities. Some of the guiding principles of effective transit-oriented development are:

- **Provide a pattern of mixed land uses as an alternative to the large-lot, auto-only served, dispersed, single-use pattern of development with a pattern of mixed land uses.** The mixing of uses at the neighborhood scale can promote more pedestrian activity and provide the convenience of having complementary services located in close proximity.

- **Provide convenient transfer between different modes of transportation at station areas.** A transit station provides a gateway to not only the immediate station area but, also, to the larger surrounding area. Feeder bus, shuttle service, pedestrian and bicycle access and in some cases, station-related parking, are all important for establishing good intermodalism and making TODs successful.

- **Match compact development with increased station area amenities.** While higher levels of development are generally assumed within TODs than in other areas, also important are neighborhood amenities such as parks, plazas, quality streetscapes with wide sidewalks, landscaping, pedestrian-oriented signage and lighting, street furniture, public art, and bicycle facilities.

- **Promote a variety of housing options.** A variety of housing and non-residential development options respond to the growing diversity of American households including the rise of smaller households, older householders, empty-nesters, and individuals living alone. A mix of housing options can better meet the needs of these groups.

- **Make parking a secondary use.** The objective is to maximize on-street parking and place limited surface parking behind buildings. Structured parking is also appropriate. This treatment of parking can be complemented by having little or no building setbacks and retail uses on the ground floor. This can promote a more attractive and pedestrian-oriented environment.

Error! Reference source not found. Station Area Development Character depicts an example of the scale and design of TOD uses that can be accommodated at most stations in this corridor and that matches the development intensity assumptions used in calculating year 2025 land use data for the alternatives.
Figure 1-2. Station Area Development Character

Multi-Family
- Ideally located within easy walking distance of a station
- Can be either new development or added to an existing community
- Can buffer single-family residences from major arterials
- Employment
- Best located at sites
- With high visibility and accessibility from existing major arterial roads
- In or near existing employment development
- Within reasonable walking or shuttle bus distance to a station

Single-Family
- Can be clustered on small lots near stations to achieve reasonable densities
- Located within reasonable access to station by comfortable pedestrian links, bike paths, public busses, kiosks & rides, or park & rides

Row-Town
- Ideal use for sites immediately adjacent to stations
- Features ground-level, locally-oriented retail with either office or residential above
- Public setting designed as pedestrian-scale environment
- Can be added to an existing community or created on undeveloped sites

North and Northeast Corridors

Charlotte Corridor Major Investment Studies
North Corridor Final Report
September 25, 2002
1.3.3 Transit Goals and Objectives

In November 2000, the Metropolitan Transit Commission (MTC) adopted a mission statement, vision, and strategic goals for services operated by CATS. The MTC is the public transit system governing board established in the 1999 Transit Governance Interlocal Agreement. MTC voting members include the Mayor of Charlotte, the Chairman of the Mecklenburg County Commission, the mayors of the six incorporated towns in Mecklenburg County, and the respective city, town, and county managers. The MTC was created to provide policy direction to transit system development and operation and to oversee transit management activities.

CATS’ mission statement is:

> To improve the quality of life for everyone in the greater Charlotte region by providing outstanding community-wide public transportation services while proactively contributing to focused growth and sustainable regional development.

This MIS was undertaken in the context of the overall adopted vision and goals of the MTC/CATS transit program as stated below.

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**CATS’ Vision Statement**

Successful accomplishment of the CATS Mission will mean that the following conditions are realized:

- A steadily increasing share of transit competitive travel markets in the Charlotte region choose to use public transportation on a regular basis.
- The citizens of the region perceive public transportation as an important public service, which benefits the community as a whole by consistently providing exemplary service that meets diverse individual needs.
- Public transportation employees are seen, and see themselves, as committed, competent, and motivated members of the region’s premier public service.
- CATS is recognized, both locally and nationally, for its contribution to effective, innovative and community-focused regional development.
### Summary of CATS’ Strategic Goals

- **Customer Service Focus:** Provide safe, dependable high-quality transportation services to all customers, and support CATS employees in that endeavor.

- **System Development:** Expand and re-organize public transportation services to retain current customers and attract new ones by providing services that meet customer and community needs while supporting transit-oriented and pedestrian-friendly land use patterns.

- **Fiscal Responsibility:** Ensure cost-effective and efficient use of resources and aggressively pursue funding partnerships to supplement local resources.

- **Community Benefits:** Provide social, economic, and environmental benefits to the community through system operations and improvements, and promote community awareness of these contributions.

- **Prepare for the Future:** Pursue process improvements, business practices, and technologies that will support cost-effective and customer-friendly service delivery in the future.

- **Invest in Employees:** Provide training and career development support that enhances employees’ ability to perform their jobs and be prepared for promotional opportunities.

### 1.3.4 MIS Goals and Corridor Objectives

To meet the goals in the 2025 *Integrated Transit/Land-Use Plan*, and the MTC/CATS goals for the transit system, the following five major goals of the MIS and corridor-specific objectives were developed by the corridor team:

**Goal 1: Improve access and mobility in the corridor and throughout the region.**

**Objectives**

- Provide regional connections with existing and planned transportation facilities.
- Provide transit connections to key activity centers through the “wedges.”
- Encourage transit use by non-traditional riders.
- Improve service and accessibility to the transit dependent.
- Improve community-to-community transit connections.
- Reduce travel time through the corridor for all modes of transportation.
- Enhance opportunities for residents to access jobs within the corridor and in the reverse commute direction.
- Reduce travel delays caused by incidents by providing reliable transit facilities.
• Provide an alternative to travel on congested streets.
• Enhance competitiveness of transit as compared to the automobile.

**Goal 2: Help implement the Centers and Corridors visions by coordinating growth and transportation.**

**Objectives**

• Serve high proportion of existing development.
• Shift high proportion of expected corridor growth to rapid transit and important feeder alignments.
• Coordinate the transit related land use initiatives of the three North Mecklenburg towns and the town of Mooresville in south Iredell.
• Coordinate transit with redevelopment needs within Charlotte.
• Distribute jobs and housing to maximize reverse commuting.
• Specify what public sector actions are needed to attract station area development investments where market driven demand is not strong enough.

**Goal 3: Locate stations to sustain local neighborhoods and maximize development opportunities.**

This goal focuses on details of land use planning around specific stations. The primary focus of such actions would be within the 1/2-mile radius around rapid transit stations. Nevertheless, many of these measures can also be implemented along key feeder routes and in other areas that may have direct access to other transit services.

The key land use objectives to achieve this are:

• Locate stations at or near existing and future community centers; avoid out of the way, less accessible sites.
• Accommodate transit related development opportunities within town centers in North Mecklenburg and South Iredell while respecting the need to protect desired urban design character.
• Maximize transit related opportunities on “greenfield” (i.e. large, unbuilt) sites outside of town centers.
• In Charlotte redevelopment areas, merge station area planning into broader comprehensive local plans that address specific housing and economic development issues.
• Create higher intensity development (especially for employment) around transit stops where such developments can be supported by local infrastructure.
• Where appropriate, mix residential, employment and convenience services around transit stops.
• Establish urban design standards and invest in public infrastructure that will ensure a high quality pedestrian friendly environment.

• Accommodate park-and-ride demand in ways that do not hinder meeting other TOD goals.

Goal 4: Preserve and protect the environment.

Objectives

• Improve air quality by reducing mobile emissions and pollutants.

• Minimize impacts to sensitive areas, such as parks, historical sites, wildlife habitats, historic and cultural sites, and wetlands, etc.

• Minimize right-of-way takings, and displacement of homes and businesses.

• Reduce fuel consumption.

• Encourage more compact development to preserve open space.

Goal 5: Provide effective and efficient transportation options in the corridor.

Objectives

• Achieve cost-effectiveness based on FTA criteria.

• Increase employment opportunities outside of Charlotte by improving transit access.

• Improve the people-carrying capacity of the existing roadway and transit system.

• Coordinate planning for bicycle and pedestrian facilities with planning for transit system services and facilities.

• Increase transportation options for east-west travel between corridors.

1.3.5 Evaluation Criteria

The various corridor goals and system plan principles listed above lead to the development of a set of evaluation criteria help determine the degree to which the various transit improvement alternatives address these needs. Figure 1-3 and Table 1-1 show the relationship between these goals and criteria. The actual application of these criteria to the North corridor alternatives are depicted in Chapter 4.
Figure 1-3. Process for Developing CATS Goals and Criteria
<table>
<thead>
<tr>
<th>Objective</th>
<th>Locally Preferred Alternative Selection</th>
<th>Overall System Optimization</th>
<th>Implementation Phasing</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Land Use</strong></td>
<td>• Existing corridor &amp; station area land use patterns</td>
<td>• Maximizes opportunity to meet Centers &amp; Corridors Land Use Vision/2025 Transit-Land Use Plan</td>
<td>• Near-term opportunities to shape emerging growth/redevelopment</td>
</tr>
<tr>
<td></td>
<td>• Existing corridor &amp; station area development character</td>
<td></td>
<td>• Land use policies in place</td>
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<tr>
<td></td>
<td>• Potential Transit-Oriented Development (TOD) sites</td>
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</tr>
<tr>
<td></td>
<td>• Existing land use policies &amp; tools for station area &amp; corridor</td>
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<tr>
<td></td>
<td>• Future corridor &amp; station area land use patterns</td>
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<td></td>
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<tr>
<td></td>
<td>• Enhance Center City &amp; core area growth</td>
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<tr>
<td><strong>Mobility/Operations</strong></td>
<td>• Ridership – total and new</td>
<td>• Ridership – total and new</td>
<td>• Immediate need to improve access to employment (Center City &amp; reverse commute locations)</td>
</tr>
<tr>
<td></td>
<td>• Travel time savings</td>
<td>• Ability to attract desired travel markets</td>
<td>• Immediate need for congestion relief</td>
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<td></td>
<td>• Change in vehicle miles of travel</td>
<td>• Travel time savings</td>
<td>• Opportunity to implement interim (TSM-type) service improvement</td>
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<td></td>
<td>• Transit dependent access</td>
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<td>• Change in transfers</td>
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<td></td>
<td>• Service reliability</td>
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<td></td>
<td>• Connections to activity centers, special event &amp; cultural sites</td>
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<tr>
<td><strong>Environment</strong></td>
<td>• Displacements</td>
<td>• Minimize disruptions (communities, natural areas, cultural resources, etc.)</td>
<td>• Minimize disruptions (communities, natural areas, cultural resources, etc.)</td>
</tr>
<tr>
<td></td>
<td>• Noise affected receivers</td>
<td>• Air quality improvements (mobile source emission reductions, Long Range Plan &amp; TIP conformity)</td>
<td>• Air quality improvements (mobile source emission reductions, Long Range Plan &amp; TIP conformity)</td>
</tr>
<tr>
<td></td>
<td>• Local traffic effects</td>
<td>• Environmental Justice (equity in distribution of benefits and costs, past investments relative to EJ populations)</td>
<td>• Environmental Justice (equity in distribution of benefits and costs, past investments relative to EJ populations)</td>
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<tr>
<td></td>
<td>• Cultural or natural resources affected</td>
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<td></td>
<td>• Properties with access affected</td>
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<td></td>
<td>• Water resources affected</td>
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<tr>
<td><strong>Financial</strong></td>
<td>• Capital costs</td>
<td>• Total system cost relative to funding capacity (capital cost, operating &amp; maintenance subsidy)</td>
<td>• Interim system cost relative to funding capacity (capital cost, operating &amp; maintenance subsidy)</td>
</tr>
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<td></td>
<td>• Incremental cost per new rider</td>
<td>• Ability to attract federal and state funds</td>
<td>• Ability to attract federal and state funds</td>
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<td></td>
<td>• Operating &amp; maintenance costs</td>
<td>• Opportunities to leverage other sources</td>
<td>• Opportunities to leverage other sources</td>
</tr>
<tr>
<td><strong>System Development/Center City</strong></td>
<td>• Synergy with other corridors (through-service and connections)</td>
<td>• Passenger distribution in Center City</td>
<td>• Synergy with other corridors (provide service connections)</td>
</tr>
<tr>
<td></td>
<td>• Operating efficiency</td>
<td>• Balance use of system capacity</td>
<td>• Need to phase system implementation</td>
</tr>
<tr>
<td></td>
<td>• Balance use of system capacity</td>
<td>• Responsiveness to urban design &amp; economic development principles</td>
<td>• Corridor readiness for program implementation (relative availability of right-of-way and station area land, land use policies in place, public acceptance)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• System expansion capacity and capability</td>
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</table>
1.4 Study Corridor

The following section briefly describes the context and setting of this MIS. It provides an overview of the economy and population of the region, and profiles the land use, roadway and transit characteristics of the North Corridor.

1.4.1 Regional Context

The Charlotte region boasts one of the most robust economies in the United States. It has become not only the commercial capital of the Carolinas but also the nation’s second-largest banking center. While Charlotte’s center city has developed into the region’s premier financial and business center, major activity centers located throughout the area also have attracted substantial business growth. Based on recent projections, job growth will continue with Mecklenburg County’s employment increasing from 530,000 in 1997 to 777,000 in 2025, a 45 percent increase. During the same timeframe, Charlotte-Mecklenburg’s population is estimated to grow by 345,000 residents, a 57 percent increase. The expansion of the regional economy also has resulted in a larger seven-county region of 1.4 million residents. Although much of this population increase has occurred within the city of Charlotte, residential growth throughout Mecklenburg and southern Iredell Counties has been significant.

1.4.2 Description of the Study Corridor

Figure 1-4 shows the extent of the North Corridor study area. The corridor extends from Center City Charlotte north approximately 30 miles to the Town of Mooresville in Iredell County. It includes portions of the Towns of Cornelius, Davidson, and Huntersville. The primary transportation facilities in the corridor are I-77, US-21 (Statesville Road), NC-115 (Old Statesville Road), and the Norfolk Southern Rail Road (NSRR) “O” line.

Population and employment growth is the fastest growing corridor in the region with 86 percent growth in households and 85 percent growth in employment forecasted for 2025.

The North Corridor is divisible into three segments, each with different land-use characteristics: Charlotte, the three independent North Mecklenburg towns, and the South Iredell-Mooresville area.

City of Charlotte

This section of the North Corridor extends from Center City Charlotte to Alexanderana Road, the ultimate boundary of the City. Most of this segment is developed, although several large tracts of vacant land may be found between Lakeview Road and Alexanderana Road.
Figure 1.4. Map of Study Corridor
Residential: Older established residential areas south of I-85 are found along Beatties Ford Road, Statesville Avenue and North Graham Street. North of I-85 are the extensive residential communities of the Derita-Nevin area, and some new residential development along Gibbon Road. Further north, some new suburban style developments are emerging east of the NC-115 corridor, e.g., near Hucks Road and Eastfield Road, and along the Beatties Ford Road corridor west of I-77. In contrast, older, often extensive mobile home developments remain a dominant form of residential use closer to the employment centers between I-77 and NC115.

Employment: Much of the Charlotte segment of the corridor along either side of I-77 is devoted to various employment uses.

The area south of I-85 is predominantly a mix of light industrial and warehouse-distribution activities. Highlights of the area north of the I-85-Sunset Road interchange feature the Metrolina Exhibition Center and numerous employment developments between I-77 and Old Statesville Road (NC-115). The easy access to I-85, I-77 and other major regional arterials makes sites within this large employment belt a desirable location for businesses heavily dependent on trucking or that need easy access to all of Charlotte Mecklenburg. Although present land uses on many of these sites near I-85 are aging, they are relatively stable and likely to remain devoted to such uses.

In contrast, most employment sites north of Sunset Road are relatively new and are dominated by flex office space and warehousing and distribution. There is relatively little multi-tenant office development, although some sites such as Perimeter Woods Business Parks south of Reames Road and west of I-77 are evolving into major office centers.

Retail: Most retail in the Charlotte section of the North Corridor is locally oriented with community scale shopping centers at Sunset Road and Beatties Ford Road or at Mallard Creek and Sugar Creek Road typical of the scale and range of stores. Some more suburban strip style retail has emerged as part of the land use mix along WT Harris Boulevard between NC115 and I-77. A major exception to the dominant small-scale trend will be the large regional mall planned for the area north of Reames Road west of I-77.

TOD Opportunities: Few large vacant parcels remain south of the future I-485. A key exception would be any station located near I-485 and Eastfield Road. Completion of I-485 will likely attract significant development interest.

Most transit oriented development (TOD) opportunities will be infill, retrofits or redevelopment. Infill and redevelopment would be key to station area development south of I-85 along Statesville Avenue or North Graham. Such activity could complement current stabilization and revitalization efforts in such neighborhoods as Greenville or Druid Hills.

The existing “town center” environment in Derita could also be enhanced by TOD planning. Although most redevelopment would likely be incremental, any phasing out of current uses of the large Metrolina Exposition Center site could create a redevelopment opportunity or regional significance.

Although not originally planned as a TOD, the regional mall at Reames Road and I-77 will likely attract other uses and the scale of this development center may offer opportunities for effective transit connections to other parts of the corridor and the region as a whole—e.g., via WT Harris.
**North Mecklenburg Towns**

North of Alexanderana Road, the Mecklenburg County section of the corridor is divided among three towns – Huntersville, Cornelius and Davidson. These communities have grown spectacularly in 1990s, in large part due to the popularity of the Lake Norman area. All three towns have since the mid 1990s pursued a variety of growth management and development code revisions with Davidson, in particular, recently enacting strict limits on development outside designated centers.

**Residential:** The Lake Norman area has been a strong magnet for residential growth since the early 1990’s. Much of this development is in multifamily housing and much of the single family housing in the Lake Norman area is on relatively small lots. Elsewhere, outside the town centers, there are somewhat dispersed concentrations of low to medium density single-family developments, primarily west of NC-115 (e.g. Caldwell Station in the southern part of Cornelius or development in Davidson east of the college). Aside from the impacts of recently adopted growth management policies, lack of public water and sewer has been the prime reason for limited development east of NC-115 in most of this section of the corridor.

**Employment:** Much of the employment pattern of this section is oriented to I-77 with major employment parks at or near I-77 Exits 23, 25 and 28. In contrast to the Charlotte section, there is relatively little warehousing and distribution and more flex office space and other services such as the medical complex near Exit 28 in Cornelius. There is some employment along NC-115 (e.g. at Bailey Road) and along the Norfolk Southern railway south of NC-73 (Sam Furr Road).

**Retail:** Typical suburban-style auto-oriented retail centers dominate key I-77 interchanges within the three towns, e.g. at Exit 25 (Sam Furr Road) in Cornelius and Exit 23 (Gilead Road) in Huntersville. The NC 21 corridor between these two exits is currently absorbing much new commercial development as well, especially that associated with auto sales. Another concentration of highway oriented strip commercial development is west of I-77 along Catawba Avenue, largely oriented to the growing Lake Norman residential developments. These activities include Lake Norman oriented businesses such as boat sales and storage.

**Mixed Use Town Centers:** Land uses policies in all three communities stress the value of their traditional town centers and each of the three towns has enacted specific policies and codes to protect and enhance the character of these centers. In Davidson, the nearby Davidson College campus directly influences the nature of its Main Street environment. Cornelius has already implemented much of its mixed-use plan at Catawba Avenue and NC-115 with a large additional area planned east of the railroad. Huntersville has a less retail oriented core at NC-115 and Gilead Road anchored by its Town Hall and related local government activities.

These efforts to revive and enhance the town centers are to some degree a reaction to the more suburban style development that dominate closer to I-77 and Lake Norman.

**TOD Opportunities:** There are three general classes of TOD opportunities in this section of the corridor: town centers, “greenfield” sites (especially along the NC-115/rail right of way) and sites at I-77 interchanges.
In anticipation of future transit service, the three North Mecklenburg towns have enacted specific transit-oriented zoning regulations and have sponsored transit-oriented development (TOD) plans for key properties close to the existing rail alignment. The new town center in Cornelius is centered on a potential rail stop. In Huntersville, this effort focuses on the former Anchor Mill site, just to the northeast of the main existing town center. Davidson is also actively planning ways to accommodate transit service in its town center, e.g. structured parking near a potential station site.

Unlike the Charlotte section, there is much vacant land available within the three towns, especially along NC-115 but also at key sites along I-77 where interchanges have not been built. Many of these “greenfield” locations—sites that are now undeveloped or only very lightly developed—may offer excellent opportunities to plan comprehensive large scale TODs.

A third type of potential TOD would be at the interchanges of I-77. Under current conditions, these opportunities would be limited by impacts on pedestrian circulation of ramps and traffic, large areas near potential stations that are devoted to right of way needs and the diminished quality of such areas for residential development. Nevertheless, these sites will attract much development that represents a significant pool of transit ridership.

**South Iredell**

The MIS study area covers south Iredell County from its boundary with Mecklenburg County to approximately NC-150 north of the Mooresville town center. Land use trends in South Iredell have been similar to those in the three North Mecklenburg towns.

- Accelerated growth (attraction of Lake Norman),
- I-77 interchange development issues,
- Increased appreciation and desire to enhance the quality of the town center (Mooresville) and
- Numerous greenfield [unencumbered and open] sites.

**Residential:** Lake Norman has been a magnet for rapid and extensive residential growth in recent years. The town of Mooresville has in place an ambitious town center revitalization plan that would introduce more residents through infill and conversion of existing surface parking lots in the area either side of the existing rail corridor that runs through the middle of the town. Areas on the edges of Mooresville Town Center, especially to the south and southwest have already seen some significant new subdivision and development.

Residential development elsewhere in the study area has been more sporadic, often as infill in older small centers such a Mount Mourne.

The town of Mooresville provides public water and sewer for much of the south Iredell section of the North Corridor. As such services are extended, the new areas served are annexed into the town making it the dominant planning entity in this section of the corridor. The spread of residential development will therefore be tied closely to the extension of public water and sewer and annexations into the Town of Mooresville.
Employment: Employment in south Iredell contains a large proportion of manufacturing and light industry but newer trends include the developments tied to the growth of the auto racing industry.

Much employment growth is now planned for the Mount Mourne area. The recent announcement by the Lowe’s Corporation of its plans to develop a large corporate campus near Mount Mourne is likely to have significant land use spin-off impacts on much of the study area within south Iredell. This area was already affected by the relocation of the Lake Norman Medical Center from its former location near Mooresville town center to a site just east of I-77 on Fairview Road.

Retail: As in the three towns to the south, growth of the Lake Norman area has sparked typical highway commercial development along such arterials as NC150 and at several of the I-77 interchanges. Much of the Mooresville Town Center is shifting to specialty retailing as older businesses close or relocate. Retail in other parts of the study area is very limited.

Mixed Use Town Centers: As with the three North Mecklenburg towns just south of it, Mooresville has also enacted specific policies and codes to protect and enhance the character of its traditional town center.

TOD Opportunities: Like its neighbors Davidson, Cornelius and Huntersville, Mooresville has enacted specific transit-oriented zoning regulations and has sponsored transit-oriented development (TOD) plans for key properties close to the existing rail alignment. The rail line penetrates Mooresville’s downtown.

Important TOD opportunities will be in the revitalizing town center and perhaps north of the town center core where existing light industrial and retail may in time be available for new uses.

Further south, the large former Burlington Mills plant is being looked at a potential redevelopment focus for the surrounding older mill town environment and some form of transit could help sustain these efforts.

In terms of scale and mixed-use opportunities, the major TOD opportunities are probably at various locations within Mount Mourne, due largely to the impacts of the Lowes and Lake Norman Medical Center growth. Both of these major developments are likely to generate much spin-off employment and retail development and create new residential demand.

Current land use patterns in the North Corridor are summarized as a generalized land use map Figure 1-5.
Figure 1-5. Land Use Map
1.5 Description of Existing Corridor-Wide Land Use and Future Growth Trends

The length of the North Corridor and the different land use characteristics that result in a variety of local development or redevelopment needs and market characteristics. Transit implementation will therefore have different potential land use impacts depending on local development trends.

1.5.1 Population and Household Growth Trends

Year 2000 data from the City of Charlotte estimates slightly more than 36,000 households in the North Corridor. Of this total, 83 percent (29,850) are within Mecklenburg County and 17 percent (6,200) are estimated within the south Iredell County portion of the corridor. Table 1-2 shows the number of households in the North Corridor by single and multi-family households and the projected rate of growth between years 2000 and 2025. Single-family households (21,150) currently constitute around 59 percent of total households in the corridor. Total households will grow by about 86 percent to 67,000 in 2025 divided into 37,750 single family and 29,250 multifamily households.

Table 1-2. 2000-2025 Households* in North Corridor

<table>
<thead>
<tr>
<th>Households</th>
<th>2000</th>
<th>2025</th>
<th>Increase</th>
<th>% Change</th>
</tr>
</thead>
<tbody>
<tr>
<td>Single-family</td>
<td>21,000</td>
<td>38,000</td>
<td>18,000</td>
<td>86%</td>
</tr>
<tr>
<td>Multi-family</td>
<td>15,000</td>
<td>29,000</td>
<td>14,000</td>
<td>93%</td>
</tr>
<tr>
<td><strong>Total Households</strong></td>
<td><strong>36,000</strong></td>
<td><strong>67,000</strong></td>
<td><strong>31,000</strong></td>
<td><strong>86%</strong></td>
</tr>
</tbody>
</table>

*All data rounded to the nearest increment of 1000.
Includes data for Mecklenburg and Iredell County segments of corridor. Data for Mecklenburg County from CDOT; data for Iredell County developed by HNTB.

1.5.2 Employment Growth

In 2000, CDOT estimated there were about 68,000 jobs in the North Corridor, divided into 16,000 office jobs, 10,000 retail jobs and 42,000 jobs in the other category. Table 1-3 shows the breakdown of employment in the North Corridor by employment category. The study area is projected to experience an enormous amount of growth in employment with an increase of 85 percent by year 2025 to more than 126,000 jobs with 54,000 office jobs, 18,000 retail jobs and 55,000 jobs in the other category. The office sector is expected to have the largest growth, around 238 percent, and the employment breakdown is expected to shift so that office will make up around 42 percent of the employment by 2025.
Table 1-3. 2000-2025 Households* in North Corridor

<table>
<thead>
<tr>
<th>Employment</th>
<th>2000</th>
<th>2025</th>
<th>Increase</th>
<th>% Change</th>
</tr>
</thead>
<tbody>
<tr>
<td>Office</td>
<td>16,000</td>
<td>54,000</td>
<td>38,000</td>
<td>238%</td>
</tr>
<tr>
<td>Retail</td>
<td>10,000</td>
<td>18,000</td>
<td>7,000</td>
<td>70%</td>
</tr>
<tr>
<td>Other</td>
<td>42,000</td>
<td>55,000</td>
<td>13,000</td>
<td>31%</td>
</tr>
<tr>
<td><strong>Total Employment</strong></td>
<td><strong>68,000</strong></td>
<td><strong>127,000</strong></td>
<td><strong>58,000</strong></td>
<td><strong>85%</strong></td>
</tr>
</tbody>
</table>

*All data rounded off to nearest increment of 1000.

Includes data for Mecklenburg and Iredell County segments of corridor. Data for Mecklenburg County from June 2001 CDOT Trend Data; data for Iredell County developed by HNTB.

The following chart (Figure 1-6) summarizes the year 2000 existing development and compares it to CDOT 2025 Trends projections for the entire corridor. These data demonstrate that much new growth is expected within the North Corridor, especially for office development. This data is presented for five main land uses: single-family households, multi-family households, office space, retail space, and other employment-related land uses, such as manufacturing, warehouse/distribution, hotel, government, etc. These are the same categories used to develop estimates for the 2025 land use potential associated with candidate stations.

Figure 1-6. North Area Land Use Change 2000-2025
1.5.3 Land Use Trends

To better understand current trends, the land use consultants conducted a “market reconnaissance” that examined a number of development factors including historical growth trends, recent market activity, current development patterns, dominant land uses, and site availability. Particular attention was paid to market trends for multi-family and office development because of their ability to concentrate more potential transit riders on less land.

The market reconnaissance provided an initial assessment of expected future demand for various types of residential and non-residential development in the corridor. The results of this market reconnaissance indicated that recent development patterns and current market trends vary within the corridor. Indeed there was enough variation within each half mile described above to divide them into smaller market sub-areas. As result, for analysis purposes, the corridor was segmented into five market sub-areas that reflect these variations (see Figure 1-7). Because of marked differences in market conditions the Charlotte section of the corridor was divided into three sub-areas (1, 2 and 3). The north Mecklenburg towns constitute sub-area 4 and south Iredell is sub-area 5.

Residential Development

In the City of Charlotte (market sub-areas 2 and 3) residential development has continued to expand outward from already developed areas. Sections of the city such as the Derita-Nevin area and portions of the corridor just west of I-77 have had substantial single-family infill and new development at low to moderate densities within the past few years. Areas closer to the Center City (sub-area 1) have not grown significantly. Nevertheless, concerted efforts to stabilize neighborhoods such as Greenville and Druid Hills adjacent to Statesville Avenue in the southernmost part of the corridor have had favorable results. Multi-family market activity, however, in most of the Charlotte section has been dormant.

The upper half of the North Corridor – the three north Mecklenburg towns and south Iredell County (market sub-areas 4 and 5) – is in the midst of a rapid increase in households, spurred largely by the rapid growth of the Lake Norman region. Such expansion is likely to continue as water and sewer is extended throughout the area. Significant development opportunities in Huntersville and Cornelius remain, especially east of NC-115. In Davidson, however, most areas near either of the potential transit alignments are already developed.

Most of this growth is in low-density, single-family developments, although the Lake Norman area has also captured a significant share of the multi-family market in the corridor—particularly in the I-77 corridor north of Sam Furr Road in Mecklenburg County. This area will remain attractive to multi-family developers over the 25-year period covered by this MIS.

An analysis of recent absorption trends of multi-family units in the corridor reveals marked differences among the market sub-areas. Projecting out recent market activity indicates that only the sub-areas 3, 4 and 5 would be expected to add new units and that public sector interventions are needed to offset these current market dynamics if sub-areas 1 and 2 are to share in such growth.
Figure 1-7. Market Sub-Areas Contained in North Corridor
Retail Employment

In the southern half of the corridor, south of Harris Boulevard, there has been minimal new retail development. There is, however, a proposed regional mall at Reames Road and I-77, which is fairly central to the corridor. The four towns have experienced a substantial amount of new regional and community auto-oriented retail and service centers, especially at key intersections with I-77. This retail development has been spurred by rapid household growth in northern Mecklenburg County and south Iredell. The pattern has led the towns to develop planning strategies with the aim of reviving their traditional town centers as transit-related counterweights to such auto-oriented development.

Non-Retail Sector Employment

Areas closer to Center City have retained a significant light industrial and warehouse distribution employment base, but many of these properties are small and underutilized. Between Sunset Road and Sam Furr Road, along the I-77 corridor, there has been an expansion of warehouse/distribution, flex and office market space. Corporate office buildings and parks are beginning to emerge as a result of high-level executives living in the Lake Norman area desiring to reduce their commutes. With the completion of I-485 in the North Corridor, office space development should significantly increase.

As with multi-family growth, recent multi-tenant office market activity has varied greatly by market sub-area with no new recent office growth in sub-areas 1 and 2.

Land Use Changes

Key land use and growth management policy changes that will influence implementation of transit-land use strategies within the corridor include the following items, expected to occur over the next 25 years:

- Annexation of the entire corridor within Mecklenburg into the City of Charlotte or the towns of Huntersville, Cornelius, or Davidson.
- Annexation of much of south Iredell County in the corridor into the town of Mooresville.
- Extension of public water and sewer to all these areas, thus enabling them to support development at urban densities.
- The continued population growth of the Lake Norman area and its related development impacts on the I-77 corridor.
- Fulfillment of specific town center plans promoting healthy mixed-use downtowns of the four independent towns.
- Significant office and retail development in the Mount Mourne area spurred by the announcement of a new Lowe’s Corporation office campus and continued growth of the Lake Norman Regional Medical Center.
- Significant residential growth of the areas east of the NC-115 and existing NSRR corridor.
- Residential growth of currently undeveloped areas within the City of Charlotte, such as Derita-Nevin community, the Beatties Ford Road corridor, areas west of Sugar Creek Road, and areas along Eastfield Road.
- Heightened interest in retail and employment development at or near the future interchanges of I-485, including the planned regional mall at Reames Road and I-77.
- Continued stabilization and revitalization of urban residential communities such as Druid Hills and Greenville.
- Greater public sector involvement in fostering revitalization of older distressed areas through economic development and redevelopment incentives and more proactive measures such as land assembly to attract private investment to locations currently of little market interest to the development community.

1.6 Transportation Facilities and Services in the Corridor

1.6.1 Roadways and Traffic

Existing Roadways

Major roadway facilities serving the North Corridor are as follows:

**Interstate 77 (I-77).** I-77 is the major carrier of north-south traffic through the North Corridor study area. I-77 is a four-lane facility (two lanes per direction) from north of I-85 through the corridor into Iredell County. I-77 carries high volumes of traffic most hours of the day (daily volumes ranging from 76,000 to 152,000 vehicles) and is congested beyond capacity during peak hours. Phase 1 of a North Carolina Department of Transportation (NCDOT) widening project, expected to be completed in 2004, will widen I-77 between I-85 and the future I-485 location from four to eight lanes. The second phase of this project will widen I-77 between future I-485 and NC-73 from four to six lanes. The latter improvements are not yet scheduled, but they will occur after 2008.

**Statesville Road (US-21).** US-21 is a north-south roadway that parallels I-77 to the east from Graham Street near Center City Charlotte through Catawba Avenue in northern Mecklenburg County. US-21 shares use of I-77 for a three-mile section between Catawba Avenue (exit 28) and Williamson Road/Charlotte Highway (Exit 33), crossing the Lake Norman Causeway, where it resumes as a separate facility that serves Mooresville in Iredell County. US-21 is a four-lane facility between Center City and I-85 and two lanes for the remainder of its length. The Long-Range Transportation Plan (LRTP) for the Mecklenburg-Union urban area, which extends through 2025, includes two separate projects to widen US-
21 to four lanes through W.T. Harris Boulevard beginning in 2004. The LRTP also calls for US-21 to be four lanes from W.T. Harris Boulevard north to NC-73 in Huntersville.

Old Statesville Road (NC-115). NC-115 is a rural two-lane facility that begins at Sunset Road to the south and runs north (parallel to US-21 and I-77, basically following the NSRR) through the northern downtowns of Huntersville, Cornelius, Davidson, and Mooresville. The City of Charlotte has programmed a widening project for NC-115 between US-21 and David Cox Road (just north of W.T. Harris Boulevard). The LRTP for the Mecklenburg-Union urban area also includes a widening project for NC-115 between David Cox Road and future I-485.

Beatties Ford Road. This thoroughfare begins on the south at West Fifth Street in Center City Charlotte and parallels I-77 to the northwest, terminating at NC-73 in the Lake Norman area. It is a four-lane facility between West Fifth Street and Cindy Lane and becomes a two-lane roadway for the remainder of the section to the northwest. There are historical markers and properties along this roadway that may preclude any future widening.

Other Roadways. Several roadways including W.T. Harris Boulevard, Mt. Holly/Huntersville Road, Hambright Road, Gilead Road, Sam Furr Road (NC-73), and Catawba Avenue run east-west across the North Corridor and provide connectivity to I-77, US-21, NC-115 and Beatties Ford Road. W.T. Harris Boulevard and NC-73 also connect I-77 with I-85.

Most of these major north-south roadways serving the Northern towns currently carry large to excessive volumes of daily traffic, particularly I-77, and are congested during peak periods. I-77 has operated at Level of Service “F” during peak periods since at least 1995. Both Statesville Road and Old Statesville Road act as parallel relief systems for I-77, during the peak hour and when there is an incident on I-77. Due to traffic demand in the area, several improvements (described below) are underway and others are being planned in the North Corridor study area.

Planned Roadway Improvements

Recognizing existing and anticipated growth in the area, the City of Charlotte, NCDOT, and local planning agencies have taken initial steps to meet the demand of traffic in the North Corridor study area.

NCDOT and CDOT have identified a number of projects in their annual transportation programs. These projects range from the simple addition of turn lanes and widening of selected roadway sections, to major updates to signal systems including the addition of video monitoring capabilities.

Existing Conditions Analysis

CDOT provided Average Annual Daily Traffic (AADT) numbers for existing conditions based on historic volume counts taken between 1998 and 2001. Level of service (LOS) analyses were conducted for both roadway segments and intersections within the Northeast Corridor study area. The results indicated the facility volume to capacity (V/C) ratio, which is an indication of how close to or how much over design capacity the facility is operating at. The V/C ratios below 1.00 represent minimal traffic congestion and V/C ratios higher than 1.00 represent high to overwhelming congestion.
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 76,000 and 152,000 vehicles per day (see Table 1-4). The eight-lane section closer to uptown Charlotte is operating at a high LOS, but the four-lane section between I-85 and NC-150 is already at or over capacity and experiencing severe congestion during peak hours.

Table 1-4. Existing Freeway LOS Analysis Results

<table>
<thead>
<tr>
<th>Freeway Segment</th>
<th>2000 AADT</th>
<th>Total Lanes</th>
<th>V/C Ratio</th>
<th>LOS</th>
</tr>
</thead>
<tbody>
<tr>
<td>I-77 South of I-85</td>
<td>152,000</td>
<td>8</td>
<td>0.92</td>
<td>Moderate</td>
</tr>
<tr>
<td>I-77 between I-85 and NC-150</td>
<td>76,000 -99,000</td>
<td>4</td>
<td>1.01 – 1.27</td>
<td>High</td>
</tr>
</tbody>
</table>

Table 1-5 lists the major roadways (arterials) within the study corridor 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 following arterial analysis is based on a planning methodology developed by Florida DOT, which is widely accepted by many transportation planning agencies. The methodology takes into consideration, among other variables, the traffic characteristics (K-factor, D-factor, PHF, flow rates), roadway characteristics (area type, length, turning bays), and signalization characteristics (number of signals, through V/C ratio, signal type). The methodology then outputs a table showing the maximum traffic volume that the arterial in question could handle for a given lane configuration and a desired LOS during the critical peak hour.

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.

Roadway capacities are limited by the operational effectiveness of the associated intersections. Therefore, selected critical intersections (limited by location and the availability of turning movement count data) were studied for the North Corridor study area. The analysis is based on the methodology suggested in the 1997 Highway Capacity Manual. Synchro, widely accepted capacity analysis software, was used to determine the V/C ratios and the corresponding LOS. CDOT requested the use of descriptive LOS designation instead of using the traditional LOS designation of “A” through “F”. The analysis results summarized in
Table 1-6 uses the descriptive LOS designation (V/C ratios below 1.00 represent minimal to moderate traffic congestion and V/C ratios higher than 1.00 represent high to overwhelming traffic congestion).

Table 1-5. Existing Arterial Roadway Critical Peak Hour LOS Analysis Results

<table>
<thead>
<tr>
<th>Roadway Segment</th>
<th>Estimated AADT (2000)</th>
<th>Total Lanes</th>
<th>Critical Peak Hour LOS</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>STATESVILLE AVENUE/ROAD</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>N. Graham St to I-85</td>
<td>12,900 – 17,200</td>
<td>4</td>
<td>Minimal</td>
</tr>
<tr>
<td>I-85 to W.T. Harris</td>
<td>6,400-25,700</td>
<td>2</td>
<td>Minimal to Overwhelming</td>
</tr>
<tr>
<td>W.T. Harris to Mt. Holly - Huntersville Rd.</td>
<td>11,200 – 19,600</td>
<td>2</td>
<td>High to Overwhelming</td>
</tr>
<tr>
<td>Mt. Holly Huntersville to Catawba</td>
<td>3,000-12,600</td>
<td>2</td>
<td>Minimal to Moderate</td>
</tr>
<tr>
<td><strong>OLD STATESVILLE ROAD</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Statesville Rd to Hucks Rd</td>
<td>11,600 – 15,200</td>
<td>2</td>
<td>High</td>
</tr>
<tr>
<td>Hucks Rd to Gilead Rd</td>
<td>8,400 – 12,900</td>
<td>2</td>
<td>Severe to Extreme</td>
</tr>
<tr>
<td>Gilead Rd to Catawba Ave</td>
<td>6,400 – 11,300</td>
<td>2</td>
<td>Minimal to Moderate</td>
</tr>
<tr>
<td><strong>MAIN STREET</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Catawba Ave to Davidson St</td>
<td>8,000 – 11,700</td>
<td>2</td>
<td>Minimal to High</td>
</tr>
<tr>
<td>Davidson St to Griffith St</td>
<td>6,700</td>
<td>2</td>
<td>Minimal</td>
</tr>
<tr>
<td>Griffith St to Iredell Co. Line</td>
<td>3,700</td>
<td>2</td>
<td>Minimal</td>
</tr>
<tr>
<td><strong>BEATTIES FORD ROAD</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>W. Trade St to I-77</td>
<td>19,100</td>
<td>4</td>
<td>Minimal</td>
</tr>
<tr>
<td>5th St to Brookshire Fwy</td>
<td>13,800</td>
<td>4</td>
<td>Minimal</td>
</tr>
<tr>
<td>Brookshire Fwy to Oaklawn Ave</td>
<td>26,500</td>
<td>4</td>
<td>High</td>
</tr>
<tr>
<td>Oaklawn Ave to LaSalle St</td>
<td>16,200</td>
<td>2</td>
<td>High</td>
</tr>
<tr>
<td>LaSalle St to Cindy Ln</td>
<td>22,900 – 26,200</td>
<td>4</td>
<td>Moderate</td>
</tr>
<tr>
<td>Cindy Ln to Sunset Rd</td>
<td>19,000</td>
<td>2</td>
<td>Overwhelming</td>
</tr>
<tr>
<td>Sunset Rd to Lakeview Rd</td>
<td>13,200</td>
<td>2</td>
<td>Severe</td>
</tr>
<tr>
<td><strong>NORTH GRAHAM STREET</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>I-277 to Statesville Ave</td>
<td>40,900</td>
<td>4</td>
<td>Overwhelming</td>
</tr>
<tr>
<td>Statesville Ave to Craighead Rd</td>
<td>19,800 – 24,700</td>
<td>4</td>
<td>Moderate to High</td>
</tr>
<tr>
<td>Craighead Rd to Sugar Creek Rd</td>
<td>12,100 – 17,000</td>
<td>4</td>
<td>Minimal</td>
</tr>
<tr>
<td><strong>W. T. HARRIS BOULEVARD</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Statesville Rd to I-77</td>
<td>15,700</td>
<td>4</td>
<td>Minimal</td>
</tr>
<tr>
<td>I-77 to Vance Rd</td>
<td>6,500</td>
<td>2</td>
<td>Minimal</td>
</tr>
</tbody>
</table>

NOTE: Level of service (LOS) is defined as follows:
- <0.85=Minimal
- 0.85-1.01=Moderate
- 1.01-1.16=High
- 1.16-1.31=Severe
- 1.31-1.40=Extreme
- >=1.40=Overwhelming
### Table 1-6. Existing Intersection Capacity Analysis

<table>
<thead>
<tr>
<th>Intersection</th>
<th>V/C Ratio</th>
<th>2001 AM Peak</th>
<th>2001 PM Peak</th>
</tr>
</thead>
<tbody>
<tr>
<td>Statesville Ave &amp; Graham St/ Liddell St</td>
<td>0.78</td>
<td>Minimal</td>
<td>1.34</td>
</tr>
<tr>
<td>Statesville Ave &amp; LaSalle St</td>
<td>0.85</td>
<td>Moderate</td>
<td>0.77</td>
</tr>
<tr>
<td>Statesville Ave &amp; I-85 Service Rd/ Tipton Dr</td>
<td>0.97</td>
<td>Moderate</td>
<td>0.87</td>
</tr>
<tr>
<td>Statesville Rd &amp; Nevin Rd</td>
<td>0.99</td>
<td>Moderate</td>
<td>1.27</td>
</tr>
<tr>
<td>Statesville Rd &amp; Old Statesville Rd/Sunset Rd</td>
<td>1.19</td>
<td>Severe</td>
<td>1.07</td>
</tr>
<tr>
<td>Statesville Rd &amp; W.T Harris Blvd</td>
<td>0.94</td>
<td>Moderate</td>
<td>0.69</td>
</tr>
<tr>
<td>Beatties Ford Rd &amp; Brookshire Fwy EB ramp/French St</td>
<td>0.44</td>
<td>Minimal</td>
<td>0.58</td>
</tr>
<tr>
<td>Beatties Ford Rd &amp; Oaklawn Ave</td>
<td>0.56</td>
<td>Minimal</td>
<td>0.50</td>
</tr>
<tr>
<td>Beatties Ford Rd &amp; LaSalle St</td>
<td>0.84</td>
<td>Minimal</td>
<td>1.09</td>
</tr>
<tr>
<td>Beatties Ford Rd. &amp; Griers Grove Rd/Cindy Ln</td>
<td>0.54</td>
<td>Minimal</td>
<td>0.46</td>
</tr>
<tr>
<td>Beatties Ford Rd &amp; Sunset Rd</td>
<td>1.00</td>
<td>Moderate</td>
<td>0.91</td>
</tr>
<tr>
<td>Graham St &amp; 6th St</td>
<td>0.63</td>
<td>Minimal</td>
<td>0.88</td>
</tr>
<tr>
<td>Graham St &amp; 12th St</td>
<td>0.58</td>
<td>Minimal</td>
<td>0.64</td>
</tr>
<tr>
<td>Graham St &amp; Dalton Ave</td>
<td>0.59</td>
<td>Minimal</td>
<td>0.44</td>
</tr>
<tr>
<td>Graham St &amp; Craighead Rd</td>
<td>1.02</td>
<td>High</td>
<td>1.01</td>
</tr>
<tr>
<td>Graham St &amp; I-85 Service Rd/ Cottonwood St</td>
<td>0.74</td>
<td>Minimal</td>
<td>0.69</td>
</tr>
<tr>
<td>Graham St &amp; I-85 SB ramp</td>
<td>0.89</td>
<td>Moderate</td>
<td>1.67</td>
</tr>
<tr>
<td>Graham St/Mineral Springs Rd &amp; Sugar Creek Rd</td>
<td>0.48</td>
<td>Minimal</td>
<td>1.04</td>
</tr>
<tr>
<td>W.T. Harris Blvd &amp; Old Statesville Rd</td>
<td>1.13</td>
<td>High</td>
<td>1.17</td>
</tr>
<tr>
<td>Sugar Creek Rd &amp; I-85 NB ramp</td>
<td>0.71</td>
<td>Minimal</td>
<td>1.07</td>
</tr>
<tr>
<td>Brookshire Blvd &amp; Mt. Holly-Huntersville Rd</td>
<td>1.34</td>
<td>Extreme</td>
<td>1.77</td>
</tr>
</tbody>
</table>

**NOTE:** Level of service (LOS) is defined as follows:

- <0.85=Minimal, <1.01=Moderate, <1.16=High, <1.31=Severe, <1.40=Extreme, >=1.40=Overwhelming
Major Problems and Deficiencies

Table 1-6 indicates that traffic congestion at many of the intersections is already high or overwhelming. The analysis also indicates that the evening peak hour is worse than the morning peak hour. The City and the State, are beginning to address this by programming various highway and intersection improvements in their long range plans, including the widening of US-21 and NC-115. These improvements and the future year traffic analysis will be discussed in Chapter 3 of this report.

1.6.2 Existing Public Transit System

CATS is the primary local public transit operator in the Charlotte-Mecklenburg area.

Regional System Overview

CATS is the local transit operator and is responsible for public transportation in the Charlotte-Mecklenburg area. The bus network in the area tends to be largely radial, providing service from 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 350 buses and para-transit vehicles which serves an average of 50,000 riders per day. Average annual transit ridership in the area increased by about 3.6 percent in fiscal year 2002, and the system is currently transporting 14.7 million passenger trips per year.

Transit service types in the region include: 43 local and 14 express routes, four neighborhood-based services, four shuttles for business parks and two local towns, as well as 76 vanpools. The network consists of local routes which 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.

Local route fares are $1.00 and express fares are $1.40. Transfers between local bus services are free with a $0.40 transfer from local to express bus services. Various multiple ride passes are available: weekly / local ten ride ($10), monthly ($40) and express ten ride ($14), or express monthly ($56).
Existing North Corridor Transit Service

Services that are present in the system and applicable to the Charlotte North Corridor include:

- Five local bus services:
  - Route 7, which provides service to neighborhoods along Beatties Ford Rd.
  - Route 13 in the Druid Hills and Wilson Heights neighborhoods.
  - Route 21, serving Double Oaks community and the Center City area.
  - Route 22 along Graham Street and serving the Tryon Hill neighborhood.
  - Route 26, which serves the communities of Oaklawn, Greenville, and Lincoln Heights.

- Two express bus routes: The Mooresville Express and Route 77X provide express service for outlying areas in the North Corridor and downtown.

- A local town shuttle: The Village Rider is a shuttle service that provides 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.

- A business park shuttle: Bus Route 33 is a north Mecklenburg connector which serves several business parks and shopping centers in the North Corridor.

Table 1-7 lists the existing transit services in the North Corridor and also shows their system wide performance and service characteristics.

Table 1-7. Transit Performance, Existing North Corridor Bus Routes

<table>
<thead>
<tr>
<th>Route Number and Name</th>
<th>Hours/Days of Service</th>
<th>Frequency</th>
<th>Annual Ridership</th>
<th>System-Wide Ranking*</th>
</tr>
</thead>
<tbody>
<tr>
<td>7 – Beatties Ford / Firestone (Local)</td>
<td>5am – 2 am, Mon. – Sat. 6am – 1 am, Sun</td>
<td>5 – 15 min., M-F 20 – 35., Sat Hourly, Sun.</td>
<td>901,000</td>
<td>3</td>
</tr>
<tr>
<td>13 – Nevin Road (Local)</td>
<td>6am – 7 pm, Mon. – Sat.</td>
<td>40 min., Mon - Sat</td>
<td>73,000</td>
<td>29</td>
</tr>
<tr>
<td>21 – Double Oaks (Local)</td>
<td>5am – 2 am, Mon. – Sat. 6am – 2 am., Sun.</td>
<td>15 – 30 min., M-F 35 – 45 min., Sat. Hourly, Sun.</td>
<td>353,000</td>
<td>16</td>
</tr>
<tr>
<td>22 – Graham Street (Local)</td>
<td>5am – 2 am, M – F 6am – 2 am., Sat-Sun</td>
<td>40 min., M-F 50 min, Sat. Hourly, Sun.</td>
<td>214,000</td>
<td>21</td>
</tr>
<tr>
<td>26 – Oaklawn (Local)</td>
<td>6am – 2 am, 7 days/ week</td>
<td>30 min., M-F 45 min., Sat. Hourly, Sun.</td>
<td>212,000</td>
<td>22</td>
</tr>
<tr>
<td>33 – North Meck Connector</td>
<td>7am – 7 pm, M-F</td>
<td>Hourly, M-F</td>
<td>NA</td>
<td>--</td>
</tr>
<tr>
<td>96 – Village Rider Davidson (Local)</td>
<td>6am – 7 pm, M-F 8am – 7 pm, Sat.</td>
<td>Hourly, 7 days/week</td>
<td>Service began Fall</td>
<td>--</td>
</tr>
<tr>
<td>Route Number and Name</td>
<td>Hours/Days of Service</td>
<td>Frequency</td>
<td>Annual Ridership</td>
<td>System-Wide Ranking*</td>
</tr>
<tr>
<td>-----------------------</td>
<td>-----------------------</td>
<td>-----------</td>
<td>------------------</td>
<td>---------------------</td>
</tr>
<tr>
<td>Shuttle</td>
<td>9am – 6pm, Sun.</td>
<td></td>
<td>2001</td>
<td>--</td>
</tr>
<tr>
<td>97 – Village Rider Cornelius (Local Shuttle)</td>
<td>6am – 7pm, M-F</td>
<td>Hourly, 7 days/week</td>
<td>Service began Fall 2001</td>
<td>--</td>
</tr>
<tr>
<td>98 – Village Rider McCoy Road (Local Shuttle)</td>
<td>6am – 7pm, M-F</td>
<td>Hourly, 7 days/week</td>
<td>Service began Fall 2001</td>
<td>--</td>
</tr>
<tr>
<td>99 – Village Rider Huntersville (Local Shuttle)</td>
<td>6am – 7pm, M-F</td>
<td>Hourly, 7 days/week</td>
<td>Service began Fall 2001</td>
<td>--</td>
</tr>
<tr>
<td>77X – North Mecklenburg Express</td>
<td>5am – 11 pm, M-F</td>
<td>10 – 30 min., M-F, Hourly, Sat.-Sun.</td>
<td>64,000</td>
<td>2</td>
</tr>
<tr>
<td>83X – Mooresville Express</td>
<td>5 am – 8 am &amp; 4 pm – 7 pm, M-F</td>
<td>30 – 60 min.</td>
<td>Service began Fall 2001</td>
<td>--</td>
</tr>
</tbody>
</table>

* System Ranking out of 43 Local Routes or 13 Express Routes

Source: CATS, 2002

Near Term Improvements

A recently completed short-term transit plan recommends improvements to the countywide transit system over the next five years. For the North Corridor, the report recommends that the 77X Express Route rationalize stop locations on Statesville to speed service and establish specific stop locations. Re-route Route 77X if park-and-ride lots can be conveniently relocated near southbound exit/entry ramps. This would permit convenient on-off access for the morning inbound trips, when passengers are generally most time-sensitive. Also, during the I-77 construction, consider using Statesville Road instead of I-77 if signal priority for transit vehicles can be established.

1.6.3 Railways

The North Corridor is traversed by several railroad lines with widely varying characteristics. The Norfolk Southern (NS) “O” Line traverses the entire length of the corridor. The CSX line that was formerly the Seaboard Coast Line runs across the southern end of the corridor. It crosses under the Brookshire Freeway near the ADM plant just north of the beginning of the “O” Line, and crosses the “O” Line alignment at grade in the same vicinity. The NS main line between Washington and Atlanta forms the eastern boundary of the corridor between North Graham Street and the Center City terminal at the Multi-Modal Center.

At the extreme northern side of the corridor a portion of the NS main line, in the vicinity of Ninth Street to the point where the “O” Line diverges from running parallel to North Graham Street near the community of Derita, lies on the boundary of the Northeast corridor and the north Corridor.
Norfolk Southern “O” Line

The “O” Line is a single-track main line that diverges from the NS Atlanta-Washington main line at the ADM plant and proceeds north through Huntersville, Cornelius, Davidson, and Mooresville to join the NS route between Asheville and Salisbury at Barber Junction, east of Statesville. The portion of the line between the ADM plant and the Statesville Road crossing is out of service, and the crossing of the CSX track just south of Seaboard Street has been removed. Access from Charlotte to the “O” Line currently exists via a cutoff track which leaves the NS Charlotte Yard just north of 30th Street and proceeds west, parallel and to the south of 36th Street, to Atando Junction at North Graham Street and Atando Avenue. The line is basically used in light-density freight service. Customers between Davidson and Charlotte are served by a road switcher out of Charlotte; customers north of Davidson are served by a road switcher from Barber. The major shipper on the line, Ameristeel, typically receives service from Charlotte six days a week. The service from Barber is less frequent, serving a customer north of Mooresville two or three times per week. However, the Barber switcher travels to Davidson to pick up empty cars set off there by the Charlotte switcher.

Amtrak uses the cutoff track between Charlotte Yard and Atando Junction to turn the Carolinian, which terminates in Charlotte, in the early mornings. The Piedmont, which arrives from Raleigh in mid-morning and returns to Raleigh in late afternoon, is turned at midday. Both these trains are subsidized by the state of North Carolina but are operated by Amtrak. The wye at Atando Junction enables the Amtrak crews to make the turnaround. Atando Junction is the nearest point to the current Charlotte Amtrak station where this maneuver can be accomplished.

All North Corridor commuter rail and DMU alternatives assume use of the “O” Line all the way from its southern end to Mooresville. It will be necessary to avoid unnecessary disruption of service to existing freight customers on the “O” Line. Depending on the type of equipment selected, operation of passenger service on the “O” Line could force a strict time separation of freight traffic. A relatively small window in the late evening and overnight hours would be allotted to serve freight customers. Further analysis at later stages of project development will be required to determine the extent to which customers can accommodate overnight pickup and setoff of cars, and the extent to which track modifications may be required.

If FRA-compliant equipment, such as locomotive-hauled coaches, is used in the commuter rail service, the possibility exists for track-sharing. The feasibility of actually implementing such an operation depends in large measure on what organization is dispatching the trains (in terms of reliability of passenger schedules) and the adequacy of available passing sidings.

The need to preserve access for turning passenger trains is less clear, and depends on when and how the proposed Multi-Modal Center is developed. If the track layout enables trains from the north terminating in Charlotte to pull through the station and continue to Charlotte Junction, doing that may possibly be preferable to using the “O” Line.

CSX Line

A CSX single-track main line runs through the North Corridor between the “O” Line and the North Carolina Railroad (NCRR) line, roughly paralleling I-277 and continuing in a northwesterly direction to Mt. Holly Junction and easterly to Monroe. The CSX line crosses
the NS main line at a diamond crossing a few hundred feet east of the former diamond crossing between the “O” Line and the CSX track. Traffic through the crossing is controlled by a NS dispatcher at a remote location. Continuing east of the crossing, the CSX line passes by the former Seaboard Air Line passenger station, crosses the NCRR at grade in the vicinity of Brevard and 12th Streets, and continues in a southeasterly direction toward Matthews.

The CSX route is not as heavily traveled as the NS main line. It is not uncommon to observe a CSX train waiting for clearance to cross the NS line. Eastbound trains waiting for clearance may currently block the former “O” Line crossing location; westbound trains likewise block the NCRR / CSX crossing.

It is extremely unlikely that CSX would allow DMU equipment that is not FRA-compliant to cross its track(s) at grade, and hardly more likely that it would agree to leave a (restored) diamond crossing of CSTX by the “O” Line clear of trains at all times to protect North Corridor train schedules. It has therefore been assumed that North Corridor trains will be grade-separated from CSX at the crossing. Consideration is being given to grade separation of the CSX / NS crossing at Graham, in conjunction with the Multi-Modal center project. Preliminary concept plans show the CSX line depressed and the NS main line elevated above present grade. Southern Street is also relocated close to, if not on, the alignment of the present on-ramp to I-277 from North Graham Street, which would be closed. It is thus relatively simple to elevate the North Corridor rail alignment over the CSX (lowered) profile to enable a grade-separated crossing.

**NS Main Line**

The NS main line from Atlanta to Washington passes through a portion of the North Corridor between North Davidson and Uptown Charlotte. The line carries heavy freight traffic, with an average of 30-35 train movements per day. In addition, Amtrak operates the Crescent between New York and New Orleans via Charlotte and Atlanta, the Carolinian between New York and Charlotte, and the Piedmont between Raleigh and Charlotte, all on daily schedules. At present the Amtrak passenger station is located on the west side of the Charlotte Yard, with street access from North Tryon Street. As noted above, plans are being developed to relocate the passenger station to the Multi-Modal center, along the NS main line in the vicinity of Trade Street.

All North Corridor rail alternatives potentially impact operations on the NS main line, at least during the construction period. The proposed access to the Multi-Modal Center 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 Center City terminal. A retaining wall and several structures for crossing over streets would have to be constructed in very close quarters 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 ADM plant. This would depend on how the ADM trackage is ultimately reconfigured.

### 1.7 Need for Transportation Improvements

During the past several decades, growth in the Charlotte-Mecklenburg region has been significant. Future growth projections for the region indicate that this trend will continue. It is
estimated that the population will increase 43 percent and that employment will increase 50 percent by the year 2025. The North Corridor is also being affected by this growth. Growth in population and employment produces increased demand for travel and thus placing increased strain on the existing transportation system.

The suburbanization of the County’s population and employment has led to a significant increase in automobile use. Because of the dispersal of jobs and residences, the automobile accounts for a large percent of travel in the urbanized areas. Rapid growth in automobile travel has produced congested traffic conditions and regional air quality problems and has affected the mobility of travelers and commuters desiring access to employment opportunities and activity centers in the Charlotte Mecklenburg area.

Some of the key transportation needs in the North Corridor include:

- There are a limited number of major roadways within the corridor. I-77, US-21 and NC115 are the only through north-south connectors between the rapidly growing towns of Mooresville, Davidson, Cornelius, and Huntersville, across Iredell and Mecklenburg Counties, to the high employment concentrations in downtown Charlotte. As a result these roadways are subject to high traffic volumes with many segments operating above capacity.

- The congestion on roadways in the corridor is expected to increase through 2025 because of the rapid population and employment growth that has been projected for Mecklenburg as well as in Iredell County. This projected demographic and employment growth will directly impact travel demand within and through the corridor. Traffic on I-77 and US 21 are particularly bad because they not only serve as feeders into downtown Charlotte, but also carry through-commuters to residential and employment centers in the corridor.

- There are only a few major arterials with very minimal cross-town connections. At present, Harris Boulevard is really the only major arterial that connects the north corridor with the other corridors and adjacent wedges within the county. Completion of I-485 may eventually help, but will also concentrate cross-county traffic on the roadways accessing I-485 interchanges. Also, the interstate and NSRR railway line creates a barrier effect, limiting east-west travel in the north corridor.

- Much of the existing land-use pattern is low-density residential with inwardly oriented roadways that do not encourage transit or pedestrian travel, thus further disadvantaging other travel modes and increasing automobile congestion.

- Current land use patterns and congestion makes effective bus service difficult. Transit is subjected to similar delays as a result of poor levels of service thus offering no significant travel time advantage over the private automobile.

- Current transit services are limited in the north corridor with - limited service coverage, inconvenient travel time, reliability and safety as a result of congested roadways.

- Lack of good transit service to the core employment areas creates few usable alternatives to the private automobile, increasing demand for additional roadway and parking facilities.

- One of the resultant effects of high traffic volumes is poor air quality. Historically, Mecklenburg County has consistently violated the federal standard for ozone levels. The region has currently attained moderate maintenance air quality status, but in order
to maintain this levels of air quality attainment, the County has stipulated various policies that would reduce the use of single occupant vehicles, the single most important source of ozone.

- High traffic volumes and congestion also contribute to higher vehicle collisions thus reducing road safety in the corridor.
2 ALTERNATIVES, RIDERSHIP AND COSTS

Chapter Summary
Chapter 2 discusses the criteria and process used in the initial screening of alternatives. Descriptions of the transit technologies, alignment alternatives and station types considered in the screening are provided, as well as an overview of public input on the alternatives.

The result of the screening of alternatives described in Chapter 2 is a short list of five refined alternatives. These are evaluated further in Chapter 3 and 4.

2.1 Screening and Selection Process

There are several possible courses of action for addressing the land use, mobility, and environmental goals of the region and the North Corridor. The alternatives carried forward for more detailed analysis were based on a two-level screening process. This methodology involved identifying a long list of alternatives, screening out alternatives that are not feasible based on an established set of criteria, and evaluating the final set of alternatives based on more detailed criteria. The sections that follow describe the process of screening the alternatives for the North Corridor.

The initial screening process assessed the universe of identified alternatives against the transportation and development goals established for the North Corridor. The study team then eliminated the alternatives displaying fatal flaws – either negative effects, or a clear inability to meet established goals and objectives. The screening process enabled the study team to focus on the remainder of the MIS to focus on the most promising alternatives.

CATS staff, Planning Commission staff and the corridor consultants developed the screening criteria. The screening criteria were consistent with those used in the West, North and Northeast Corridors MISs. They are presented below in Table 2-1. The level of detail corresponds to the specificity of data available for the defined alternatives at this stage in the MIS.

Table 2-1. Screening Criteria Used to Evaluate Alternatives

| 1. Environmental and engineering issues, including available right-of-way, potential traffic effects, environmental issues, and environmental justice |
| 2. Public scoping, including evaluation of comments and issues identified during the scoping process |
| 3. Redevelopment opportunities, to determine which alignments might not serve areas with opportunities for redevelopment |
| 4. Development opportunities, to determine which alignments serve areas for future development |
| 5. Potential displacements, to determine which alignments have the potential for a high |
number of residential and business displacements

6. **Activity centers served**, to determine which current and future activity centers the alignment may serve

7. **Support of local goals**, to determine which alignments serve the adopted neighborhood plans and long range transportation plans, among others

8. **Customer satisfaction**, to determine if the alignment would benefit customers in terms of time or dollar savings, and to determine if the service would “make sense” to those who would use it

9. **Appropriate (dominant) mode**, to determine if the mode would meet the transportation needs of the corridor and would fit with the character of the corridor and the overall regional system

In general, the criteria help in assessing how much a given alternative furthers the 2025 *integrated Transit/Land-Use Plan* preferred vision of land use development and transit in the region and the corridor. This forms the basis for examining to what extent each alternative offer a way to evaluate the extent to which desired mobility improvements – such as faster travel speeds, reduced congestion and improved connectivity between major destinations – might be achieved by the alternatives. They also allow for inclusion of public, community and government input on the alternatives, and consideration of technical/environmental issues.

### 2.1.1 Summary of Previous System Planning Activities

Rapid transit for the North Corridor has been under consideration for at least a decade. All key initiatives have stressed the need to closely coordinate transit implementation decisions with changes in land use policies to promote more compact, efficient development patterns.

In 1989, CDOT produced a *Transit Corridors Study* as part of the 2005 *Transportation Plan*. In that document, the North Corridor was one of eight reviewed as potential transit corridors. A key conclusion of this study was that, similar to other corridors with an existing rail right-of-way, transit could be a viable transportation option provided that low-density, dispersed development patterns happening at the time changed to make more efficient use of the extensive large undeveloped tracts along such rights-of-way.

After the *Centers and Corridors* vision was established, a Committee of 100 was formed to develop a transportation and land use vision for the region. In its 1994 report, the Committee of 100 called for official adoption of the *Centers and Corridors* concept (which made the North Corridor one of the five major corridors), and for identifying and beginning to purchase rights–of-way for fixed guideway transit.

In 1997, a study led by the Towns of Davidson and Huntersville summarized a review of potential rail transit service along four possible rights of way in north Mecklenburg County and south Iredell County. The study recommended implementation of rail transit in close coordination with transit-supportive land use policies along the existing rail corridor parallel to NC-115. Simultaneously, new land use policies and codes were adopted in the towns that called for more compact, pedestrian-oriented development, and for using transit as a means to protect or revive the viability of the traditional town centers.
The 2025 Integrated Transit/Land-Use Plan examined both rail and bus rapid transit (BRT) alternatives. The plan recommended a dual system of BRT along I-77, and Diesel Multiple Units (DMUs) along the NSRR right-of-way, with both systems ending in Davidson. The rail recommendation was qualified in that full implementation was to occur only after corridor land uses were dense enough to support rail. The 2025 Integrated Transit/Land-Use Plan also suggested that more growth be directed to the rail corridor stations and that the BRT stations not be treated as TOD opportunities until the station-related growth along the rail corridor was well established. An important aspect of the plan was that the recommendations for the North Corridor and the phasing of their implementation were closely coordinated with transit implementation in the other four corridors. Also, the 2025 Integrated Transit/Land-Use Plan explicitly linked the rapid transit recommendations to key feeder bus links and a vast expansion of local bus services throughout the North Corridor.

2.1.2 Technologies Considered

The 2025 Integrated Transit/Land-Use Plan for Charlotte – Mecklenburg recommended various rapid transit technologies that were then analyzed as part of this MIS, to determine the best-fit modes for the Charlotte North Corridor. Three rapid transit technologies were considered to hold the most merit for further investigation: BRT, commuter rail, and LRT.

Later in the North Corridor study process, a decision was made to exclude LRT and instead focus the North Corridor MIS analysis on BRT and Commuter rail technology alternatives. The decision to omit LRT was in large part due to discussions with NSRR, confirming their position that if the “O” line remains an active freight rail track, any LRT service would have to be on separate tracks at least 40 feet from the existing track. LRT would therefore be considerably more costly as a result of the extra width that would be required for right-of-way. Furthermore, the added cost required to construct the overhead electrical system for the LRT system on a more than 30-mile alignment was considered excessive for a single corridor.

Basic characteristics for BRT, commuter rail, and LRT technologies are described in greater detail below. Actual routings or alignments for various project alternatives will be described in Section 2.2, Definition of Alternatives.
**Light Rail Transit (LRT)**

LRT is the technological descendant of the streetcar. A distinctive feature of LRT is that vehicles draw power from an overhead wire. This overhead power collection allows LRT systems to be integrated with other at-grade (street level) transportation modes and pedestrian traffic. With overhead power collection and articulated LRT vehicles (two cars “hinged together”), LRT can operate in mixed traffic on tracks embedded in the street (like streetcars), on at-grade rights-of-way with street and pedestrian crossings, or on exclusive rights-of-way.

Average speeds for LRT are 15 to 30 miles per hour, with top speeds ranging from 45 to 60 miles per hour. The passenger carrying capacity varies between 4,000 to 15,000 trips per hour per track. Cost per mile for LRT can range from $15 to $30 million per mile, although costs can be much higher when it is put on aerial structures or in tunnels. Over a dozen North American cities have constructed LRT systems in the last ten years: Baltimore, Calgary, Dallas, Denver, Edmonton, Los Angeles/Long Beach, Pittsburgh, Portland, Sacramento, Salt Lake City, San Diego, San Jose, and St. Louis. Cities that recently decided to implement LRT are Virginia Beach/Norfolk, Seattle and Houston. LRT has been selected as the locally-preferred alternative for the South Corridor in Charlotte.

**Key characteristics of LRT:**
- LRT vehicles can operate as a single car or multi-unit train
- LRT can serve closely spaced stations (less than a mile apart) because of the ability of vehicles to accelerate rapidly.
- LRT vehicles cannot operate on the same tracks as railroad locomotives because of different vehicle strength requirements. An LRT track located in an existing railroad right-of-way must be separated by at least 40 feet from adjacent active freight tracks.
- The per mile capital cost of LRT is typically higher than for a busway or commuter rail system, primarily because of the overhead electrical wiring involved.
Commuter rail

Commuter rail refers to express rail transit operating over conventional railroad tracks. Commuter rail can be trains of passenger coaches pulled or pushed by a diesel or electric locomotive, or advanced DMUs where passenger cars are powered by diesel motors mounted on the cars. This system is often used to serve medium to lower density passenger environments. Lines are typically up to 30 miles in length with stations spaced two to five miles apart, and link city centers and mid-size towns with suburban surroundings. Trips tend to be longer, and are mostly journey-to-work trips. Therefore, in some corridors, commuter rail service is only provided during the peak commuting periods in the peak direction. Average speeds range from 20 to 45 miles per hour, with top speeds reaching 45 to 75 miles per hour. Passenger carrying capacity can range from 1,000 to 20,000 trips per hour per track, depending on frequency of trains and the number of cars per train.

Commuter rail is an attractive option where an available railroad exists and where the tracks can be shared with freight trains. While sharing tracks reduces the capital cost (as compared to building new tracks), commuter rail train schedules and the amount of service provided can be compromised by having to share tracks with intercity passenger and rail freight trains. Locomotive propelled commuter rail can operate at the same time as freight or intercity passenger trains. DMUs do not have adequate vehicle strength to operate concurrently with freight trains (a Federal Railroad Administration (FRA) safety requirement).

Many metropolitan areas have commuter rail systems, including Boston, New York/New Jersey/Connecticut, Philadelphia/Wilmington, Baltimore/Washington, Miami, Chicago, Dallas/Fort Worth, San Francisco/San Jose/Sacramento, and Los Angeles. Numerous cities are considering commuter rail, and several of these are considering the use of DMUs. DMUs are typically higher-performance (better acceleration and deceleration) than locomotive-propelled commuter rail equipment. However, none of the modern, high-
performance DMUs meets FRA standards for crashworthiness, and therefore cannot share track with freight trains. Currently there are no modern DMU systems operating in the U.S. However, because of its potential cost savings, several manufacturers are developing vehicles for the U.S. market. The Flexliner, which visited Charlotte-Mecklenburg in early 1998, is one example of a DMU.

**Bus Rapid Transit (BRT)**

This option consists of buses operating in exclusive busways with on-line stations similar to a LRT system, or on roads with improvements to allow buses to bypass traffic congestion. On-line BRT stations can have off-vehicle fare collection, which speeds up service by allowing all doors of the bus to be used for loading.

A key attribute of a BRT system is the ability to employ express buses that combine collection, line-haul, and distribution functions. With a BRT system, a bus could loop through a neighborhood picking up passengers within walking distance of their homes. It then could enter the busway via a special busway ramp and serves on-line stations just like a rail rapid transit vehicle. It then leaves the busway via another busway ramp and circulates through an employment center.

BRT also can make use of high occupancy vehicle (HOV) lanes built as part of the highway program. These are lanes that are open to vehicles carrying more than a designated number of passengers. HOV facilities are included in the region’s adopted LRTP and could be used by buses. Modern BRT also is beginning to make use of new low floor hybrid technology buses that can operate under both electric and diesel or natural gas power in different parts of the corridor.

In North America, busways have been constructed in Ottawa and Pittsburgh. An arterial street busway developed in Curitiba, Brazil, features fully enclosed, weather-protected and air-conditioned stations with ticket platforms that are level with the floor of the bus. This type of station decreases passenger boarding and exiting times, thereby reducing overall travel time. It also offers passengers a

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**Key characteristics of BRT:**

- BRT can combine the use of existing roadways and new bus-only facilities.
- Because a range of vehicle capabilities is feasible, service frequencies can be matched to travel demand patterns.
- BRT can serve corridor volumes ranging from 1,000-2,000 passengers per hour up to 20,000 passengers per hour.
- BRT does not require a continuous guideway like rail. It can operate on existing streets where necessary.
more comfortable and secure waiting environment that is similar to rail transit stations.

Some communities are using a modification of BRT – called Enhanced Bus/Rapid Bus -- as an early investment strategy. Enhanced Bus/Rapid Bus offers a level of transit above what would be considered local express service with fewer stops, more sophisticated shelters and signs, and real-time passenger information. Enhanced Bus/Rapid Bus, however, has overall less capital investment than BRT, since Enhanced Bus/Rapid Bus usually does not include a dedicated transitway separated from other vehicular traffic. Like BRT, Enhanced Bus/Rapid Bus can serve as a stepping stone to rail transit by building ridership in an alignment. Los Angeles, for example, is using Enhanced Bus/Rapid Bus initially at the end of its new Metro Rail lines. Vancouver and Phoenix also utilize Enhanced Bus/Rapid Bus services on busy corridors with rail potential.

### 2.1.3 Alignments Considered

Based on the long list of alternatives developed in the 2025 Integrated Transit/ Land-Use Plan, this list was expanded, as shown in Table 2-2, to incorporate suggestions from the public and to accommodate further refinement of the mobility needs and issues in the North Corridor.

When the North Corridor MIS began, the FTA required consideration of “No-Build” and “Transportation System Management (TSM)” alternatives for every MIS. No-Build means that no action beyond projects that are already funded would be taken in the Corridor. TSM includes low cost actions taken to make existing facilities work more efficiently (such as changing the timing of traffic signals to make intersections flow more smoothly or adding more bus service to an existing route), rather than implementing major new transportation projects.

In December 2000, after the North Corridor MIS was underway, the FTA suggested that the No-Build and TSM alternatives could be combined into a single alternative called the “Future Baseline” alternative. The Future Baseline Alternative was developed to recognize that some improvements will be made to the existing North Corridor over the next 25 years so studying No-Build conditions would not be particularly valuable.

Table 2-2 summarizes the long list of alternatives in the North Corridor and highlights the alternatives that were carried forward for more detailed analysis. Note that alternatives were re-numbered in order to maintain the numeric sequence in the next stage of analysis.

The alternatives were screened based on a set of criteria that measure how well each of the alternatives meets the project goals. These criteria are both quantitative and qualitative, and allow decision-makers to quickly compare the advantages and disadvantages of each alternative.

During the first level of screening, a small number of measures that could be readily applied were used. These measures were based on existing and easily obtainable data and information. During the second level of screening, the full array of quantitative and qualitative measures was used based on the data derived from the subsequent analysis.
Table 2-2. Recommended Disposition by Alternative

<table>
<thead>
<tr>
<th>Alt. #</th>
<th>Name</th>
<th>Via</th>
<th>Inner/Outer Terminus</th>
<th>Recommendation</th>
<th>Source of Recommendation</th>
</tr>
</thead>
<tbody>
<tr>
<td>N-1</td>
<td>No-Build</td>
<td>(N. A.)</td>
<td>(N. A.)</td>
<td>Merged into N-2 per FTA guidance</td>
<td>2025 LRTP</td>
</tr>
<tr>
<td>N-2</td>
<td>Baseline</td>
<td>(N. A.)</td>
<td>(N. A.)</td>
<td>Must retain for comparative purposes</td>
<td>Team, following FTA guidance</td>
</tr>
<tr>
<td>N-3</td>
<td>Commuter rail (11 stations)</td>
<td>Commuter rail on NSRR “O” Line + Enhanced Bus/Rapid Bus to Beatties Ford</td>
<td>Center City / Mooresville</td>
<td>Retain</td>
<td>Team modification of 2025 Plan</td>
</tr>
<tr>
<td>N-4</td>
<td>DMU (17 stations)</td>
<td>Diesel Multiple Units (DMU) on “O” Line</td>
<td>Center City / Mooresville</td>
<td>Retain</td>
<td>2025 Plan</td>
</tr>
<tr>
<td>N-5</td>
<td>Bus Rapid Transit (BRT) on I-77 + Commuter rail</td>
<td>BRT on I-77 with Commuter rail on NSRR “O” Line</td>
<td>Center City / Mooresville</td>
<td>Retain</td>
<td>2025 Plan</td>
</tr>
<tr>
<td>N-6</td>
<td>BRT only</td>
<td>BRT on I-77 and US-21 (N-5 alignment)</td>
<td>Center City / Mooresville</td>
<td>Retain</td>
<td>Team</td>
</tr>
<tr>
<td>N-7</td>
<td>Commuter rail (11 stations) + streetcar</td>
<td>Commuter rail on NSRR “O” Line w/streetcar to Beatties Ford</td>
<td>Center City / Mooresville</td>
<td>Drop. Streetcar access to Center City difficult; no advantage over Enhanced Bus/Rapid Bus</td>
<td>Team</td>
</tr>
<tr>
<td>N-8</td>
<td>Light Rail Transit (LRT)</td>
<td>NSRR “O” Line</td>
<td>Center City / Mooresville</td>
<td>Drop; same rationale as in 2025 Plan</td>
<td>Mentioned in 2025 Plan</td>
</tr>
<tr>
<td>N-9</td>
<td>BRT on US-21 + Commuter rail (11 stations)</td>
<td>BRT on I-77 and US-21 with Commuter rail on NSRR “O” Line</td>
<td>Center City / Mooresville</td>
<td>Drop; can better serve land uses on US-21 from I-77 busway using design variations</td>
<td>Team</td>
</tr>
<tr>
<td>N-10</td>
<td>BRT on US-21 + Commuter rail (17 stations)</td>
<td>BRT on I-77 and US-21 with Commuter rail on NSRR “O” Line</td>
<td>Center City / Mooresville</td>
<td>Drop; can better serve land uses on US-21 from I-77 busway using design variations</td>
<td>Team</td>
</tr>
</tbody>
</table>

Note: Alternatives N-2 through N-6 were shortlisted and carried through to the next tier of evaluation. Subsequently, another alternative was added to the short list and labeled “N-7”, which is not to be confused with the N-7 in this table.
2.1.4 Station Locations and Types Considered

One of the five overriding goals of the MIS focuses on land use: “to locate stations to sustain local neighborhoods and maximize development opportunities.” Hence a “Station Typology Guide” was created for all the MIS corridor studies to provide for consistency in the design and siting of stations. The station areas are defined by functional category as neighborhood, community, district or regional, based upon their locational context. Each would have a different footprint on the surrounding area and would generate a different level of activity today and in the future. Design elements - such as landscaping, special paving/crosswalks, signage, lighting, shelter, street furniture, public art and civic plazas – would add considerably to the appeal and functionality of the station. Each of the station area types is described and illustrated below.

**Neighborhood Stations**

Neighborhood stations would be located largely in residential neighborhoods where the potential for pedestrian and bicycle access is high. These stations would offer transit accessibility to a service area where there generally would be limited local bus service and no station-related parking. Neighborhood stations create a center for the immediate area with a high level of walkability and pedestrian-friendly features.

**Community Stations**

Community stations likely would be located near commercial corridors and/or minor collector or arterial streets where they can be served by the local or feeder bus network. With some parking facilities, they serve several adjacent neighborhoods and beyond. Drop off lanes at the station will be included for “kiss-and-ride” passengers. Because the community station areas will accommodate a mix of residential uses, retail services and offices, they can be developed with a high level of walkability and pedestrian-friendly features. Community stations also offer other TOD, redevelopment and adaptive re-use opportunities.

**District Stations**

District stations are situated at or near major collector or arterial streets and/or intersections where they can be served by several major bus routes – and perhaps a bus transfer facility. Drawing from a large sub-region and well connected to major roads, they require more parking (including a park-and-ride facility) than community stations. District stations need strong walkability and pedestrian-friendly features. New development around district stations is envisioned to be multi-level and multi-use with retail employment and multi-family housing.

**Regional Stations**

Regional transit stations outside of the Center City would include a major park-and-ride facility and be serviced by transit or automobile. Regional stations also may serve as major bus transfer facilities, and may be located at or near regional interstate highway interchanges. Typically associated with regional destinations such as major mixed-use centers or special travel generators such as stadiums or universities, development around these stations is expected to be multi-level and multi-use.
Once candidate stations were located and their function within the alternative determined, they were assigned one of the following hierarchical designations: neighborhood, community, district or regional. This reflects, in ascending order, the presumed direct ridership catchment of the station, whether it would be served by local or more important bus routes, whether it would have significant park-and-ride functions and whether it is associated with a major special generator. **Table 2-3** lists the stations by mode and station typology/type for the North Corridor.

**Table 2-3. North Corridor Stations**

<table>
<thead>
<tr>
<th>Mode</th>
<th>Typology Code</th>
<th>Station</th>
<th>Type*</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rail</td>
<td>B</td>
<td>28th/Moretz</td>
<td>Community</td>
</tr>
<tr>
<td></td>
<td>C</td>
<td>Atando</td>
<td>Community</td>
</tr>
<tr>
<td></td>
<td>D</td>
<td>Derita</td>
<td>Community</td>
</tr>
<tr>
<td></td>
<td>E</td>
<td>Metrolina</td>
<td>Community</td>
</tr>
<tr>
<td></td>
<td>F</td>
<td>WT Harris</td>
<td>District</td>
</tr>
<tr>
<td></td>
<td>G</td>
<td>Eastfield</td>
<td>Regional</td>
</tr>
<tr>
<td></td>
<td>H</td>
<td>Hambright</td>
<td>Community</td>
</tr>
<tr>
<td></td>
<td>I</td>
<td>Verhoeff</td>
<td>Community</td>
</tr>
<tr>
<td></td>
<td>J</td>
<td>Anchor Mills</td>
<td>Community</td>
</tr>
<tr>
<td></td>
<td>K</td>
<td>Sam Furr</td>
<td>District (Park &amp; Ride)</td>
</tr>
<tr>
<td></td>
<td>L</td>
<td>Caldwell</td>
<td>Community</td>
</tr>
<tr>
<td></td>
<td>M</td>
<td>Cornelius</td>
<td>District</td>
</tr>
<tr>
<td></td>
<td>N</td>
<td>Davidson</td>
<td>Community</td>
</tr>
<tr>
<td></td>
<td>O</td>
<td>Mount Mounr</td>
<td>District</td>
</tr>
<tr>
<td></td>
<td>P</td>
<td>Mooresville</td>
<td>District</td>
</tr>
<tr>
<td></td>
<td>Q</td>
<td>Williams Street</td>
<td>District (Park &amp; Ride)</td>
</tr>
<tr>
<td>BRT</td>
<td>b.</td>
<td>Greenville</td>
<td>Community</td>
</tr>
<tr>
<td></td>
<td>c.</td>
<td>Kohler</td>
<td>Community</td>
</tr>
<tr>
<td></td>
<td>d.</td>
<td>Newland</td>
<td>Community</td>
</tr>
<tr>
<td></td>
<td>e.</td>
<td>Crestdale</td>
<td>Neighborhood</td>
</tr>
<tr>
<td></td>
<td>f.</td>
<td>Beatties Ford</td>
<td>District</td>
</tr>
<tr>
<td></td>
<td>g.</td>
<td>Sunset</td>
<td>Community</td>
</tr>
<tr>
<td></td>
<td>h.</td>
<td>Lakeview</td>
<td>Neighborhood (Emp.)</td>
</tr>
<tr>
<td></td>
<td>i.</td>
<td>Harris-Reames</td>
<td>Regional</td>
</tr>
<tr>
<td></td>
<td>j.</td>
<td>Hambright</td>
<td>District</td>
</tr>
<tr>
<td></td>
<td>k.</td>
<td>Mt. Holly-Huntersville</td>
<td>Community</td>
</tr>
<tr>
<td></td>
<td>l.</td>
<td>Gilead</td>
<td>District</td>
</tr>
<tr>
<td></td>
<td>m.</td>
<td>Stumptown</td>
<td>Community</td>
</tr>
<tr>
<td></td>
<td>n.</td>
<td>Sam Furr</td>
<td>District</td>
</tr>
<tr>
<td></td>
<td>o.</td>
<td>Westmoreland</td>
<td>Neighborhood</td>
</tr>
<tr>
<td></td>
<td>p.</td>
<td>Catawba</td>
<td>District</td>
</tr>
<tr>
<td></td>
<td>q.</td>
<td>Griffith</td>
<td>Community</td>
</tr>
<tr>
<td></td>
<td>r.</td>
<td>Langtree</td>
<td>District</td>
</tr>
<tr>
<td></td>
<td>s.</td>
<td>Mount Mounr – I-77</td>
<td>District</td>
</tr>
<tr>
<td></td>
<td>t.</td>
<td>Mount Mounr – NC-115</td>
<td>District</td>
</tr>
<tr>
<td></td>
<td>u.</td>
<td>Lowrance</td>
<td>Community</td>
</tr>
<tr>
<td></td>
<td>v.</td>
<td>Mooresville</td>
<td>District</td>
</tr>
<tr>
<td></td>
<td>w.</td>
<td>Williams Street</td>
<td>District (Park &amp; Ride)</td>
</tr>
</tbody>
</table>

* Station type based on Program Advisor’s Station Typology Manual, June 2001.
In addition to the direct comments from the public and agencies, station location selection involved input from several other sources. Candidate station locations that evolved throughout the development of the final four Build alternatives were carried through to the end of the MIS process. In the North Corridor, the similarity of alignments to those studied in the 2025 Integrated Transit/Land-Use Plan meant that many of the same locations were part of the initial definition of alternatives. Other stations were added as warranted after further investigation of local conditions, such as current land use, development opportunities, etc.

Because the number and location of candidate stations identified during the MIS process are highly tentative, the criteria used to locate candidate stations stressed general opportunities and constraints rather than site-specific conditions. Most candidate station locations are based on one or more of the following considerations:

- The explicit recommendations of adopted plans for town centers in Mooresville, Cornelius, Davidson and Huntersville.
- Specific major potential development or redevelopment opportunities. These included the Lowrance BRT station in Mooresville (adjacent to the large former Burlington Mill complex), the Anchor Mills rail station in Huntersville (site of a closed mill that is being replanned for mixed use) and the Metrolina station that may be the most significant redevelopment site in the corridor south of I-485.
- The location of major specific single users with large ridership potential, such as the proposed Lowe’s Corporation office campus in Mount Mourne or the Central Piedmont Community College (CPCC) campus at Verhoeff Drive along the rail right-of-way.
- Key highway intersections or interchanges where stations could be easily served by major feeder connections to other areas of the corridor. This consideration was especially important for locating candidate stations such as that at Sam Furr (NC-73) along the BRT alternative and W.T. Harris along both the rail and BRT alternatives.
- The locations of large “greenfield” (open, undeveloped or very lightly developed) sites served by existing or planned arterial or collector roads that could support significant new residential, employment or mixed-use based TOD.
- Locations within Charlotte that were very accessible to existing residential neighborhoods such as Druid Hills (Kohler BRT and 28th-Moretz DMU stations). Such locations were deemed preferable to those more oriented to the light industrial employment areas of the lower half of the corridor, since such light industrial areas are not generally highly conducive to transit ridership.
- Potential access by automobile when the main or an important function of the station is to serve a significant park-and-ride need, for example, at Williams Street in Mooresville.

While not intended to be site-specific, candidate station locations shown for the alternatives did respond to the following constraints:

- Locations had to be as visible and as accessible to pedestrians as possible.
- Locations had to be free of any major engineering fatal flaws, such as sharp curves on rail alignments.
2.1.5 Screening and Refinement of Alternatives

The screening process consisted of two levels of screening. In the initial screening process or the “first level screening” the study assessed the universe of identified alternatives against the transportation and development goals established for the North Corridor. The study team then eliminated the alternatives displaying fatal flaws – either negative effects, or a clear inability to meet established goals and objectives. During the second level of screening, the study could concentrate on this refined list of alternatives to trade-off benefits and costs and provide the MTC with sufficient materials to make an informed choice on a LPA.

First Level Screening

The first level screening was based on existing data and information, extensive fieldwork, a “windshield” survey of environmental conditions, and the likely ability of the alternatives to meet the corridor mobility and land use goals and objectives. This screening process included examining each alternative for the following:

- Presence of engineering or environmental “fatal flaws” that would eliminate an alternative from further consideration.
- The potential to serve existing land uses and to support future development TOD or redevelopment at likely station areas.
- The ability to link major activity/employment/residential centers within the North Corridor and to other centers in Charlotte-Mecklenburg and, therefore, to attract ridership.
- The potential to minimize displacements (relocating businesses or residents to make room for transit improvements).
- The likelihood of capital costs being in an acceptable range.
- The ability to provide equitable service to all people in the corridor.
- The ability of the alternative to provide transit to known transit-dependent communities in the corridors.

Second Level Screening

The second level screening was applied to the final alternatives carried forward for more detailed technical analysis. This screening step was based on detailed data and information obtained by preparing conceptual engineering plans; developing capital, operating, and maintenance cost estimates; conducting more detailed environmental analyses covering all typical environmental categories; conducting land use/community development and economic development analyses; meeting extensively with various publics; and preparing a cost effectiveness analysis using FTA guidance. The results of the second level screening will be considered by the MTC to select a LPA at the end of the MIS process. This consideration will include an assessment of how well each alternative performs with respect to the goals established for this corridor. This assessment will include both quantitative measures of effectiveness and cost effectiveness, and a qualitative assessment of financial feasibility and equity considerations. The sources of these measures are:
Public involvement is key to a project’s success.

Public Input on Alternatives

An important element of the screening process was the consideration of information obtained during the public involvement activities conducted throughout the study. The input received from many citizens was used to define and refine the alternatives for further consideration in the North Corridor. Meetings were held with various groups including the North Corridor Technical Team, the general public, civic groups, neighborhood and business associations, and stakeholders (parties such as local small business owners with a large “stake” in the decisions made for the Corridor).

As a result of an extensive public involvement program conducted for the scoping phase of the North Corridor MIS project, a significant number of public comments, suggestions, and feedback were obtained from the communities in the study area. This public input was considered in the analysis of the range of alternatives being considered, and incorporated in the refinement of the alignments (routes), modes (types of transit), and station locations for the proposed transit corridor.

Many issues and concerns were raised throughout the study process. The most prevalent concerns that were raised in the public process included:

- **Land use and TOD:** People were concerned about an increase in density in their neighborhoods. To them, density meant an increase in unattractive, low-income apartment housing. Citizens in the towns also relayed that they wanted a transit alternative that encouraged “good growth,” meaning shops and homes around a transit stop with easy pedestrian-friendly access to the stations, rather than “bad growth,” such as big box or strip malls with insulated car-oriented designs. Thereby, calling for investment not only to be focused on the transit development aspects, i.e. stations and services, but also to invest in “place-making” or non-transit urban design elements such as streets, curbs, sidewalks and lighting.

- **Connectivity:** The public stressed that access to other corridors was a necessity for any transit alternative. They wanted to be able to ride transit to other destinations in the county, not just in the corridor or to Center City Charlotte.

- **Costs and funding:** Many people were concerned about the price of rapid transit, and that they would ultimately pay for it. Citizens asked: How much of the half-cent sales tax would cover implementation? Are there funding sources other than the local tax?
Will there be enough riders to justify such a large public expenditure? Both Mecklenburg County residents and Iredell County residents were concerned about Iredell County contributing money to extend service in the North Corridor.

- Technologies: The mode of transit was an issue for many people. They were concerned about the differences in operating and capital costs between the rail alternative and the BRT alternative. People in the northern part of the corridor expressed that BRT lacked the appeal that rail has, while people in the southern part of the corridor focused on the flexibility of buses. People throughout the corridor stated that travel time is a vital element of any alternative.

- Geography and Demographics: Because of the geographic and demographic distance between the northern and southern parts of the Corridor, opinions varied greatly. Many people living in the north concentrated on the specific needs of town life, namely the distance to Charlotte, the perceived increase in positive economic growth because of a train and the negative stereotype of buses. People living in the southern part of the Corridor expressed the concern that CATS had already chosen rail as the preferred alternative because people in the towns had more money. They also commented that a rail alternative was impractical for them since they live so close to the city.

Following is a summary of the additions or modifications that were made to the alternatives to be carried forward in the MIS process as result of public and agency comments:

- For all alternatives: a new component consisting of Enhanced Bus/Rapid Bus service on W. T. Harris was added because of comments received indicating that commuters frequently travel between the North and Northeast Corridors.

- Alternatives N-3, N-4, and N-5: As a result of concerns from the Towns of Cornelius, Davidson and Mooresville, minimal parking will be provided for all commuter rail alternatives at their downtown stations; however, other opportunities will be pursued to provide adequate park-and-ride facilities at nearby stations. For the Town of Mooresville, the end of the line station was moved approximately one mile beyond the downtown to provide a sufficiently large area for a park-and-ride lot.

- Alternatives N-5 and N-6: Concerns raised from neighborhoods located west of I-77 led to developing BRT alternatives that would serve these communities more directly.

- Alternatives N-5 and N-6: The Beatties Ford area was identified by a technical team member as needing improved transit service because of the highly transit-dependent communities in the vicinity. A Enhanced Bus/Rapid Bus component was added to all North Corridor alternatives to address this comment.

- Alternatives N-3, N-4, and N-6: The location of stations was coordinated with the municipalities located in the corridor for the Commuter rail alternative, and their comments and desires were considered in locating all potential stations. A possible alternate alignment bypassing the Greenville neighborhood was identified as a “design option” to be studied further in the next phase of project development if one of these listed alternatives is selected as the LPA.

These comments were also used to help develop goals and objectives for the North Corridor that reflected these concerns, and the alternatives were refined to make them consistent with community input.
2.2 Definition of Alternatives

The long list of alternatives was reduced to a set of five alternatives that was then evaluated in greater detail. Four “build” alternatives were recommended for further analysis, along with the Baseline Alternative. Subsequently, a fifth build alternative was recommended for study that combined elements of two of the existing alternatives. This fifth alternative is described in the sections that follow and is called N-7, not to be confused with the N-7 that was dropped during the initial analysis. Commuter rail and BRT technologies were considered and are described along with the alternatives in the sections that follow.

The five build alternatives that were studied in more detail included commuter rail (two variations), BRT, and a combination of commuter rail and BRT. These alternatives offered acceptable capital costs, good linkage of centers, minimum displacements, and equitable service. They also appeared to offer opportunities for TOD to serve transit-dependent populations. They presented no fatal flaws, thus meeting all of the criteria established for the initial analysis.

The alternatives were given designations wherein the letter indicates the corridor (N for North) and the number represents a particular alternative in that corridor. The 2025 No-Build alternative was designated as “1,” and the TSM alternative as “2”. The Build alternatives in each corridor start at “3”. After this numbering system was developed, it was decided to proceed with a single Baseline alternative rather than separate No-Build and TSM alternatives. For consistency, the numbering was not changed. The new Baseline alternative is “1,” there is no alternative “2,” and “3” and higher designate the Build alternatives.

In the North Corridor, there are three commuter rail technology options: an 11-station option using conventional diesel-powered engine-hauled commuter rail technology (Alternative N-3) and a 17-station option, which would use DMU technology (Alternative N-4 and N-7). There is also a combined commuter rail and BRT technology option (Alternative N-5), a single BRT technology option (Alternative N-6), and a combined DMU plus bus on HOV lanes option (N-7).

2.2.1 Alternative N-1: Baseline Alternative

The development of the 2025 Baseline Alternative began with expanding bus services on the existing CATS bus network, assuming a continuation of current trends and adoption of the proposed service policies for the ongoing Countywide Transit Services Study. This alternative includes an increased number of transit hubs, expanded express services, and general increases in service to keep pace with passenger demand. The baseline network also includes LRT service in the South Corridor.

To minimize the number of passengers transferring in the Center City, all non-express routes serving Center City Charlotte are through-routed (individual routes are interconnected). CATS routes that are already interconnected remain unchanged. New combined routes were created for route pairs serving corridors on opposite sides of the Center City. The new through-routed bus services are limited to a round trip operating time of approximately 180 to 200 minutes. This round trip operating time was achieved by shortening selected routes to serve a series of transit hubs that are also served by a network of local bus routes that do not travel downtown. Express routes operate only during peak periods with inbound service in the morning and outbound service in the afternoon.
The baseline network consists of LRT service from Pineville to Center City, 18 trunk routes serving the Center City, four circumferential routes linking major passenger generators, 20 local routes providing local service only and 12 express routes operating to Center City. The peak period service frequencies would be:

- 15 minutes on local routes 1, 3, 7, 8 and 12
- 10 minutes on all express routes 200, 201 and 242 to 245 and on local route 11 South,
- 30 minutes on local routes 2, 4, 5, 6, 9, 10, 11 Northeast and 13 to 18 and on express routes 223, 240, 241, 280, 281 and 284, 14, 15 and 17
- 15 minutes for South Corridor LRT service
- 30 minutes on all circumferential routes
- 5 minutes on local route 367
- 10 minutes on local route 364
- 15 minutes on local routes 305 and 365
- 30 minutes on local routes 302, 309, 343 to 345, 348, 349, 363 and 369

Based on these headways and excluding paratransit vehicles, CATS' current bus fleet of 281 vehicles would increase to 562 buses plus 15 LRT vehicles in 2025.

The assumed operating speeds including stops for the bus services range from 8 mph in Center City to 20 mph in the outer suburbs. For freeway bus operations the assumed speeds range from 25 mph to 50 mph. The LRT operating speeds in the South Corridor are consistent with those assumed for the PE/EIS phase of rapid transit planning/design in this corridor.

Under the Baseline Alternative in the North Corridor there would be eight trunk routes serving the Center City, two circumferential routes linking major passenger generators, five local routes providing local service only and two express routes operating to Center City.

2.2.2 Alternative N-3: Commuter rail (11 Stations)

In this alternative, the express bus routes in the baseline alternative would be supplemented by conventional diesel-powered engine-hauled commuter rail technology on an alignment that would follow an existing rail corridor. The commuter rail alignment would begin at the proposed Multi-Modal station on West Trade Street, proceed on a new track parallel and just west of the NSRR Main Line to West 9th Street, then enter the Archer-Daniels-Midland (ADM) property on the NSRR “O” line alignment. It is assumed that the alignment would be grade-separated from the CSX line at Seaboard Street as part of a project to grade-separate the NSRR main line from the CSX line in that area. The alignment would continue along the “O” line through the Northern Towns to Mooresville. There would be eleven stations outside Center City at the approximate locations shown in Figure 2-1. Trains would be scheduled every 20 minutes during peak periods, every 60 minutes in the midday and 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 the proposed Charlotte Multi-Modal Station would be 32 minutes.

An alignment variation that replaces the service between the Brookshire Freeway and Atando Avenue would divert from the “O” Line in the vicinity of the ADM property, pass over a depressed CSX line and under the Brookshire Freeway, and join the most westerly existing track over North Tryon Street through the existing Amtrak Station. From there, this alignment variation would rejoin the “O” Line to the northern towns via the Atando junction track. This variation would include an additional station where the track crosses over North Tryon Street, which would add 10 minutes to the in-vehicle travel time between Davidson and the West Trade Multi-Modal station.

2.2.3 Alternative N-4: DMU Rail (17 Stations)

This alternative is similar to Alternative N-3 except that DMU rail technology would be used. That would allow the number of stations served outside Center City to be increased from 11 to 17 as shown in Figure 2-2. Despite the use of the higher performance DMU technology, the increased number of stations would reduce the average operating speed to 35 miles per hour, increasing the in-vehicle travel time between Davidson and the Charlotte Multi-Modal Station to 38 minutes.

2.2.4 Alternative N-5: Bus Rapid Transit on I-77 and Commuter rail

This alternative combines the DMU rail service in Alternative N-4 with a BRT service in the I-77 corridor that would have 22 stations outside Center City, as shown in Figure 2-3. The BRT all-stops service would operate between the Charlotte Transportation Center in Center City and Mooresville. The buses would follow Trade Street and North Graham Street in mixed traffic via the West Trade Multi-Modal station to an exclusive at-grade busway on Statesville Avenue. From there the busway alignment would follow LaSalle Street to enter the I-77 corridor. Between LaSalle Street and Sunset Road, the alignment is an exclusive busway on the west side of I-77. North of Sunset Road, the busway operates as shoulder bus lanes on I-77 all the way to Fairview Road in Iredell County, except for across Lake Norman where the BRT buses operate in the I-77 general-purpose lanes. From Fairview Road to Mooresville, the BRT buses operate in mixed traffic on NC-115.

Buses would be scheduled every 5 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 the Charlotte Multi-Modal Station would be 35 minutes.

Supplementing the all-stops service would be three express bus routes serving the area west of I-77. These express services follow the same routes as in the Baseline Alternative N-1 except that they use the busway once they enter the I-77 corridor. The in-vehicle express bus travel time from Davidson to the Charlotte Multi-Modal Station is 28 minutes.
Figure 2-1 Map of N-3 Alignment
Figure 2-2  Map of N-4 Alignment
Figure 2-3  Map of N-5 Alignment
2.2.5 Alternative N-6: Bus Rapid Transit on I-77

In this alternative the BRT service described in Alternative N-5 would operate alone with no commuter rail service, as shown in Figure 2-3. Additional express bus routes would replace the commuter rail service to serve the area on the east side of I-77 (see Figure 2-4).

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

After some of the initial analysis was done, variations on some of the build alternatives were proposed and called hybrid alternative N-7. The numeric sequence was followed in numbering this alternative, which is not to be confused with the original N-7 that was dropped from the long list of alternatives. This “hybrid” alternative is similar to Alternative N-5, combining the 17-station DMU alternative described in N-5 with BRT using median HOV lanes rather than shoulder lanes in the I-77 corridor. The median BRT would utilize HOV lanes to be constructed by NCDOT as part of the I-77 widening project. This BRT use of the median HOV lanes will therefore minimize the additional cost of establishing BRT service in the North Corridor. (see Figure 2-5)

The BRT alignment follows I-77, using median HOV lanes between I-277 in Center City Charlotte to Fairview Road in Mount Mourne. From Center City the buses would follow Trade Street in mixed traffic to the West Trade Multi-Modal station to the ramps to I-77. Once on I-77 the buses would merge across the general travel lanes to enter the buffer separated median HOV lanes.

Five BRT stations would be provided, four of which are recommended as off-line stations accessed by a T-ramp. The T-ramp would avoid adding time and distance required by a bus to weave in and out of the HOV lanes across three freeway lanes to serve the stations. The provision of BRT stations within the freeway median that could be served directly by buses are 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 platform or platforms and the barriers separating the other HOV lane traffic from the buses serving the stations.
Figure 2.4 Map of N-6 Alignment
Figure 2.5 Map of Hybrid Alternative N-7
2.3 Projected Ridership

Estimates of ridership on each of the alternatives were obtained from the regional travel demand model used by the Charlotte DOT. The model has previously been used in the Regional Air Quality analysis and the development of the update to the Regional Long Range Transportation Plan. The multiple travel demand model runs included combinations of alternatives from each of the four corridors being evaluated as part of this MIS process. LRT was used in the South Corridor in all of the regional packages because it is currently the subject of further evaluation in the ongoing Preliminary Engineering/DEIS project. Regional travel on both the highway and the transit systems were estimated and the evaluation of the estimates looked at both.

The range of transit estimates for each of the corridors takes into consideration that the ridership in one corridor is dependent on the transit options and alignments in that corridor as well as the connections to and similar choices in the other corridors. Additional model runs will be performed with the selected corridor alternatives subsequent to this evaluation. Further, ridership was estimated for three components (modes) of transit: base or background bus network; express bus network; and the rapid transit network of guideway or tracks.

2.3.1 Ridership Results

Table 2-4 includes the ridership estimates and other measures of the relative performance of each of the alternatives. The “Daily Guideway Boardings” are those segments of travelers’ transit trips that use the transit services operating on the guideway component of the transit system. “New System Transit Trips” measure those new trips attracted not only by the guideway improvements but also by the other service improvements in the corridor or adjoining sections of the wedges that are part of the overall corridor alternative. Therefore, an alternative’s new transit trips can be nearly equal or even exceed the alternative’s guideway boardings. “Daily Travel Time Savings” are the number of hours of personal travel time saved per day as a result of each alternative. “Transit Dependent Access” refers to the number of riders that could access the alternative based on auto ownership and age.

The most significant result of the evaluation is that all of the BRT options have higher ridership ranges than their rail counterparts. This is because of the higher level of service provided on the BRT guideway (with effective headways in the three to six minute range) and the ability of feeder/support bus routes to use the guideway to eliminate transfers and reduce travel times into the Center City.
Table 2-4. Projected Ridership and Performance Measures, 2025

<table>
<thead>
<tr>
<th>Alternatives</th>
<th>Transit Mode</th>
<th>Total Daily Boardings</th>
<th>New System Transit Trips(^2)</th>
<th>Daily Travel Time Savings (hours)</th>
</tr>
</thead>
<tbody>
<tr>
<td>N-1: Future Baseline(^1) (enhanced bus service)</td>
<td>Bus</td>
<td>3,100</td>
<td>N/A</td>
<td>N/A</td>
</tr>
<tr>
<td>N-3: Commuter rail (11-stations)</td>
<td>BRT</td>
<td>N/A</td>
<td>9,730</td>
<td>1,300</td>
</tr>
<tr>
<td></td>
<td>Rail</td>
<td>8,000-10,000</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Bus</td>
<td>13,200</td>
<td></td>
<td></td>
</tr>
<tr>
<td>N-4: DMU Rail (17 stations)</td>
<td>BRT</td>
<td>N/A</td>
<td>10,530</td>
<td>1,600</td>
</tr>
<tr>
<td></td>
<td>Rail</td>
<td>9,000-11,000</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Bus</td>
<td>13,100</td>
<td></td>
<td></td>
</tr>
<tr>
<td>N-5: BRT on I-77 &amp; Commuter Rail</td>
<td>BRT</td>
<td>16,000-17,000</td>
<td>15,130</td>
<td>2,200</td>
</tr>
<tr>
<td></td>
<td>Rail</td>
<td>4,000-5,000</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Bus</td>
<td>12,400</td>
<td></td>
<td></td>
</tr>
<tr>
<td>N-6: BRT on I-77</td>
<td>BRT</td>
<td>18,000-20,000</td>
<td>12,830</td>
<td>2,200</td>
</tr>
<tr>
<td></td>
<td>Rail</td>
<td>N/A</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Bus</td>
<td>11,400</td>
<td></td>
<td></td>
</tr>
<tr>
<td>N-7: DMU (17 station) with BRT/Express on I-77</td>
<td>HOV</td>
<td>9,000-10,000</td>
<td>11,330</td>
<td>1,500</td>
</tr>
<tr>
<td></td>
<td>Rail</td>
<td>7,000-8,000</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Bus</td>
<td>11,000</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

\(^1\)For Future Baseline, number of daily boardings on bus routes serving corridor
\(^2\)Over Future Baseline Alternative

**Origin and Destination Trips**

Another important factor in the analysis of the transit alternatives is understanding the origins and destinations of the transit trips. Center City trips are significant because they are more likely to be home-based-work trips, which are more transit-competitive than other trip types. However, intracorridor trips are also significant since the more intracorridor trips, the greater the balance of transit use along the corridor. **Table 2-5** shows the percent of corridor transit trips for the differing origin-destination markets for each alternative.

Table 2-5. Corridor Transit Trip Origin/Destinations

<table>
<thead>
<tr>
<th>Alternative</th>
<th>Percent of Corridor Transit Trips</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>To Center City</td>
</tr>
<tr>
<td>N-1: Future Baseline(^1) (enhanced bus service)</td>
<td>23%</td>
</tr>
<tr>
<td>N-3: Commuter rail (11-stations)</td>
<td>15%</td>
</tr>
<tr>
<td>N-4: DMU Rail (17 stations)</td>
<td>25%</td>
</tr>
<tr>
<td>N-5: BRT on I-77 &amp; Commuter Rail</td>
<td>16%</td>
</tr>
<tr>
<td>N-6: BRT on I-77</td>
<td>15%</td>
</tr>
<tr>
<td>N-7: DMU (17 station) with BRT/Express on I-77</td>
<td>15%</td>
</tr>
</tbody>
</table>

*Includes trips to other corridors and areas outside of the corridors
As seen in the above table, most of the build alternatives in the North Corridor have between
15 and 25 percent of their trips serving the Center City and between 38 and 43 percent of
their transit trips beginning and ending in the corridor. In all Build alternatives, almost half of
the transit trips are to areas other than the corridor and the Center City.

2.3.2 Mobility Consequences

Future Baseline

Under Future Baseline conditions, transit service expands somewhat in terms of geographic
coverage, to serve new population and employment growth in presently unserved parts of
the corridor. The new services are typically feeders or local-area circulators that enable
residents and employees to access existing line-haul or express routes such as the 77X. Where
travel demand forecasts indicate a need, existing service is increased to accommodate growth of demand.

This type of service expansion is necessary to maintain transit’s market share and degree of accessibility. To the extent the expansion can be coordinated with development plans it can assist in promotion of transit oriented development and other techniques to improve regional mobility. However, in the absence of fixed guideways and other evidence of permanent commitment to transit service, its ability to assist in TOD is limited. With most of the transit service on general-purpose streets and highways, schedule speeds will not be competitive relative to private autos. Therefore, except for the few situations where preferential treatment can exist, such as the existing Independence Boulevard service in the SE Corridor, transit’s attractiveness as an alternative to private auto use will be quite limited.

Build Alternatives

General Observations. All of the Build alternatives attract more riders than the Future Baseline, and individual trip lengths appear somewhat longer in many cases. This probably reflects the fact that with the improvements in transit provided by the Build alternatives, more origin-destination pairs are accessible by transit, especially for longer, inter-corridor or corridor-to-wedge trips.

In general, BRT provides a one-seat ride for more users than the rail modes, although transfer rates for all Build alternatives appear to be higher than for the Future Baseline. This probably reflects the fact that more users find transit more attractive in the Build alternatives despite the transfer.

Alternative N-3: Commuter rail (11-station option). The 11-station commuter rail alternative would improve transit travel times noticeably in the trip to Center City Charlotte from the northern Mecklenburg towns. However, the market for this journey is only a portion of the corridor, and the need to drive to the train station will cause many prospective rail riders to consider remaining in their cars and using I-77. Improvements in inter-corridor connections and corridor-to-wedge services, however, will increase overall accessibility and transit usage. As one measure of the overall increase in service, 50% more buses are required in North Corridor operations to provide the service programmed to go with Alternative N-3. Average weekday number of transit trips in the corridor increases by 6,600.

Two impacts of transit operations on general traffic in the corridor warrant discussion. First, the large number of grade crossings along the Norfolk Southern “O” Line in the North
Corridor will require special treatment, and may cause a minor inconvenience to those having to cross the tracks. It is intended that a number of minor crossings may be closed and consolidated. This will cause drivers to have to take a slightly longer path to reach their destinations, but they will be safer since the remaining crossings will be protected by automatic gates. Slight delays are also to be expected at the few major streets that cross the tracks, since the gates will stop traffic four times hourly in the peak periods.

Second, localized traffic congestion is likely to occur around stations with major park-and-ride facilities at certain times, limited to just prior to inbound morning train arrival times and just after outbound evening train arrivals. Stations with major parking facilities will be sited, where possible, away from the traditional town centers on greenfield sites, and careful station area planning will be applied to mitigate the impacts of traffic. Mitigation plans will be developed during the environmental phase of the study.

Rail transit service will also affect freight rail operations in the corridor. Although locomotive-hauled coaches as intended for this alternative are Federal Railway Administration (FRA)-compliant and thus capable of sharing the track with freight, the nature of the switching operations that occur on the “O” Line are not really compatible with the headways proposed for peak-hour commuter services. Thus, freight service would have to operate in the off-peak times, and it may be necessary to schedule deliveries to some customers during night hours.

Alternative N-4: DMU Rail (17-Station Option). Impacts of the 17-station rail alternative using diesel multiple units (DMU) are generally the same as for Alternative N-3. However, six additional stations are part of this alternative, most of them closer to Center City Charlotte than those in the 11-station alternative. New ridership of 7,400 (average weekday trips) is a slight increase over N-3, and the increase in bus fleet is only half that required for N-3. Walk-in access is more important in the close-in station areas.

Since the operating plan is the same for N-4 and N-3, the impacts on highway and street traffic are generally similar. One exception would be at crossings next to stations which exist only in the 17-station option; trains would be operating at slower speeds approaching and departing stations than when the stations do not exist, so crossing gates will be in lowered position for slightly longer. This is most likely to affect traffic on Sam Furr Road, 28th Street / Moretz and Atando Avenue at North Graham Street.

Alternative N-5: BRT on I-77 and 11-Station Commuter rail. The combination of BRT and commuter rail service using conventional diesel locomotives, is accessible to more people than the rail-only options, and N-5 attracts 12,000 new average weekday trips. By far the majority of these are attracted to the BRT services; commuter rail attracts fewer riders than even in N-3. This is a result of the much greater frequency of BRT service, which operates as often as every three minutes where demand warrants. (By contrast, commuter rail service at best would run every 15-20 minutes for limited peak periods).

About one third of the BRT users reach the BRT stations by auto, which suggests that some local area congestion may occur in the vicinity of stations. However, BRT vehicles will arrive much more frequently and carry fewer passengers each than trains, so the net effect will be attenuated.

Some minor interference with the flow of general vehicular traffic may occur in the vicinity of BRT park-and-ride lots and stations at I-77 ramps, depending on actual locations. If BRT
operates in the shoulder lanes, continuing the shoulder operation on the off-ramps will help mitigate the interference, as will creation of cut-outs for buses to stop on the on-ramps out of the flow of on-bound general traffic. Preferential treatment of buses at the diamond interchange intersections may have to be minimal in order not to unduly restrict auto flows, but this must be balanced against person-per-hour flow rates that can be achieved by preferential treatment for buses. Detailed traffic analyses and mitigation plans will be developed in the next phase of project development.

Impacts of the commuter rail service will be similar to those for Alternative N-3, but on a somewhat smaller scale due to lower ridership.

Alternative N-6: BRT on I-77. Alternative N-6 is BRT only, and it attracts 9,700 new average weekday trips to transit in the corridor. This is slightly higher than Alternative N-5, reflecting primarily substitution of BRT for rail by commuters for whom rail is not an option in this alternative. In general, the impacts of this alternative are similar to N-5.

Alternative N-7: BRT (in HOV lanes) on I-77 and 17-DMU. The BRT option in this alternative operates in the median HOV lanes on I-77. As a result, on-line stations must be located in the median, where passengers will access them by pedestrian bridges above the freeway. Buses will enter I-77 with the general traffic and work their way to the HOV lanes. Effectively, this results in the BRT performing relatively well in the suburbs-to-Center-City trips, but not providing very good access for inter-suburban trips or those within the city of Charlotte but not having one trip end in Center City. New transit trips are estimated as slightly more than for the commuter rail alternatives but less than for BRT in the shoulder lanes on I-77.

The buses weaving across the general traffic lanes on I-77 to access or leave the HOV lane poses a slightly increased safety hazard and may impede general traffic slightly more than the shoulder lane operation. These drawbacks must be balanced against the relatively low capital cost of the alternative.

The DMU rail operations have essentially the same impacts as in N-4, but are somewhat diminished since rail boardings in N-7 are estimated at approximately 75% of N-4.

2.4 Capital and Operating & Maintenance Costs

A major factor in determining the effectiveness of the proposed transit investments is the cost of the project. Long term financial plans include both the costs associated with building the project (capital costs) and also the annual expense of running a transit system (operating and maintenance costs).

2.4.1 Capital Costs

Rail and bus capital costs were estimated by establishing unit costs, adjusted for local conditions, to apply to each typical section developed according to the basic design specifications for the technology to be used in each corridor. Alignments were laid out and typical sections identified for the full length of each line. Private property acquisitions needed for transportation purposes were mapped and their square footage estimated. Individual parcels were not counted. Right-of-way costs were developed by using the
average square-foot costs for the vicinity and type of land use involved. Quantities were then developed, and the cost per running foot for each typical section was applied, to establish the cost of trackwork, structures, etc.\(^1\) Lump sum costs per station and for the yard and shop complex were developed, and costs per track foot were established for electrical and other systems. The operating plan, adjusted to reflect ridership forecasts, was used to determine rolling stock (buses, train cars) requirements. Contingencies for each cost category, appropriate to the level of uncertainty for that category, were applied to the basic construction cost estimates. “Soft costs,” including design, construction management, start-up, insurance, and agency administrative costs, were estimated as a percent of construction costs.

Capital costs includes a rolled up sum of the following elements:

- **Guideway Elements** - Drainage, subgrade, retaining walls, aerial structures, subway structures, trackwork (for rail), paving (for BRT)
- **Storage and Maintenance Facilities** – Vehicle storage and maintenance buildings, trackwork for rail vehicle storage, maintenance of way facilities, office support areas, major shop equipment, operations control center. Expansion of bus facilities if needed.
- **System Elements** - Signals and control systems, grade crossing protection, communications, electrification, fare collection equipment.
- **Stations** - Station buildings, platforms and canopies, station parking and driveways
- **Vehicles** – Revenue and non-revenue vehicles (rail and bus). BRT, LRT, Commuter rail or DMU transit vehicles based on current market rates.
- **Special Conditions** - Allowances for utilities relocation, demolition, roadway modifications, environmental mitigation
- **Right of Way** – Costs of buying land that is required for the various transit build alignments. Land acquisition, relocation, permanent and temporary easements, business damages
- **“Soft” Costs** - Engineering, project management, project insurance, agency project administration costs

**Table 2-6** summarizes and compares the estimated capital costs by category for each alternative. A description of each category is described above. The table shows that N-5 has the highest capital costs, estimated at $427 million. But this is largely because the alternative is a combination of two modes, BRT and commuter rail. N-6 with BRT on I-77 has the lowest costs which is estimated at $177 million.

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\(^1\) Quantity take-offs refers to the process of quantifying a project element by a designated measurement, i.e. linear feet of double track rail.
Table 2-6. Summary of Estimated Capital Costs by Alternative

<table>
<thead>
<tr>
<th>Capital Cost Item</th>
<th>CR</th>
<th>DMU</th>
<th>BRT</th>
<th>CR</th>
<th>Total</th>
<th>BRT</th>
<th>BRT</th>
<th>DMU</th>
<th>Total</th>
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<tr>
<td>Guideway Elements</td>
<td>$72</td>
<td>$72</td>
<td>$58</td>
<td>$72</td>
<td>$130</td>
<td>$58</td>
<td>N/A</td>
<td>$72</td>
<td>$72</td>
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<td>Storage &amp; Maint. Facilities</td>
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<td>$2</td>
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<td>$7</td>
<td>$6</td>
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<td>System Elements</td>
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<td>$9</td>
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<tr>
<td>Vehicles</td>
<td>$38</td>
<td>$46</td>
<td>$25</td>
<td>$38</td>
<td>$63</td>
<td>$28</td>
<td>$5</td>
<td>$46</td>
<td>$56</td>
</tr>
<tr>
<td>Special Conditions</td>
<td>$16</td>
<td>$16</td>
<td>$8</td>
<td>$16</td>
<td>$24</td>
<td>$8</td>
<td>$0.3</td>
<td>$16</td>
<td>$16</td>
</tr>
<tr>
<td>Right-of-Way</td>
<td>$30</td>
<td>$31</td>
<td>$29</td>
<td>$30</td>
<td>$59</td>
<td>$5</td>
<td>$5</td>
<td>$31</td>
<td>$36</td>
</tr>
<tr>
<td>Soft Costs</td>
<td>$49</td>
<td>$54</td>
<td>$37</td>
<td>$49</td>
<td>$86</td>
<td>$37</td>
<td>$12</td>
<td>$54</td>
<td>$65</td>
</tr>
<tr>
<td><strong>TOTAL</strong></td>
<td><strong>$230</strong></td>
<td><strong>$251</strong></td>
<td><strong>$197</strong></td>
<td><strong>$230</strong></td>
<td><strong>$427</strong></td>
<td><strong>$177</strong></td>
<td><strong>$55</strong></td>
<td><strong>$251</strong></td>
<td><strong>$307</strong></td>
</tr>
</tbody>
</table>

Numbers may not sum to total due to rounding

2.4.2 Operating and Maintenance Costs

Operating and Maintenance (O&M) costs were estimated by using the resource build-up cost approach favored by the FTA. The bus cost model was based on CATS’ actual operating experience. The Independent variables for the bus O&M model are peak vehicles, platform hours, vehicle revenue miles, and unlinked passenger trips.

The commuter rail cost O&M model uses commuter rail cost data as documented in the National Transit Database (NTD) for four U.S. commuter rail properties: Virginia Railway Express, Trinity Railway Express (Dallas-Ft. Worth), Tri-Rail (South Florida), and MARC (Maryland). These are all "purchased" operations (that is, not directly operated by the owner), so the level of data collected is limited. Variables are vehicle-hours, vehicle-miles, and peak vehicles.

The DMU rail cost O&M model assumes that a DMU train can be operated by a single crew person, much the same as an LRT train. The DMU model generally assumes the LRT model’s labor and materials costs for comparable cost categories, except for a few specific items, such as fuel cost, that would be expected to be quite different. Fuel cost was taken from builder’s specifications and other categories modified using professional judgment.

Operating statistics for the Future Baseline and Build Transit Network were derived from the Visum based network model.
Table 2-7. Operating Statistics by Alternative

<table>
<thead>
<tr>
<th>Alternative Number</th>
<th>Mode Type</th>
<th>Total Peak Vehicles</th>
<th>Total Vehicle Hours</th>
<th>Total Vehicle Miles</th>
<th>Route Direction Miles</th>
</tr>
</thead>
<tbody>
<tr>
<td>N-1</td>
<td>Bus</td>
<td>69</td>
<td>231,000</td>
<td>3,535,000</td>
<td>451</td>
</tr>
<tr>
<td></td>
<td>Rail</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>N-3</td>
<td>Bus</td>
<td>103</td>
<td>338,000</td>
<td>5,040,000</td>
<td>691</td>
</tr>
<tr>
<td></td>
<td>Rail</td>
<td>10</td>
<td>32,000</td>
<td>1,042,000</td>
<td>57</td>
</tr>
<tr>
<td>N-4</td>
<td>Bus</td>
<td>87</td>
<td>322,000</td>
<td>5,482,000</td>
<td>694</td>
</tr>
<tr>
<td></td>
<td>Rail</td>
<td>14</td>
<td>37,000</td>
<td>1,141,000</td>
<td>57</td>
</tr>
<tr>
<td>N-5</td>
<td>Bus</td>
<td>108</td>
<td>408,000</td>
<td>7,958,000</td>
<td>688</td>
</tr>
<tr>
<td></td>
<td>Rail</td>
<td>4</td>
<td>17,000</td>
<td>465,000</td>
<td>57</td>
</tr>
<tr>
<td>N-6</td>
<td>Bus</td>
<td>115</td>
<td>418,000</td>
<td>8,312,000</td>
<td>753</td>
</tr>
<tr>
<td></td>
<td>Rail</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>N-7</td>
<td>Bus</td>
<td>97</td>
<td>379,000</td>
<td>7,533,000</td>
<td>752</td>
</tr>
<tr>
<td></td>
<td>Rail</td>
<td>6</td>
<td>26,000</td>
<td>703,000</td>
<td>57</td>
</tr>
</tbody>
</table>

Table 2-7 shows the annual operating statistics that apply for bus and rail type services in the various project alternatives. These data are based on the service policies summarized in Table 2-8 with adjustments in frequency of service on bus routes projected to have lower ridership. Alternative N-1 or future baseline does not include major capital investment and assumes much lower service levels. The total number of total annual vehicle service hours, which includes garage pull-outs and an allowance for extra service when required, varies from a low of 231,000 hours in N-1 and 359,000 hours in N-4, the minimum build alternative to a high of 425,000 hours in N-5, the maximum build alternative. Alternative N-5 includes both a DMU service and BRT and thus has more combined service hours than either rail alternatives N-3 (CR only) and alternative N-4 (DMU only) or alternative N-6 (BRT only). In terms of the service provided to the public, expressed in the number of revenue miles of service and directional route miles, the “best” alternatives are Alternative N-6 (BRT only) at 8.3 million annual miles and 753 directional miles of service and Alternative N-5 (BRT/DMU) at 8.4 million annual miles and 745 directional miles of service.

Table 2-8. Transit Service Characteristics

<table>
<thead>
<tr>
<th>Mode</th>
<th>Span of Service</th>
<th>Days of Operation</th>
<th>Headways</th>
<th>Train Consists</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>Peak</td>
<td>Midday</td>
</tr>
<tr>
<td>CR</td>
<td>20 Hours</td>
<td>7 days/week</td>
<td>20</td>
<td>60</td>
</tr>
<tr>
<td>DMU</td>
<td>20 Hours</td>
<td>7 days/week</td>
<td>30-15</td>
<td>60-20</td>
</tr>
<tr>
<td>BRT</td>
<td>20 Hours</td>
<td>7 days/week</td>
<td>5</td>
<td>10</td>
</tr>
<tr>
<td>Bus Network</td>
<td>Varies</td>
<td>Varies</td>
<td>60-5</td>
<td>60-30</td>
</tr>
</tbody>
</table>
Table 2-9 shows the annual operating and maintenance costs that apply for bus and rail type services in the various project alternatives. The Future Baseline (N-1) is estimated only for improvements in this corridor.

Table 2-9. Summary of Operating and Maintenance Costs by Alternative

<table>
<thead>
<tr>
<th>Cost Categories</th>
<th>Mode/Range Type</th>
<th>Incremental Cost by Alternative in Millions</th>
<th>N-1</th>
<th>N-3</th>
<th>N-4</th>
<th>N-5</th>
<th>N-6</th>
<th>N-7</th>
</tr>
</thead>
<tbody>
<tr>
<td>Vehicle Operation Costs</td>
<td>Bus</td>
<td></td>
<td>$7.8</td>
<td>$3.9</td>
<td>$3.2</td>
<td>$6.7</td>
<td>$7.1</td>
<td>$5.6</td>
</tr>
<tr>
<td></td>
<td>Rail</td>
<td></td>
<td>N/A</td>
<td>$5.0</td>
<td>$2.3</td>
<td>$1.0</td>
<td>N/A</td>
<td>$1.6</td>
</tr>
<tr>
<td>Maintenance Costs</td>
<td>Bus</td>
<td></td>
<td>$3.0</td>
<td>$1.6</td>
<td>$1.0</td>
<td>$3.0</td>
<td>$3.3</td>
<td>$1.8</td>
</tr>
<tr>
<td></td>
<td>Rail</td>
<td></td>
<td>N/A</td>
<td>$3.4</td>
<td>$8.5</td>
<td>$5.4</td>
<td>N/A</td>
<td>$6.4</td>
</tr>
<tr>
<td>General Administration Cost Estimates</td>
<td>Bus</td>
<td></td>
<td>$4.4</td>
<td>$2.2</td>
<td>$1.3</td>
<td>$2.8</td>
<td>$3.2</td>
<td>$2.0</td>
</tr>
<tr>
<td></td>
<td>Rail</td>
<td></td>
<td>N/A</td>
<td>$2.1</td>
<td>$1.1</td>
<td>$0.3</td>
<td>N/A</td>
<td>$0.5</td>
</tr>
<tr>
<td>Total Operating and Maintenance Cost Estimates</td>
<td>Bus</td>
<td></td>
<td>$15.2</td>
<td>$7.7</td>
<td>$5.5</td>
<td>$12.4</td>
<td>$13.5</td>
<td>$9.4</td>
</tr>
<tr>
<td></td>
<td>Rail</td>
<td></td>
<td>N/A</td>
<td>$10.5</td>
<td>$11.9</td>
<td>$6.7</td>
<td>N/A</td>
<td>$8.5</td>
</tr>
<tr>
<td>Total O&amp;M Cost</td>
<td></td>
<td></td>
<td>$15.2</td>
<td>$18.2</td>
<td>$17.4</td>
<td>$19.1</td>
<td>$13.5</td>
<td>$17.9</td>
</tr>
</tbody>
</table>

Numbers may not sum to total due to rounding.

The data in the Table show that the O&M cost of all the build alternatives is more than twice that of the future baseline except for Alternative N-6, which is just over 80% higher than the future baseline cost. Alternative N-6 is the only alternative without a rail component and comparing it to the other build alternatives shows that generally speaking the additional O&M cost of the rail component is more than that of the consequent saving in the bus component O&M costs.
3 AFFECTED ENVIRONMENT AND CONSEQUENCES

Chapter Summary

This chapter lists the transportation, land use and environmental data for the various Commuter rail and BRT alternatives that are used to evaluate the alternatives in chapter 4.

One of the goals of the North Corridor MIS is to preserve and protect the environment. Therefore, each of the alternatives identified in the screening process described in Chapter 2 was studied in more detail to identify substantive environmental issues and concerns that may affect the pending decision on the selection of a preferred alternative. This analysis is not a technical assessment of all the environmental conditions in the corridor, but rather a screening to highlight issues that will be important in the MIS decision process, and to provide information that facilitates a comparison between the proposed alternatives to occur.

The information contained in this chapter will contribute to the evaluation of alternatives and the selection of a LPA. Future development of the preferred investment strategy will require environmental review consistent with the NEPA. This chapter summarizes the results of the analysis. Thirteen specific impact areas have been analyzed as described in the sections that follow.

3.1 Transportation

Future year (2025) traffic analysis was performed for all intersections discussed in the Existing Conditions section of this report. The analysis of morning and evening peak hour traffic volumes at each intersection under existing conditions was conducted using existing turning movement volumes for each intersection approach. The existing conditions turning movements were based on traffic counts obtained by the City of Charlotte. Forecast year 2025 turning movements were estimated by applying growth factors as determined from a comparison of 2000 and 2025 traffic model assignments. Forecast year freeway traffic volumes were also estimated based on applying the growth between the 2000 and 2025 freeway traffic model assignments.

The analysis of 2025 conditions for the future baseline and other build alternatives under consideration assumed that planned and programmed highway, intersection and other improvements are in place by 2025. Major improvements assumed to be in place for the future baseline condition by 2025 are as follows:

- I-85 is widened from 4-lanes to 8-lanes between University City Boulevard (north of Exit 43) and Speedway Boulevard (Exit 49) and from 4-lanes to 6-lanes north of Speedway Boulevard (Exit 49) to Poplar Tent Road (Exit 52),
- Beatties Ford Road will be a continuous 4-lane section between W. Trade to Lakeview Road,
- Old Statesville Road (NC-115) will be widened to 4-lane from US-21 to I-485,
• Statesville Avenue/ Road (US-21) will be a 4-lane section from I-85 north to Catawba avenue,
• W.T. Harris, between I-77 and Vance will be a 6-lane section,
• I-485 is assumed to be completed and in operation,
• I-77 is widened to 8-lanes north of I-85 and HOV lanes in place, and
• South Corridor LRT is in place

3.1.1 Future Baseline Conditions
Future year analysis results are tabulated in Table 3-1. I-77 is expected to be operating at overwhelming congested conditions during both the morning and evening peak hours.

Table 3-1. Year 2025 Future Baseline Freeway LOS Analysis Results

<table>
<thead>
<tr>
<th>Freeway Segment</th>
<th>2025 AADT</th>
<th>Total Lanes</th>
<th>V/C Ratio</th>
<th>Peak Hour LOS</th>
</tr>
</thead>
<tbody>
<tr>
<td>I-77 South of I-85</td>
<td>243,000</td>
<td>8</td>
<td>1.75</td>
<td>Overwhelming</td>
</tr>
<tr>
<td>I-77 between I-85 and NC-150</td>
<td>108,000-253,000</td>
<td>8</td>
<td>1.47-2.63</td>
<td>Overwhelming</td>
</tr>
</tbody>
</table>

Table 3-2 lists the major roadways (arterials) in the study area and their 2025 future baseline operating conditions. Capacity analysis was performed using the same methodology as was used for the existing conditions analysis.

Future travel conditions on these major arterials are expected to be congested. It appears that future travel demand in the North Corridor exceeds the roadway capacity. Roadway improvements (widening) programmed in the 2025 Long Range Plan, help reduce the level of congestion on some roadways but not eliminate congestion. Even with the widening of Statesville Avenue, there is still moderate level of congestion (V/C >1.01). A short section of Beatties Ford Road, between Sunset Road and Lakeview, seems to benefit from the proposed widening.

Table 3-3 summarizes the LOS at selected intersections. Capacity analysis was performed using the same methodology as was used for the existing conditions analysis. It appears that, under the 2025 future baseline scenario, peak hour travel condition at a majority of the intersections would be severe to overwhelming (V/C ratios above 1.00).
<table>
<thead>
<tr>
<th>Roadway Segment</th>
<th>Range of 2025 AADT</th>
<th>Total Lanes</th>
<th>Critical Peak Hour LOS</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>STATESVILLE AVENUE/ROAD</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>N. Graham St to Cindy Lane</td>
<td>40,000</td>
<td>4</td>
<td>Extreme to Overwhelming</td>
</tr>
<tr>
<td>Cindy Lane to Catawba</td>
<td>8,000 – 43,000</td>
<td>4</td>
<td>Minimal to Moderate</td>
</tr>
<tr>
<td><strong>OLD STATESVILLE AVENUE</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Statesville Rd to W.T. Harris</td>
<td>28,000 – 32,300</td>
<td>4</td>
<td>Severe</td>
</tr>
<tr>
<td>W.T. Harris to Hucks Road</td>
<td>17,200 – 19,600</td>
<td>4</td>
<td>Minimal to Moderate</td>
</tr>
<tr>
<td>Hucks Road to I-485</td>
<td>23,400 – 26,700</td>
<td>4</td>
<td>High to Severe</td>
</tr>
<tr>
<td>Gilead Rd to Catawba Ave</td>
<td>12,100 – 18,700</td>
<td>2</td>
<td>Extreme to Overwhelming</td>
</tr>
<tr>
<td><strong>MAIN STREET</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Catawba Ave to Davidson St</td>
<td>15,000</td>
<td>2</td>
<td>Severe to Extreme</td>
</tr>
<tr>
<td>Davidson St to Griffith St</td>
<td>11,000 – 14,000</td>
<td>2</td>
<td>Overwhelming</td>
</tr>
<tr>
<td>Griffith St to Iredell Co. Line</td>
<td>5,700 – 6,000</td>
<td>2</td>
<td>Minimum</td>
</tr>
<tr>
<td><strong>BEATTIES FORD ROAD</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>W. Trade St to I-77</td>
<td>25,800</td>
<td>4</td>
<td>Moderate</td>
</tr>
<tr>
<td>5th St to Brookshire Freeway</td>
<td>22,300</td>
<td>4</td>
<td>Moderate</td>
</tr>
<tr>
<td>Brookshire Frwy to Oaklawn Ave</td>
<td>40,000</td>
<td>4</td>
<td>Overwhelming</td>
</tr>
<tr>
<td>Oaklawn Ave to LaSalle St</td>
<td>28,000</td>
<td>4</td>
<td>Moderate</td>
</tr>
<tr>
<td>LaSalle St to Cindy Lane</td>
<td>36,000</td>
<td>4</td>
<td>Severe to Extreme</td>
</tr>
<tr>
<td>Cindy Lane to Sunset Rd</td>
<td>25,200</td>
<td>4</td>
<td>High</td>
</tr>
<tr>
<td>Sunset Rd to Lakeview Rd</td>
<td>13,300</td>
<td>4</td>
<td>Minimal</td>
</tr>
<tr>
<td><strong>NORTH GRAHAM STREET</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>I-277 to Statesville Ave</td>
<td>64,000</td>
<td>4</td>
<td>Overwhelming</td>
</tr>
<tr>
<td>Statesville Ave to Craighead Rd</td>
<td>30,000 – 37,200</td>
<td>4</td>
<td>Extreme to Overwhelming</td>
</tr>
<tr>
<td>Craighead to Sugar Creek Rd</td>
<td>25,800 – 31,500</td>
<td>4</td>
<td>Severe</td>
</tr>
<tr>
<td><strong>W. T. HARRIS BOULEVARD</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Statesville Rd to I-77</td>
<td>25,600 – 43,200</td>
<td>4</td>
<td>High to Overwhelming</td>
</tr>
<tr>
<td>I-77 to Vance Rd</td>
<td>52,400</td>
<td>6</td>
<td>Severe</td>
</tr>
</tbody>
</table>

NOTE: Level of service is defined as follows:
- <0.85=minimal, <1.01=Moderate, <1.16=High, <1.31=Severe, <1.40=Extreme, >=1.40=Overwhelming
Table 3-3. Year 2025 Future baseline Intersection Capacity Analysis

<table>
<thead>
<tr>
<th>Intersection</th>
<th>V/C Ratio</th>
<th>LOS</th>
<th>V/C Ratio</th>
<th>LOS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Statesville Ave &amp; Graham St/ Liddell St</td>
<td>1.25</td>
<td>Severe</td>
<td>2.50</td>
<td>Overwhelming</td>
</tr>
<tr>
<td>Statesville Ave &amp; LaSalle St</td>
<td>1.53</td>
<td>Overwhelming</td>
<td>1.34</td>
<td>Extreme</td>
</tr>
<tr>
<td>Statesville Ave &amp; I-85 Service Rd/ Tipton Dr</td>
<td>1.59</td>
<td>Overwhelming</td>
<td>1.60</td>
<td>Overwhelming</td>
</tr>
<tr>
<td>Statesville Rd &amp; Nevin Rd</td>
<td>1.76</td>
<td>Overwhelming</td>
<td>1.42</td>
<td>Overwhelming</td>
</tr>
<tr>
<td>Statesville Rd &amp; Old Statesville Rd/Sunset Rd</td>
<td>1.77</td>
<td>Overwhelming</td>
<td>1.79</td>
<td>Overwhelming</td>
</tr>
<tr>
<td>Statesville Rd &amp; W.T. Harris Blvd</td>
<td>1.36</td>
<td>Extreme</td>
<td>1.18</td>
<td>Severe</td>
</tr>
<tr>
<td>Beatties Ford Rd &amp; Brookshire Fwy EB ramp/French St</td>
<td>0.86</td>
<td>Moderate</td>
<td>1.85</td>
<td>Overwhelming</td>
</tr>
<tr>
<td>Beatties Ford Rd &amp; Oaklawn Ave</td>
<td>0.94</td>
<td>Moderate</td>
<td>0.71</td>
<td>Minimal</td>
</tr>
<tr>
<td>Beatties Ford Rd &amp; LaSalle St</td>
<td>1.79</td>
<td>Overwhelming</td>
<td>2.36</td>
<td>Overwhelming</td>
</tr>
<tr>
<td>Beatties Ford Rd &amp; Griers Grove Rd/Cindy Ln</td>
<td>0.93</td>
<td>Moderate</td>
<td>0.69</td>
<td>Minimal</td>
</tr>
<tr>
<td>Beatties Ford Rd &amp; Sunset Rd</td>
<td>1.36</td>
<td>Extreme</td>
<td>1.58</td>
<td>Overwhelming</td>
</tr>
<tr>
<td>Graham St &amp; 6th St</td>
<td>1.11</td>
<td>High</td>
<td>2.36</td>
<td>Overwhelming</td>
</tr>
<tr>
<td>Graham St &amp; 12th St</td>
<td>1.01</td>
<td>High</td>
<td>1.13</td>
<td>High</td>
</tr>
<tr>
<td>Graham St &amp; Dalton Ave</td>
<td>1.05</td>
<td>High</td>
<td>0.67</td>
<td>Minimal</td>
</tr>
<tr>
<td>Graham St &amp; Craighead Rd</td>
<td>1.85</td>
<td>Overwhelming</td>
<td>1.47</td>
<td>Overwhelming</td>
</tr>
<tr>
<td>Graham St &amp; I-85 Service Rd/ Cottonwood St</td>
<td>1.16</td>
<td>Severe</td>
<td>1.16</td>
<td>Severe</td>
</tr>
<tr>
<td>Graham St &amp; I-85 SB ramp</td>
<td>1.78</td>
<td>Overwhelming</td>
<td>7.02</td>
<td>Overwhelming</td>
</tr>
<tr>
<td>Graham St/Mineral Springs Rd &amp; Sugar Creek Rd</td>
<td>0.98</td>
<td>Moderate</td>
<td>5.15</td>
<td>Overwhelming</td>
</tr>
<tr>
<td>W.T. Harris Blvd &amp; Old Statesville Rd</td>
<td>2.47</td>
<td>Overwhelming</td>
<td>2.49</td>
<td>Overwhelming</td>
</tr>
<tr>
<td>Sugar Creek Rd &amp; I-85 NB ramp</td>
<td>1.58</td>
<td>Overwhelming</td>
<td>2.01</td>
<td>Overwhelming</td>
</tr>
<tr>
<td>Brookshire Blvd &amp; Mt. Holly-Huntersville Rd</td>
<td>4.27</td>
<td>Overwhelming</td>
<td>3.31</td>
<td>Overwhelming</td>
</tr>
</tbody>
</table>

NOTE: Level of service is defined as follows:

<0.85=Minimal, <1.01=Moderate, <1.16=High, <1.31=Severe, <1.40=Extreme, >=1.40=Overwhelming
3.1.2 Transportation Consequences

The build alternatives under consideration for the North Corridor are as follows:

- N-3: 11 Station Conventional Commuter Rail on NSRR
- N-4: 17 Station DMU Commuter Rail on NSRR plus BRT on I-77
- N-5: BRT on I-77 plus Conventional Commuter Rail
- N-6: BRT on I-77
- N-7: 17 Station DMU Commuter Rail on NSRR plus BUS on I-77 HOV

A preliminary evaluation was undertaken to assess the extent of traffic consequences in the corridor. This evaluation was based on three factors:

- The number of traffic lanes impacted, i.e. if any existing traffic lanes would be used to realize the particular alternative and thereby reduce roadway capacity
- The number of left turns eliminated on local through streets or at major intersections
- The number of street closures that would occur as a result of the rapid transit alternative

Rail Alternatives

The North Corridor alternatives follow either the existing Norfolk Southern rail line or the I-77 alignment. Because there is little variation in the alignment of these alternatives, the following analysis focuses on the mode rather than on a particular alternative.

In the North Corridor, there is little variation among the rail alternatives under consideration. N-3 is the commuter rail alternative with 11 stations and N-4 is DMU commuter rail Alternative with 17 stations. All rail alternatives make use of the existing NSRR right-of-way. Therefore, there is minimum impact on adjacent highways and intersections. Roadway capacity could be impacted due to signal pre-emption, high volume of turning vehicles accessing station/ park-and-ride locations, and closing and rerouting of closely spaced crossings with low traffic volume. These impacts and appropriate mitigation measures will be explored in detail in the next phase of the study.

Some street closures are proposed for the rail alternatives. These are primarily minor crossings that are closely spaced and serve a limited number of properties.

At this phase in the MIS study, impacts of rail alternatives were evaluated using guidelines provided in the ITE publication, “Light Rail Transit Grade Separation Guidelines,” March 1992. The ITE guidelines take into account the train frequency and cross street traffic volume to determine if at-grade crossing is feasible or if more detailed evaluation is required as the study progresses into the design phase. Table 3-4 lists the locations and its recommended assessment for the rail alternatives.
Table 3-4. Year 2025 At Grade Rail Crossing Feasibility

<table>
<thead>
<tr>
<th>Cross Street</th>
<th>Location</th>
<th>Peak Hour Volume</th>
<th># of Lanes</th>
<th>Volume per Lane</th>
<th>Assessment</th>
</tr>
</thead>
<tbody>
<tr>
<td>W. Trade St</td>
<td>W. of Graham St</td>
<td>1120</td>
<td>4</td>
<td>280</td>
<td>Feasible</td>
</tr>
<tr>
<td>5th St</td>
<td>W. of Graham St</td>
<td>1290</td>
<td>4</td>
<td>325</td>
<td>Feasible</td>
</tr>
<tr>
<td>Statesville Ave</td>
<td>N. of Graham St</td>
<td>2060</td>
<td>4</td>
<td>515</td>
<td>Needs Further Evaluation</td>
</tr>
<tr>
<td>Gibbon Rd</td>
<td>W. of Sugar Creek Rd</td>
<td>940</td>
<td>2</td>
<td>470</td>
<td>Feasible</td>
</tr>
<tr>
<td>Nevin Rd</td>
<td>E. of Gibbon Rd</td>
<td>1030</td>
<td>2</td>
<td>515</td>
<td>Needs Further Evaluation</td>
</tr>
<tr>
<td>David Cox Rd</td>
<td>E. of Old Statesville Rd</td>
<td>270</td>
<td>2</td>
<td>135</td>
<td>Feasible</td>
</tr>
<tr>
<td>Hucks Rd</td>
<td>E. of Old Statesville Rd</td>
<td>990</td>
<td>2</td>
<td>490</td>
<td>Feasible</td>
</tr>
<tr>
<td>Eastfield Rd</td>
<td>E. of Alexanderana Rd</td>
<td>1300</td>
<td>2</td>
<td>650</td>
<td>Needs Further Evaluation</td>
</tr>
<tr>
<td>Huntersville/ Concord Rd</td>
<td>E. of Main St</td>
<td>900</td>
<td>2</td>
<td>445</td>
<td>Feasible</td>
</tr>
<tr>
<td>Ramah Church Rd</td>
<td>E. of Old Statesville Rd</td>
<td>1380</td>
<td>2</td>
<td>690</td>
<td>Needs Further Evaluation</td>
</tr>
<tr>
<td>McCord Rd</td>
<td>E. of Old Statesville Rd</td>
<td>900</td>
<td>2</td>
<td>490</td>
<td>Feasible</td>
</tr>
<tr>
<td>Sam Furr Rd</td>
<td>E. of Old Statesville Rd</td>
<td>1630</td>
<td>2</td>
<td>815</td>
<td>Needs Further Evaluation</td>
</tr>
<tr>
<td>Main St</td>
<td>E. of Potts St</td>
<td>1620</td>
<td>2</td>
<td>810</td>
<td>Needs Further Evaluation</td>
</tr>
<tr>
<td>Griffith St</td>
<td>W. of Main St</td>
<td>2060</td>
<td>4</td>
<td>515</td>
<td>Needs Further Evaluation</td>
</tr>
<tr>
<td>Beatty St</td>
<td>W. of Main St</td>
<td>600</td>
<td>2</td>
<td>300</td>
<td>Feasible</td>
</tr>
<tr>
<td>Langtree Rd</td>
<td>W. of Main St</td>
<td>630</td>
<td>2</td>
<td>315</td>
<td>Feasible</td>
</tr>
<tr>
<td>Fairview Rd</td>
<td>W. of Mecklenburg Hwy</td>
<td>1760</td>
<td>2</td>
<td>875</td>
<td>Needs Further Evaluation</td>
</tr>
</tbody>
</table>

NOTE: Assumes 4 trains per hour

BRT Alternatives

The BRT alternatives operate on Beatties Ford Road, Statesville Avenue/Road and I-77 for a majority of the alignment. On the interstate highway, addition of BRT buses does not adversely impact freeway operations because, as discussed in the earlier section, I-77 is already projected to be congested by 2025 and the buses would operate on shoulders. Operation of BRT buses on I-77 brings up the potential issue of safety as buses accelerate and decelerate as they approach entry/exit ramp gore areas and ramp terminals at the interchanges. Adequate signage and roadway markings are required for safe and efficient operations at these locations.

The addition of BRT buses would have some impact on adjacent roadways where they are assumed to run on exclusive/guided busway; these impacts would occur because of street and access closures. In the northern part of Mecklenburg County, BRT buses are assumed to operate in mixed-flow traffic and are not expected to have a significant effect at intersections and arterial roadways. BRT buses are assumed to operate on exclusive/guided busway along some sections on Statesville Avenue, between North Graham Street and LaSalle Street. A detailed review of impacts in the vicinity of Callahan Street and Woodward Avenue should be conducted in the next phase of the study.
In the North Corridor there are two alternatives that use commuter rail along with BRT. As discussed in the earlier section of the report, N-5 uses commuter rail with BRT on I-77. Alternative N-7 proposes the use of DMU commuter rail with BRT making use of the I-77 HOV lanes currently under construction. Because these alternatives propose the use of the existing NS rail line and the existing I-77 freeway, additional ROW taking and other traffic effects would be minimal. BRT has the potential to cause greater traffic disruption compared to commuter rail because BRT would be operating at frequent headways (4 to 5 minutes) as compared to 15-minute rail headways. The operation of commuter rail and BRT would have some impact on traffic because of access control at certain locations, frequent BRT stops (especially without bus bays) signal pre-emption/priority, high volume of turning vehicles accessing station/park-and-ride locations, and closing and rerouting of closely spaced crossings with low traffic volume. These impacts and appropriate mitigation measures will be explored in detail in the next phase of the study.

3.2 Land Use and Economic Activity

The intent of this section is to gain an understanding of each alternative’s existing and future development potential. The approach is designed to provide an understanding of the current conditions for the alternatives and the development potential within one-half mile radius of the candidate stations. The methodology for determining the development potential is summarized. Finally, the land use consequences of each alternative are documented, and a comparison of the alternatives is provided. The result of these analyses is intended to help rate the strengths of each alignment’s land use potential in support of a Locally Preferred alternative for the North Corridor.

3.2.1 Existing and Future Development Potential by Alternative

As part of the MIS process, the land use consultants analyzed the development or redevelopment potential of each alternative by studying the half-mile area surrounding each candidate station. Such an analysis provides the best gauge of how well each alternative may meet the goals of serving a high proportion of existing development, as well as attracting a high proportion of expected future corridor growth.

Differences of “2025 Station Area Development Potential” Data from the Official CDOT “Trends” Forecasts

The quantification of potential land use changes for each alternative presented in this section stems from work specific to this MIS and does not constitute any official forecast or set of growth projections. Consequently, these estimates are not used for other MIS related processes, such as estimation of ridership, which must be based on officially adopted forecasts. In Charlotte-Mecklenburg, the allocation of land uses, population, and employment are the 2025 “trends” forecasts that the Charlotte Department of Transportation (CDOT) prepared in 2001.

When developing the trend forecasts, CDOT staff participated in a projections process that included staff from the CMPC, and the other local jurisdictions. The trends projections had to be based on control totals for the region, policies in place, current zoning, and other factors that limit the conditional aspects of projections to a minimum. The official distribution of future household and job growth within each Corridor had to take into account the overall
distribution of jobs and growth within the region. Arbitrary allocations of growth to specific locations were precluded by “zero sum” assumptions used and the technique by which overall control totals would be “disaggregated” to local areas.

In contrast, the assessment in this MIS report was not as constrained and could assume optimal policy, financial, and regulatory conditions for transit-related development. This included assuming that all station areas would have appropriate zoning to allow the uses and intensities needed to meet the land use goals of the MIS. Furthermore, in redevelopment areas, where current market demand to build new housing or employment space is weak, the consultants assumed implementation of all key public sector interventions needed to attract private sector investments in transit-oriented development.

Consequently, while official projections were used to estimate existing (year 2000) households and jobs around candidate stations, all 2025 conditions, referred to in the following land use sections are estimates generated in this report.

Methods Used to Estimate Future Development Potential by Alternative:

Each of the alternatives varies in the total potential year 2025 households and jobs located within ½ mile of the candidate stations associated with that alternative. These differences stem from a variety of factors including, number of stations, amount of existing development, land available for future development or redevelopment, uses and intensities appropriate to the specific location, established long term policies and foreseeable market demand for such uses.

Since the Baseline Alternative is not an actual alignment but rather improvements to the existing bus service to be implemented by 2025, it was not necessary to include it in the evaluation of the land use benefits of the alternatives. In general, the Baseline Alternative will deliver improved transit service and improved circulation. However, this alternative does not significantly contribute to specific growth plans, nor is it expected to have direct impacts on land uses or zoning.

To estimate the potential 2025 land use benefits around the candidate stations for each alternative the MIS, land use consultants used the following process.

- Through an initial “opportunities and constraints” analysis, the land use consultants estimated the total potential capacity for development and redevelopment around each station for each alternative. Figure 3-1 is the opportunities and constraints summary for the candidate station at Verhoeff Drive. This illustrates how existing conditions and the designation of development or redevelopment “opportunity sites” were documented for each candidate station. Figure 3-2, Station and Opportunity Sites, shows the overall distribution of these sites throughout the corridor along the alternative alignments.

- The next step was to divide this potential capacity among the five land categories: single family and multi-family housing, and office, retail, and “other” employment. Current land use patterns, market trends, and established local plans or committed projects all influenced the land uses and their location around each station. Figure 3-3 is an example of the potential Year 2025 land use for the candidate station at Verhoeff Drive.
Figure 3-1. Example of Station Area Opportunities and Constraints Verhoeff Drive (Commuter Rail)
Figure 3-2. North Corridor Stations and Opportunity Sites
Figure 3-3. Example of Station Area Analysis 2025 Station Area Development Potential Verhoeff Drive (Commuter Rail)
Figure 3-4. Station Area Conceptual Scenario for Eastfield Road (Commuter Rail)

Note 1:
The land uses shown around the candidate stations depict only one possibility of a range of potential choices and do not constitute a "best use plan." Detailed plans and related actions (zoning, appropriate zoning) will be developed in the next phase of transit land use planning after an assessment the number and location of stations is fixed.

Note 2:
All stations will have some park and ride accommodations. The preliminary assessment of this candidate station is that the potential park and ride demand is moderate.

Steps Needed:
- Land assembly
- Reserve well sized park & ride site
- Buffer impacts of I-485 and new interchange
- Improve pedestrian access across NC 115
- Improve the Arthur Davis Road/Eastfield Road intersection (4-way stop or signalize)
- New road connection between Hucks Road and Eastfield Road to support development potential
- Extend Dobson Road to Statesville Road
• Figure 3-4 shows a more detailed station area “scenario” for the Eastfield candidate station. Such scenarios were created for a few selected stations to illustrate the potential 2025 station area programs, and to show how key urban design and pedestrian walkability objectives cited in Chapter 1 might be achieved. Most stations had more development capacity than was likely to be used by 2025. Consequently, market demand analysis was used that examined expected growth trends to determine how much new housing and employment development could reasonably be expected by 2025. This means the 2025 land use data is not “build out” data.

• Using assumed typical station area yield factors for each land use type, the presumed demand was translated into total dwelling units or jobs for each station area. These assumed yields were used for all alternatives in all four MIS corridors to ensure that the land use benefits of transit implementation could be easily compared.

• Because assessing station area potential at the MIS stage must be very preliminary, all data for jobs and households are rounded off to increments of the nearest 1,000.

Existing Development

One measures used to assess the land use benefits of each alternative is the degree to which it would serve existing households and employment within the North corridor.

Table 3-5 shows year 2000 household and employment development within one half mile of the candidate stations for the build alternatives and the proportion of existing households and employment served in the corridor by each of the alternatives. The percent calculation is based on year 2000 total households and employment from Chapter 1, Table 1-2.

2 The assumed yield factors were developed for all corridor MIS projects. The assumed yields per gross acre are: single family households = 6 dwelling units (du)/acre; multi-family = 20 du/acre; office employment = 60 employees/acre; retail employment = 25 employees/acre; other employment = 11 employees/acre.
Table 3-5 Percent of Year 2000 Development Served by North Alternatives (Within One-half Mile of Station Areas)

<table>
<thead>
<tr>
<th>Alternative</th>
<th>Households*</th>
<th>Employment*</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Total</td>
<td>Single-Family</td>
</tr>
<tr>
<td>N-3: Commuter Rail with 11 Stations</td>
<td>4,000</td>
<td>2,000</td>
</tr>
<tr>
<td></td>
<td>(11%)*</td>
<td>(5%)*</td>
</tr>
<tr>
<td>N-4: Diesel Multiple Units (DMU) Rail with 17 Stations</td>
<td>6,000</td>
<td>3,000</td>
</tr>
<tr>
<td></td>
<td>(17%)*</td>
<td>(14%)*</td>
</tr>
<tr>
<td>N-5: Bus Rapid Transit (BRT) on I-77 &amp; Commuter Rail</td>
<td>11,000</td>
<td>5,000</td>
</tr>
<tr>
<td></td>
<td>(31%)*</td>
<td>(23%)*</td>
</tr>
<tr>
<td>N-6: BRT on I-77</td>
<td>8,000</td>
<td>4,000</td>
</tr>
<tr>
<td></td>
<td>(22%)*</td>
<td>(19%)*</td>
</tr>
<tr>
<td>N-7: 17 Station Rail with BRT/Express Bus on 177</td>
<td>7,000</td>
<td>3,000</td>
</tr>
<tr>
<td></td>
<td>(19%)*</td>
<td>(14%)*</td>
</tr>
<tr>
<td>All North Corridor</td>
<td>36,000</td>
<td>21,000</td>
</tr>
</tbody>
</table>

Source: CDOT

*All data for alternatives have been rounded off to nearest increment of 1000.
**Note: Percentages are of the corridor total (bottom row of table) for each land use.

3.2.2 Consequences of Alternatives

The following sections describe the results of applying the process to each of the alternatives and compare the results to the year 2000 level of development. These sections also summarize the basic relationships of each alignment to corridor land uses, and they present the data results for each of the five basic land use categories: Single Family, Multi-Family, Office, Retail, and Other Employment. The following descriptions and discussions of the five alignments and their constituent stations highlight the 2000 to 2025 development potential for households and employment. Key stations are identified.

Alternative N-3: Commuter Rail (11 Stations)

Like all the rail alternatives in the North Corridor, this alternative uses the existing Norfolk Southern rail alignment between Center City and Mooresville. The operational needs of conventional commuter rail service limit the number of stations to less than the number cited in the 2025 Integrated Transit/Land-Use Plan. All the main centers in the four towns have stations (as does Derita which is a “town center” equivalent in the Charlotte section of the corridor).

The need to serve such town centers limits the number of additional stations that can serve the greenfield areas of the corridor. These greenfield sites are limited to key locations such as the Mount Mourne area and Hambright. The operational needs of this alternative also reduce the number of potential stations that can serve the more urban areas closer to
Center City Charlotte. Indeed, the proposed station at WT Harris is the only other Charlotte station on this alternative.

Because stabilization and infill rather than massive change is a key strategy of the adopted plans for the four town centers, the expected potential growth associated with this alternative is relatively modest except at a few stations such as Mount Mourne.

The accompanying Figure 3-5 reflects the summary differences in development potential (DP) for households and employment between 2000 and 2025 for N-3.

Figure 3-5. Alternative N3, 2000 to 2025 Development Potential Comparisons (Within One-half Mile of Station Areas)

Key stations in Alternative N-3 include:

- The town centers in Mooresville, Davidson, Cornelius
- Anchor Mills: a redevelopment site close to the Huntersville town center
- Mount Mourne: station would serve both the planned Lowe’s corporate campus and the growing Lake Norman Medical Center.
- Derita: the closest in town station that can provide a mixed-use focus for the growing Derita-Nevin area.
- Williams Street: primarily as a park-and-ride station for the Mooresville area

**Alternative N-4: DMU Rail:**

This alternative uses the same alignment as N-3 but the DMU technology permits locating more stations along the route. This permits this alternative to add several significant greenfield sites such as the one near the future I-485 and Eastfield Road, at Caldwell on the boundary between Cornelius and Huntersville and at Verhoeff Drive. Furthermore, N-4 allows adding more stations within Charlotte at the Metrolina site and at 28th and Moretz near the Druid Hills and Tryon Hills neighborhoods.

The accompanying Figure 3-6 reflects the summary differences in development potential (DP) for households and employment between 2000 and 2025 for Alternative N-4.
In addition to those cited for N-3 alternative, key stations in alternative N-4 include:

- **Metrolina**: the main redevelopment opportunity along the Charlotte section of the alignment.
- **Eastfield**: this largely greenfield station with access to both transit and I-485 offers significant high intensity mixed use TOD opportunity. These opportunities can be shared with the Hambright station.
- **Verhoeff**: provides opportunity for transit related mixed-use development and can serve the growing North Mecklenburg campus of the Central Piedmont Community College.

### Alternative N-5: Combined BRT on I-77 (Alt N-6) and Commuter Rail (Alt. N-3)

This alternative is a blend of full BRT service on I-77 with 24 stations and the 11-station commuter rail alternative N-3. The cumulative effect is to locate candidate stations at or near almost all the key activity centers in the North Corridor.

This alternative places transit close to many of the employment centers of the Charlotte section of the corridor and to the highly suburbanized commercial and employment centers at key I-77 interchanges in the four independent towns. Many of these I-77 interchange developments—e.g. at Exit 25 in Huntersville or at WT Harris— are very auto-dependent and generally developed as a collection of typical suburban style independent, free standing businesses. Although this gives this alternative a substantial base of existing and potential jobs, it raises issues regarding how these areas might acquire more of the TOD qualities advocated in Chapter 1 if transit stations were to locate at these sites.

Nevertheless, not all the I-77 related stations are committed to this type of development. Four of the candidate stations in south Iredell are not on the Interstate and would be closely associated with large planned developments (e.g., the Lowe’s corporate campus) or existing or potential town center environments. The currently developing Birkdale Village mixed use center near I-77 and NC-73 (Sam Furr Road) may also be a trend away from typical interchange development patterns toward a model more amenable to transit support. Also, the BRT stations below I-85 would be more closely related to existing urban neighborhoods such as Greenville or Druid Hills.
As a two-system configuration, this N-5 alternative also includes all the land use potential discussed in the description of N-3.

The accompanying Figure 3-7 reflects the summary differences in development potential (DP) for households and employment between the 2000 and 2025 for Alternative N-6.

Figure 3-7. Alternative N-5, 2000 to 2025 Development Potential Comparisons (Within One-half Mile of Stations)

Key stations in alternative N-5 include:

- All those cited in the description of N-3
- Kohler and Greenville: BRT stations here become attractors of residential and commercial redevelopment
- Beatties Ford: would serve as an important transfer point for bus connections to neighborhoods west of I-77; has some TOD related development potential.
- Hambright BRT: a non-interchange environment that could develop with high degree of qualitative TOD mixed use characteristics
- WT Harris BRT: would provide closest rapid transit connection to the planned regional mall and related developments near Reames road

Alternative N-6: BRT on I-77

This alternative is the sole BRT-only alternative that the MIS examined in the North Corridor.

The existing and potential employment base near N-6 candidate stations is substantial. Over time, the currently highly auto-oriented developments at many interchanges could evolve into more ideal TOD environments as the useful life of existing developments begin to diminish. But this transformation is likely to be a post-2025 phenomenon.

Without rail to improve their accessibility, many of the greenfield sites along NC-115 might be less competitive with sites along the I-77 corridor for attracting significant new residential and employment uses. Station areas such as that at Verhoeff Drive would likely be developed as typical suburban density single family housing rather than the more intensive transit-oriented uses with mixed-use employment and/or higher density housing that can be coordinated with the implementation of transit.
BRT on I-77 would likely be an added amenity for locations near candidate stations. But the market analysis done for this MIS indicates that much of the potential 2025 development around the candidate sites would, under any circumstances, likely seek locations near the Interstate.

The accompanying Figure 3-8 reflects the summary differences in development potential (DP) for households and employment between the 2000 and 2025 for Alternative N-6.

![Figure 3-8](image)

**Figure 3-8. Alternative N-6, 2000 to 2025 Development Potential Comparisons (Within one-half Mile of Stations)**

Key stations in alternative N-6 include:

- All those BRT stations cited for N-5
- Mooresville and Mount Mourne: BRT stations at these locations would assume the functions of the rail alternative stations that are part of the other North Corridor alternatives

**Alternative N-7: DMU with 17 stations with Bus on HOV Lanes on I-77**

This alternative emerged as a hybrid in the later stages of the MIS process and is a means to provide key land use benefits of Alternatives N-4 and the mobility needs of BRT on I-77 while reducing overall costs.

In effect, N-7 is a modified version of the recommendation of the 2025 Integrated Transit/Land-Use Plan. The primary land use difference between N-7 and the 2025 Integrated Transit/Land-Use Plan is in the extension of the transit system to Mooresville in South Iredell and relatively fewer stations overall along the rail alternative compared to the 2025 Integrated Transit/Land-Use Plan.

The TOD emphasis would be on the rail alignment; the BRT component of this alternative would serve the accessibility needs of many of the key activity centers along I-77. Most BRT stops would be primarily for bus transfers and there would be a very limited number of potential TOD BRT stations (4 compared to 24 in Alternative N-6). Consequently, the transit related development potential of Alternative N-7 is very similar to that of Alternative N-4.

The accompanying Figure 3-9 reflects the summary differences in development potential (DP) for households and employment between the 2000 and 2025 for Alternative N-6.
Figure 3-9. Alternative N-7, 2000 to 2025 Development Potential Comparisons (within one-half mile of Stations)

Key stations in alternative N-7 include:

- The rail stations cited for Alternative N-4
- Harris-Reames, Gilead, Stumptown and Sam Furr off the HOV lanes on I-77; these would be the only full-fledged TOD opportunities on I-77.

3.2.3 Comparison of Alternatives to Each Other

Upon documenting the potential 2025 station area land use potential for each North Corridor alternative, it became possible to compare the quantitative land use benefits for households and jobs of each alternative to the others. **Table 3-6** summarizes the year 2025 station area potential for each of the alternatives and compares these results to the year 2000 baseline estimates for each alternative. **Figure 3-10** presents these findings in a bar chart format.

**Table 3-6. Comparison of Year 2000 and Year 2025 (Potential) Development within 1/2-mile of North Candidate Stations***

<table>
<thead>
<tr>
<th>Alternative**</th>
<th>Households</th>
<th>Employment</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>2000 Total</td>
<td>2025 Total</td>
</tr>
<tr>
<td>N- 3: Commuter Rail 10 Stations</td>
<td>3,000</td>
<td>9,000</td>
</tr>
<tr>
<td>N- 4: DMU Rail 17 Stations</td>
<td>6,000</td>
<td>14,000</td>
</tr>
<tr>
<td>N- 5: BRT on I-77 &amp; Commuter Rail</td>
<td>11,000</td>
<td>32,000</td>
</tr>
<tr>
<td>N- 6: BRT on I-77</td>
<td>8,000</td>
<td>25,000</td>
</tr>
<tr>
<td>N-7: DMU + Bus on HOV on I-77</td>
<td>7,000</td>
<td>17,000</td>
</tr>
</tbody>
</table>

*Data are rounded off to the nearest increment of 1,000
** Does not include data for Center City stations.
Table 3-6 provides some of the key land use data used in the evaluation of the alternatives described below in Chapter 4 of this Summary Report. The evaluation process includes many factors and the numbers presented in Table 3-6 are combined with other qualitative evaluations to reach a decision regarding overall land use benefits. A full discussion of the evaluation for land use and other issues is contained in chapter 4. Nevertheless, it is appropriate here to highlight some of the more significant implications of Table 3-6.

- As is readily apparent, the rail alternatives differ in their land use benefits with N-4 ahead of N-3 in both added households and jobs. This difference is largely due to the seven additional stations that the DMU alternative would serve.
- Both rail alternatives serve key town centers such as Derita, Cornelius or Mooresville and the proposed Mount Mourne TOD, but the N-4 alternative picks up more potential greenfield sites such as those within the Eastfield Road and Verhoeff Drive station areas.
- N-7 is essentially the same as N-4, with the addition of four more potential TOD opportunities along the I-77 HOV lane alternative at Harris-Reames, Gilead, Stumptown, and Same Furr.
- Comparing the two full-fledged BRT alternatives to each other is not open to such simple interpretation. N-6 is a bus only alternative with 24 stations, primarily along

Figure 3-10. Comparison of 2000 and 2025 Potential Jobs and Households for North Corridor Alternatives
the I-77 corridor. The N-5 alternative does not have more BRT stations but is significantly different than N-6, primarily because it adds the N-3 commuter rail alternative.

- When comparing the N-5 and N-6 alternatives to the rail only alternatives (N-3 and N-4), the major difference is the higher amount of existing and future employment and households accessible to the BRT alignments. This is because the BRT would operate closer to large existing commercial and residential developments along I-77, which currently depend on vehicular interstate travel.
- Much potential development along the I-77 corridor is expected to occur with or without transit. [In effect, this is development that could be expected as part of the Baseline alternative.]
- In contrast, it is reasonable to assume that the more mixed use, higher intensity development associated with the rail alternatives would not likely occur without expectations that rail transit would eventually serve these sites. Indeed, much of the household and employment growth attributed to the town center sites along the rail options (e.g., at the Cornelius town center) is already underway in accord with development plans devised in anticipation of rail service.

**Total and Post-2025 Development Potential**

Another means to evaluate the alternatives is to compare the total potential TOD capacity (measured in acres), by calculating the amount used between 2000 to 2025 and the remaining post-2025 development capacity of each alignment. Transit is a long-term investment, and its land use benefits will extend well beyond the 2025 horizon year used for this MIS. Measuring total capacity as well as that remaining after 2025 provides a quantitative factor in evaluating the potential TOD benefits of each alternative that was part of the evaluation described in Chapter 4.

**Table 3-7** describes the total development and redevelopment capacity in acres for each alternative in terms of the amount absorbed by 2025 as well as the amount that would presumably be available for post-2025 station area development.

**Table 3-7. 2000 to 2025 Development Potential Comparisons by Alternative**

<table>
<thead>
<tr>
<th>Alternative</th>
<th>Total Capacity (Acres)</th>
<th>Capacity Absorbed by 2025 (Acres)</th>
<th>Capacity Remaining Post 2025 (Acres)</th>
</tr>
</thead>
<tbody>
<tr>
<td>N-3: Commuter rail 11 Stations</td>
<td>1,252</td>
<td>822 (66%)</td>
<td>430 (34%)</td>
</tr>
<tr>
<td>N-4: DMU Rail 17 Stations</td>
<td>2,339</td>
<td>1,374 (59%)</td>
<td>965 (41%)</td>
</tr>
<tr>
<td>N-5: BRT on I-77 &amp; Commuter rail</td>
<td>3,939</td>
<td>2,859 (73%)</td>
<td>1,080 (27%)</td>
</tr>
<tr>
<td>N-6: BRT on I-77</td>
<td>2,969</td>
<td>2,252 (76%)</td>
<td>717 (24%)</td>
</tr>
<tr>
<td>N-7: DMU (17 stations) with Bus in HOV lanes on I-77</td>
<td>2,876</td>
<td>1,784 (62%)</td>
<td>1,092 (38%)</td>
</tr>
</tbody>
</table>
3.3 Property Consequences

Property may be affected in a number of ways. One of these relates to direct property acquisitions as a result of right-of-way requirements. The other relates to access and mobility impacts as a result of the new rapid transit system.

3.3.1 Property Acquisitions

Acquisition of property will be necessary to implement any of the proposed alternatives for the North Corridor and is dependent upon the design and operational requirements for each particular mode and alignment. The proposed alignments for the alternatives in the North Corridor use existing rights-of-way of highway, major arterial, and railroad corridors for the major portion of the proposed alignments. This provides an opportunity to minimize the impacts to properties, residences, and businesses adjacent to the alternatives.

This assessment of impacts is based on conceptual engineering efforts and considers only the acreage necessary for the estimated right-of-way needed for the proposed transit alternative alignments, along with some station area requirements. It does not provide estimates of actual parcel acquisitions including residences, businesses, or other structures that may be necessary to address indirect impacts (such as access for construction vehicles) to properties along the proposed alignments. It is likely that in addition to the estimates of property acquisitions contained in this analysis, there would be property acquisitions and displacements of buildings as a result of construction activities and other disturbances and encroachments during project implementation for any of the alternatives. A more detailed assessment of the total acquisition and relocation impacts of the alternatives would be conducted as part of the later phases of project development.

Table 3-8 lists the total acreages estimated for property acquisitions based on the land to be acquired for the proposed right-of-way, station parking, and bus terminal areas for each alternative. The Future Baseline Alternative would not require commercial or residential acquisitions or displacements.

<table>
<thead>
<tr>
<th>Alternative</th>
<th>Potential ROW Acquisition (in acres)</th>
</tr>
</thead>
<tbody>
<tr>
<td>N-3: Commuter rail 11 stations</td>
<td>18 – 24</td>
</tr>
<tr>
<td>N-4: DMU Rail 17 Stations</td>
<td>30 – 34</td>
</tr>
<tr>
<td>N-5: BRT on I-77 &amp; Commuter rail</td>
<td>41 – 53</td>
</tr>
<tr>
<td>N-6: BRT on I-77</td>
<td>23 – 29</td>
</tr>
<tr>
<td>N-7: DMU 17 station with Bus on HOV lanes on I-77</td>
<td>30 – 34</td>
</tr>
</tbody>
</table>

Alternatives N-3 and N-4 have similar impacts regarding property acquisitions because they use the existing NSRR corridor for the majority of the alignment. An additional rail track and
supporting structures would be required in the Center City portion of Charlotte, and would require acquisition of property in this area to accommodate the additional track. The property acquisition in this area would be approximately one to two acres and impact the Elmwood and Pinewood Cemeteries that are located adjacent to the existing rail corridor. Approximately 35 known gravesites in these cemeteries could potentially require relocation as a result of the construction impacts in this area. Property acquisitions for a rail maintenance yard and shop for Alternatives N-3 and N-4 would occur in the vicinity of Timber Road in Iredell County south of Mooresville. Approximately two acres of property would be acquired for the proposed maintenance yard and shop for the commuter rail vehicles. The majority of the properties to be acquired are vacant or undeveloped parcels.

In addition to the property acquisitions for the rail alignments, property would be required for parking and bus terminal drop-off areas at several of the proposed commuter rail stations. Alternative N-3 could require an estimated 15 to 20 acres to accommodate the 11 stations proposed for this type of rail service. Alternative N-4 could require an estimated 27 to 30 acres for the 17-station rail service option.

Alternative N-3 is estimated to require a total of 18 to 24 acres of right-of-way. Alternative N-4 is estimated to require a total of 30 to 34 acres of right-of-way.

Other types of impacts related to property acquisitions for Alternatives N-3 and N-4 are the closure and consolidation of some roadways and driveway crossings along the existing rail corridor that would be necessary for protection and safety of traffic and trains at certain intersections of the railroad and roadways. A detailed assessment of these types of at-grade crossing improvements for the rail alternatives was recently conducted and the results of that study are discussed in the next section.

Alternative N-6 involves the operation of BRT service along the existing I-77 corridor for the majority of the proposed alignment, and along major arterials near the Center City of Charlotte and the portion of the alignment in Iredell County, thereby minimizing the impacts along the project corridor. Approximately three to four acres of property would be acquired in very small amounts along certain portions of these arterial roadways to accommodate the BRT alignment and maintain the existing traffic lanes.

Property acquisitions for station area parking and bus terminal facilities could require an additional 20 to 25 acres for a total of 23 to 29 acres of property acquisition for Alternative N-6. Most of the affected properties are in industrial uses or are vacant.

Alternative N-5 would require the combined property acquisitions of Alternatives N-3 and N-6, for a total of 41 to 53 acres of right-of-way acquisition. Alternative N-7 would require the property acquisitions of Alternative N-4 with a total of 30 to 34 acres of right-of-way acquisition.

Several measures are available to minimize the adverse impacts to properties and landowners as a result of right-of-way acquisitions for any of the alternatives. During the design refinements of the project, efforts would be made to minimize the amount of right-of-way required. Relocation assistance would be provided to residents and business displaced in accordance with Federal Uniform Relocation Assistance and Real Property Acquisitions Act to assist landowners and tenants affected by the project right-of-way requirements.
3.3.2 Properties with Access Affected by Transit

Properties with access impacted for the North Corridor was estimated for the Rail and BRT alternatives.

For rail alignments, only properties along and adjacent to the rail line were considered as being impacted as a result of closing existing access roads. A study completed for CATS and NCDOT (Traffic Separation Study, October 2001), identified and recommended that some of the existing access roads should be closed for efficiency and to maximize the benefit of rail operations. These were primarily minor crossings that were closely spaced and usually serving a limited area such as individual/private properties.

For BRT alignments, properties were considered as being impacted due to access impacts only if the bus operation would require closing existing driveways or entranceways. BRT in the North Corridor would use North Graham, Statesville, and I-77. Since BRT on I-77 would operate within its right-of-way, there would not be any impacts to access roads to properties. BRT buses along North Graham Street and Statesville (north of Fairview Road) would operate in mixed-flow traffic; thus, existing access roads would not be impacted. A short section of Statesville Road between North Graham and LaSalle Street may operate on exclusive guided busway, thus causing some impacts to existing streets.

Table 3-9 summarizes the number of properties with access affected. A detailed listing of access points are included in the technical document. The table shows that the rail option would impact 205 properties in Mecklenburg County and 71 properties in Iredell County. In the BRT option, only 58 properties would be impacted in Mecklenburg County.

<table>
<thead>
<tr>
<th></th>
<th>RAIL Alternatives</th>
<th>BRT Alternatives</th>
</tr>
</thead>
<tbody>
<tr>
<td>Iredell county</td>
<td>71</td>
<td>None</td>
</tr>
<tr>
<td>Mecklenburg county</td>
<td>205</td>
<td>58</td>
</tr>
<tr>
<td>Total</td>
<td>276</td>
<td>58</td>
</tr>
</tbody>
</table>

3.4 Visual and Aesthetic Conditions

Development of a mass transit system may have visual and aesthetic effects upon their surroundings. These potential effects are most often at the ground level (created by rail tracks, bus guideways or station structures) or elevated (such as elevated guideways). Most of these effects are both revealed and mitigated during design of the transit system, and are not relevant to the selection of an alternative in the MIS.

The highest potential for visual and aesthetic intrusion from any transit system occurs when sections of the guideway are elevated. Although the identification of locations and lengths of elevated structures is very preliminary, the conceptual engineering completed to-date has identified the potential locations for elevated structures in the North Corridor for each alternative.
3.4.1 Existing Conditions

The North Corridor study area encompasses a diverse range of visual environments. The southern portion of the corridor is predominantly a mix of office, light industrial and warehousing/distribution activities with some multi-family residential areas newly introduced to the urban core of the city. The mid-section of the corridor has established communities of older single-family residential neighborhoods with numerous industrial, office and commercial properties clustered along the major arterials and intersections. Redevelopment of some of the formerly more blighted areas has occurred in recent years, and more multi-family and commercial and office developments have been introduced to the area.

The northern portion of the corridor has experienced significant low to mid-density suburban-style residential and commercial growth, particularly near highway interchanges and along Lake Norman in the towns of Huntersville, Cornelius, Davidson and Mooresville. These towns have small-town settings in the older sections of the communities with mature landscaped vegetation and primarily single-family residences, although some higher density residential developments have been built in recent years. Outside of the northern towns, the northern part of the corridor is a generally semi-rural environment of former farmsteads with some remaining undeveloped areas.

Although no specific scenic resources have been identified in the North Corridor study area, the visual environment of several areas along the project corridor is considered to be valuable to the communities in this area. Within Huntersville, Cornelius, Davidson and Mooresville, there are historic districts along the NSRR corridor that are considered to be community assets. Davidson College and the Lake Norman area, which is a major recreational resource to the Charlotte region, are also located in the corridor.

There are also isolated properties along the NSRR/NC-115 corridor that may be considered to have significant visual and aesthetic qualities, such as the nineteenth and early-twentieth century residences, former farmsteads, and other potentially historic structures that are visible from the NSRR corridor. In many areas along the railroad corridor, the visual characteristics are typical of those found around a rail facility with industrial and manufacturing uses, and little or no vegetation screening along the tracks. In some of the residential areas that are adjacent to the rail corridor, vegetation may partially block views of the corridor.

The visual character of the I-77 corridor is typical of many freeway environments with limited views of development along the highway except at interchanges. Most of the interchange areas along I-77 in the study area are highly developed with commercial and office uses, lodging, restaurants, and other businesses that serve the motorists and communities nearby.
3.4.2 Consequences

The major elements of the proposed alternatives that may affect visual quality of the project corridor are the introduction of new physical elements, such as station areas and any elevated structures associated with the commuter rail or BRT alignments. In general, the impacts of all the proposed alternatives to the visual character of the study corridor are expected to be minimal since the proposed alignments are located along or within existing transportation facilities. The Future Baseline Alternative in particular is likely to have limited impacts, although there are individual locations where visual or aesthetic changes would occur. The scale of physical elements would generally be small, with the largest being bus shelters. Involving community members in the design of the structures could mitigate any negative effects resulting from these small facilities.

Alternatives N-3 and N-4 involve the operation of commuter rail service along the existing NSRR corridor, which generally minimizes the potential visual impacts associated with these alternatives. The most significant new element would be the proposed train stations and associated parking and bus terminal facilities located at some of the stations. No specific station design has been determined for the rail alternatives, however, it is anticipated that the stations would range from fairly simple platform stops with shelters to more elaborate transit centers for higher passenger volumes. The rail stations would be located at street level. The design concept of each station would be developed during later phases of project development and would allow for the integration visually and functionally with their particular surroundings, in order to complement the existing visual character of the station setting.

The primary areas of potential visual alteration would be expected to occur where larger park-and-ride facilities are located adjacent to the rail station. Both Alternatives N-3 and N-4 have the potential to cause visual impacts to those neighborhoods located near proposed stations, particularly in the communities of Derita, Huntersville, Cornelius, Davidson and Mooresville.

The addition of an elevated section of these rail alternatives in the Center City of Charlotte adjacent to the existing rail corridor will also be a new physical element to this area. However, there are no residential neighborhoods that are directly in view of this part of the corridor, and no significant visual impacts are expected within this area.

Alternative N-6 would involve operation of BRT along the I-77 corridor and would not create any significant new visual changes to the freeway setting. The addition of BRT stations primarily at interchanges would not be expected to create significant adverse visual impacts to these areas, which are highly developed with commercial, office and multi-family residential uses. The short portions of the BRT alignment that are located along major arterials would operate similarly to the existing bus service in these areas and would not introduce any significant visual changes to these corridors.

Alternative N-5 would have impacts similar to a combination of Alternatives N-3 and N-6 and Alternative N-7 would have impacts similar to Alternatives N-4 and N-6

Compatible design concepts would be used to mitigate any visual and aesthetic impacts of the project to better integrate the project’s infrastructure into the community. Complementary design guidelines, materials, landscaping, signing, lighting, and public art would be considered in the station area planning efforts. Architectural elements and vegetative
screening could also be used to minimize any changes in views from nearby neighborhoods that may be affected.

3.5 Air Quality

National Ambient Air Quality Standards (NAAQS) for six criteria air pollutants: carbon monoxide (CO), nitrogen dioxide (NO₂), sulfur dioxide (SO₂), ozone, particulate matter, and lead. Mecklenburg County was originally declared non-attainment for CO on March 3, 1978. The county was re-designated as a maintenance area for CO on September 18, 1995 based on monitoring continuous attainment from 1990 to 1995. Mecklenburg County was declared non-attainment for ozone on November 15, 1990. The county was re-designated as a maintenance area for ozone on July 5, 1995 based on continuous attainment from 1990 to 1994. The 2025 LRTP for MUMPO modeled rapid transit in each of the five corridors. MUMPO made a conformity finding on the LRTP on April 3, 2002, and USDOT concurred in this ruling on April 15, 2002.

3.5.1 Existing Conditions

The North Corridor study area is located within the Charlotte-Gastonia-Rock Hill air basin. In 1999, Charlotte had 34 days exceeding the NAAQS for daily 8-hour ozone standard.

3.5.2 Consequences

An overall improvement in air quality in the Charlotte-Gastonia-Rock Hill air basin is expected to result from implementation of any of the transit alternatives for the North Corridor when compared to the 2025 Future Baseline alternative. The selection of the BRT and/or LRT transit improvements will not reduce air pollution but instead will reduce the growth in air pollution by reducing the growth in regional vehicle-miles traveled. LRT technology may offer greater air quality benefits than BRT technology (LRT vehicles would be powered electrically, while BRT vehicles likely would be diesel-powered), depending on the technology used to generate the electricity used to power the LRT.

Localized microscale air-quality impacts may result from proposed park-and-ride facilities and changes in traffic volumes at intersections adjacent to stations. Although these effects would occur at different locations under each alternative, no alternative would produce a substantially greater effect than another. Further quantification of microscale impacts will be conducted during preparation of the EIS.

3.6 Noise

The FTA General Noise Assessment procedure outlined in Transit Noise and Vibration Impact Assessment and the associated FTA General Noise Assessment Spreadsheet were used to determine potential noise effects along each alternative for both BRT and commuter rail technologies.
3.6.1 Existing Conditions

Noise measurements were taken at 14 locations throughout the study area to establish the existing noise environment in areas with noise-sensitive uses along the proposed corridors. Existing noise levels in the study area range between typical suburban and urban levels. Noise levels along the southern half of the North Corridor were typical of noise levels near major roadways. Noise levels along the northern half of this corridor were lower most of the day, but peaked when trains passed by. Major noise sources in the project area included traffic, trains, and aircraft.

3.6.2 Consequences

Table 3-10 shows the estimated project-generated noise levels at 50 feet for diesel locomotive propelled commuter rail and BRT both at grade and on an aerial structure. At the time of writing, noise emissions were not available for DMU vehicles.

Table 3-10 Project-Generated Noise Levels

<table>
<thead>
<tr>
<th>Technology</th>
<th>At-Grade Ldn (dBA) @ 50 ft</th>
<th>Leq (day) (dBA) @ 50 ft</th>
<th>On Aerial Structure Ldn (dBA) @ 50 ft</th>
<th>Leq (day) (dBA) @ 50 ft</th>
</tr>
</thead>
<tbody>
<tr>
<td>Commuter Rail</td>
<td>60</td>
<td>62</td>
<td>N/A</td>
<td>N/A</td>
</tr>
<tr>
<td>BRT</td>
<td>59</td>
<td>54</td>
<td>59</td>
<td>54</td>
</tr>
</tbody>
</table>

Source: FTA General Noise Assessment Spreadsheet (FTA, 1997)

Assumptions:
- Commuter Rail Speed – 60 mph
- Commuter Locomotives per train – 1
- Commuter Rail Vehicles per hour – 3 daytime (avg.) and 1 nighttime (15 min/30 min headways)
- BRT Vehicles per hour – 12 daytime and 8 nighttime (5 minute/15 min headways)
- BRTs are 2-axle buses

According to the FTA Noise Impact Criteria, if the noise generated by the project alone is 62 Ldn (or Leq(h)), consequences would occur if the existing noise exposure at a receiver is less than 67 Ldn (or Leq(h)). If the project is projected to generate 59 Ldn (or Leq(h)), consequences would occur if the existing noise exposure is less then 63 Ldn (or Leq(h)).

The Future Baseline Alternative could possibly have noise impacts associated with additional bus service if noise level increases exceed the threshold criteria. Such impacts would be very localized and associated with acceleration/stopping at transit stops or intersections. There would be no vibration impacts.

Receptors in close proximity to the proposed alternatives would experience substantial increases in total noise levels. However, in many parts of the study area the noise exposure that would result from the project would be minor compared to existing noise sources. Therefore, noise impacts under the FTA criteria are only predicted to occur within a very narrow band surrounding the evaluated alternatives.
Table 3-11 shows the type and distance of noise impacts for the various alternatives in the North Corridor.

Table 3-11. Noise Impacts in the North Corridor

<table>
<thead>
<tr>
<th>Alternative</th>
<th>Existing Ldn</th>
<th>Type of Impact (Ldn)</th>
<th>Distance to Impact (feet)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Minor Impact</td>
<td>Major Impact</td>
</tr>
<tr>
<td>N 3</td>
<td>57 - 69</td>
<td>56 - 64</td>
<td>62 - 69</td>
</tr>
<tr>
<td>N 4</td>
<td>57 - 69</td>
<td>56 - 64</td>
<td>62 - 69</td>
</tr>
<tr>
<td>N 5</td>
<td>57 - 69</td>
<td>56 - 64</td>
<td>62 - 69</td>
</tr>
<tr>
<td>N 6</td>
<td>58 - 69</td>
<td>57 - 64</td>
<td>62 - 69</td>
</tr>
<tr>
<td>N 7</td>
<td>57 - 69</td>
<td>56 - 64</td>
<td>62 - 69</td>
</tr>
</tbody>
</table>

Ldn – Day/Night Levels

The impact area for the Alternative N-3 would range between 150 and 425 feet from the centerline of the alignment, depending on the location within the corridor. Along Alternative N-4, the impact area would extend to between 19 and 60 feet from the centerline. For Alternative N-5 and Alternative N-7, the impact area would extend to between 19 and 150 feet from the centerline. Along Alternative N-6, the impact area would extend to between 45 and 150 feet from the centerline.

The area experiencing severe impacts, as defined by the FTA criteria, would be much smaller. In most locations it would be between one-third and one-half of the area predicted to experience any impact under the FTA criteria.

While the project alternatives for the North Corridor would not substantially increase noise levels in most of the study area, there would be an increase in the frequency of train or bus noise. At 50 feet away, the maximum noise level from a commuter rail locomotive is approximately 88 dBA, and for a commuter bus 85 dBA. These noise levels are equal to or less than the maximum noise level of approximately 88 dBA from a freight-train locomotive at 50 feet. Along the southern half of the North Corridor, there would not be a substantial increase in the frequency of occurrence of peak noise levels, because of the current relatively high volume of train, truck and bus operations. Along the northern half of this corridor, the maximum noise levels experienced would not increase, but the frequency of noise peaks would increase.

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3 A decibel (dBA) is a measure of noise. A noise level increase of 3 dBA is barely discernible to the human ear, and an increase of 5 dBA is a noticeable increase. Because the decibel scale is logarithmic, a doubling of the number of noise sources, such as traffic volume or train operations, increases noise levels by 3 dBA. A 10-fold increase in the number of noise sources will add 10 dBA. A noise source emitting a noise level of 60 dBA combined with another noise source of 60 dBA yields a combined noise level of 63 dBA, not 120 dBA.
3.7 Ecosystems

The alternative alignments were inspected during field investigations to identify wetlands, streams, and potentially suitable habitat for protected species. Identified wetlands were sketched on topographic mapping and their areas are approximate.

Plant and animal species with federal classifications of Endangered or Threatened are protected under Section 7 of the Endangered Species Act of 1973, as amended (16 USC 1531-1543)(Act). The alternative alignments were evaluated with respect to protected species in terms of recorded locations and the consequences of alternatives on potential suitable habitat for protected species.

3.7.1 Existing Conditions

Wetlands

Wetlands are under the jurisdiction of the U.S. Army Corps of Engineers and Section 404 of the Clean Water Act, which regulates any actions that would alter the conditions of the jurisdictional wetlands. The National Wetland Inventory Maps prepared by the U.S. Fish and Wildlife Service were reviewed to determine the location and types of wetlands present in the study area. The general wetland categories found in the study area are associated with the floodplain areas along streams in the project corridor, and are generally less than 10 acres in size and less than six feet deep. The wetlands present within the vicinity of the proposed alternatives are generally associated with retention basins and seasonally or temporarily flooded areas, thus there the build alternatives have no consequences on wetlands in the study area.

Protected Species

The North Corridor study area has undergone tremendous urbanization during the past few decades, and there are few natural areas remaining in the corridor. Most of the rural settings and agricultural land in Mecklenburg County has been or is currently being altered by commercial, industrial, office and residential development. The few remnants of natural areas in the corridor are located primarily along floodplains and wetlands and within some of the undeveloped tracts farther from the Center City of Charlotte. There are no designated ecologically sensitive areas or nature preserves located in the project corridor.

Three types of wooded areas are identifiable in the project study area: disturbed, mesic mixed hardwood forest, and pine forest. Much of the wildlife in the project study area likely use these various communities for forage, cover, and nesting habitat.

This community encompasses several types of habitat that have been or are currently impacted by human disturbance such as roadside shoulders, maintained yards, and cutover areas. Cutover areas have been clearcut or thinned in the recent past. This habitat is dominated by tree types such as honey locust, white ash, sweetgum, black cherry, shortleaf pine, sassafras, willow oak, hawthorn, and mimosa. Plants include blackberry, ragweed, goldenrod, thistle, pokeweed, winged sumac, horse nettle, broomsedge, honeysuckle, wisteria, kudzu and poison ivy.

Dominant hardwoods include blackgum, black locust, sycamore, white ash, green ash, willow oak, southern red oak, Virginia pine, tulip poplar, red maple, and sweetgum.
subcanopy is represented by red cedar, hazelnut, dogwood, black cherry, winged elm, American elm, and red bud. Near wetland areas and stream tributaries, other plant species commonly found are box elder, hickory, American beech, and jack-in-the-pulpit.

Within the project study area, isolated tracts of pine forest exist characterized by shortleaf pine, Virginia pine and loblolly pine species.

The various community types found within the study area have the potential to support many wildlife species. Common mammals found in these habitat types include raccoons, squirrels, white-tailed deer, numerous rodent species, and eastern cottontails. Also found within these terrestrial communities are a wide variety of amphibians, reptiles and bird species.

Within Mecklenburg County there are currently four federally-protected threatened and endangered species as listed by the U.S. Fish and Wildlife Service. Within Iredell County there is one federally-protected threatened species. Table 3-12 lists those species as well as the species of federal concern that exist in these counties. One species is classified as C1, which indicates it is under consideration for federal listing as a threatened species.

<table>
<thead>
<tr>
<th>Type</th>
<th>Common Name</th>
<th>Scientific Name</th>
<th>Status</th>
</tr>
</thead>
<tbody>
<tr>
<td>Vertebrates</td>
<td>Bald eagle</td>
<td><em>Haliaeetus leucocephalus</em></td>
<td>Threatened</td>
</tr>
<tr>
<td>Invertebrates</td>
<td>Carolina heelsplitter</td>
<td><em>Lasmigona decorata</em></td>
<td>Endangered</td>
</tr>
<tr>
<td>Vascular Plants</td>
<td>Michaux’s sumac</td>
<td><em>Rhus michauxii</em></td>
<td>Endangered</td>
</tr>
<tr>
<td></td>
<td>Schweinitz’s sunflower</td>
<td><em>Helianthus schweinitzii</em></td>
<td>Endangered</td>
</tr>
<tr>
<td></td>
<td>Smooth coneflower</td>
<td><em>Echinacea laevigata</em></td>
<td>Endangered</td>
</tr>
</tbody>
</table>


3.7.2 Consequences

Wetlands

The Future Baseline Alternative would have no impacts to jurisdictional wetlands. The limited amount of construction for this alternative would occur within existing rights-of-way where no jurisdictional wetlands are known to exist. None of the build alternatives have impacts on wetlands. The alternatives should generate little or no additional runoff, and no changes in the types of pollutants associated with transportation movements through the corridor are anticipated to impact water quality.

Protected Species

The wildlife communities within the project study area would experience minimal impacts as a result of the proposed project. The majority of the alignments of the proposed alternatives are within the existing right-of-way of freeways, major arterials, and railroad corridors. There
is no encroachment into areas of significant vegetation or sensitive habitats that would result in loss of significant wildlife populations. Those areas along the proposed alternatives that could be cleared of brush or other vegetation as a result of project construction are areas within highly disturbed and urban environments.

A review of the North Carolina Natural Heritage Program database of rare species indicate that one endangered and one species of federal concern were recorded as being present within the project study area. Although specific biological surveys for these species were not conducted as part of this analysis, it is anticipated that the proposed project will have no effect on any federally-protected species given the disturbed nature of the project corridor for all the alternatives. The proposed alternatives are located primarily within the existing rights-of-way of roadway or railroad corridors, which do not provide the type of habitat suitable for these rare species. Thus the build alternatives do not have any consequences on protected species in the corridor. During later phases of project development, a more detailed assessment will be performed to determine whether any rare species are present within the impact zone of the proposed project.

3.8 Water Resources

Under Section 401 of the federal Clean Water Act, the NC DWQ requires mitigation for all cumulative stream effects that are greater than 150 linear feet. Construction of a culvert or a bridge with piers in the waterway would be considered a consequence. The alternative alignments were evaluated with respect to stream crossings in terms of linear feet of stream affected by construction.

In accordance with Executive Order 11988 (May 24, 1977), federal agencies shall determine whether a proposed action will occur in a floodplain. For major federal actions significantly affecting the quality of the human environment, the evaluation shall be included in any statement prepared under the National Environmental Policy Act (NEPA). The alternative alignments were evaluated with respect to floodplains and floodways in terms of linear feet crossed.

3.8.1 Existing Conditions

The water resources located in the North Corridor study area lie within the Catawba River drainage basin. The major water body is Lake Norman along the northwestern boundary of the study area. The major streams within the project corridor are Irwin Creek, McIntyre Creek, Long Creek, Torrence Creek, McDowell Creek, and tributaries of Rocky River. The North Corridor Environmental Maps 1 through 4 show the water resources within the study area, including watershed boundaries, lakes, streams, floodplains, wetlands, and surface water protection zones.

All of the previously-mentioned streams within the study area, with the exception of Torrence Creek, have been assigned a best use classification of “C” by the North Carolina Division of Water Quality. Class C waters are suitable for aquatic life propagation and survival, fishing, wildlife and secondary recreation and agriculture. Torrence Creek has a classification of “WS-IV” which denotes protected waters that are generally in moderately to highly developed watersheds. No streams that are classified as high quality waters or water supplies are located within the project corridor.
Each of the streams listed above has a regulatory floodway and associated 100-year floodplains as designated by the federal Floodplain Rate Insurance Maps prepared by the Federal Emergency Management Agency. The floodplains along most of the streams and creeks within the project corridor are fairly narrow in most areas and generally follow the stream channels. Mecklenburg County has also designated a stream protection zone, as part of the Surface Water Improvement and Management (SWIM) program, along most of these waterways, to provide a protective buffer area along stream channels in order to minimize environmental degradation and adverse water quality impacts.

3.8.2 Consequences

The proposed Build alternatives would not require any new stream crossings of any creeks in the study area and would not involve any channel modifications of the existing streams. The proposed alternatives generally follow existing transportation facilities such as highways, major arterials and railroad corridors and would result in minimal encroachments into nearby streams. Therefore, it is expected that the all of the proposed alternatives would have minimal impacts to streams and water quality in the study area. Project construction in areas near water resources could cause temporary impacts during clearing and grubbing activities and construction of hydraulic structures such as culverts and drainage pipes. These activities could result in increased sedimentation and siltation from soil erosion, and temporarily muddying local water resources. Mitigation measures to minimize these types of impacts involve the use of best management practices for protection of surface waters and sedimentation control guidelines during construction of the project.

The proposed alternatives are located primarily within the existing rights-of-way of highway, major arterial roadways, and railroad corridors and are expected to involve minimal encroachment into floodplain areas within the study area. Any impacts to floodplains that may be associated with construction activities are expected to be minimal and temporary in nature. The build alternatives therefore are not considered to have any consequences on floodplains in the corridor.

3.9 Cultural Resources

Section 106 of the National Historic Preservation Act of 1966, as amended (36 CFR 800), requires all federal agencies to take into consideration the effect of federally assisted, licensed or permitted projects on these resources. In addition, historic resources are provided protection under Section 4(f) of the Department of Transportation Act of 1966 (set forth in 49 USC 1653(f), amended and codified in 49 USC 303, and expanded in 23 USC 138). The alternative alignments were evaluated with respect to the number of historic resources adjacent to portions of alternative alignments where additional right-of-way would be required.
3.9.1 Existing Conditions

Historic Properties

A Phase I reconnaissance level architectural survey was conducted for the North Corridor in accordance with Section 106 to identify all historic properties, and those properties fifty years of age or older that appear to merit the Phase II intensive level evaluation needed to determine NRHP eligibility. The study area was defined as approximately one-quarter mile on either side of each alternative alignment and included the areas of direct and indirect effects around proposed transit stations.

Historic properties are defined as those resources that have been added to either the NRHP or the North Carolina Study List. The North Carolina Study List, is a list of resources that have had preliminary determinations of eligibility made by the State Historic Preservation Office (SHPO), or been designated as local landmarks by the Charlotte-Mecklenburg Historic Landmarks Commission.

The North Corridor study areas for the two corridors contained 52 historic or potentially historic architectural resources. Within the total survey population are nineteenth and twentieth-century houses, farmsteads, rural and urban communities, industrial buildings, commercial blocks, scholastic architecture, churches, bridges, railroad depots, gas stations, and a library. Of these 52 sites, eight are listed as NRHP properties, seven are designated as being of local historical significance, and 37 are considered to be potentially historic and warrant a more detailed investigation that would be considered for later phases of project development.

Archaeological Sites

No known archaeological sites are located within the proposed corridors of any of the alternatives. There are a few prehistoric recorded sites within the study area but none of these sites would be impacted by the proposed alternatives.

Parklands and Community Resources

There are several public parks, greenways and recreational facilities located within the North Corridor study area, some of which are along the project corridor. Sections 4(f) of the Department of Transportation Act prohibits the use of land from publicly owned parks, recreation areas, wildlife refuges or historic sites for any federally-funded projects unless there is no feasible and prudent alternative.
Table 3-13 lists the historic resources contained in the Northeast Corridor.

**Table 3-13. Historic Resources Located in the North Corridor**

<table>
<thead>
<tr>
<th>Name</th>
<th>Site #1</th>
<th>Type²</th>
<th>Location</th>
<th>Alternative Alignments</th>
</tr>
</thead>
<tbody>
<tr>
<td>(Former) Stonewall Hotel (ca. 1910)</td>
<td>13</td>
<td>None</td>
<td>West Trade Street</td>
<td>N-5, N-6</td>
</tr>
<tr>
<td>Fourth Ward Historic District (ca. 1880 through ca. 1940)</td>
<td>14</td>
<td>LHD</td>
<td>Charlotte, N-C</td>
<td>N-3, N-4, N-5, N-6, N-7</td>
</tr>
<tr>
<td>(Former) United States Post Office (Charles A. Jonas Federal Building (ca. 1930))</td>
<td>15</td>
<td>None</td>
<td>W. Trade Street between- Mint-t and- d Graham Streets</td>
<td>N-5, N-6</td>
</tr>
<tr>
<td>(Former) Charlotte Cotton Mills (1880-1881)</td>
<td>16</td>
<td>LL</td>
<td>508 West Fifth Street</td>
<td>N-3, N-4, N-5, N-6, N-7</td>
</tr>
<tr>
<td>Warehouse (ca. 1920)</td>
<td>17</td>
<td>None</td>
<td>North Graham Street between- West Fifth and West Sixth Streets</td>
<td>N-3, N-4, N-5, N-6, N-7</td>
</tr>
<tr>
<td>Bridge (ca. 1930)</td>
<td>18</td>
<td>None</td>
<td>Carrying the Seaboard Railroad over Sixth Street</td>
<td>N-3, N-4, N-5, N-7</td>
</tr>
<tr>
<td>Elmwood Cemetery (established 1853)</td>
<td>19</td>
<td>None</td>
<td>West Sixth Street, west of Graham Street</td>
<td>N-3, N-4, N-5, N-7</td>
</tr>
<tr>
<td>Recommended Industrial Historic District (ca. 1925)</td>
<td>20</td>
<td>None</td>
<td>600 Block, West Fifth Street</td>
<td>N-3, N-4, N-5, N-7</td>
</tr>
<tr>
<td>Recommended Industrial Historic District (ca. 1920)</td>
<td>21</td>
<td>None</td>
<td>North and South Sides, Seaboard Street west of Tenth Street</td>
<td>N-3, N-4, N-5, N-7</td>
</tr>
<tr>
<td>Recommended North Graham Street Historic District (ca. 1920-ca. 1950)</td>
<td>24</td>
<td>None</td>
<td>1300-1500 Blocks, North Graham Street</td>
<td>N-3, N-4, N-5, N-6, N-7</td>
</tr>
<tr>
<td>(Former) Ford Motor Company Plant (1924)</td>
<td>25</td>
<td>None</td>
<td>1801 North Statesville Avenue</td>
<td>N-3, N-4, N-5, N-6</td>
</tr>
<tr>
<td>Hebrew Cemetery (1867)</td>
<td>26</td>
<td>None</td>
<td>West side, North Statesville Avenue</td>
<td>N-3, N-4, N-5, N-6</td>
</tr>
<tr>
<td>Art Moderne Bridge (1941)</td>
<td>27</td>
<td>None</td>
<td>Carrying Woodward Street over the Norfolk Southern Railway</td>
<td>N-3, N-4, N-5, N-7</td>
</tr>
<tr>
<td>Warehouse (late 1930s)</td>
<td>28</td>
<td>None</td>
<td>West side of North Graham Street</td>
<td>N-3, N-4, N-5, N-7</td>
</tr>
<tr>
<td>McGee Lumber Company (ca. 1930)</td>
<td>29</td>
<td>None</td>
<td>233 North Graham Street</td>
<td>N-3, N-4, N-5, N-7</td>
</tr>
<tr>
<td>Granite Company (1920s)</td>
<td>30</td>
<td>None</td>
<td>900 Norris Avenue at intersection with N. Graham Street</td>
<td>N-3, N-4, N-5, N-7</td>
</tr>
<tr>
<td>Welsh-McIntosh House (1907)</td>
<td>31</td>
<td>LL</td>
<td>5501 Gibbon Road</td>
<td>N-3, N-4, N-5, N-7</td>
</tr>
<tr>
<td>Christenbury Farm (ca. 1890)</td>
<td>32</td>
<td>None</td>
<td>Christenbury Road at junction with Gibbon Road</td>
<td>N-3, N-4, N-5, N-7</td>
</tr>
<tr>
<td>Croft Historic District (ca. 1900)</td>
<td>33</td>
<td>LL &amp; NR</td>
<td>East side N.-C. 115</td>
<td>N-3, N-4, N-5, N-7</td>
</tr>
<tr>
<td>Cashion House (ca. 1880)</td>
<td>34</td>
<td>None</td>
<td>Old Statesville Road just south of junction with Eastfield Road</td>
<td>N-3, N-4, N-5, N-7</td>
</tr>
<tr>
<td>Cashion-Moore House (ca. 1880)</td>
<td>35</td>
<td>None</td>
<td>South side of Eastfield Road overlooking the Norfolk Southern Railway</td>
<td>N-3, N-4, N-5, N-7</td>
</tr>
<tr>
<td>(Former) School (ca. 1900)</td>
<td>36</td>
<td>None</td>
<td>North side of Eastfield Road at junction with Alexanderana Road</td>
<td>N-3, N-4, N-5, N-7</td>
</tr>
<tr>
<td>Gas Station (ca. 1925)</td>
<td>37</td>
<td>None</td>
<td>N.-C. 115 at junction with Alexanderana Road</td>
<td>N-3, N-4, N-5, N-7</td>
</tr>
<tr>
<td>Wilson House and Farm (1840)</td>
<td>38</td>
<td>LL</td>
<td>11400 Old Statesville Road</td>
<td>N-3, N-4, N-5, N-7</td>
</tr>
<tr>
<td>Dr. H. L. Seay House (ca. 1940)</td>
<td>39</td>
<td>None</td>
<td>Verhoeff Road at N-. C. 115</td>
<td>N-3, N-4, N-5, N-7</td>
</tr>
<tr>
<td>Charles and Laura Alexander House (ca. 1900)</td>
<td>40</td>
<td>LL</td>
<td>East side of Main Street</td>
<td>N-3, N-4, N-5, N-7</td>
</tr>
<tr>
<td>McAuley House (ca. 1890)</td>
<td>41</td>
<td>None</td>
<td>West side of Main Street</td>
<td>N-3, N-4, N-5, N-7</td>
</tr>
<tr>
<td>House (ca. 1890)</td>
<td>42</td>
<td>None</td>
<td>East side of Main Street</td>
<td>N-3, N-4, N-5, N-7</td>
</tr>
<tr>
<td>Name</td>
<td>Site #¹</td>
<td>Type²</td>
<td>Location</td>
<td>Alternative Alignments</td>
</tr>
<tr>
<td>-----------------------------------------------------</td>
<td>---------</td>
<td>--------</td>
<td>-----------------------------------------------</td>
<td>------------------------</td>
</tr>
<tr>
<td>Commercial Block (ca. 1925)</td>
<td>43</td>
<td>LL</td>
<td>West side of Main Street at intersection with Gilead Road</td>
<td>N-3, N-4, N-5, N-7</td>
</tr>
<tr>
<td>Ice House (ca. 1920)</td>
<td>44</td>
<td>None</td>
<td>Main Street, just north of Gilead Road</td>
<td>N-3, N-4, N-5, N-7</td>
</tr>
<tr>
<td>Huntersville Associated Reformed Presbyterian Church</td>
<td>45</td>
<td>None</td>
<td>West side of Main Street, Huntersville</td>
<td>N-3, N-4, N-5, N-7</td>
</tr>
<tr>
<td>Anchor Cotton Mills and Mill Village</td>
<td>46</td>
<td>None</td>
<td>Huntersville</td>
<td>N-3, N-4, N-5, N-7</td>
</tr>
<tr>
<td>Caldwell Station School</td>
<td>47</td>
<td>None</td>
<td>East side of N-C-115, 1.0 mile North of N-C-73</td>
<td>N-3, N-4, N-5, N-7</td>
</tr>
<tr>
<td>Cornelius Historic District</td>
<td>48</td>
<td>LHD</td>
<td>Downtown Cornelius</td>
<td>N-3, N-4, N-5, N-7</td>
</tr>
<tr>
<td>Davidson Historic District</td>
<td>49</td>
<td>NR</td>
<td>Downtown Davidson</td>
<td>N-3, N-4, N-5, N-7</td>
</tr>
<tr>
<td>Walls-Houston House</td>
<td>50</td>
<td>NR</td>
<td>East side of N-C-115, 0.1 mile south of SR-1223, Mount Mourne</td>
<td>N-3, N-4, N-5, N-7</td>
</tr>
<tr>
<td>Will Mott House</td>
<td>51</td>
<td>NR</td>
<td>North side of SR-1102, 0.2 mile west of N-C-115, Mount Mourne</td>
<td>N-3, N-4, N-5, N-7</td>
</tr>
<tr>
<td>Brow-Hobbs House</td>
<td>52</td>
<td>None</td>
<td>East side of N-C-115 at SR-1102, 0.2 mile down unpaved lane, Mount Mourne</td>
<td>N-3, N-4, N-5, N-7</td>
</tr>
<tr>
<td>Monroe-Bell House</td>
<td>53</td>
<td>None</td>
<td>East side N-C-115, 0.2 mile North of SR-1102, Mount Mourne</td>
<td>N-3, N-4, N-5, N-7</td>
</tr>
<tr>
<td>Mount Mourne</td>
<td>54</td>
<td>NR</td>
<td>West side N-C-115, 0.6 mile North of SR-1189, Mount Mourne</td>
<td>N-3, N-4, N-5, N-6, N-7</td>
</tr>
<tr>
<td>Recommended Mooresville Textile Mill Village Historic District</td>
<td>55</td>
<td>None</td>
<td>South side of Mooresville, loosely bounded by Parker, Gennette, and Mill streets, and Cabarrus Avenue, Mooresville</td>
<td>N-3, N-4, N-5, N-6, N-7</td>
</tr>
<tr>
<td>Mooresville Public Library</td>
<td>56</td>
<td>None</td>
<td>East side of South Main Street, Mooresville</td>
<td>N-3, N-4, N-5, N-6, N-7</td>
</tr>
<tr>
<td>Broad Street Row Historic District</td>
<td>57</td>
<td>NR</td>
<td>200 and 300 blocks of Broad Street and adjoining blocks oriented to railroad tracks, Mooresville</td>
<td>N-3, N-4, N-5, N-6, N-7</td>
</tr>
<tr>
<td>Mooresville Downtown Historic District</td>
<td>58</td>
<td>NR</td>
<td>Downtown Mooresville’s commercial core adjoining residential blocks</td>
<td>N-3, N-4, N-5, N-6, N-7</td>
</tr>
<tr>
<td>Cook’s Grocery Store</td>
<td>59</td>
<td>None</td>
<td>East side N-C-115, Mooresville</td>
<td>N-3, N-4, N-5, N-6, N-7</td>
</tr>
<tr>
<td>Espy Watt Brawley House</td>
<td>61</td>
<td>NR</td>
<td>Northeast corner of N-C-115 and Williams Street, Mooresville</td>
<td>N-3, N-4, N-5, N-6, N-7</td>
</tr>
<tr>
<td>Armory</td>
<td>65</td>
<td>None</td>
<td>West side of N-C-115, Mooresville</td>
<td>N-3, N-4, N-5, N-6, N-7</td>
</tr>
</tbody>
</table>

1. MK # = Site designation for sites in Mecklenburg County assigned by the SHPO
2. SL = Study List (Designation just prior to NRHP listing)
   NR = National Register historic listing
   LHD = Locally-designated historic listing
   LL = Local landmark
   SP = Surveyed Property more than 50 years old that may or may not be eligible for the National Register.

Source: NC State Historic Preservation Office (SHPO)
3.9.2 Consequences

**Historic Properties**

Some of the historic and potentially historic sites within the surveyed study area are located adjacent to the proposed alternatives. Although none of the proposed alternatives would directly impact these historic or potentially historic sites through right-of-way acquisition, it is possible that there would be indirect impacts associated with noise, visual, or traffic impacts that may result from implementation of the proposed project. Since the Future Baseline Alternative does not add major new elements to the existing structural environment, it has the lowest level of potential for impacts to cultural resources. Table 3-14 shows the potentially affected historic properties in the North Corridor.

<table>
<thead>
<tr>
<th>Alternative Alignments</th>
<th>Potentially Affected Sites</th>
</tr>
</thead>
<tbody>
<tr>
<td>N-3: Commuter Rail 11 Stations</td>
<td>Fourth Ward (Indirect), North Davidson Historic District, Mooresville Historic District</td>
</tr>
<tr>
<td>N-4: DMU Rail 17 Stations</td>
<td>Fourth Ward (Indirect), North Davidson Historic District, Mooresville Historic District</td>
</tr>
<tr>
<td>N-5: BRT on I-77 &amp; Commuter Rail</td>
<td>Fourth Ward (Indirect), North Davidson Historic District, Mooresville Historic District</td>
</tr>
<tr>
<td>N-6: BRT on I-77</td>
<td>Fourth Ward (Indirect), Mooresville Historic District</td>
</tr>
<tr>
<td>N-7: DMU (17 stations) with BRT/Express on I-77</td>
<td>Fourth Ward (Indirect), North Davidson Historic District, Mooresville Historic District</td>
</tr>
</tbody>
</table>

The most likely indirect impacts of the rail or BRT alternatives would occur in the Center City area of Charlotte, which includes the Fourth Ward Historic District. All of the proposed alternatives travel through or adjacent to this district and could affect the integrity of this resource.

Alternatives N-3 and N-4 also travel along the northernmost edge of North Davidson Historic District and through the Mooresville Historic District along the existing rail corridor and could result in indirect impacts to these resources.

Alternative N-6 travels through the Mooresville Historic District along NC-115, which serves as the Main Street of the town. This alignment could result in indirect impacts to these resources.

Alternative N-5 would have indirect impacts similar to those described for Alternatives N-3 and N-6 combined. Alternative N-7 would have indirect impacts similar to those described for Alternatives N-4 and N-6 combined.

Although the alternatives listed above could have an indirect effect on an historic resource, a determination as to whether the impact would be considered an adverse effect according to the SHPO standards would be part of a more detailed study in later phases of project development. A comprehensive cultural resources study would be conducted as part of the future planning phases of the project to determine the level of impact to historic resources.
that would be affected. In consultation with the SHPO agency, appropriate mitigation measures to minimize any adverse impacts would be identified.

**Archaeological Sites**
There will be no consequences to any archaeological sites in the study area.

**Parklands and Community Resources**
None of the proposed alternatives would directly impact the parkland, greenways or public recreational facilities within the study area as a result of right-of-way acquisition or implementation of the proposed project. Although there are several of these types of resources located adjacent to the proposed alternatives, it is not expected that they would be adversely affected by the project, and no Section 4(f) impacts would result from implementation of any of the proposed alternatives. It is anticipated that the proposed project would provide improved access to these resources.

The build alternatives have no consequences to parklands or community resources in the North Corridor.

### 3.10 Contamination Sites/Hazardous Materials

The US Environmental Protection Agency (EPA) defines hazardous waste as any waste material or combination of waste materials that poses a hazard to human health, welfare, or the environment. Examples of hazardous waste sites include landfills, dumps, pits, lagoons, salvage areas, and storage tanks. The alternative alignments were evaluated with respect to numbers of hazardous and potentially hazardous waste sites adjacent to the alternative alignments that would require additional right-of-way acquisition.

#### 3.10.1 Existing Conditions
A preliminary survey of potentially contaminated and hazardous materials handling and/or storage sites was conducted for the project study corridors to identify the known locations of these types of sites and their proximity to the proposed alternatives. This survey included a review of federal, state, and local government databases of known sites of environmental contamination, generators of hazardous materials, petroleum products storage, and recorded spills and leaks of hazardous materials. The following sources of information were reviewed in this survey:

- Federal and State National Priority List Sites
- Federal RCRA (Resource Conservation and Recovery Act)
- Federal CORRACTS (RCRA Corrective Actions)
- Federal CERCLIS (Comprehensive Environmental Response, Compensation, and Liability Index ) and CERCLIS-NFRAP (No Further Remedial Action)
- State CERCLIS Listing
- State Solid Waste Disposal Landfill
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- State LUST (Leaking Underground Storage Tank)
- Federal TRIS (Toxic Release Inventory System)
- Federal ERNS (Emergency Response Notification System)
- Federal Hazardous Waste Generator
- State Spill Sites
- Facility Index System (FINDS)
- Federal RCRA Violations

In addition, site reconnaissance, interviews, aerial photography and historical records were reviewed as part of this survey.

3.10.2 Consequences

Table 3-15 contains the number of sites that are potentially affected waste sites. The results of the records review and field investigations indicate that there are several known sites of recorded contamination and hazardous substances present within the study area. These sites were reviewed to determine those sites that were located within 0.125 mile of the proposed centerline of the alternative alignments, or a total survey corridor of 0.25 mile wide along each of the proposed alternatives. This inventory was then narrowed to include those sites that were located within 100 feet of the alignment alternatives and could potentially be impacted by the proposed project. The Future Baseline Alternative would have no impacts.

The survey indicates that there are nine sites identified from the databases listed above that are located within the 200-foot wide zone along Alternatives N-3 and N-4, which follows the existing NSRR corridor. Of these nine sites, six are designated as LUST/ERNS sites, one site is both a LUST/ERNS and RCRA violation site, and two sites are designated as FINDS sites. These sites are associated with gas stations, auto repair, trucking facilities and commercial and industrial activities. All of these sites are located outside of the existing right-of-way of the existing NSRR corridor and are not expected to be impacted by Alternatives N-3 or N-4.

Alternative N-6 has eight sites located within a 200-foot wide zone along this BRT alignment, the majority of which follows the I-77 corridor. All eight sites are designated as LUST/ERNS sites and are associated with gas stations, dry cleaners, and other commercial and industrial activities. All of the eight sites are located outside of the existing right-of-way of I-77 and the major arterials this alternative follows, and are not expected to be impacted by Alternative N-6.

Alternative N-5 is a combination of Alternative N-3 and N-6 alignments. Alternative N-7 is a combination of Alternative N-4 and N-6 alignments. Therefore, the 17 sites listed above represent the number of known sites for Alternative N-5 and Alternative N-7. None of these sites is expected to be impacted by this alternative.
Table 3-15 Effects to Potential Hazardous Waste Sites

<table>
<thead>
<tr>
<th>Alternative Alignments</th>
<th>Waste Sites Located Within 200 Feet</th>
<th>Potentially Affected Waste Sites</th>
</tr>
</thead>
<tbody>
<tr>
<td>N-1: Future Baseline</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>N-3: Commuter Rail 11 Stations</td>
<td>9</td>
<td>9</td>
</tr>
<tr>
<td>N-4: DMU Rail 17 Stations</td>
<td>9</td>
<td>9</td>
</tr>
<tr>
<td>N-5: BRT on I-77 &amp; Commuter Rail</td>
<td>11</td>
<td>17</td>
</tr>
<tr>
<td>N-6: BRT on I-77</td>
<td>17</td>
<td>8</td>
</tr>
<tr>
<td>N-7: DMU (17 stations) with BRT/Express on I-77</td>
<td>17</td>
<td>17</td>
</tr>
</tbody>
</table>

The findings of the preliminary 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 serve as a guide for identifying potential contamination in the proposed project corridors. As part of the subsequent phases of project development, a complete Phase 1 environmental assessment would be conducted to identify in detail the potential impacts related to hazardous materials or contaminated sites that could be associated with the construction and implementation of a particular alternative.

3.11 Environmental Justice

Executive Order 12898 requires federal agencies to develop a strategy for their programs, policies and activities to avoid disproportionate and adverse human health and environmental impacts on minority and low-income populations. The USDOT promotes nondiscrimination in its programs through a department-wide strategy and process that integrates environmental justice principles into existing planning requirements. The Executive Order re-emphasizes the requirement to assess and consider the impacts of transportation projects, not only on the natural environment but also on the people and their communities, through a pro-active engagement with all stakeholders in public involvement activities during program planning as well as in project development.

3.11.1 Existing Conditions

A review of the year 2000 U.S. Census data was conducted for the study area for this assessment of potential environmental justice impacts. A minority population is considered to exist if the percentage of minorities in the affected area is greater than 50 percent, or is significantly higher than the minority population percentage in the general area. The total minority population for Mecklenburg County was approximately 36 percent for the year 2000. The highest population densities within the North Corridor study area are in and around the Center City of Charlotte and certain concentrations within Huntersville, Cornelius, Davidson, and Mooresville.
The census data indicates a wide range of socioeconomic and demographic characteristics within the North Corridor study area. Generally, the neighborhoods in the southern one-third of the corridor area includes greater concentrations of minority populations, and of households with incomes below the national poverty level. There are also small concentrations of minority populations in Mooresville. Of the 40 census block groups within the project study area, 15 block groups have higher than average minority populations, and three of those 15 block groups are considered to be low-income areas based on a median household annual income lower than the national poverty level. The low-income areas are located in the southernmost portion of the study area.

Although the income level data for Iredell County was not available, based on 1990 income data for these block groups, it is assumed that these areas would not be low-income areas. For this analysis, year 2000 Mecklenburg County averages for minority population were also used for Iredell County.

3.11.2 Consequences

The Future Baseline alternative would not adversely impact minority areas disproportionately. Implementing any of the proposed Build alternatives would introduce a new transportation service to the study area and provide a new option for residents to access employment, schools, and other facilities. Several low-income and minority communities would be affected by the proposed alternatives. Table 3-16 shows the number low-income and minority block groups that each alternative alignment passes through.

Table 3-16. Affected Low-Income and Minority Block Groups

<table>
<thead>
<tr>
<th>Alternative Alignments</th>
<th>Number of Low-Income Block Groups</th>
<th>Number of Minority Block Groups</th>
</tr>
</thead>
<tbody>
<tr>
<td>N-3: Commuter Rail 11 Stations</td>
<td>1</td>
<td>4</td>
</tr>
<tr>
<td>N-4: DMU Rail 17 Stations</td>
<td>1</td>
<td>4</td>
</tr>
<tr>
<td>N-5: BRT on I-77 &amp; Commuter Rail</td>
<td>3</td>
<td>9</td>
</tr>
<tr>
<td>N-6: BRT on I-77</td>
<td>2</td>
<td>5</td>
</tr>
<tr>
<td>N-7: DMU (17 stations) with BRT/Express on I-77</td>
<td>3</td>
<td>10</td>
</tr>
</tbody>
</table>

*Low-Income Block Groups based on 1990 Census, Minority Block Groups based on 2000 Census. Effects are the same for BRT and LRT.

Transit dependent persons were assumed to be those people whose income status was below poverty level. In order to estimate the number of persons below the poverty level within a half-mile of stations along the alternative alignments, it was assumed that low-income people were evenly distributed across the 2000 Census block groups.

Table 3-17 shows the transit dependent persons within ½ mile of proposed stations. Based on the information in the table, there will be a slightly greater benefit for transit dependent persons along Alternative Alignment N-5.
Table 3-17. Transit Dependent Persons Near Alternative Alignment Stations

<table>
<thead>
<tr>
<th>Alternative Alignments</th>
<th>Total Number of Transit Dependent Persons* Within One-Half Mile of Proposed Stations</th>
</tr>
</thead>
<tbody>
<tr>
<td>N-3: Commuter Rail 11 Stations</td>
<td>383</td>
</tr>
<tr>
<td>N-4: DMU Rail 17 Stations</td>
<td>1659</td>
</tr>
<tr>
<td>N-5: BRT on I-77 &amp; Commuter Rail</td>
<td>3990</td>
</tr>
<tr>
<td>N-6: BRT on I-77</td>
<td>3612</td>
</tr>
<tr>
<td>N-7: DMU (17 stations) with BRT/Express on I-77</td>
<td>1762</td>
</tr>
</tbody>
</table>

* Persons below the poverty level

Alternatives N-3 and N-4 would expose homes and businesses that are located along the project railroad corridor to potential impacts related to noise and visual changes, however, those impacts are not expected to be significantly adverse. They are documented in Section 6.0 Visual Quality and Aesthetics and Section 8.0 Noise. The right-of-way acquisitions for this alternative would not impact any low-income and minority areas.

Alternative N-6 would have similar types and degree of impacts as the other alternatives in the study area; however, the higher number of BRT stations located in the areas of minority and low-income communities could be considered as a greater benefit to these areas than Alternatives N-3 and N-4. The potentially adverse impacts related to noise and visual changes are also not expected to be significant. The right-of-way acquisitions for this alternative would not impact any low-income and minority areas.

Alternative N-5 would have impacts and benefits similar to N-3 and N-6 combined and Alternative N-7 would have impacts and benefits similar to N-4 and N-6 combined.

In general, the proposed project would not result in disproportionately adverse impacts on low-income or minority communities in the study 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 along the project corridor.

3.12 Summary of Affected Environment Analysis

A summary matrix of the impacts associated with each build alternative is provided in Table 3-18. Several of the impact categories are not affected by the proposed alternatives. This matrix highlights the alternatives (by mode and alignment) and the level of potential impact for each environmental category, based upon a subjective ranking of low, moderate, and high for the relative impacts of each. For those impact categories that are not affected by an alternative, the level of impact is listed as “none.” The summary matrix is presented as an aid to comparing alternatives; however, a ranking of “high” does not necessarily imply that the actual impact is severe, but that the alternative itself rates as relatively “high” for the

<table>
<thead>
<tr>
<th>Alternative Alignments</th>
<th>Total Number of Transit Dependent Persons* Within One-Half Mile of Proposed Stations</th>
</tr>
</thead>
<tbody>
<tr>
<td>N-3: Commuter Rail 11 Stations</td>
<td>383</td>
</tr>
<tr>
<td>N-4: DMU Rail 17 Stations</td>
<td>1659</td>
</tr>
<tr>
<td>N-5: BRT on I-77 &amp; Commuter Rail</td>
<td>3990</td>
</tr>
<tr>
<td>N-6: BRT on I-77</td>
<td>3612</td>
</tr>
<tr>
<td>N-7: DMU (17 stations) with BRT/Express on I-77</td>
<td>1762</td>
</tr>
</tbody>
</table>

* Persons below the poverty level

Alternatives N-3 and N-4 would expose homes and businesses that are located along the project railroad corridor to potential impacts related to noise and visual changes, however, those impacts are not expected to be significantly adverse. They are documented in Section 6.0 Visual Quality and Aesthetics and Section 8.0 Noise. The right-of-way acquisitions for this alternative would not impact any low-income and minority areas.

Alternative N-6 would have similar types and degree of impacts as the other alternatives in the study area; however, the higher number of BRT stations located in the areas of minority and low-income communities could be considered as a greater benefit to these areas than Alternatives N-3 and N-4. The potentially adverse impacts related to noise and visual changes are also not expected to be significant. The right-of-way acquisitions for this alternative would not impact any low-income and minority areas.

Alternative N-5 would have impacts and benefits similar to N-3 and N-6 combined and Alternative N-7 would have impacts and benefits similar to N-4 and N-6 combined.

In general, the proposed project would not result in disproportionately adverse impacts on low-income or minority communities in the study 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 along the project corridor.
impact that it creates. The report section that discusses the specific impacts should be consulted for detailed discussion of the alternatives.

Table 3-18 summarizes the impacts associated with the project build alternatives. The majority of the Screening Categories for parklands, communities, visual quality, noise, water quality, wetlands, floodplains, cultural resources, economically sensitive areas, endangered species and hazardous materials sites have none or low impacts for the various build alternatives. In the case of potential noise, alternative NE-4 has low to moderate impacts, since commuter rail has higher noise levels than BRT. Cultural impacts are low to moderate for N-3, N-4 and N-5 and N-7.

Table 3-18 Summary Matrix of the Consequences Associated with Project Build Alternatives

<table>
<thead>
<tr>
<th>Screening Category Indicator</th>
<th>N-3: Commuter rail 11 Stations</th>
<th>N-4: DMU Rail 17 Stations</th>
<th>N-5: BRT on I-77 &amp; Commuter rail</th>
<th>N-6: BRT on I-77</th>
<th>N-7: Hybrid</th>
</tr>
</thead>
<tbody>
<tr>
<td>Local Traffic Effects</td>
<td>Low</td>
<td>Low</td>
<td>Low</td>
<td>Low</td>
<td>Low</td>
</tr>
<tr>
<td>Potential to Induce Land Use/Zoning Changes</td>
<td>High</td>
<td>Moderate to high</td>
<td>High</td>
<td>Moderate to High</td>
<td>High</td>
</tr>
<tr>
<td>Potential Section 4(f) Effect on Parklands</td>
<td>None</td>
<td>None</td>
<td>None</td>
<td>None</td>
<td>None</td>
</tr>
<tr>
<td>Number of Acres to be Acquired as New Right-of-Way</td>
<td>18 – 24 acres</td>
<td>30 – 34 acres</td>
<td>41 – 53 acres</td>
<td>23 – 29 acres</td>
<td>53 – 63 acres</td>
</tr>
<tr>
<td>Potential Impact to Visual Quality</td>
<td>Low</td>
<td>Low</td>
<td>Low</td>
<td>Low</td>
<td>Low</td>
</tr>
<tr>
<td>Potential for Noise Impacts</td>
<td>Low to Moderate</td>
<td>Low</td>
<td>Low</td>
<td>Low</td>
<td>Low</td>
</tr>
<tr>
<td>Potential Impact to Water Quality</td>
<td>Low</td>
<td>Low</td>
<td>Low</td>
<td>Low</td>
<td>Low</td>
</tr>
<tr>
<td>Potential Impact to Jurisdictional Wetlands</td>
<td>None</td>
<td>None</td>
<td>None</td>
<td>None</td>
<td>None</td>
</tr>
<tr>
<td>Potential Impact to Flood Level or Floodplain</td>
<td>None</td>
<td>None</td>
<td>None</td>
<td>None</td>
<td>None</td>
</tr>
<tr>
<td>Potential Impact to Cultural Resources</td>
<td>Low to Moderate</td>
<td>Low to Moderate</td>
<td>Low to Moderate</td>
<td>Low</td>
<td>Low to Moderate</td>
</tr>
<tr>
<td>Potential Impact to Ecologically-Sensitive Areas</td>
<td>None</td>
<td>None</td>
<td>None</td>
<td>None</td>
<td>None</td>
</tr>
<tr>
<td>Potential Impact to Threatened and Endangered Species</td>
<td>None</td>
<td>None</td>
<td>Low</td>
<td>Low</td>
<td>Low</td>
</tr>
<tr>
<td>Potential for Impact to Hazardous Materials Sites</td>
<td>Low</td>
<td>Low</td>
<td>Low</td>
<td>Low</td>
<td>Low</td>
</tr>
</tbody>
</table>
4 COMPARATIVE BENEFITS AND COSTS

Chapter Summary

This chapter describes the transportation, land use and environmental effects of the various light rail and bus rapid transit alternatives that are defined in Chapter 2.

In this chapter, the benefits, costs and impacts of each of the transit Build alternatives are compared to one another — and to the Future Baseline system that does not entail a major capital investment. All of the technical data, and screening criteria presented earlier in Chapters 2 and 3 are considered in this evaluation.

Section 4.1 begins with a discussion of the goals and evaluation criteria used in this MIS. It also briefly reviews how the MIS criteria mesh with the FTA’s New Starts requirements. Section 4.2 describes the specific criteria and measures used in the evaluation, and the results of the evaluation of the baseline and Build alternatives on land use, community and economic development; mobility and operations; environmental effects; financial considerations; system development/Center City; and equity measures.

Section 4.3 summarizes those measures that differ substantially between the alternatives evaluated. Section 4.4 outlines the next steps required to refine the implementation plan for improving transit in Charlotte and the surrounding area.

4.1 Evaluation Criteria

The purpose of the MIS is to determine the need for and the nature of transit service improvements in the various corridors of the Charlotte region. The various corridor goals and system plan principles stated in Chapter 1, lead to the development of a set of evaluation criteria to help in determining the degree to which the various transit improvement alternatives address these needs.

The reasons for adopting a standard set of evaluation criteria are to provide a comparable level and set of criteria for use as the basis for system development and to provide those data required for FTA New Starts funding evaluation, if desired. These criteria were adopted by the MTC on October 23, 2001 for all corridors. They are presented in Table 4-1.

The table summarizes a procedure that provides for the evaluation of the corridors and system at three levels as depicted by the columns in Table 4-1 as follows:

- LPA – at the Corridor level;
- Overall System Optimization;
- Implementation Phasing

This MIS uses the first set of criteria to evaluate the alternatives for the North Corridor. The other two levels of evaluation criteria will be used for overall system optimization and for determining which alternative will have the best chance at a phased implementation.
FTA New Starts Criteria

All of the MISs use criteria established by the FTA for evaluating the various corridor alternatives. These criteria are utilized to ensure that CATS has the data necessary to apply for Federal funds for design and construction of the locally preferred alternative. The five FTA Project Justification Criteria, which reflect the same criteria and measures as the corridor measures are:

- Mobility Improvements;
- Environmental Benefits;
- Operating Efficiencies;
- Cost Effectiveness; and
- Existing Land Use, Transit Supportive Land Use Policies, and Future Patterns.

In addition, FTA considers “Other Factors” which are:

- Degree of Local Financial Commitment;
- The degree that institutions (local transportation initiatives, parking policies, etc.) are in place as assumed in the forecasts;
- Multi-modal emphasis of the locally preferred investment strategy;
- Environmental justice considerations and equity issues;
- Opportunities for increased access to employment for low-income persons, and welfare-to-work initiatives;
- Public involvement program activities, including private sector and institutional involvement;
- Livable communities initiatives and local economic development initiatives;
- Consideration of alternative land use development scenarios in local evaluation and decision making for the locally preferred transit investment decision; and
- Consideration of innovative financing, procurement, and construction techniques, including design-build turnkey applications.
<table>
<thead>
<tr>
<th>Objective</th>
<th>Locally Preferred Alternative Selection</th>
<th>Overall System Optimization</th>
<th>Implementation Phasing</th>
</tr>
</thead>
</table>
| **Land Use**                  | • Existing corridor & station area land use patterns  
• Existing corridor & station area development character  
• Potential Transit-Oriented Development (TOD) sites  
• Existing land use policies & tools for station area & corridor  
• Future corridor & station area land use patterns  
• Enhance Center City & core area growth | • Maximizes opportunity to meet Centers & Corridors Land Use Vision/2025 Transit-Land Use Plan | • Near-term opportunities to shape emerging growth/redevelopment  
• Land use policies in place |
| **Mobility/Operations**       | • Ridership – total and new  
• Travel time savings  
• Change in vehicle miles of travel  
• Transit dependent access  
• Change in transfers  
• Service reliability  
• Connections to activity centers, special event & cultural sites | • Ridership – total and new  
• Ability to attract desired travel markets  
• Travel time savings | • Immediate need to improve access to employment  
(Center City & reverse commute locations)  
• Immediate need for congestion relief  
• Opportunity to implement interim (TSM-type) service improvement |
| **Environment**               | • Displacements  
• Noise affected receivers  
• Local traffic effects  
• Cultural or natural resources affected  
• Properties with access affected  
• Water resources affected | • Minimize disruptions (communities, natural areas, cultural resources, etc.)  
• Air quality improvements (mobile source emission reductions, Long Range Plan & TIP conformity)  
• Environmental Justice (equity in distribution of benefits and costs, past investments relative to EJ populations) | • Minimize disruptions (communities, natural areas, cultural resources, etc.)  
• Air quality improvements (mobile source emission reductions, Long Range Plan & TIP conformity)  
• Environmental Justice (equity in distribution of benefits and costs, past investments relative to EJ populations) |
| **Financial**                 | • Capital costs  
• Incremental cost per new rider  
• Operating & maintenance costs | • Total system cost relative to funding capacity (capital cost, operating & maintenance subsidy)  
• Ability to attract federal and state funds  
• Opportunities to leverage other sources | • Interim system cost relative to funding capacity (capital cost, operating & maintenance subsidy)  
• Ability to attract federal and state funds  
• Opportunities to leverage other sources |
| **System Development/Center City** | • Synergy with other corridors (through-service and connections)  
• Operating efficiency  
• Balance use of system capacity | • Passenger distribution in Center City  
• Balance use of system capacity  
• Responsiveness to urban design & economic development principles  
• System expansion capacity and capability | • Synergy with other corridors (provide service connections)  
• Need to phase system implementation  
• Corridor readiness for program implementation (relative availability of right-of-way and station area land, land use policies in place, public acceptance) |
4.2 Evaluation of Project Alternatives

4.2.1 Land Use, Community Development & Economic Development

The land use criteria included a combination of land use measures discussed in Chapter 3. Existing household and employment patterns, projected future patterns, a bikeability and walkability analysis of station areas, and potential Center City growth in employment and households were assessed. Specifics about each evaluation measure are listed below.

**Evaluation Measures**

1. **Existing corridor and station area land use patterns.** This evaluation is measured by the existing households and employment characteristics of each alignment in 2000 within ½ mile of the stations.

2. **Existing corridor and station area development character.** This is a qualitative measure using three factors: first, rating the land use mix and conditions of existing development patterns that are transit supportive; second, the quality of pedestrian/bicycle access within the station areas of each alignment; and third, the amount of redevelopment land within each alignment.

3. **Potential Transit-Oriented Development (TOD) Sites.** To measure TOD potential within ½ mile of the stations, this criterion considered three land use factors:
   - Developed areas that have the potential for evolving or being redeveloped as TOD sites,
   - Existing sites that currently have TOD characteristics that could be further enhanced; and
   - Potential TOD sites at greenfield (vacant land) sites.

4. **Existing land use policies and tools for station area and corridor.** The North Corridor includes four towns and the City of Charlotte. Each has approached transit planning slightly differently, but all have policies in place to support transit. In the four towns this is especially true for areas that the rail alternatives would serve. Cornelius and Huntersville have enacted specific transit district zoning that will apply to the rail based alternatives. Mooresville and Davidson do not have such zoning but the master plans for their town centers assume future transit service and have been tailored to encourage transit supporting land uses and such TOD concerns as walkability. These policies apply primarily to areas around the rail alternatives, but Davidson has also applied these principles to its Interstate 77 interchange at Griffith Street. The Charlotte-Mecklenburg Planning Commission (CMPC) has updated its General Development Policies for the City and County to promote transit supportive land use. These General Development Policies and regulatory mechanisms are intended to support transit-oriented development in station areas and will be equally applicable to all stations of each alternative that lie within the Charlotte city limits.

5. **Future corridor and station area land use patterns.** Estimates of future growth in households and employment were made based upon Station Area Concepts developed for each alignment and constituent stations.

6. **Enhance Center City and core area growth.** All of the transit build alternatives will enhance the Center City to some degree by creating better access to the region’s business and cultural center. This measure considered the projected number of trips
beginning or ending in the Center City. The alternative and technology with the highest number of trips to and from the Center City was scored the highest.

Findings

Table 4-2 qualitatively summarizes the findings for key land use measures and enables the comparison of North Corridor alternatives.

Table 4-2. Evaluation of Alternatives by Land Use, Community Development and Economic Development Criteria

<table>
<thead>
<tr>
<th>MEASURES</th>
<th>N-1: Future Baseline</th>
<th>N-3: Commuter rail (11 Station option)</th>
<th>N-4: DMU Rail (17 station option)</th>
<th>N-5: BRT on I-77 11 Station Commuter rail</th>
<th>N-6: BRT on I-77</th>
<th>N-7 HOV on I-77 and 17 station DMU</th>
</tr>
</thead>
<tbody>
<tr>
<td>Existing corridor &amp; station area land use patterns</td>
<td>Low</td>
<td>Low-Med</td>
<td>Medium</td>
<td>High</td>
<td>Med-High</td>
<td>Med-High</td>
</tr>
<tr>
<td>Existing corridor &amp; station area development character</td>
<td>Low</td>
<td>Med-High</td>
<td>High</td>
<td>Medium</td>
<td>Low-Med</td>
<td>High</td>
</tr>
<tr>
<td>Potential Transit-Oriented Development (TOD) sites</td>
<td>Low</td>
<td>Medium</td>
<td>Med-High</td>
<td>Medium</td>
<td>Low-Med</td>
<td>Med-High</td>
</tr>
<tr>
<td>Existing land use policies &amp; tools for station area &amp; corridor</td>
<td>Low</td>
<td>High</td>
<td>High</td>
<td>Med-High</td>
<td>Low-Med</td>
<td>Med-High</td>
</tr>
<tr>
<td>Future corridor &amp; station area land use patterns</td>
<td>N/A</td>
<td>Low</td>
<td>Low-Med</td>
<td>High</td>
<td>Med-High</td>
<td>Medium</td>
</tr>
<tr>
<td>Enhance Center City &amp; core area growth</td>
<td>Low</td>
<td>Med-High</td>
<td>Med-High</td>
<td>High</td>
<td>Medium</td>
<td>Low-Med</td>
</tr>
</tbody>
</table>

* Full evaluation table is presented in Section 4.3

N-1, the Future Baseline alternative, did not score well with any measure since the proposed low-capital improvements do not include established stations where TOD potential could be realized.

The land use criteria were applied to each transit build alternative by examining various land use measures, including existing household and employment patterns, projected future patterns, market support for transit, support of community growth and redevelopment goals, and the extent and potential quality of TOD sites along alignments. The evaluation addressed criteria adopted by the MTC in October 2001 and shown in Table 4.1. The results of the evaluation were then scored by how well the various alternatives achieved each measure.

Market support for TOD and the degree to which an alternative supports community growth and redevelopment goals was higher for the rail alignments than the BRT alignments because of the nature of the development environment within the small north Mecklenburg and southern Iredell towns. Many of the potential rail stations are located within the town centers of Huntersville, Cornelius, Davidson, and Mooresville, all of which have local development environments that support high-density, pedestrian-friendly, transit-oriented development.

The same holds true for public policy support for transit. All three north Mecklenburg towns have adopted policies that create incentives, and in some instances, require developers to build transit-oriented communities. Alternatives that have stations within the centers of these towns therefore scored higher with respect to existing public policy supporting transit.
Although station areas along I-77 have more land available to develop upon than station areas along the rail line, the acreage of potential TOD sites is slightly higher along rail alignments. Much of the development along I-77 is currently automobile-oriented, meaning low-density residential and single use, front-loaded parking commercial development. Therefore, the N-3, N-4 and N-7 alternatives scored higher than the N-6 alternative. The N-5 alternative scored high because it is a combination of a rail and a BRT alignment.

There are a number of existing and planned land use developments along the rail line that not only support transit service, but focus on it. Future land use patterns along I-77 support interstate-related development such as strip retail centers. Therefore, the N-3, N-4 and N-7 rail alternatives score higher than the N-6 BRT alternative for this measure, while the N-5 (combination of rail and BRT) alternative scores in between N-3/N-4/N-7 and N-6. Because of available land, current development activity patterns and the number of stations, the estimated number of jobs and households added within the station areas are much higher for the BRT alternatives than for the rail alternatives. Land along the I-77 corridor (where potential BRT is located) is rapidly being developed with retail centers, residential communities, and office parks, most of which are not transit-oriented, but do generate additional jobs and households.

Existing Corridor and Station Area Land Use Patterns

- N-3 Commuter Rail (11 stations) scores lowest because, with the least number of stations, it has the lowest quantity of existing households and jobs within a half-mile radius of its potential stations.
- N-5 BRT on I-77 and Commuter Rail scores highest because, with 29 total stations, it has the highest quantity of existing households and jobs within a half-mile radius of the potential stations.

Existing Corridor and Station Area Development Character

- N-6 BRT on I-77 scores lowest because this measure is based on both walkability and support for transit usage. Because of its automobile orientation, existing interstate-related development along I-77 is seldom walkable and the right-of-way areas devoted to roads and ramps diminishes greatly the ability to develop the fine grained mixed use qualities consistent with the TOD guidelines adopted by the MTC.
- N-4 and N-7 score high not only because of the number but also the location of their stations. Four of the six potential Charlotte stations are located in mostly developed areas that are walkable and provide service to the most transit-dependent population. Stations in the four town centers also would serve areas that have a high proportion of pedestrian-oriented, mixed-use environments.

Potential Transit-Oriented Development (TOD) Sites

- Although it has the second highest amount of station area development capacity, N-6 BRT on I-77 scores lowest because much of the acreage within its station areas will be hard to develop as potential TODs consistent with the established guidelines. Most stations for this alternative are at sites likely to remain heavily auto-oriented for several decades. Also, given the proximity to I-77 interchanges, they are less desirable for residential development than sites along the rail right of way.
• Although they have the second lowest amount of station area development capacity, N-4 and N-7 score highest because of the location of their stations (within already approved TOD areas in the northern towns). They are also the only alternatives to have a station located at I-485.

**Existing Land Use Policies and Tools for Station Area and Corridor**

• Each of the four towns north of Charlotte has adopted land use policies or other regulatory measures that support transit oriented development. The City of Charlotte will also adopt transit zoning in the near future.

• N-6 BRT on I-77 scores lowest. While only Charlotte and Davidson have or will have land use policies that support TOD along I-77, Huntersville, Cornelius, and Mooresville’s existing land use policies tend to support automobile-oriented uses along the interstate (predominantly big-box retail, minimal mixed-use development, etc.).

• N-4 scores highest because most of its stations are within areas that have or will have transit-supportive land use policies or adopted plans that coordinate land use development with the implementation of transit. N-3 is somewhat lower because it has fewer stations.

**Future Corridor and Station Area Land Use Patterns**

• N-3 Commuter rail (11 stations) scores the lowest because it has the least amount of potential estimated households and jobs within a half-mile radius of its stations in 2025.

• N-5 BRT on I-77 and commuter rail (11 stations) scores the best because it has the highest amount of estimated potential 2025 households and jobs within a half-mile radius of its potential stations.

**Enhance Center City and Core Area Growth**

• This criteria ranked transit trips to Center City Charlotte.

• The amount of transit riders coming into Center City Charlotte did not vary significantly between the alternatives.

**4.2.2 Mobility and Operations**

**Evaluation Measures**

The category of Mobility Improvements is one of the six categories of criteria used by FTA to justify projects for New Starts category funding. To address this category, the two areas of mobility and operations were selected.

Mobility includes mobility and access; two terms that describe the quality of transportation services. Mobility refers to the choices that are available to make trips and access refers to the ability to get to destinations of choice. Each of these terms indicates a different component of the ability of a wide range of persons to get from where they are to where they want to be, when they want to be there. Some persons have little choice in how this takes place and others have a number of choices. Both categories of potential transit system customers are important to the ultimate viability and success of a transit system in fulfilling its mission in a cost effective manner.
The “Operations” category addresses the way in which a proposed improvement contributes to or detracts from the operating efficiency of the transit system, in terms of vehicle and staff utilization, which also impacts cost effectiveness. This is the “supply side” of the evaluation.

To better measure and compare mobility, access and operations among alternatives a number of specific items were selected from those generated by the ridership forecasts. They are:

1. **Total Daily Guideway Boardings**: Daily boardings on either express bus routes (for the Future Baseline alternative) or boardings on the LRT or BRT guideway for the year 2025 for each alternative. The “Daily Guideway Boardings” are those segments of travelers’ transit trips that use the transit services operating on the guideway component of the transit system.

2. **New System Transit Trips**: Daily riders that can be attributed to the new system (not merely shifts from current transit modes) above the Future Baseline alternative in 2025. “New System Transit Trips” measure those new trips attracted not only by the guideway improvements but also by the other service improvements in the corridor or adjoining sections of the wedges that are part of the overall corridor alternative.

3. **Travel-Time Savings**: The average travel time for trips provides an indication of both time savings and changes in the travel delay experienced by transit and highway users. The alternative with the highest overall travel time savings over the Future Baseline alternative was ranked best.

4. **Transit Dependent Access**: Access to transit by those who typically do not have an alternative way to get to where they want to go is an important measure of the success of a transit alternative. It is measured by the total number of households below the federal poverty level in 1990, located within one-half mile of transit stations for each alternative.

5. **Service Reliability**: Another measure of the efficiency of a transit alternative is the relative likelihood that an alternative will be able to meet its operating schedule. When a system is on an exclusive right-of-way, it has a higher probability of meeting the established schedule than one that is operating in mixed traffic. Alternatives with a high amount of exclusive and partial separation were given higher scores.

6. **Connections to Activity Centers, Special Event and Cultural Sites**: The ability of a transit system to link major trip generators and attractors in a corridor is another important mobility measure. Access for "non-work" type trips extends the utility of a transit system and addresses congestion during times that are typically away from the standard peak periods of travel. Examples of these sites include college and university campuses, libraries, transportation centers, sports complexes, major malls, museums and other cultural centers.
Findings

Table 4-3 summarizes the mobility and operations measures as they compare across the North Corridor alternatives.

Table 4-3. Evaluation of Alternatives According to Mobility and Operations Criteria

<table>
<thead>
<tr>
<th>MEASURES</th>
<th>N-1: Future Baseline</th>
<th>N-3: Commuter rail (11 Station option)</th>
<th>N-4: DMU Rail (17 station option)</th>
<th>N-5: BRT on I-77 (11 Station Commuter rail)</th>
<th>N-6: BRT on I-77</th>
<th>N-7 HOV on I-77 and 17 station DMU</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total Daily Guideway Boardings</td>
<td>3,100</td>
<td>8,000-10,000</td>
<td>9,000-11,000</td>
<td>20,000-22,000</td>
<td>18,000-20,000</td>
<td>16,000-18,000</td>
</tr>
<tr>
<td>New Daily Transit Trips</td>
<td>N/A</td>
<td>9,730</td>
<td>10,530</td>
<td>15,130</td>
<td>12,830</td>
<td>11,330</td>
</tr>
<tr>
<td>Daily Travel Time Savings (hours)</td>
<td>N/A</td>
<td>1,300</td>
<td>1,600</td>
<td>2,200</td>
<td>2,200</td>
<td>1,500</td>
</tr>
<tr>
<td>Transit Dependent Access (within 0.5 mi.)</td>
<td>N/A</td>
<td>383</td>
<td>1,659</td>
<td>3,990</td>
<td>3,612</td>
<td>1,762</td>
</tr>
<tr>
<td>Service reliability</td>
<td>Low-Med</td>
<td>Medium</td>
<td>High</td>
<td>Medium</td>
<td>Medium</td>
<td>High</td>
</tr>
<tr>
<td>Connections to activity centers, special event &amp; cultural sites</td>
<td>Medium</td>
<td>Medium</td>
<td>High</td>
<td>Medium</td>
<td>Medium</td>
<td>High</td>
</tr>
</tbody>
</table>

With regard to boardings, i.e. total daily guideway boardings as well as new daily transit trips, the BRT alternatives performed slightly better than the pure rail alternatives. Alternative N-5 which is a combination of BRT and an 11-station commuter rail has the highest total daily guideway boardings ranging between 20,000 and 22,000 as well as the highest new daily transit trips at 15,130. This is followed closely by N-6 and N-7 with more than 16,000 boardings. N-3, the 11-station commuter rail reports between 8,000 and 10,000 total daily boardings and 9,730 new transit trips. It should be noted that the Total Daily Guideway Boardings row in Table 4.3 only includes BRT and/or rail guideway boardings, and does not include boardings on complementary local and feeder bus routes in the Corridor. These latter numbers are shown in Chapter 2, Table 2-4, thus providing total corridor-wide boarding by alternative.

The pure rail alternatives use an existing rail corridor alignment and thus only offer low-medium access to transit dependent riders. BRT in conjunction with a commuter rail alignment afford the greatest access to transit dependent riders. The combination supports regional mobility needs of both the east and west portions of the corridor. Because of the extended length of the corridor (29 miles) and less frequent stops, rail service would be an efficient alternative for commuters to Center City Charlotte.

4.2.3 Environmental Effects

Evaluation Measures

It should be noted that for MIS purposes the review of the environmental and community effects of the alignment alternatives is only an initial assessment of fatal flaws. An EIS would come later in the process as part of the Preliminary Engineering stage.

As stated in Chapter 3, the air quality analysis indicated that all of the alternatives would reduce the number of regional vehicle-miles traveled. Therefore, all would be ranked equally in terms of reducing energy consumption as well as emission levels. As a result, this factor was not included in the evaluation table.

The environmental and community impacts in the evaluation matrix were rated by the following characteristics:
1. **Displacements** – The number of displacements was derived by counting the number of potential acres of right-of-way required where relocations of the residents or tenants might be necessary to construct the transit alignment and/or stations.

2. **Potential for noise impacts** – The number and type of potential sensitive receptors exposed to projected noise levels above the FTA impact threshold were evaluated along each alternative.

3. **Local traffic effects** – The build alternatives were compared against the Future Baseline alternative to measure the change in traffic congestion.

4. **Cultural or natural resources affected** – This criterion was a cumulative average of the individual ratings for five sub criteria: Historic and/or archaeological properties affected; acreage of parkland impacted; the number of community and/or cultural facilities affected; suitable habitat for protected species; and the number of hazardous materials and/or waste sites along the alternative.

5. **Properties with access affected** – The number of curb cuts (access/egress from public street to private property) along each alternative was counted.

6. **Water resources affected** – This criterion was analyzed using a cumulative average of the individual ratings for four sub criteria: linear feet of stream crossings affected, linear feet of floodplains affected, linear feet of floodways impacted, and acreage of wetlands affected by each alternative alignment.

**Findings**

All of the “build” alternatives considered for the corridor have minimal or no effects or impacts on the natural and manmade environment for the following reasons:

- Neighborhood character changes - no adverse impacts to the general setting or community functioning, and alternatives are not expected to create major barriers to social interaction or stability of these local neighborhoods along the corridor.

- Visual and aesthetic consequences - these too are expected to be minimal, since for the most part alternatives are located in alignments along or within existing transportation facilities. In addition, compatible and complementary design concepts such as materials, landscaping, signing, lighting and public art could be used to mitigate any visual impacts that may arise.

- None of the project alternatives are expected to substantially increase noise levels in the project study area. There will be an increase in frequency of train or bus noise, particularly in the northern portion of the corridor where peak transit volumes will be increased considerably. Along the southern half of the North Corridor, there would not be a substantial increase in the frequency, because current volumes of train, truck and bus operations are relatively high in this portion of the corridor.

- No threatened or endangered species will be affected.

- Water resources will not be impacted since proposed alternatives are largely located in existing rights-of-way of highway, major arterial roadways, and railroad corridors and will have minimal encroachment on floodplains in the study area.

- No known archaeological sites are located within the proposed alignments.

- There are no historic or potentially historic sites that would directly be affected by any of the alternatives. There is a possibility of indirect impacts associated with noise, visual,
or traffic impacts that would require further investigations in PE/DEIS phases of the project.

- Although there are several public parks, greenways, and recreational facilities located within the North Corridor, none of these will be directly affected by any of the alternatives.

- The results of records review and field investigations indicate that there are several known sites of recorded contamination and hazardous substances present in the study area. None are located inside the proposed rights-of-way, and therefore they are not expected to be directly impacted.

For most of the environmental categories, the impacts are very low and cannot be used as a significant differentiator to compare the various build alternatives.

Table 4-4 below contains two environmental criteria that show a difference among the alternatives. These include the “potential acres of right-of-way that would be required” to construct the alternative and the “local traffic impacts” that would be generated by the individual alternatives.

Alternative N-5 is expected to require the largest amount of right-of-way - between 41 and 53 acres. Clearly, this is because the alternative contains both a BRT on I-77 as well as the commuter rail option and is more likely to be associated with a larger number of park-and-ride facilities. The 11-station commuter rail option in alternative N-3 requires the least amount of right-of-way, requiring between 18 and 24 acres of land. Alternative N-4, the DMU 17-station rail option requires between 30-34, while Alternative N-6, the BRT on I-77 requires between 23 and 29 acres for right-of-way.

Local traffic effects for the various north alternatives are minimal and isolated at some crossings. Although the Commuter rail alternatives may require closing some of the existing railroad crossings, local traffic circulation is not adversely impacted. Majority of the BRT alignment is within I-77’s right-of-way and on arterial streets, it operates in mixed-traffic thus minimizing any potential impacts on local traffic. Thus the local traffic effect is low and it is not a major differentiating factor among the alternatives in the north corridor.

Other local traffic impacts as a result of operating characteristics including, signal pre-emption, arriving/ existing station and park & ride traffic would be investigated in detail in the next phase of the project.
### Table 4-4. Evaluation of Alternatives According to Environmental Criteria

<table>
<thead>
<tr>
<th>MEASURES</th>
<th>N-1: Future Baseline</th>
<th>N-3: Commuter rail (11 Station option)</th>
<th>N-4: DMU Rail (17 station option)</th>
<th>N-5: BRT on I-77 (11 Station Commuter rail)</th>
<th>N-6: BRT on I-77</th>
<th>N-7 HOV on I-77 and 17 station DMU</th>
</tr>
</thead>
<tbody>
<tr>
<td>Displacements (ROW takes)</td>
<td>Low</td>
<td>Low-Med</td>
<td>Medium</td>
<td>High</td>
<td>Medium</td>
<td>Medium</td>
</tr>
<tr>
<td>Potential for noise impacts</td>
<td>Low</td>
<td>Low-Med</td>
<td>Low</td>
<td>Low-Med</td>
<td>Low</td>
<td>Low-Med</td>
</tr>
<tr>
<td>Local traffic effects</td>
<td>N/A</td>
<td>Low-Med</td>
<td>Low-Med</td>
<td>Low</td>
<td>Low-Med</td>
<td>Low-Med</td>
</tr>
<tr>
<td>Cultural or natural resources affected</td>
<td>Low</td>
<td>Low-Med</td>
<td>Low-Med</td>
<td>Low-Med</td>
<td>Low</td>
<td>Low-Med</td>
</tr>
<tr>
<td>Properties with access affected</td>
<td>Low</td>
<td>Med-High</td>
<td>Med-High</td>
<td>High</td>
<td>Low</td>
<td>Med-High</td>
</tr>
<tr>
<td>Water resources affected</td>
<td>None</td>
<td>None</td>
<td>None</td>
<td>None</td>
<td>None</td>
<td>None</td>
</tr>
</tbody>
</table>

#### 4.2.4 Financial

**Evaluation Measures**

Capital and operating costs clearly play a significant deciding role in the evaluation and choice of a preferred alternative for the North Corridor. These costs, in conjunction with ridership, are used to estimate the cost-effectiveness of each build alternative. **Table 4-5** below shows various financial criteria or measures, including capital and annual operating and maintenance costs for the various corridor alternatives. All costs are in 2002 dollars. The capital costs include all engineering, design, construction, facilities, rolling stock and contingency costs required to implement the alternatives.

When each fixed guideway or rapid transit alternative has been implemented, additional funding will be required to operate and maintain that new piece of the system. The annual operating and maintenance (O&M) costs summarized in the table, include all the costs related to the fixed guideway component and the support non-guideway service component of each alternative. The annual O&M costs are those over and above the cost to operate and maintain the Future Baseline (N-2) Alternative.

The measure “incremental cost per new rider” also summarized in the table below, is a cost effectiveness measure that provides a means of comparing the benefits of the alternatives being considered relative to the costs of the alternatives. This measure, expressed in 2002 dollars, is based on the total annualized capital investment and annual operating costs divided by the forecasted change in annual new transit trips, and compared to the Future Baseline (N-1) Alternative. It offers an indication of the return of investment in terms of new transit trips being made as a result of the transit improvement.

#### Table 4-5. Evaluation of Alternatives According to Financial Criteria

<table>
<thead>
<tr>
<th>MEASURES</th>
<th>N-1: Future Baseline</th>
<th>N-3: Commuter rail (11 Station option)</th>
<th>N-4: DMU Rail (17 station option)</th>
<th>N-5: BRT on I-77 (11 Station Commuter rail)</th>
<th>N-6: BRT on I-77</th>
<th>N-7 HOV on I-77 and 17 station DMU</th>
</tr>
</thead>
<tbody>
<tr>
<td>Capital costs</td>
<td>N/A</td>
<td>$230 M</td>
<td>$251 M</td>
<td>$427 M</td>
<td>$179 M</td>
<td>$307 M</td>
</tr>
<tr>
<td>Incremental cost per new transit trip</td>
<td>N/A</td>
<td>$13.16</td>
<td>$12.42</td>
<td>$12.88</td>
<td>$7.61</td>
<td>$12.99</td>
</tr>
<tr>
<td>Operating &amp; maintenance costs</td>
<td>$15.2M</td>
<td>$19.1M</td>
<td>$17.2M</td>
<td>$19.1M</td>
<td>$13.5M</td>
<td>$17.9M</td>
</tr>
</tbody>
</table>
Findings

Costs for Alternative N-5 are highest since they include both BRT on I-77 as well as the 11-station commuter rail. This alternative is the only option that incorporates two rapid transit modes along separate alignments. The stand-alone BRT option on I-77 is Alternative N-6, and has lower capital costs than any of the other alternatives since it remains for the most part on the existing I-77 right-of-way. Commuter rail service would operate on the available Norfolk-Southern “O” line. Although this rail line needs to be upgraded, it is a less expensive alternative than building a new guideway along a new right-of-way.

The O&M cost estimates are highest for Alternative N-7, again because this alternative incorporates two transit options. As with the capital costs, the lowest cost alternative is N-6.

In terms of cost-effectiveness, the lower the cost, the better the return on investment. Cost per new transit trip is highest for Alternative N-3. Even thought it is one of the lower cost alternatives to build, relative to the lower number of transit trips made on this option, it received a worse rating. Unlike Alternative N-3, the N-6 received the best cost effectiveness rating because it carries more riders for a significantly lower capital cost.

Financing

Given that five corridors are being considered for capital and operational funding and will draw on the same funding sources, the financial analysis will be conducted at the system level. The financial feasibility analysis will examine the extent to which sufficient funding is available, or can be developed, to support the construction, operation, and maintenance of an alternative in the context of the other funding needs and obligations of the region.

4.2.5 System Development/Center City

Because each corridor’s transit service needs to work as part of an overall system coming together in the Center City, the Corridor MIS and system plan evaluations must identify how an alternative can work as part of the overall system/Center City transit plan. Table 4-6 summarizes the evaluation of each alternative using the following three criteria:

1. Synergy with Other Corridors: This criterion measures how well an alternative provides connections to other corridors within the system based on the customer’s perspective. This measurement focuses on inter-connection of corridors using potential travel markets.

2. Operating Efficiency: This factor examines how well each alternative fits within an overall system from an operations perspective. Each alternative is evaluated to determine its potential to provide through service to other corridors, thus avoiding deadhead operations that add to system operating and maintenance costs.

3. Balanced Use of System Capacity: This criterion evaluates how well an alternative takes advantage of existing rail or highway capacity. An alternative that operates on an under-utilized rail line or that uses roadway lanes with low traffic volumes would rate better on this criterion than one that would eliminate well-used traffic lanes in order for it to be implemented.
### Table 4-6 Evaluation of Alternatives According to System Development /Center City Criteria

<table>
<thead>
<tr>
<th>MEASURES</th>
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<th>N-3: Commuter rail (11 Station option)</th>
<th>N-4: DMU Rail (17 station option)</th>
<th>N-5: BRT on I-77 (11 Station commuter rail)</th>
<th>N-6: BRT on I-77</th>
<th>N-7 HOV on I-77 and 17 station DMU</th>
</tr>
</thead>
<tbody>
<tr>
<td>Synergy with other corridors (through-service and connections)</td>
<td>Low</td>
<td>Medium</td>
<td>Medium</td>
<td>Med-High</td>
<td>Med-High</td>
<td>Med-High</td>
</tr>
<tr>
<td>Operating efficiency</td>
<td>Low</td>
<td>Medium</td>
<td>Medium</td>
<td>Med-High</td>
<td>High</td>
<td>Med-High</td>
</tr>
<tr>
<td>Balance use of system capacity</td>
<td>Low</td>
<td>High</td>
<td>High</td>
<td>High</td>
<td>High</td>
<td>High</td>
</tr>
</tbody>
</table>

### Findings

Synergy defines an alternative’s ability to provide either through transit service from one corridor to another, or convenient connections that facilitate through service. It also defines an alternative’s ability to serve several travel markets. All alternatives in the North Corridor have relatively convenient connections to other corridor services by being able to transfer at the Transportation Center, the West Trade Intermodal Station and/or along Trade Street. However, the rail options do not have the same level of access as the bus alternatives since they require a transfer at the West Trade Intermodal to connect with any other corridor. The bus alternatives do well because they can interline with any other corridor.

Operating Efficiency defines an alternative’s ability to operate through services. All bus alternatives do well here, but rail alternatives do not rate that well in the North Corridor since they must end at the West Trade Intermodal Station.

System Capacity relates to the ability of an alternative to use existing transportation capacity and/or facilities. The North Corridor rail alternatives do well because they take advantage of the existing NS "O" line, while the North bus alternatives must use regular freeway lanes until the freeway is reconstructed with HOV lanes and reinforced shoulders by NCDOT.

Population segments paying for alternatives or financial equity relates to the sources of capital and operating funds for transportation improvements. Funding may include a variety of sources including the existing transit tax, federal, state, and local general revenues, gasoline taxes, or other specific taxes, and user fees or costs such as fares paid by transit passengers, tolls paid by highway users, and gasoline and maintenance costs paid by auto users.

Financial equity addresses how the sources of these funds relate to the users of the services and to various income groups. For example, general revenue funds are based on broad taxes such as income, sales, or property taxes and are not directly related to an individual’s use of the facility, whereas highway tools and transit fares apply more directly to those who use the facility. Environmental considerations are, for the most part, not an issue with any of the alternatives since the analysis demonstrated that in most of the categories there were no significant effects produced by any of the “build” alternatives. However, even though there was a range of acreage required by each of the alternatives, none of them would disproportionately displace residences or businesses in the minority and low-income areas they traverse.
4.2.6 Community Involvement Response

The people who live and work in the North Corridor are the ones most familiar with the corridor’s transportation problems, and best able to evaluate ideas for improvements. Public involvement has been an essential element to the project and various methods have been employed to involve the local community and other stakeholders in the broader MIS process as part of a public involvement plan. This comprehensive public involvement plan was used to define key issues and concerns that exist with regard to transit and land use in the corridor. The participation process was also designed to inform the public of the project and therefore incorporated various information-sharing media to increase public awareness and knowledge of the project. It also served as an important means of obtaining valuable local input, proactively seeking the participation and views of the broader public and allowed a channel for citizen feedback to be incorporated into the project’s decision-making process.

Numerous outreach efforts and techniques were used as part of the broader public participation process including stakeholder interviews, public meetings, presentations to neighborhood associations, business organizations and other interest groups in the corridor, newsletters, website and other participation techniques.

Many issues and concerns were raised as a result of the public participation process, some of the most common concerns included:

- Land use and TOD: People were concerned about an increase in density in their neighborhoods. To them, density meant an increase in unattractive, low-income apartment housing. Citizens in the towns also relayed that they wanted a transit alternative that encouraged “good growth,” meaning shops and homes around a transit stop with easy pedestrian-friendly access to the stations, rather than “bad growth,” such as big box or strip malls with insulated car-oriented designs. Thereby, calling for investment to not only be focused on the transit development aspects i.e. stations and services, but also to invest in “place-making” or non-transit urban design elements such as streets, curbs, sidewalks and lighting.

- Connectivity: The public stressed that access to other corridors was a necessity for any transit alternative. They wanted to be able to ride transit to other destinations in the county, not just in the corridor or Center City Charlotte.

- Costs and funding: Many people were concerned about the price of rapid transit, and that they would ultimately pay for it. Citizens asked: How much of the half-cent sales tax would cover implementation? Are there funding sources other than the local tax? Will there be enough riders to justify such a large public expenditure? Both Mecklenburg County residents and Iredell County residents were concerned about Iredell County contributing money to extend service in the North Corridor, but for different reasons.

- Geography and Demographics: Because of the geographic and demographic distance between the northern and southern parts of the corridor, opinions varied greatly. Many people living in the north concentrated on the specific needs of town life, namely the distance to Charlotte, the perceived increase in positive economic growth because of a train and the negative stereotype of buses. People living in the southern part of the Corridor expressed the concern that CATS had already chosen rail as the preferred alternative because people in the towns had more money. They also commented that a rail alternative was impractical for them since they live so close to the city.

- Technologies: The mode of transit was an issue for many people. They were concerned about the differences in operating and capital costs between the rail alternative and the BRT alternative. People in the northern part of the corridor expressed that BRT lacked the appeal that rail has while people in the southern part of the corridor focused on the
flexibility of buses. People throughout the corridor stated that travel time is a vital element of any alternative.

Most of these concerns were addressed during public meetings and by refining each of the alternatives to avoid the negative impacts that were raised. In addition, decision-makers will carefully consider public comments before deciding on a LPA for the North Corridor.

4.2.7 Equity

Equity considerations generally fall within three classes:

- The extent to which the transit investments improve transit service to various population segments, particularly those that tend to be transit dependent
- The distribution of the cost of the alternatives across population segments through the funding mechanism used to cover the local contribution to construction and operation
- The incidence of any significant environmental effects, particularly in neighborhoods immediately adjacent to proposed facilities

Based on the material presented in Section 3.11, the economic and community development, mobility, and environmental benefits of the North Corridor alternatives accrue to the residents of the corridor as well as to the Charlotte-Mecklenburg region, while the relatively few adverse effects are borne primarily by those persons residing in the corridor.

In general, the BRT and Commuter Rail/DMU alternatives considered would not result in disproportionately adverse effects on low-income or minority communities in the study 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, as well as potential economic development along the corridor. All the alternatives would expose some homes and businesses to noise and visual effects but the BRT alternatives are seen as providing greater mobility benefits to these affected communities than the Commuter Rail/DMU alternatives. If a Commuter Rail/DMU alternative is selected as the Locally Preferred Alternative, mitigation and avoidance design option will be evaluated further during preliminary engineering and the environmental impact statement phase.

Established regional, state, and federal funding mechanisms will be used for construction and operations of any of the alternatives and will be part of the CATS capital and operating budgets, and no new taxes will be required. The use of established federal and regional sources means no one group in the study area or the region receives a disproportionate share of the financial burden of the capital and O&M costs relative to the benefits received. No financial equity considerations are raised by any of the alternatives, either in terms of the source of subsidy or the level of fare payments required of passengers.

4.3 Discussion of Trade-Offs

The trade-offs analysis is an evaluation in which all relevant criteria are considered together, including both quantifiable and non-quantifiable considerations. The relevant criteria include only those measures where discernible and significant differences can be noted between alternatives. While all of the information collected during the study and presented previously was considered in the evaluation of alternatives, some considerations do not distinguish between alternatives. Therefore, only those considerations that were deemed decisive in
differentiating alternatives are presented here. Trade-offs refer to the fact that any alternative may have both positive and negative aspects and that selecting a LPA requires balancing these trade-offs.

Within a corridor, a number of types of trade-offs may exist. Examples of the types of trade-offs are:

- Among alignments: one alignment may serve a greater concentration of existing population, for example, while another could better stimulate new development and thus a larger future population.
- Among modes: a mode that typically has more stations enables a greater percent of riders to access the service by walking. However, the more stops, the more divided is the market for TOD and more stations mean an increase in travel time.

All of the transit alternatives examined in the MIS are feasible, but each have varying costs and benefits. To determine how well the North Corridor alternatives would meet the project goals and objectives selected by the MTC, an evaluation matrix format was used to summarize key distinguishing data by category (see Table 4-7).

Identification and Explanation of Significant Differences

Among the five build alternatives that the North Corridor MIS examined in detail, the major differences in land use impacts are between the BRT-based alternatives and the rail-based alternatives.

The BRT alternatives would potentially serve a higher number of existing households and employment within the station areas. This is in large part due to the higher number of stations associated with BRT in Charlotte and in the four towns, and the nature of development surrounding most of the I-77 interchanges where many of the BRT stations would be located.
<table>
<thead>
<tr>
<th>MEASURES</th>
<th>N-1: Future Baseline</th>
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<th>N-7 HOV on I-77 and 17 station DMU</th>
</tr>
</thead>
<tbody>
<tr>
<td>Land Use</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Existing corridor &amp; station area land use patterns</td>
<td>N/A</td>
<td>Low-Med</td>
<td>Medium</td>
<td>High</td>
<td>Med-High</td>
<td>Med-High</td>
</tr>
<tr>
<td>Existing corridor &amp; station area development character</td>
<td>N/A</td>
<td>Med-High</td>
<td>High</td>
<td>Medium</td>
<td>Low-Med</td>
<td>High</td>
</tr>
<tr>
<td>Potential Transit-Oriented Development (TOD) sites</td>
<td>N/A</td>
<td>Medium</td>
<td>Med-High</td>
<td>Medium</td>
<td>Low-Med</td>
<td>Med-High</td>
</tr>
<tr>
<td>Existing land use policies &amp; tools for station area &amp; corridor land use patterns</td>
<td>N/A</td>
<td>High</td>
<td>High</td>
<td>Med-High</td>
<td>Low-Med</td>
<td>Med-High</td>
</tr>
<tr>
<td>Future corridor &amp; station area land use patterns</td>
<td>N/A</td>
<td>Low</td>
<td>Low-Med</td>
<td>High</td>
<td>Med-High</td>
<td>Medium</td>
</tr>
<tr>
<td>Enhance Center City &amp; core area growth</td>
<td>N/A</td>
<td>Low-Med</td>
<td>Med-High</td>
<td>High</td>
<td>Medium</td>
<td>Low-Med</td>
</tr>
<tr>
<td>Mobility/Operations</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total Daily Guideway Boardings</td>
<td>3,100 8,000-10,000 9,000-11,000</td>
<td>20,000-22,000 18,000-20,000</td>
<td>16,000-18,000</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>New Daily Transit Trips</td>
<td>N/A</td>
<td>9,730</td>
<td>10,530</td>
<td>15,130</td>
<td>12,830</td>
<td>11,330</td>
</tr>
<tr>
<td>Daily Travel time savings (hours)</td>
<td>N/A</td>
<td>1,300</td>
<td>1,600</td>
<td>2,200</td>
<td>2,200</td>
<td>1,500</td>
</tr>
<tr>
<td>Transit dependent access (within 0.5 mi.)</td>
<td>N/A</td>
<td>383</td>
<td>1,659</td>
<td>3,990</td>
<td>3,612</td>
<td>1,762</td>
</tr>
<tr>
<td>Connections to activity centers, special event &amp; cultural sites</td>
<td>Medium</td>
<td>Medium</td>
<td>High</td>
<td>Medium</td>
<td>Medium</td>
<td>High</td>
</tr>
<tr>
<td>Environment</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Displacements (ROW takes)</td>
<td>Low</td>
<td>Low-Med</td>
<td>Medium</td>
<td>High</td>
<td>Medium</td>
<td>Medium</td>
</tr>
<tr>
<td>Potential for noise impacts</td>
<td>Low</td>
<td>Low-Med</td>
<td>Low</td>
<td>Low-Med</td>
<td>Low</td>
<td>Low</td>
</tr>
<tr>
<td>Local traffic effects</td>
<td>N/A</td>
<td>Low</td>
<td>Low-Med</td>
<td>Low</td>
<td>Low</td>
<td>Low-Med</td>
</tr>
<tr>
<td>Cultural or natural resources affected</td>
<td>Low</td>
<td>Low-Med</td>
<td>Low-Med</td>
<td>Low-Med</td>
<td>Low</td>
<td>Low-Med</td>
</tr>
<tr>
<td>Properties with access affected</td>
<td>Low</td>
<td>Med-High</td>
<td>Med-High</td>
<td>High</td>
<td>Low</td>
<td>Med-High</td>
</tr>
<tr>
<td>Water resources affected</td>
<td>None</td>
<td>None</td>
<td>None</td>
<td>None</td>
<td>None</td>
<td>None</td>
</tr>
<tr>
<td>Financial</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Capital costs</td>
<td>N/A</td>
<td>$230 M</td>
<td>$251 M</td>
<td>$427 M</td>
<td>$179 M</td>
<td>$307 M</td>
</tr>
<tr>
<td>Incremental cost per new transit trip</td>
<td>N/A</td>
<td>$13.16</td>
<td>$12.42</td>
<td>$12.88</td>
<td>$7.61</td>
<td>$12.99</td>
</tr>
<tr>
<td>Operating &amp; maintenance costs</td>
<td>$15.2M</td>
<td>$19.1M</td>
<td>$17.2M</td>
<td>$19.1M</td>
<td>$13.5M</td>
<td>$17.9M</td>
</tr>
<tr>
<td>System Development</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Synergy with other corridors (through-service and connections)</td>
<td>Low</td>
<td>Medium</td>
<td>Medium</td>
<td>Med-High</td>
<td>Med-High</td>
<td>Med-High</td>
</tr>
<tr>
<td>Operating efficiency</td>
<td>Low</td>
<td>Medium</td>
<td>Medium</td>
<td>Med-High</td>
<td>High</td>
<td>Med-High</td>
</tr>
<tr>
<td>Balance use of system capacity</td>
<td>Low</td>
<td>High</td>
<td>High</td>
<td>High</td>
<td>High</td>
<td>High</td>
</tr>
</tbody>
</table>

N/A: Not Applicable
The BRT based alternatives N-5 and N-6 serve the mobility needs of the I-77 corridor and Lake Norman areas very well. Nevertheless, they do little to promote the goals and plans for the town centers, and have more limited potential to create the type of TOD environments that the 2025 Integrated Transit/Land-Use Plan and the goals of the MIS process seek to create. In assessing the qualitative “development character” of the alternatives, the rail based options—N-3, N-4 and N-7—receive higher rankings because of their advantages regarding pedestrian access, finer grained mix of uses and future TOD potential.

Rail-based options support and facilitate the implementation of adopted land use regulations and policies of Charlotte, Huntersville, Cornelius, and Davidson. They also serve future development potential east of I-77 and the “O” line. BRT or Enhanced Bus along I-77 alone would not support TOD as effectively as rail service along the “O” line.

Market support for TOD development and the degree to which an alignment supports community growth and redevelopment goals were higher for the rail alignments than the BRT alignments because of the nature of the development environment within the north Mecklenburg and southern Iredell towns. Many of the potential rail stations are located within the town centers of Huntersville, Cornelius, Davidson, and Mooresville, all of which have local development environments that better support high-density, pedestrian-friendly, transit-oriented development.

The same holds true for public policy support for transit. All three north Mecklenburg towns and Mooresville have adopted policies that create incentives, and in some instances, require developers to build transit-oriented communities. Alignments that have stations within the centers of these towns would obviously score higher with respect to existing public policy supporting transit.

Although station areas along I-77 have more available land to develop upon than station areas along the rail line, the quality of potential TOD sites is generally higher along the rail alignment alternatives. Much of the development along I-77 is currently contemporary, automobile-oriented, “suburban” residential and commercial development. It should be noted, however, that if a BRT alignment were chosen as the locally preferred alternative, local land use controls could change to accommodate transit-oriented development along I-77. Regardless, the N-3, N-4 and N-7 alignments currently score higher than the N-6 alignment with respect to the qualitative aspects of TOD planning. The N-5 alignment also scores well because it is a combination of a rail and a BRT alignment.

There are a number of existing and planned land use developments along the rail line that not only support transit service, but focus on it. Future land use patterns along major portions of I-77 support interstate-related development such as strip retail centers. Therefore, the N-3, N-4 and N-7 rail alignments score higher than the N-6 BRT alignment for this measure, while the N-5 (combination of rail and BRT) alignment scores fall between the pure rail and pure BRT choices.

Because of the total available land, existing development patterns and numerous candidate stations, the estimated number of jobs and households added within the station areas between 2000 and 2025 are much higher for the BRT alignments than for the rail alignments. Land along the I-77 corridor (where potential BRT is located) is rapidly being developed with retail centers, residential communities, and office parks, most of which are not transit-oriented, but do generate additional jobs and households. From a purely...
quantitative standpoint then, the two main BRT based alternatives—N-5 and N-6—score the highest.

A partial reason for the lower quantitative ratings for the rail alignment are due to the location of many of the stations in existing town centers and the number of park-and-ride facilities available. The amount of available land for new development is very limited in Huntersville and Davidson and to some degree in Mooresville. The existing established “town center” character at these locations and current local policies make massive redevelopment of these areas extremely unlikely. Cornelius has a large greenfield TOD site planned east of the railroad. In Huntersville and Mooresville, and perhaps to a greater extent Davidson, the role of TOD planning is not significant growth but rather stabilization, enhancement and incremental infill of the town centers. Transit is seen as a key ingredient in their efforts to counter strong trends that have been drawing much commercial and residential activity out of these centers to the I-77 and related highway corridors (NC-73 and NC-150)

4.4 Next Steps

The Major Investment Studies document the technical information on the various alignments and technologies studied in each corridor and provide comparative analyses of the alternatives. A separate document, the Corridor System Plan, uses the MIS analysis results to develop an overall system plan.

The Corridor System Plan includes:

- The alignment and technology recommendations in each corridor (locally preferred alternative);
- The strategy for weaving together the five corridors in downtown and integrating the existing Transportation Center and proposed West Trade Street Multi-Modal Station; and
- The implementation plan that describes the proposed schedule and financing strategy for constructing rapid transit in the corridors.