SEVEN PORTALS STUDY

An Investigation of Economic Development in North Carolina Through Logistics Villages

Charlotte Region

Final Report

December 31, 2011

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CHARLOTTE REGION REPORT

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For the

Governor's Logistics Task Force
and
The North Carolina Department of Transportation

Final Report

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Disclaimer

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This regional study was accomplished through the dedicated efforts of a small study team which is part of a much larger study team looking at both statewide issues and other commerce regions. The study team members for this region included:

UNC-Charlotte Team

S. Gary Teng, Ph.D., P.E. - Professor & Director, Systems Engineering & Engineering Management Program & Center for Lean Logistics & Engineered Systems, lead investigator and lead writer.

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Executive Summary

The goal of this study was investigating potential logistics villages within one of the seven economic development regions across the state. The initial focus was proximity for air, rail, and highway connectivity at potential sites, but the study discovered other possibilities for successful villages. Each village is evaluated for strengths, weaknesses, and needs, with emphasis on identifying what infrastructure improvements are needed to support such a village at that location. The study does not recommend specific sites above others. The major findings from this study are incorporated into a master report covering the entire state titled *Seven Portals Study – An Investigation of How Economic Development Can be Encouraged in North Carolina Through Infrastructure Investment.*

This report presents a summary of the current status of logistical infrastructure in place and planned for future development in the Charlotte Region of North Carolina. It responds to the needs of the State and Region to integrate the functions of economic development, transportation planning, and logistics system/ business environment enhancement. Both government agencies (e.g., the NC Department of Transportation, NC Department of Commerce, City of Charlotte, Iredell County, etc.) and the private sector have been instrumental in providing input and review for this study. The Charlotte regional logistics study at its core has identified just a sample of suitable sites among a larger number of sites that can be developed to improve the overall logistics operational capacity in the Charlotte region and the State of North Carolina. This report presents in a uniform fashion relevant data, on a handful of development sites that allows the study team to document the efficiency and effectiveness of Charlotte region's logistics infrastructure.

In consideration of the available development sites in the Charlotte Region, the study team's approach was to describe each site's potential to enhance overall logistics operations in the Region. Data shown in this report can be used to further integrate a regional and statewide logistics system. This report on the Charlotte Region, or "Portal," has been developed in tandem with an additional six regions that basically encompass all 100 counties. Ultimately, the long-term goal is to contribute to the way that North Carolina can improve the safety, security and efficiency of our ability to transport and manage freight systems efficiently and cost effectively.

A summary of terminology used in the report will assist the reader in understanding the report. The terms "Portal" and "Region" are used interchangeably throughout the report, and refer to the seventeen counties in the greater Charlotte Region, 12 in North Carolina and five in South Carolina. Only sites and counties in North Carolina were included in this study, however. Likewise, the term "Village" is used interchangeably to identify each county and the cities and towns within each county. We have specifically addressed four counties or "villages:" Iredell, Mecklenburg, Rowan, and Union. Cabarrus County and the City of Concord were identified as locations where sites that can be developed are apparent, but not given full treatment in developing the study results.

Finally, the term "site" is used to identify a specific property, either undeveloped at present, actively organized to seek developers or financial backing, or available in its present status to be considered as a potential logistics site in the future. Each site covered in this report is in fact

active in planning, designing or construction of the property with an aim toward equipping the site for warehousing or light manufacturing.

This report relates the discussions of the study team with managers involved in "marketing" their sites features, strengths and opportunities for improvement. Environmental concerns and security issues are addressed in an overall generic approach – no specific analysis of these issues by site. The ultimate purpose of this study was to provide information on the greater Charlotte Region's logistics system capabilities, and how with further development, it can enhance the economic development of the Region and the State.

1 Introduction

There are currently several major challenges facing the State of North Carolina in economic development and in logistics network development and operations. Over the past decades the state has grown in population, consequently increasing the usage and deterioration of our transportation and logistics infrastructure. The State's industries have transitioned from an economy based on textiles, furniture, and tobacco industries to specialized knowledge industries such as advanced manufacturing, aerospace, energy, pharmaceuticals, bio-technology, and financial services. Therefore, the State Legislature and the Departments of Transportation and Commerce have developed a strategy to study the current logistics network with the idea of providing background information to develop a statewide logistics plan to accommodate not only the State's economic growth but also to be able to take advantage of changes in the global business environment. To study this issue, the Governor has appointed a State Logistics Task Force. This study report is one of seven regional "portals" studies that will provide the Task Force ideas and data upon which to guide the State in improving our transportation/logistics systems.

The greater Charlotte region is one of the nation's major transportation and distribution centers. Charlotte is fortunate to have several factors that make business easier to conduct and more profitable, such as geographic location, climate, close proximity to major U.S markets, the intersection of two major Interstates, good and improving rail service, and an emerging multi-modal transportation network. One major component of that transportation network is container freight. It is projected that total container traffic in the U.S. will triple over the next 20 years. Container freight movement in the Charlotte region will follow the same trend. The Charlotte region's economic growth is straining beyond capacity our highway and rail infrastructure. Bottlenecks in the flow of goods affect interstate and other major highway routes serving the City of Charlotte, in particular during morning and afternoon peak hours. This study report hopefully will help develop an integrated plan for both highway and logistics networks in the Charlotte region and statewide.

Globalization has stimulated the growth for marine freight shipments as well as airfreight in the Charlotte region and in North Carolina. Air cargo volume is expected to rise to more than double of the current volume in Charlotte and in North Carolina within the next 15 years. International shipments are expected to lead that growth. Therefore, major attention in this study will focus on a sample of potential sites for the creation of several counties developing as what we call "logistics villages" that can be a part of an integrated logistics network in North Carolina, taking advantage of the Charlotte region's multimodal shipping capability and hence the economy. At least one property in each of four counties that are developing as logistics-oriented sites will be described.

2 Overview of the Charlotte Region

2.1 Background information on the Regional Economy

The Charlotte region is the sixth largest trading area in the United States. Available freight services through air, rail, and highways and proximity to several east coast ports provide an opportunity for the region to be a competitive location in the global logistics and trade network. The region we have included in this study is composed of 12 North Carolina counties as shown in Figure 2-1. However, most of the Charlotte region's planning for economic development and transportation systems is a joint effort among 12 North Carolina and 4 South Carolina counties through Charlotte Regional Partnership and other organizations (see Figure 2-2).

In relation to the advantage of Charlotte region's location, about 60% of the US population (and the industrial base) live within 2 hours of flight time or one day delivery time by motor freight. The Bi-State Charlotte region has a population of 2.6 million residents with a labor force of 1.1 million people. The region is a major economic engine for both States. Charlotte Douglas International Airport (CLT) is the major airport in the two states. Four rail lines including both Norfolk Southern, CSX, and two "short line" railroads are part of a network of more than 43,200 miles of track. A major rail switching yard for Norfolk Southern currently is located just north of Charlotte's downtown, but plans are well underway to move that facility to property owned by Charlotte Douglas International.

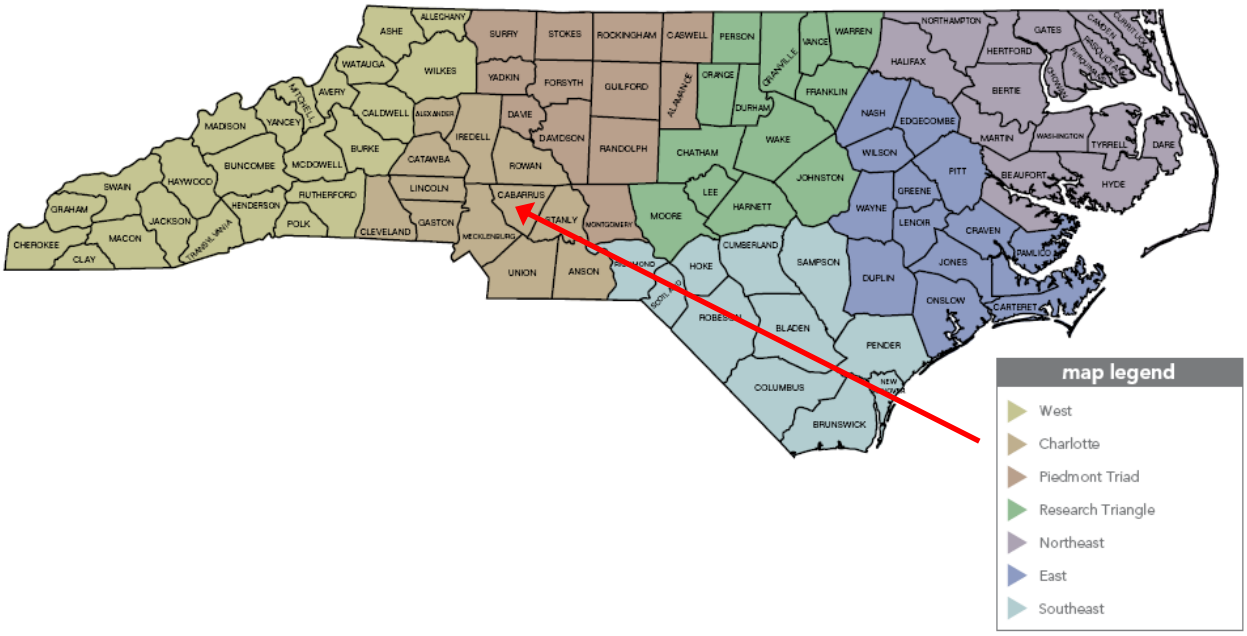

Figure 2-1: The 12-County Charlotte Region in North Carolina

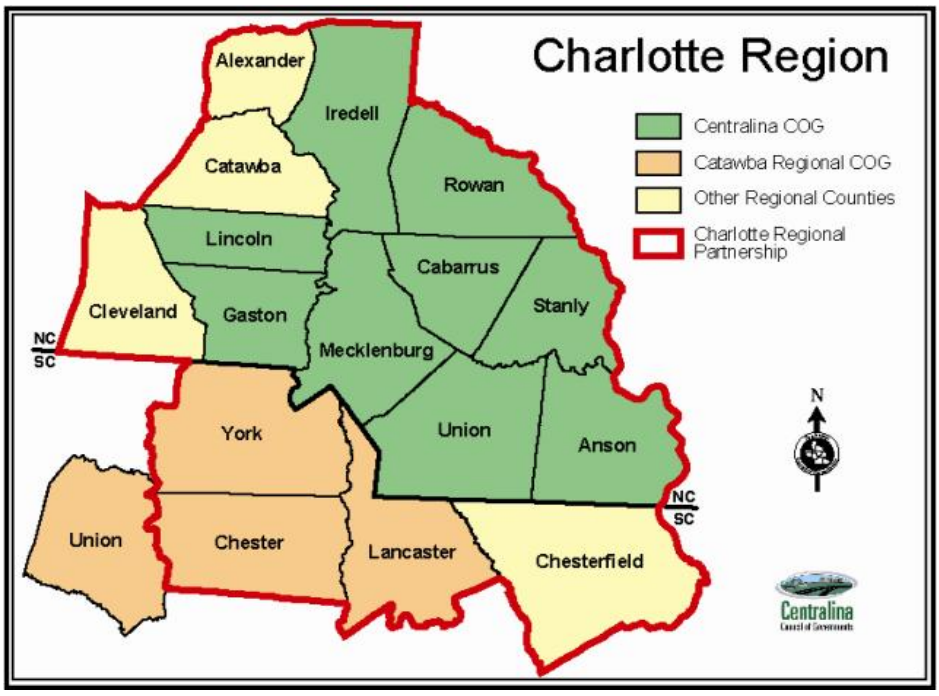

Figure 2-2: The 16-County Bi-State Charlotte Region

Current major focus areas in industry and business development in the region include:

- Advanced Manufacturing
- Logistics and Transportation
- Defense and Aerospace
- Finance
- Health
- Energy (emerging)
- Motorsports
- Film
- International Business
- Tourism

The Charlotte region has the reputation of being an attractive location for companies to establish business and manufacturing facilities. One of the main attractions to the companies is the available air service, and direct flights to more than 160 domestic and international locations with over 500 flights daily [1,2].

Table 1-1 shows the types of industry located in the Greater Charlotte Region as well as current employment figures. These data for calendar years 2009 and 2010 demonstrate that the area is diversified in the types of industry which has attracted to the area and Charlotte is no longer just a banking town. About 73 percent of Fortune 500 companies have facilities in the area. Therefore, planning for future logistics systems must consider the fulfillment of business needs to a variety of industries.

	09 establishments	09 annual employment	10 establishments	10 annual employment	% change (est.)	% change (emp.)
Total All Industries	63,664	985,200	62,686	965,931	-1.54%	-1.96%
Total Government	1,553	108,620	1,527	112,960	-1.67%	4.00%
Total Private Industry	62,132	797,954	61,159	777,150	-1.57%	-2.61%
Agriculture Forestry Fishing & Hunting	279	1,118	280	1,015	0.36%	-9.21%
Mining	51	448	47	391	-7.84%	-12.72%
Utilities	78	1,397	76	1,538	-2.56%	10.09%
Construction	6,541	51,677	6,447	45,645	-1.44%	-11.67%
Manufacturing	3,166	114,925	3,131	109,625	-1.11%	-4.61%
Wholesale Trade	5,451	53,101	5,367	50,966	-1.54%	-4.02%
Retail Trade	7,742	111,287	7,745	108,221	0.04%	-2.76%
Transportation	1,615	14,018	1,622	17,096	0.43%	21.96%
Information	935	22,293	954	21,301	2.03%	-4.45%
Finance and Insurance	3,822	55,966	3,765	55,907	-1.49%	-0.11%
Real Estate and Rental and Leasing	2,754	13,464	2,708	12,491	-1.67%	-7.23%
Professional and Technical Services	6,900	47,785	7,036	46,773	1.97%	-2.12%
Management of Companies and Enterprises	460	30,430	464	30,193	0.87%	-0.78%
Administrative and Waste Services	3,768	61,119	3,789	61,539	0.56%	0.69%
Educational Services	1,198	50,009	1,168	57,585	-2.50%	15.15%
Health Care and Social Assistance	4,806	111,850	4,965	112,275	3.31%	0.38%
Arts, Entertainment and Recreation	858	19,642	851	17,030	-0.82%	-13.30%
Accommodation and Food Services	4,449	83,782	4,525	81,212	1.71%	-3.07%
Other Services Ex. Public Admin	4,439	23,512	4,563	23,034	2.79%	-2.03%
Public Administration	413	36,663	417	35,299	0.97%	-3.72%
Unclassified	3,960	2,088	2,766	975	-30.15%	-53.30%

Table 2-1: Greater Charlotte Regional Employment (2009-2010)

(Source: EDIS Report)

One very important economic development in the Charlotte area is the region's new role in the energy industry. The obvious "big player" is Duke Energy, which has been one of the Fortune 500 companies that have helped shape Charlotte and the region as a major growth and development area. At present, the established industries and businesses affiliated with the energy industry are leaping into a new era in research and development through a partnership with UNC Charlotte to develop on campus an Energy Production and Infrastructure Center (EPIC). Faculty and staff for this R&D facility will move into its new building on the Charlotte Research Institute campus later in 2011. The energy industry will continue for quite some time to be a dominant regional economic force. Charlotte has become a major hub of energy-related services with the following companies and organizations located in the Region [3].

- AREVA NP, Inc.
- Duke Energy
- EPRI
- Fluor
- Metso Power
- Piedmont Natural Gas
- PPG Industries
- Shaw Power Group
- Siemens Energy, Inc.
- Toshiba Nuclear
- URS/Washington Group
- Westinghouse

A current campaign being led by the Charlotte Regional Partnership and other industry leaders is aimed at ensuring that the Charlotte region will continue to be a recognized leader in the development and use of energy to attract jobs and investments. One strategy obviously is to create more energy-oriented jobs in the region. The proposed merger between Duke Energy and Progress Energy should result in Charlotte playing an even more important role in the energy industry.

2.2 Developing a Logistics Strategy

The following key issues should be addressed in supporting the future logistics needs for a variety of industries in the region. These issues apply not only to the energy production and infrastructure, but to most other businesses as well:

- Developing public and private sector partnerships to create the logistics vision that can support and enhance economic development in the region and the State.
- Coordinating with other partnerships to establish common goals and priorities for the region that can maximize all advantages for the region's economical growth and can minimize associated disadvantages.
- Enhancing access to ports in the State as well as to Charleston, Norfolk, and Savannah for increasing international trade.
- An effort to identify and coordinate all regional logistics/transportation planning and business marketing efforts. This entity should be able to work with the Governor's office; State agencies such as Commerce, Labor, Transportation, and Utilities Commission; universities and community colleges; local partnerships and agencies; and the private sector, including shippers and carriers.
- Developing sustainable and innovative logistics/transportation strategies.
- Integrating and economizing on the needs of five business sectors that lie at the heart of a strategic development plan:
    - Logistics and distribution
    - Advanced manufacturing
    - Energy
    - Defense and security
    - Bio-technology

Infrastructure needs include the completion of highway improvements now planned or underway. Public-private partnerships are anticipated, supported by tolling for such improvements. Norfolk Southern and CSX track improvements are also important if freight throughput goals are to be achieved.

2.3 Goals & Objectives of the Charlotte Regional Logistics Study

The Charlotte region study team has identified a number of potential logistics-oriented sites that have a great potential develop in logistics capabilities in the Charlotte region. The ultimate purpose is to enhance the efficiency and effectiveness of Charlotte region logistics infrastructure and operations as a component of a regional development plan that will build and diversify the State's economy. Businesses and industry increasingly need access to shipping raw materials, components, and finished products in order to meet their own business objectives.

The **OVERARCHING GOAL** of this study is to present relevant information that can be used by the public and private sectors in the Region and State that will help justify removing bottlenecks currently existing in the Charlotte region, to make our logistics system more efficient, and to add more economic value (or GRP – Gross Regional Product) to the Region and the State.

The following list shows specific objectives for the Charlotte regional study. Each of these objectives has been accomplished and is documented in this report.

- **Objective # 1**: To find potential feasible "logistics sites" in the Charlotte region that can add value to the integrated logistics system in the State, and discuss and document the potential for success (and potential barriers) with site developers.
- **Objective # 2**: To develop a quantitative and qualitative description of several logistics villages (i.e., counties in the region) and sites (i.e., specific properties) that are actively pursuing development including logistical support to the businesses and industries being sought for each property.
- **Objective # 3**: To analyze the current, planned, and future multimodal transportation network that will serve the sites studied in objective 2.
- **Objective # 4:** For logistics sites and counties in the Charlotte region, to describe in a very general way the various environmental and security issues that will affect the region as a whole.
- **Objective # 5:** Evaluate the four "Villages" (Counties) included in this study by assessing their strengths, areas needing improvement, and development needs.

3. Examples of Villages and Sites in the Charlotte Region

3.1 Logistics Village 1 – Charlotte and Mecklenburg County

The first potential logistics village location in Charlotte region is the Charlotte site. This proposed village is composed of a cluster of three areas that include the Charlotte Douglas International Airport area, the Arrowood-Westinghouse Industrial center and airport industrial center inside Steel Creek area, and mixed-use communities of the Dixie-Berryhill area.

Figure 3-1: Aerial View of Logistics Village 1-Charlotte Airport Site

(Source: GoogleEarth, Inc.)

3.1.1 Site 1 – Charlotte Douglas International Airport (CLT)

Charlotte Douglas (CLT) is the largest airport in NC and has three major runways. Table 3-1 shows CLT's runway information. A list of relevant data for CLT includes [1]:

- Airport Cargo Service:
  - 50+ acres of ramp space
  - Over 800,000 square feet of building space
  - 119,551 tons of cargo moved through CLT in 2009
  - Currently serves 20 cargo airlines
- With over 100,000 ft^2 of concession space
- Five Concourses and 91 passenger gates for commercial airlines
- A Foreign Trade Zone (#57) for duty-free storage is located next to the airport
- Airport maintains support relationships with US Customs, US Department of Immigration, and US Department of Agriculture
- Over 680 Daily Departures (Sept. 2010)
  - Non-stop service to 131 in-country destinations
  - Non-stop service to 29 international destinations
- Airport has over 18,000 Employees & served 34,536,666 passengers in 2009

The airports runway details are shown in Table 3-1 [4]:

DIRECTION	LENGTH		SURFACE
	FT	M	
18L/36R	8,676	2,644	ASPHALT/CONCRETE
18C/36C	10,000	3,048	CONCRETE
18R/36L	9,000	2,743	CONCRETE
5/23	7,502	2,287	ASPHALT/CONCRETE

Table 3-1: CLT Runways

Figure 3-2 represents the average daily flight by month for 2008 through 2010 with the latest data for 2010 showing increased flight volume. CLT has an air cargo center with over 800,000 square feet of building space and 50 plus acres of ramp space dedicated to air cargo, with 18 companies operating here. Air cargo plays an important role in the airport operations and the logistics operations in Charlotte and in the State. It is important to understand the existing air cargo volumes to determine future growth and expansion needs of CLT and the State's air freight services. The following figure shows the total air cargo volume in tons for 2008 through 2010 for both enplaned and deplaned cargo [5].

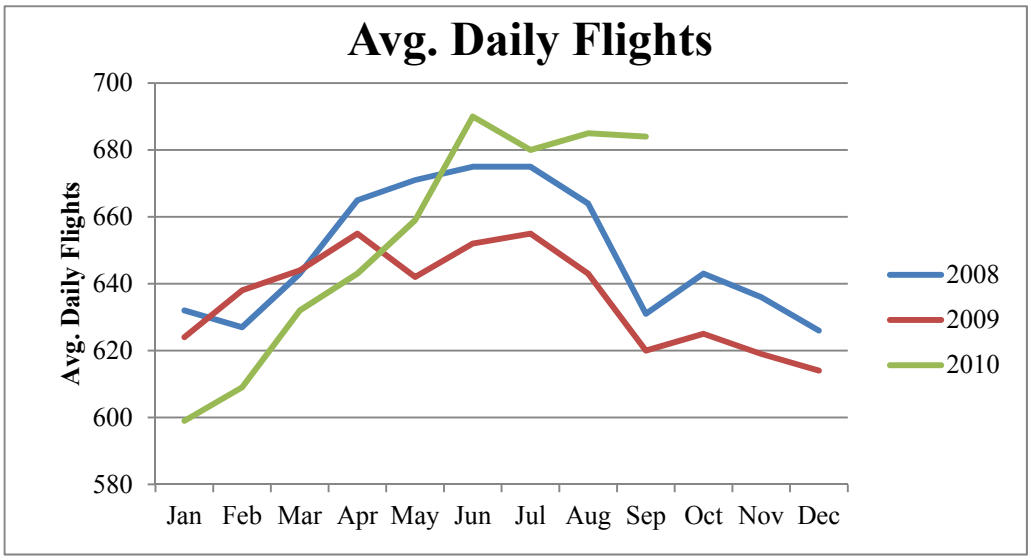

Figure 3-2: Average Daily Flight Operations at CLT

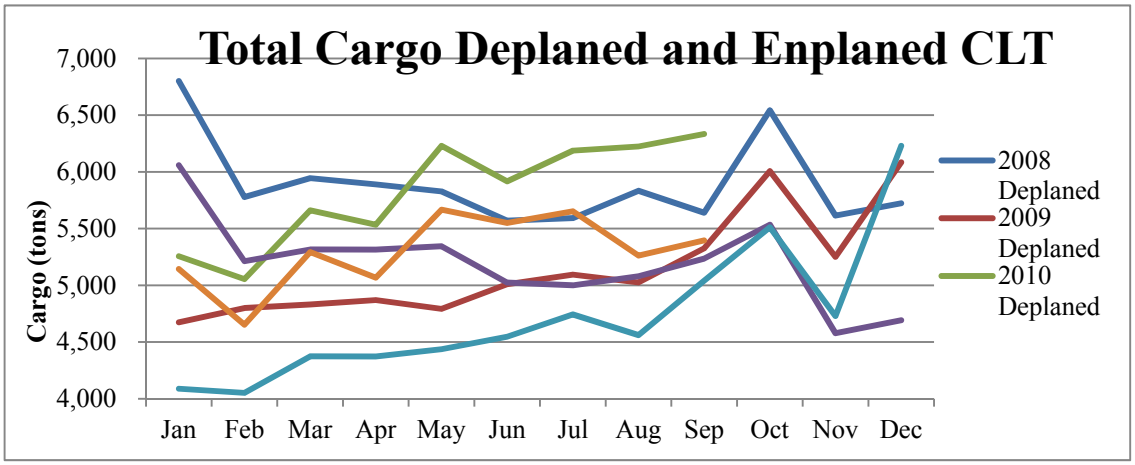

Figure 3-3: Total Cargo Deplaned and Enplaned through CLT

In Figure 3-3, the total cargo for CLT shows that in each of the 3 years and more cargo was deplaned than enplaned with an increase in 2010 [5]. The reported total cargo tons include three categories: traditional air freight including express cargo service, air mail, and international air freight. There are expected increases in international freight for CLT and it is an important consideration for future airport expansion and Charlotte area logistics system design. The figure below (Figure 3-4) shows the total percent contribution for each of the cargo categories, with 2010 showing increased percentage of international freight [5].

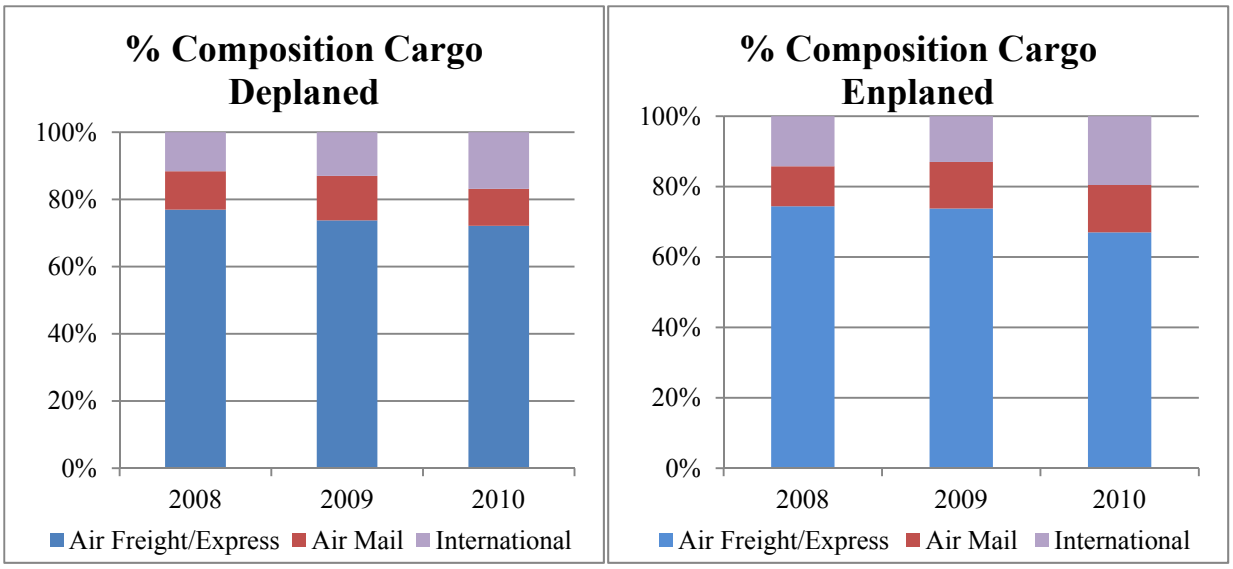

Figure 3-4: Percentage Composition of Cargo Deplaned and Enplaned through CLT

The existing activity reports for CLT show that the airport continues to grow and already has a solid base as a premier passenger and cargo airport with highly ranked operations [5]. The airport's future depends on many factors with continued freight growth through the intermodal facility and increased volumes with runway expansions.

An important aspect in evaluating the overall impact of this particular logistics site lies in estimating future air freight volume. Table 3-2 shows the projected freight volumes for air cargo with North Carolina as the destination and origin [6]. It can reasonably be assumed that CLT air freight would experience the same or higher growth rate over the next two decades.

Year	2009	2015	2020	2025	2030	2035
NC Destination Air Freight	74.6	94.3	111.5	131.5	155.1	179.5
NC Origin Air Freight	61.3	95.5	132.9	182.8	239.9	300.1
Total	**135.9**	**189.8**	**244.4**	**314.2**	**395.0**	**479.5**
% Increase		**39.6%**	**28.8%**	**28.6%**	**25.7%**	**21.4%**

Table 3-2: Projected Air Freight in North Carolina (to 2035)

(measured in tons)

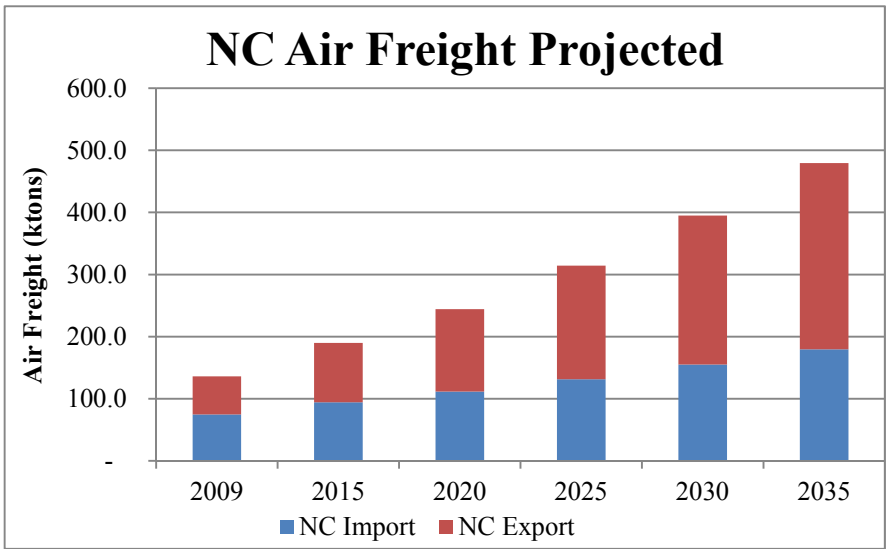

Figure 3-5: NC State Projected Air Freight

The projections show significant increase in the air cargo volumes for the state of North Carolina, specifically the increase in NC exports (see Figures 3-5) [7]. This data is then extrapolated for the Charlotte Douglas Airport to project the minimum air cargo volumes expected (see Table 3-3 & Figure 3-6). Note that in 2035 it is projected that Charlotte will handle almost 90 percent of all air freight shipped in the state. However, these projections apparently do not account for projected increase in air freight shipped through the new FedEx facility at the Piedmont Triad International Airport.

Year	2009	2015	2020	2025	2030	2035
CLT Air Freight (Tons)	119,070	166,264	214,087	275,308	346,034	420,118

Table 3-3: Projected Air Freight through CLT

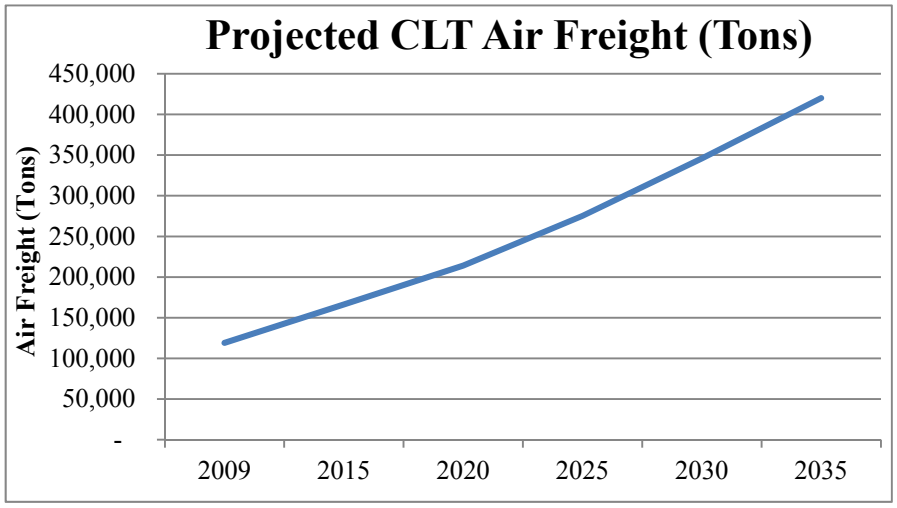

Figure 3-6: Projected Air Freight through CLT

Figure 3-6 shows the dramatic increase in air cargo expected for the CLT airport and the State of NC. This trend of cargo volume increase will require significant logistics and infrastructure improvement to ensure that CLT can handle air freight efficiently and in the most cost effective manner to serve Charlotte region and the State of NC.

There are plans for future airport expansion and development that include:

- New intermodal facility between two runways
- East terminal expansion
- Terminal roadway and lobby expansion
- Concourse E planning 4 more gates (now 32 gates)
- A 7000 space parking deck to replace the 2 decks in front of the airport

Figure 3-7 shows the CLT development plan. Note that there is allocated space south of the terminal that can be used to double the size of the current planned Norfolk-Southern intermodal terminal (which is totally being constructed to the western side of the airport property - located between the two parallel N-S runways. The planned Norfolk Southern intermodal terminal will be described in Section 3.1.4.

3.1.2 Site 2 – Steel Creek Area

> (The sites selected to be a part of the Charlotte-Mecklenburg Logistics Village consists of not only the Intermodal Terminal at Charlotte-Douglas, but also three additional parcels elsewhere in the County—the Arrowood-Westinghouse Industrial Center and the Airport Industrial Center in Steel Creek and Dixie-Berryhill)

Steele Creek is an available site located in southwest Mecklenburg County, located south of CLT and west of Sugar Creek and I-77, which generally includes the area within the yellow boundary on the map in Figure 3-8 [8]. Inside the Steele Creek area, there is an industrial area along Westinghouse Boulevard, called Arrowood-Westinghouse Industrial Center, (see Figures 3-8 & 3-9) , separating the residential and commercial areas of Upper Steele Creek and Lower Steele Creek. It is at the south of the Charlotte Airport with around 2,266 acres of land. The area also includes an Airport Industrial Center area that is south of airport. Figure 3-9 shows the locations of Arrowood-Westinghouse Industrial Center and Airport Industrial Center [9].

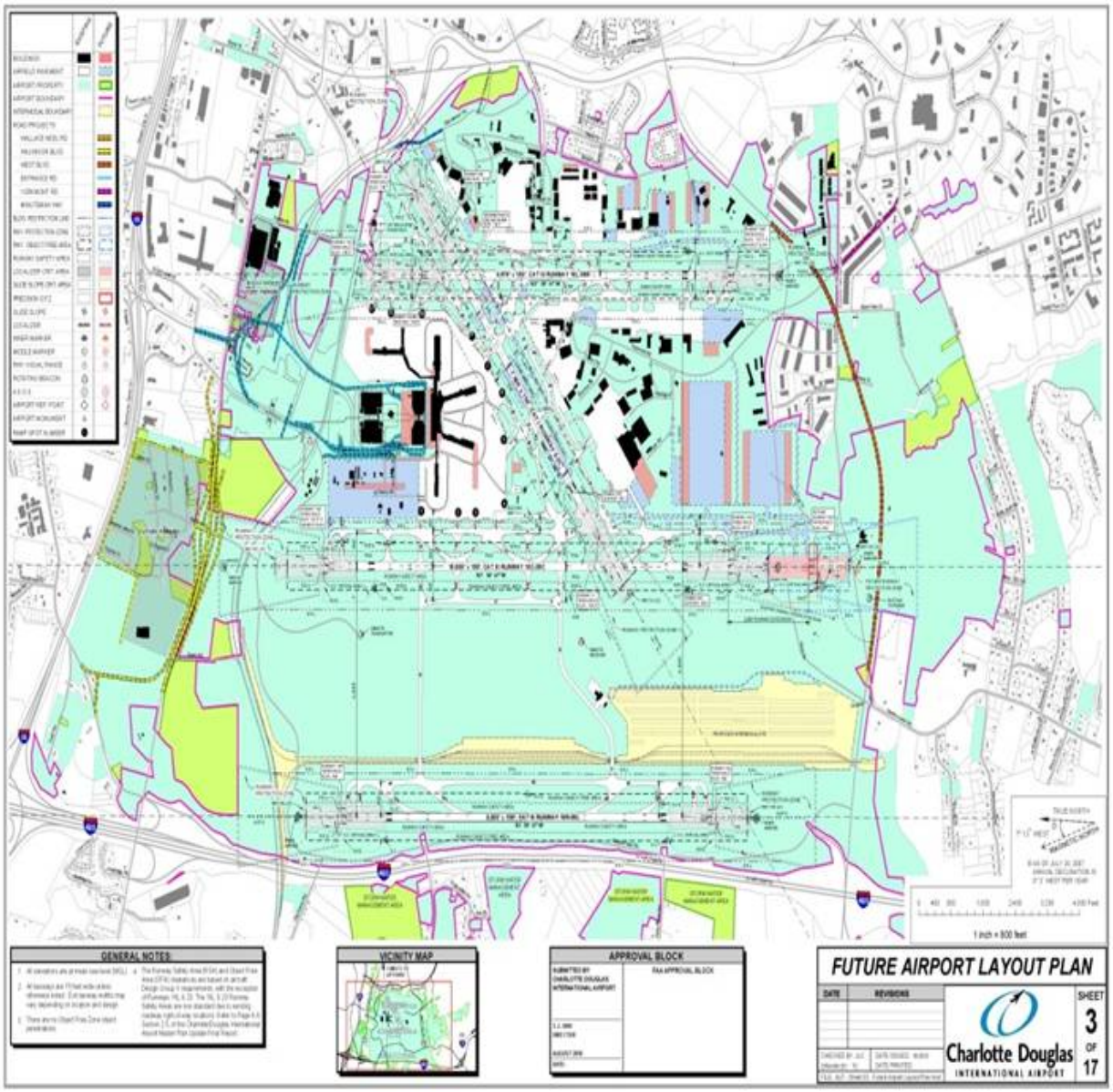

Figure 3-7: CLT airport development plan

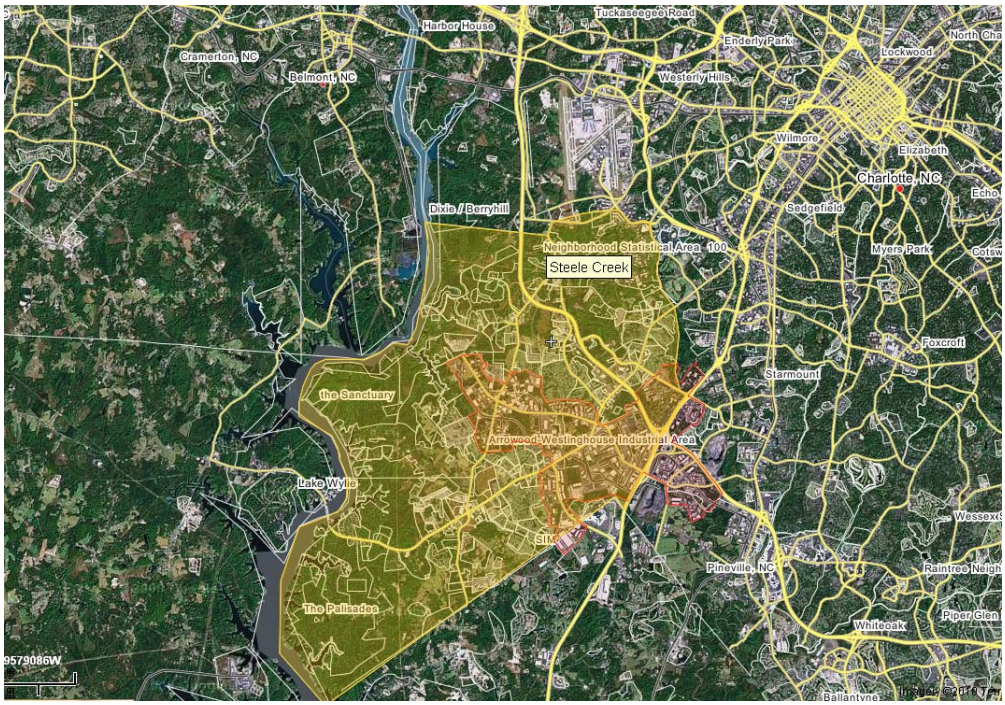

Figure 3-8: Steel Creek Area with Arrowood−Westinghouse Industrial Center

(Source: Wikimapia)

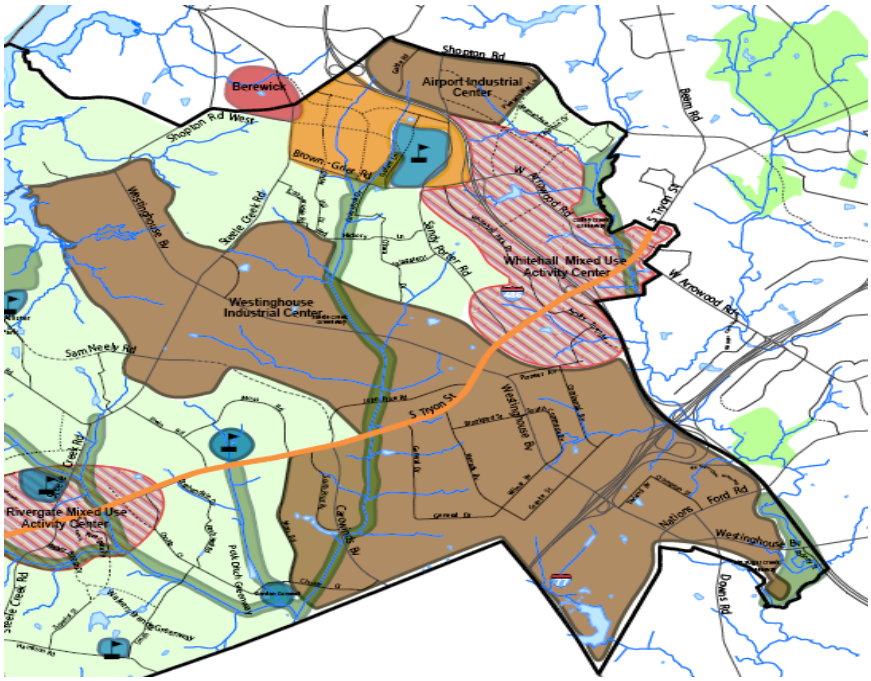

Figure 3-9: Arrowood−Westinghouse Industrial Center

3.1.3 Site 3 – Dixie-Berryhill Area

The third site selected as a part of the Charlotte logistics village is the Dixie-Berryhill area. This area is described in the Dixie-Berryhill Strategic Plan [10], adopted in April 2003. The plan covered economic development, land use, and design for the area west of the Charlotte-Douglas International Airport between the Catawba River and I-485 to encourage high quality mixed-use development, and to support transit-oriented development (TOD).

The Dixie-Berryhill area encompasses approximately 7,600 acres. The area is bounded by I-485 to the east; the Catawba River to the west; I-85 to the north; and Rock Island Road, Shopton Road and Steele Creek Road (NC 160) to the south (see Figure 3-10) [11]. Figure 3-11 shows the proposed land use map from the Dixie-Berryhill Strategic Plan. On the map, mixed-use communities are in the vicinity of the proposed project. The eastern portions of these communities, near the Charlotte-Douglas International Airport, are proposed primarily for employment/mixed-use developments, with higher-intensity employment uses proposed along the major transportation corridors. Residential development is proposed in the western portions of these communities. These mixed-use communities are close to the airport and can be considered as a part of the integrated cluster for Charlotte logistics village.

Figure 3-10: Dixie-Berryhill Area

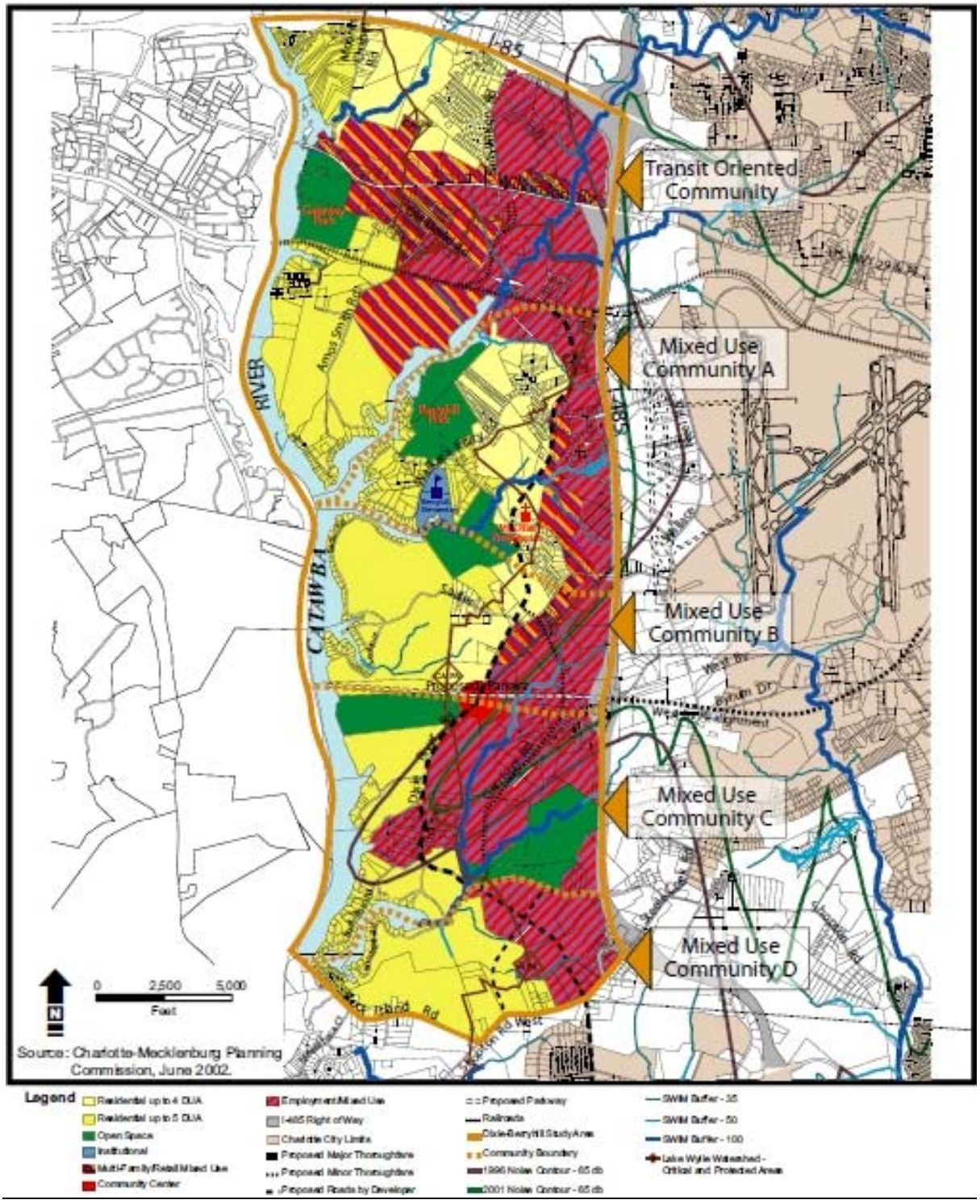

Figure 3-11: Dixie-Berryhill Area Plan

3.1.4 Rail Network in Greater Charlotte Region

There are two major railways that go through the Charlotte region: Norfolk Southern and CSX. Norfolk Southern is headquartered in Norfolk, VA with 21,500 route miles in 22 eastern states including operations in Canada. CSX is based out of Jacksonville, FL with 21,000 route miles in 23 states also including operations in Canada. Norfolk Southern railways predominantly cover the north and south rail lines while CSX mostly covers the east and west infrastructure. Both firms offer logistical solutions for multiple clients within the Charlotte region. Figure 3-12 shows the railway map in the Charlotte area.

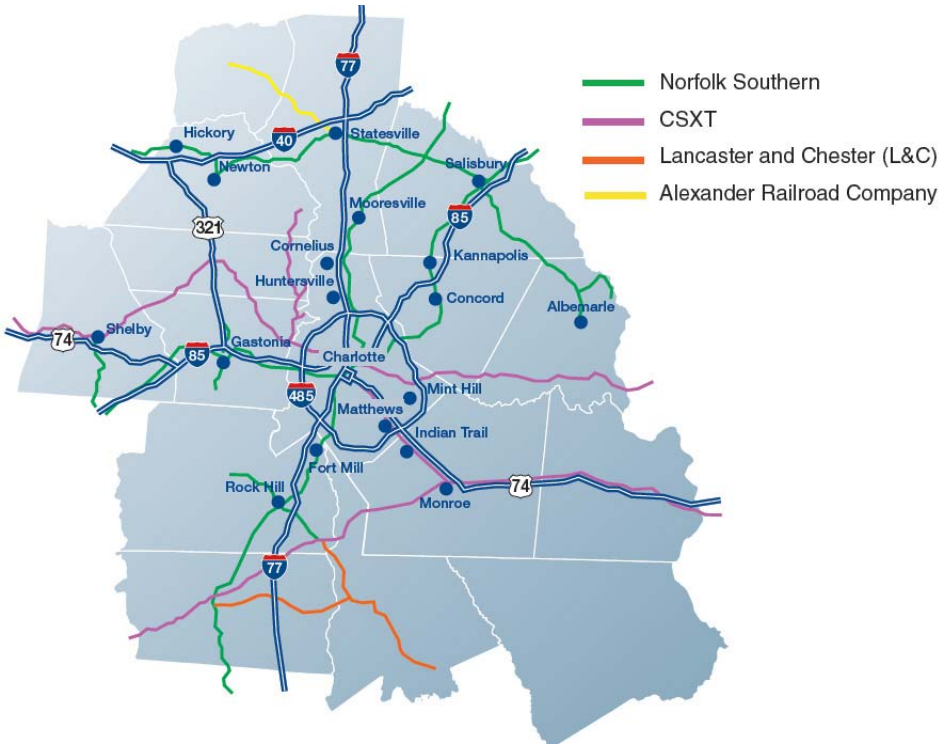

Figure 3-12: Railroads and Highways in Charlotte Region

For the perspective of further developing a logistics system, railways serve as a means to transport heavy load material between the Charlotte region and the rest of the areas served by the two main-line railroads. Therefore, the railways are a system component acting as an interface between the seaport components, the airport, and the inland port/logistics village components.

The operational requirements of the railways in Charlotte region as a system component are to:

- Provide intermodal terminals at seaports and Charlotte Douglas International Airport
- Meet capacity needs to railcar and container storage
- Partner with CSX and Norfolk Southern to share railways

- Partner with CSX, Norfolk Southern, the North Carolina Railroad, local governments, and businesses to obtain land for expansion
- Meet industry standards for safety

The maintenance and support functions to be considered include:

- Train and railcar maintenance and inspections
- Crane servicing
- Broker and freight consolidators
- Railway maintenance and inspections
- Support yard track
- Access to roadways
- Respond to railroad mishaps, spills, derailing, etc.

The measures of effectiveness of the rail component as a part of the NC logistics system are:

- Volume of freight (throughput tonnage of cargo handled) to decide if demand is met
- Railway capacity, including:
    - Infrequent delays
    - No disruption of service
    - Continual funding for maintenance and expansion

Currently, Norfolk Southern has an existing intermodal yard located between North Tryon Street and North Brevard Street in North Charlotte, shown in Figure 3-13. The North Charlotte facility increased its business between 1998 and 2007 by 74% to a total of 117,000 lifts. (A lift is the loading or unloading of a trailer from a railcar.) This facility has reached its peak capacity and is operating an inefficient satellite parking operation to store containers in several off-site parking lots, until the containers are retrieved by customers. These off-site storage operations increase truck traffic and congestion through Charlotte and other storage areas in the region, and adversely affect road safety. Additionally, it does not meet the system requirements listed above. This North Charlotte intermodal facility is unable to expand due to its close proximity to uptown Charlotte.

Charlotte-Douglas International Airport applied for and received a TIGER grant from the federal government for funding to create an intermodal facility on airport property. The facility will initially have capacity for 200,000 lifts annually, with 250,000 lifts projected within five years of operation. This re-location of the intermodal facility to the airport and its added capacity are directly linked to the projected increase of cargo volume through the Charlotte-Douglas International Airport over the next 25 years. Figures 3-14 and 3-15 show the plan for the new 200 acre intermodal terminal in CLT [1,12,13,14].

Both Mainline Railroads in the Charlotte Region are also connected to the adjoining logistics regions through two Shortline companies. Figure 3-12 shows the Lancaster and Chester (L&C) Railway, which connects the adjoining South Carolina counties to the CSX and Norfolk Southern. Also shown is the logistical connection to the Hickory area, where the Alexander Railroad Company connects Taylorsville, Hiddenite, and Stony Point to its Statesville hub.

Figure 3-13: Existing Norfolk Southern Intermodal Yard

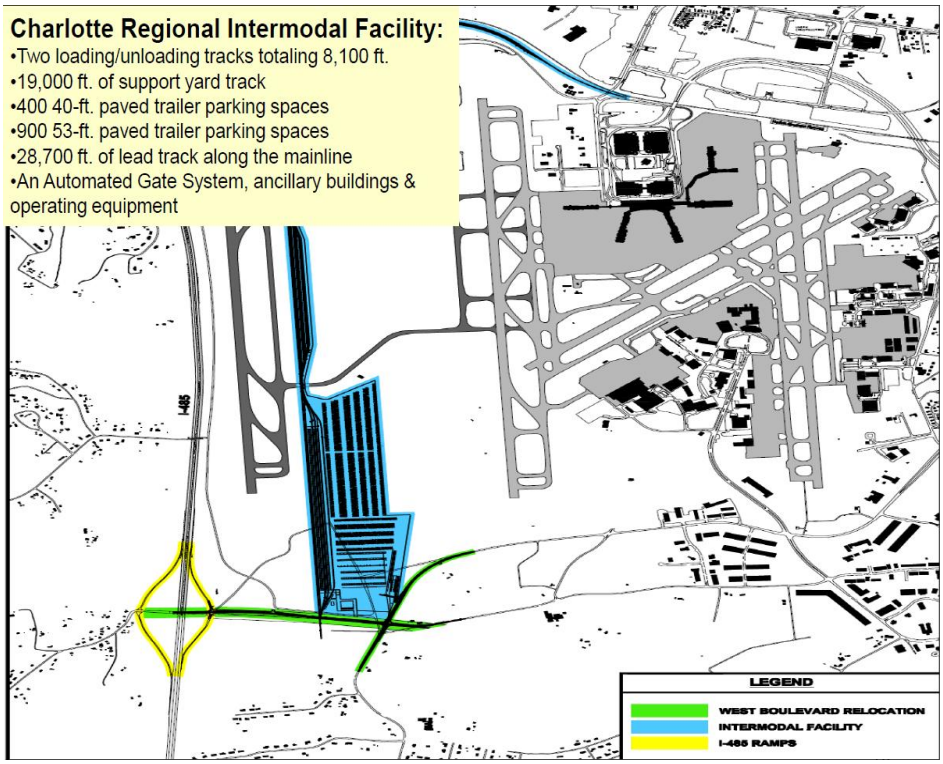

Figure 3-14: The Planned New Intermodal Terminal

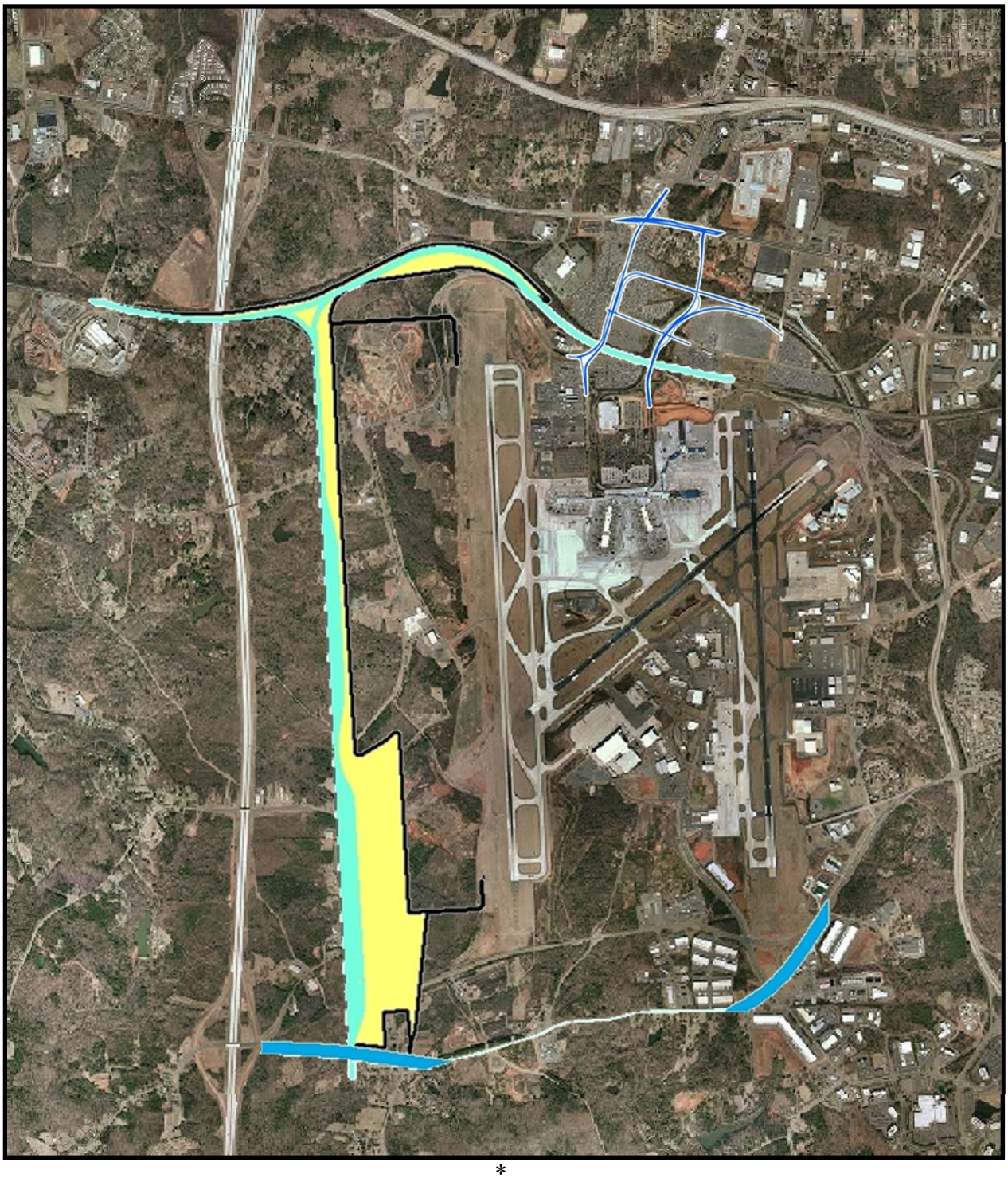

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Figure 3-15: The Planned New Intermodal Terminal

Southeast High Speed Rail Improvements and the CRISP project

In early 2011, the North Carolina Board of Transportation is in support of the NCDOT's application for $290 million of a portion of $2.1 billion in available federal funding. This was assured by the agreement with the USDOT to provide up to $55 million in state matching funds should North Carolina be awarded the federal funds. The move is a key element in helping to develop high-speed passenger rail service and enhance the state's intercity passenger rail service. Some of the projects included in the North Carolina plan include new bridges at Sugar Creek Road and 36th Street in Charlotte, as well as track improvements to support new multi-modal stations in Charlotte, along with Lexington and Hillsborough.

The federal funds will be awarded in calendar year 2011 on a competitive, discretionary basis, and winning applicants must provide a minimum 20 percent in matching funds. In January, NCDOT was awarded $545 million in American Recovery and Reinvestment Act (ARRA) funding to support the development of the Southeast High Speed Rail Corridor and the state's intercity passenger rail program. It is estimated to create or maintain 4,800 private-sector jobs. When completed, the corridor will run from Washington, D.C. to Charlotte. The State has already received the first of the ARRA funding, $20.3 million, from the Federal Railroad Administration. Those dollars are being used to refurbish passenger coaches and locomotives on ***North Carolina's Amtrak***, so that it can expand service across the state.

Another rail improvement project is the Charlotte Railroad Improvement and Safety Program (CRISP). This project will include upgrading existing track infrastructure in the region, with a planning/design window of 50 years. The long-range goal is to improve speed and capacity of all rail infrastructure that will help to implement the Southeast High Speed passenger rail service. The project will include improvements affecting the major freight railroads in the region (Norfolk Southern and CSX Transportation) as well as the CATS Light Rail Transit system (LRT). This effort will help improve safety for vehicles and passengers, as well as pedestrians.

This program will also help relieve overall rail congestion that is projected in the future. The two freight railroads anticipate continued growth, especially affecting intermodal containers from the ports at Charleston and Wilmington. Charlotte's intercity passenger rail ridership has increased 370 percent over the past two decades. High speed rail is projected by the NCDOT to add one million annual passenger trips, and generate more revenue than any other proposed high speed rail corridor in the country.

Key improvements to be constructed by the CRISP project include placing the CSXT tracks in a trench at a lower elevation from the Norfolk Southern and CATS north corridors. Detour tracks will also be built to accommodate both railroads. Crossings at 9th Street, Johnson Street and Church Street in the uptown area will be closed. The Norfolk Southern current switching yard, as mentioned above, will be relocated to the area at Charlotte Douglas airport between the second and third parallel runways. Other modifications will be needed at the ADM (Archer Daniels Midland) facility in the NW corner of the downtown area. Several other area rail projects (Figure 3-17) will be coordinated through the CRISP project:

- CATS North Corridor and Blue Line Extension
- Clanton Road Extension, including closure of the Donald Ross Road crossing

- CSXT intermodal yard expansion
- MLK Jr. Boulevard extension
- Back Creek Church Road and McLean Road RR crossing improvements
- Double tracking of Orr Road to Concord, and
- Piedmont & Northern Railroad Reactivation & Cedar Yards Improvements

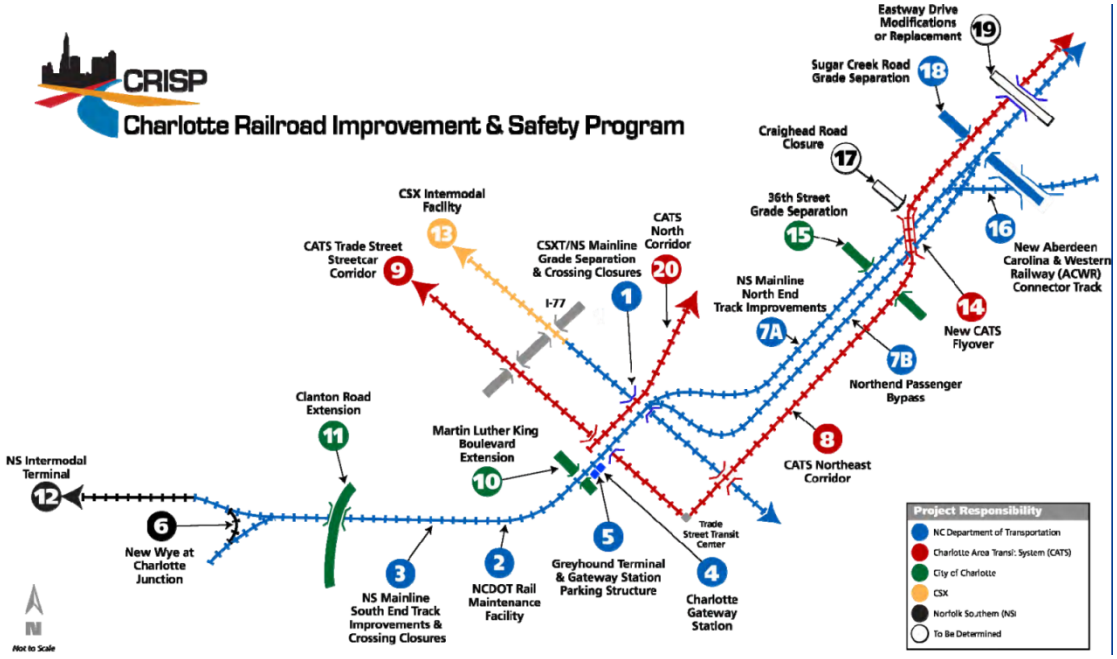

Figure 3-16: CRISP Program Map

3.1.5 Regional Highway Network and Planned Improvements

Two major interstate highways intersecting the region, plus an almost-complete outer loop (I-485) make Charlotte well connected as shown in Figure 3-12 and 3-16. Charlotte is served by a relatively efficient highway system, except for key log-jams typically on every weekday morning and afternoon peak hours. When there are no extreme delays, Interstates I-77 and I-85 connect with distant urban centers and manufacturing belts in the northeast, southwest and the midwest. Interstate I-40 and I-85 (at least through North Carolina) are vital east-west links. I-77 is a north-south interstate connecting with I-26 in South Carolina and I-81 through the Shenandoah Valley in Virginia and I-77 through Virginia, West Virginia, and on to Ohio and Western Pennsylvania. Additional connectivity in the Charlotte region is available on U.S. Routes 74, 29 and 321. [3]

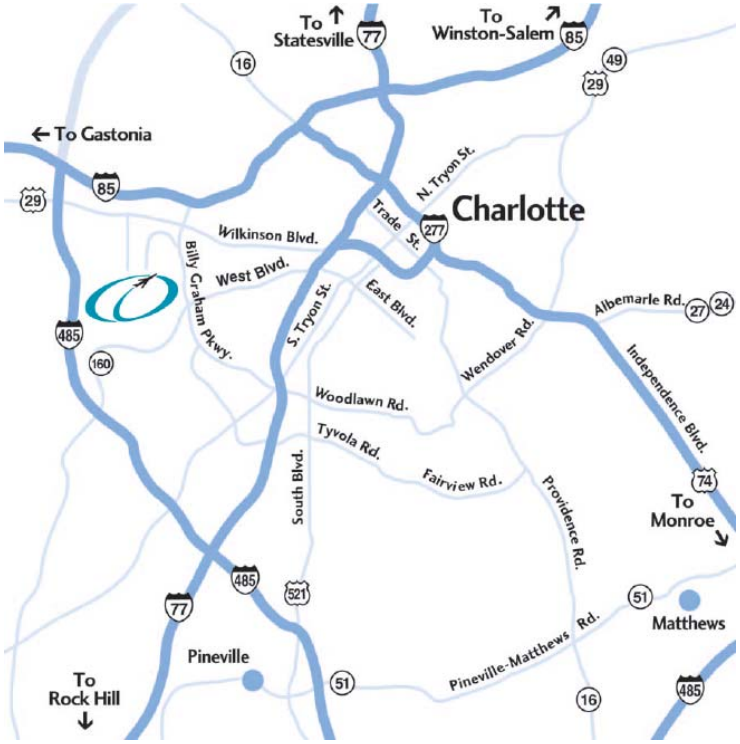

Figure 3-17: Highway Network in the Region

From the logistics system perspective, highway/freeway access is critical to the transportation of goods from one area to the other. The operational requirements of the highways, toll roads and freeways, as system components are:

- Provide access between port locations (air, land, and sea) to distribution centers, warehouses, retailers and merchandisers
- Meet industry standards for safety
- Accommodate specialized goods by truck
- Provide capacity for direct routes, mitigation of traffic, choke points and bottlenecks
- Adequate rest and parking areas for truckers

The maintenance and support functions to be considered are:

- Priority for State Road Maintenance Unit
- Funding to maintain road and bridge conditions
- Truck traffic that impacts highway and bridge maintenance budgets to a significant degree

Future strategies for growth could include:

- Truck-only toll (TOT) lanes
- Increase highway capacity (adding lanes)
- Completing the I-485 loop to bypass some of Charlotte's congested areas
- Increased truck size and weights, and investment in infrastructure to support weights

The measures of effectiveness of this component for the system operations are:

- Volume of freight (throughput of cargo handled) to see if demand is met
- Roadway capacity, including:
  - Infrequent delays
  - Traffic flow and congestion
  - Continual funding for maintenance and expansion

Charlotte Area Major Road Projects [15]

a) **Completion of Charlotte Outer Loop** - last section currently under construction [16].

The I-485 Interstate Loop is important in making the flow of trucks through and around the Charlotte area more smoothly. The completion of the Loop will allow trucks to bypass the congested sections of I-85 and I-77 near Charlottes uptown. This will ensure the goods flow through Charlotte area more efficiently. Currently, there are two project segments remaining for the completion of the Charlotte Outer Loop. Two major projects are identified in the State Transportation Improvement Program (TIP) documentation.

- TIP Project R-2248E will add on new alignment an eight-lane freeway across northern Mecklenburg County from NC 115 N to I-85 north and east of Charlotte. It is approaching the right-of-way acquisition phase. The plans used for the acquisition of right-of-way for this project are being finalized. NCDOT also proposes to construct two new interchanges connecting I-485, one at Prosperity Church Road and the other at Mallard Creek Road. Its estimated cost for construction is $185 million dollars. Further details of this project include:
  - Complete I-485/NC 115 interchange
  - Extend Alexanderama Road from NC 115 to connect with Eastfield Road
  - Construct bridge to carry Brown Road over I-485
  - Realign Johnston-Oehler Road to connect with the Prosperity Church Road/Dearmon Road intersection
  - Realign Mallard Creek Road and Odell School in the vicinity of the proposed I-485/ Mallard Creek Road interchange

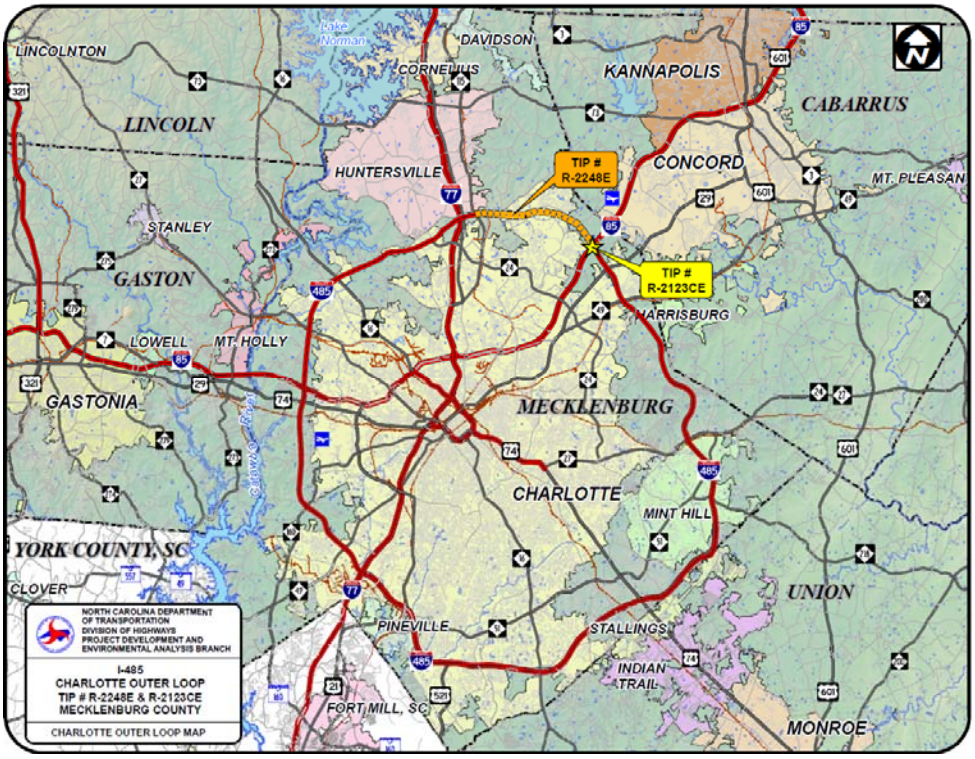

Figure 3-18: Charlotte Outer Loop Completion

- TIP Project R-2123CE will reconstruct the current I-85/I-485 interchange and provide a four-level direct connection between existing I-485and I-85 (see Figure 3-17). This project is currently in the preliminary engineering phase. Preliminary designs are being developed and environmental studies are being completed to quantify and document the potential impacts to the natural and human environment. TIP Project R-2123CE proposes to modify the existing trumpet interchange connecting I-85 to I-485 in northeast Charlotte to a fully-directional interchange. The proposed interchange will be the final link in the I-485 Charlotte Outer Loop. Its estimated cost for construction is $155 million dollars. Further details of this project includes replacing the existing bridge carrying Mallard Creek Road over I-85 to accommodate the new on and off-ramps connecting I-85 to the new interchange.

.

b) **Construction of Monroe Bypass -** NC Turnpike Authority Project [17]

The Monroe Connector/Bypass is a proposed tolled highway from US 74, near I-485 in southeastern Mecklenburg County, to US 74 in the area between the towns of Wingate and Marshville in Union County (see Figure 3-18). This project will be further described in Section 3.2.4.

c) **Garden Parkway** - NC Turnpike Authority Project [18]

The Garden Parkway will be a new highway on new alignment from I-85 west of Gastonia to I-485/NC 160 near the Charlotte Douglas International Airport (see Figure 3-19). Garden Parkway is promoted to improve east-west travel around the south side of Gastonia, and will establish a direct access route between the rapidly growing area of southeast Gaston County and Lake Wylie, and southwestern Mecklenburg County. It also improves traffic flow on some sections of I-85 and US 29-74. It will also provide a quick access to the airport area from southern Gaston County, and will be a highway link from automotive manufacturing center in Greenville-Spartanburg area to the intermodal freight site at Charlotte-Douglas. The length of the Parkway is 21.9 miles and its preliminary cost is estimated at $910.7 million for the section from US 321 to I-485/NC160. Final costs will be determined during design. The Parkway is scheduled to be open to traffic in 2015.

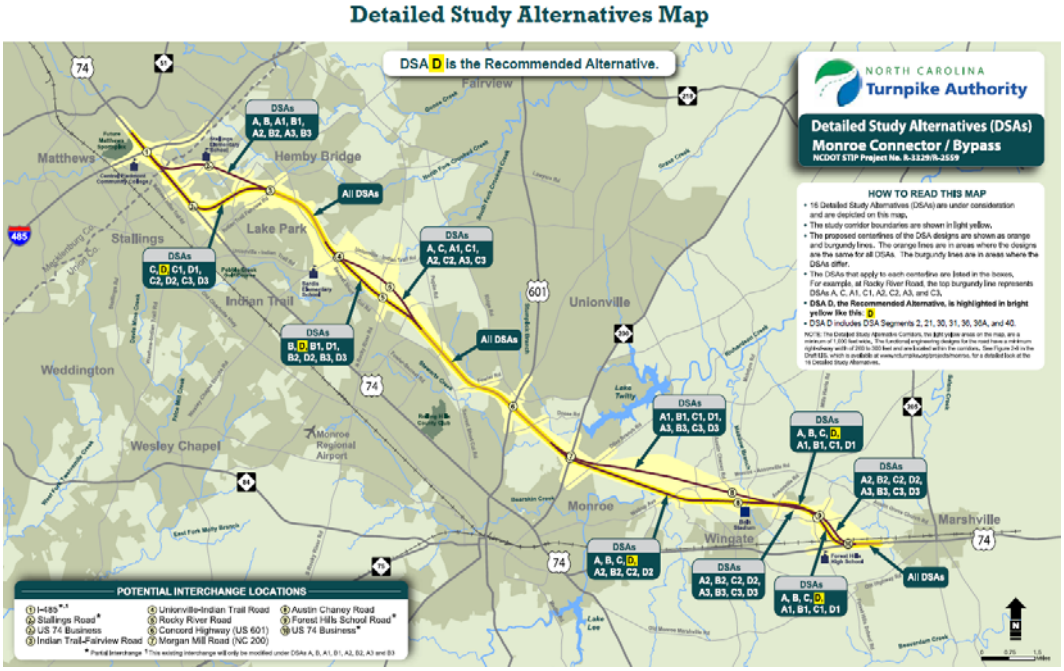

Figure 3-19: Monroe Bypass Map

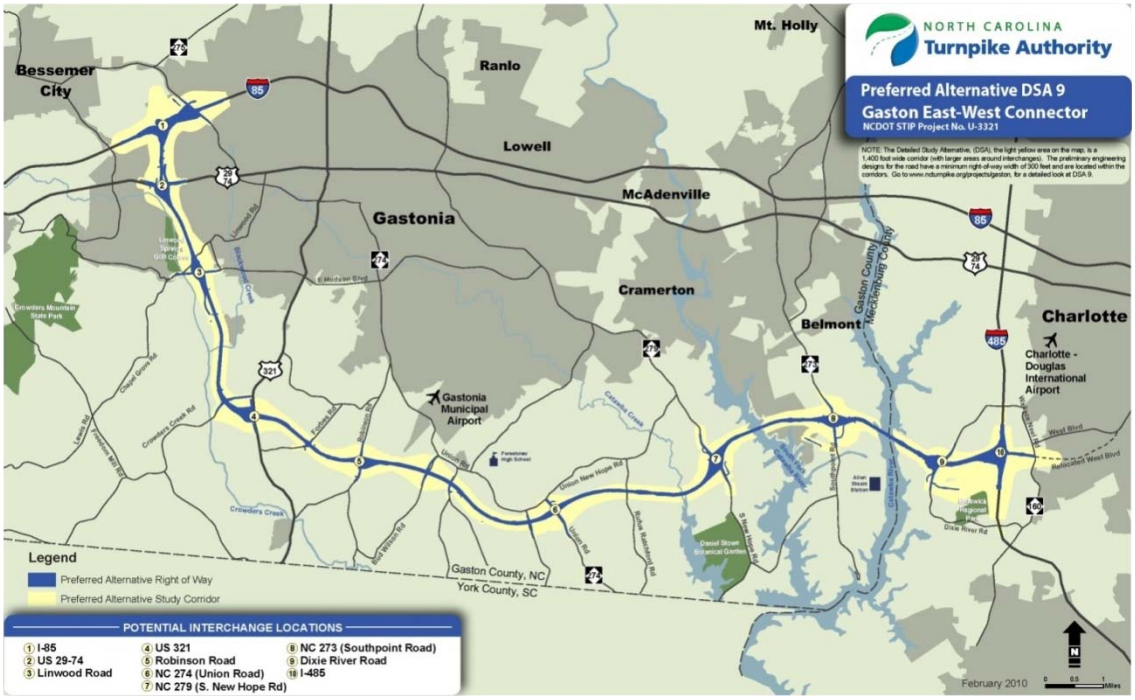

Figure 3-20: Garden Parkway Map

d) **I-77 widening** from Brookshire Freeway in Charlotte to I-40 in Statesville [14].
TIP Project I-3311A consists of widening I-77 from its interchange with I-85, going north to the completed Charlotte Outer Loop (I-485). This project involves widening the existing four-lane interstate facility to an 8-lane freeway. The project also includes widening and strengthening the outside shoulders to meet current design standards and to accommodate traffic shifts during construction. Another project scheduled for later construction (I-3311B) will expand the section of I-77 from I-485 to NC-73 (Sam Furr Road) to a six-lane freeway.

The HOV lane on southbound I-77 will be extended from I-85 at the Brookshire Freeway (I-277) interchange (a total HOV lane length of 10 miles), while the northbound HOV lane will extend north of the I-85 interchange with W. T. Harris Boulevard (a total HOV lane length of about five miles) [19]. The estimated cost for the right of way is $18.5 million dollars and the construction cost for both projects is estimated at $125.6 million dollars.

e) **NC 49 widening** from Harrisburg to the Yadkin River – TIP Project R-2533 [15,20] consists of widening NC 49 from east of SR 2630 (Cline Road) to east of NC 73 in Cabarrus County to 4 lanes. It is a segment of a larger project to widen NC 49 to multi-lanes from Harrisburg to the Yadkin River.

NC49 is part of the North Carolina Department of Transportation's Strategic Highway Corridor Program and is considered to play a critical role in regional and statewide

mobility. In addition to local traffic using NC 49, many travelers use NC 49 and US 64 as an alternative route between Raleigh and Charlotte. Expansion of the roadway will provide a greater level of service and enhance the safety of the facility. Funding for this project will help local, state, and federal government efforts to reduce traffic injury and fatalities and congestion. The cost is estimated at $2 million dollars.

f) **US 74 (Independence Boulevard)** Albemarle Road to Charlotte Outer Loop - TIP Project U0209B [15] has regional significance and is identified as a route on North Carolina's Strategic Highway Corridor system. The estimated cost for the project is at $137.6 Million dollars.

In summary, Figure 3-20 identifies several locations on both interstate and other major arterials in the Charlotte region that exhibit both recurring congestion and are subject to incident-causation congestion. The above mentioned road projects (a through f) are intended in part to deal with these weak links. Figure 3-21 shows the planned long-range transportation improvements for Charlotte and Mecklenburg County.

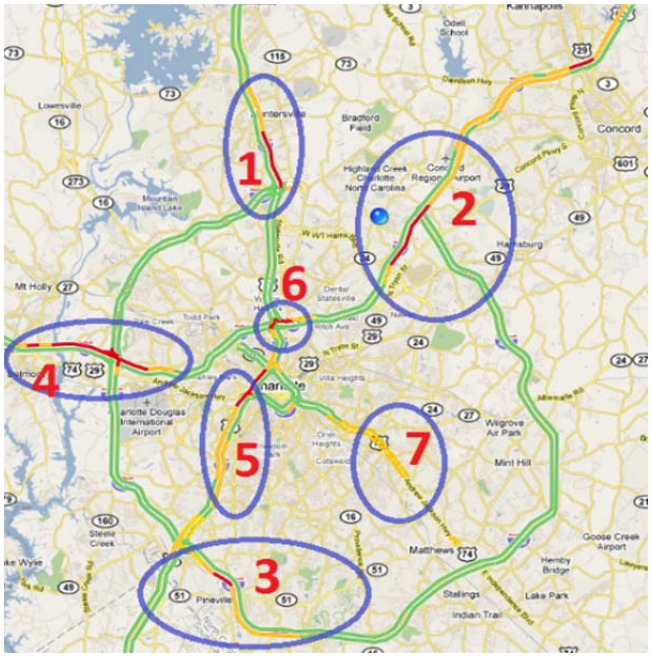

Figure 3-21: Identified Truck Bottlenecks in Charlotte

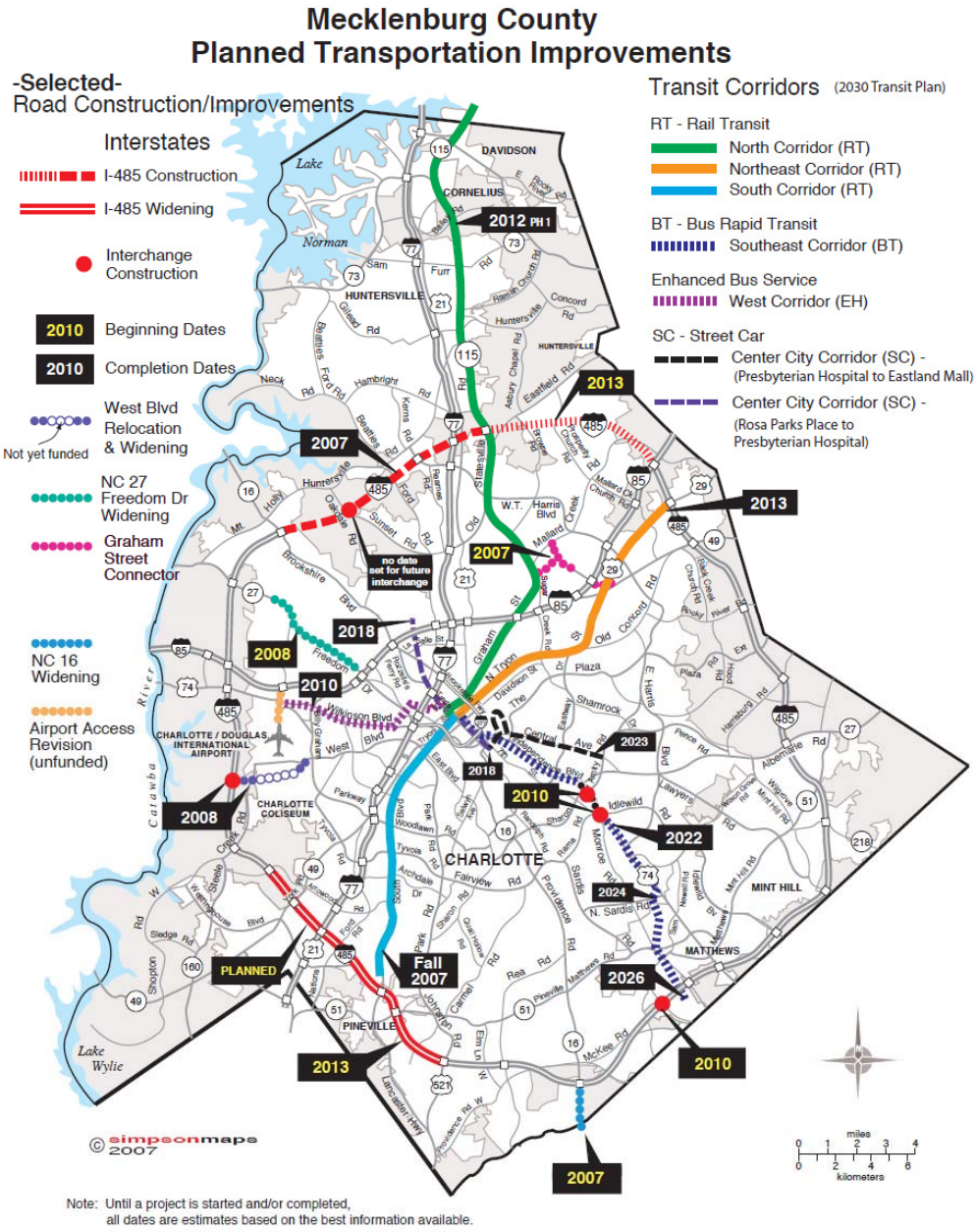

Figure 3-22: Long-range Transportation Improvements for Mecklenburg County

3.1.6 Access to Seaports

A part of the logistics system efficiency is determined by the interfaces between the system components. It is critical for the greater Charlotte region to obtain better connectivity between its logistics operations and east coast seaports, as shown in the following summaries.

Port of Charleston

- One of the busiest container ports along the Southeast and Gulf coasts (behind Savannah, GA and Virginia Ports, VA)
- Ranked sixth nationally in containership calls in 2009
- Access to 13 of the top 15 carriers in the U.S. container trade
- Intermodal access via rail and highways to the Charlotte region
- CSX and Norfolk Southern both operate large, well-equipped rail yards in Charleston

Port of Savannah

- Features the largest single-terminal complex with the longest contiguous dock on the east coast
- Garden City Terminal offers 10,293 linear feet of berthing length, with the Ocean Terminal providing an additional 5,768 linear feet of berthing length
- Rail access to the Charlotte region via Norfolk Southern and CSX Transportation

Port of Wilmington

- Full service port and marine terminal
- Rail access to the Charlotte region via Norfolk Southern and CSX
- Highway access limited but accessible from I-95 and I-40 (congested for several miles in the City of Wilmington)
- Deck height averages 12 ft above mean low water
- Facility can load over 800 tons per hour outbound with a 70,000 ton storage capacity

Port of Morehead City

- Ranks second in U.S. rubber imports, behind New Orleans, LA
- Highway access limited but accessible from I-95 and US Hwy 70
- Direct rail access via Norfolk Southern

Port of Virginia - Norfolk International Terminals

- Land area of 648 acres, fifty-foot-deep entrance channels at the north and south ends, serviced by 89,300 feet of rail track and 11 Suez-class container cranes
- Provides 34,219 TEUs of container storage space; 2,340,000 square feet total of covered pier, dry, and cold storage space; and space for 702 stacked truck chassis
- Accessible via I-64, I-564, and Terminal Blvd, also via rail serviced by Norfolk Southern Railway, CSX Corporation, and Eastern Shore Railroad

- 4 berths, with 32,000-square-foot warehouse

3.1.7 Regional Employment

As stated in the previous section, there are diverse industries located in the Charlotte area. The following tables show the top industries and employers in the area and Mecklenburg County employment overview data.

Charlotte Area's Fortune 500 Headquarters		
Company Name	**Revenue ($ billions)**	**Rank**
Bank of America (Banking)	150.5	5
Lowe's (Retail)	47.2	42
Duke Energy (Utilities)	12.7	181
Nucor (Metals)	11.2	206
Family Dollar (Retail)	7.4	305
Goodrich Corp. (Aerospace and Defense)	6.7	334
Sonic Automotive (Automotive Retailing)	6.3	345
SPX (Electronics)	4.9	427

Table 3-4: Charlotte Region's Fortune 500 Headquarters

Largest Employers	No. of Employees
Carolinas Healthcare System	26283
Wells Fargo/Wachovia Corp	20000
Charlotte-Mecklenburg Schools	19485
Bank Of America	13960
Wal-Mart Stores Inc	13192
Presbyterian Regional Healthcare Corp	9000
Delhaize America Inc/Food Lion, LLC	8658
Duke Energy Corp	7757
North Carolina State Government	7479
US Airways	5955

Table 3-5: Largest Employers in Mecklenburg County

Table 3-6 shows a number of facts concerning Charlotte area employment over the past two years. Among the items of interest is that the overall change in employment from 2009 to 2010 showed only a 1.47 percent decrease. Government employment actually increased by 4.10 percent, and private industry decreased by 2.59 %. Of those sectors of the economy that employed more than 10,000, the industry with the largest number of jobs lost between these two

years was in Arts, Entertainment, and Recreation. The largest numbers of employees by sector in the Charlotte region are in Health Care and Social Services (approximately 59,000 out of 528,000). Manufacturing in Mecklenburg County was the eighth largest employer overall, with approximately 29,000 employed in this sector in 2010. Manufacturing also lost a larger proportion of its employees between these two years, with a 4.53 % reduction.

	09 establishments	09 annual employment	10 establishments	10 annual employment	% change (est.)	% change (emp.)
Total All Industries	32,369	536,568	31,900	528,655	-1.45%	-1.47%
Total Government	537	57,946	498	60,319	-7.26%	4.10%
Total Private Industry	31,837	445,421	31,402	433,875	-1.37%	-2.59%
Agriculture Forestry Fishing & Hunting	28	831	28	767	0.00%	-7.70%
Mining	13	225	12	168	-7.69%	-25.33%
Utilities	18	0	19	0	5.56%	0.00%
Construction	2,513	26,610	2,488	23,390	-0.99%	-12.10%
Manufacturing	996	30,759	995	29,365	-0.10%	-4.53%
Wholesale Trade	3,194	34,206	3,126	32,856	-2.13%	-3.95%
Retail Trade	3,343	54,396	3,346	52,752	0.09%	-3.02%
Transportation	717	3,023	729	2,905	1.67%	-3.90%
Information	619	18,479	628	17,584	1.45%	-4.84%
Finance and Insurance	2,329	48,178	2,278	48,321	-2.19%	0.30%
Real Estate and Rental and Leasing	1,637	9,699	1,614	9,041	-1.41%	-6.78%
Professional and Technical Services	4,411	38,068	4,499	36,861	2.00%	-3.17%
Management of Companies and Enterprises	302	24,121	319	23,805	5.63%	-1.31%
Administrative and Waste Services	2,025	41,164	2,025	41,383	0.00%	0.53%
Educational Services	588	25,808	555	30,705	-5.61%	18.97%
Health Care and Social Assistance	2,247	59,239	2,371	59,466	5.52%	0.38%
Arts, Entertainment and Recreation	404	11,667	417	10,430	3.22%	-10.60%
Accommodation and Food Services	2,321	46,303	2,367	44,796	1.98%	-3.25%
Other Services Ex. Public Admin	2,223	12,685	2,327	12,466	4.68%	-1.73%
Public Administration	72	16,622	73	16,530	1.39%	-0.55%
Unclassified	2,374	1,284	1,684	605	-29.06%	-52.88%

Table 3-6: Mecklenburg County Employment Overview

(source: EDIS Report)

In general, the most attractive component of Charlotte logistics village is the integration of Charlotte-Douglas International Airport (which offers great services with relatively low cost and high efficiency) and the available surrounding areas (Dixie-Berryhill area and the Arrowood-

Westinghouse Industrial Center of Steel Creek area) that offers multiple modes of transportation. There are two major rail carriers, Norfolk-Southern and CSX, for freight rail transportation. And there are light rail system LYNX in operation and SEHSR under development for passenger rail services. In addition, CRISP includes many projects to improve the current rail infrastructure in Charlotte.

The convenient highway/freeway access for the proposed Charlotte logistics village includes I-85, I-77, I-485, and US 74. Road projects such as Charlotte outer Loop (last section), Monroe Bypass, and Garden Parkway, etc. are either under consideration or scheduled for construction. Its connections with ports of Charleston, Savannah, Wilmington, Morehead City, and Norfolk International Terminals make Charlotte more competitive with a diversified transportation system. Besides, the planned intermodal facility in CLT by Norfolk-Southern will combine air, rail and road transportation methods to bring Charlotte logistics village even more opportunities for successful economical development.

3.2 Logistics Village 2 – Monroe and Union County

The second logistics village studied in this report was Monroe and Union County. In addition to the Charlotte-Monroe Executive Airport, a second site chosen in the Union County Logistics Village is Legacy Park, a 5000-acre development just east of Monroe that plans to include a CSX intermodal terminal on-site. This development is the vision of the Union County Partnership for Progress, with an objective of developing a premier business park in eastern Union County serving the Charlotte metro region [21]. As shown in Figure 3-23, the proposed Legacy Park has regional connectivity to the Charlotte area and is located approximately 30 miles away from Charlotte's downtown.

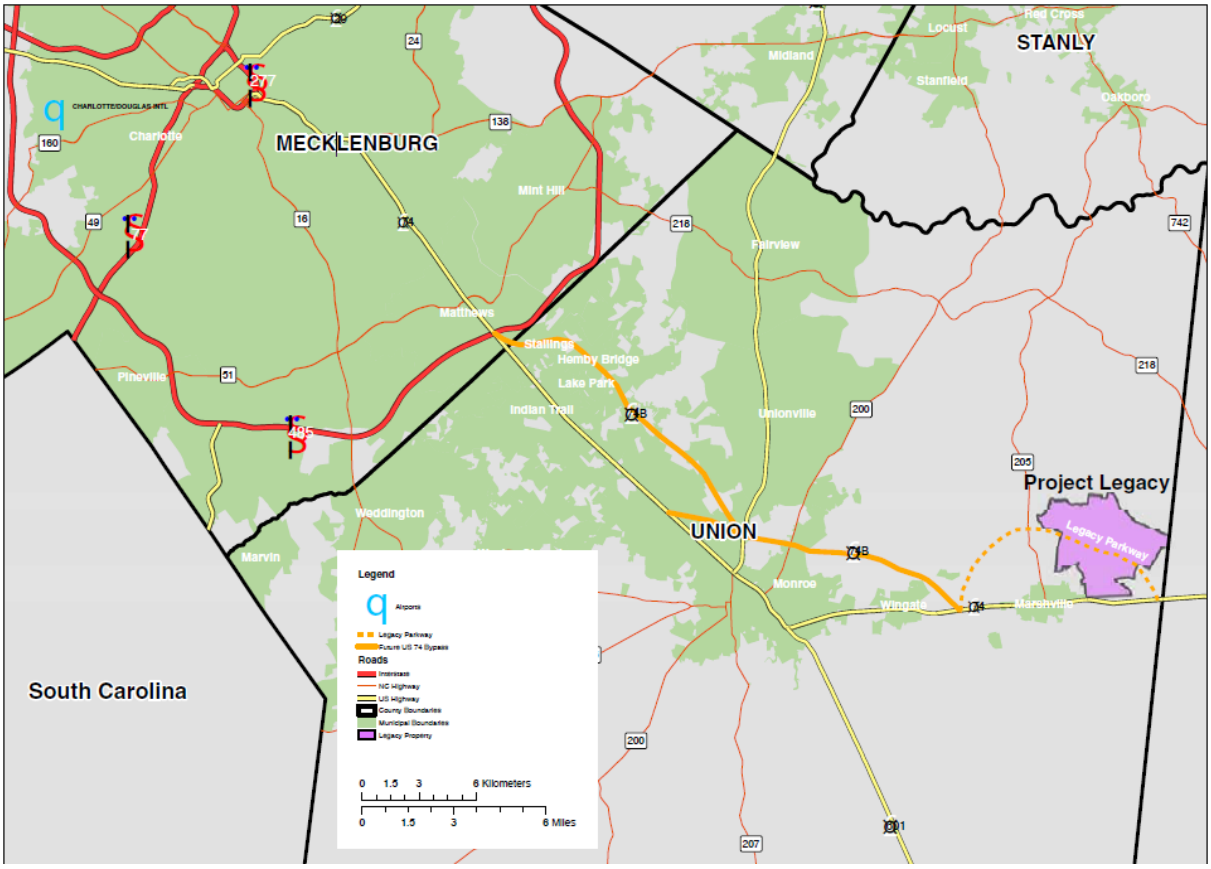

Figure 3-23: Area Map of Logistics Village 2 Site

3.2.1 Charlotte-Monroe Executive Airport

Charlotte-Monroe Executive Airport has a runway that is 5,500 ft long and 100 ft wide. It mainly serves as a fueling station with tie down and hangers available (Figure 3-24). The airport is currently securing funding for improvements to extend its runway from 5,500 ft to 7,000 ft. The airport is located less than five miles from the center of Monroe. It is located directly adjacent to CSX rail lines and is less than a mile from Highway 74.

Figure 3-24: Aerial view of Charlotte-Monroe Executive Airport

3.2.2 Site at Legacy Park

Legacy Park is a development with a proposed 5,000-acre industrial and commercial park located north of U.S. Highway 74 in eastern Union County (see Figure 3-23). The southern boundary of the proposed park runs along Highway 74 and is adjacent to the east/west rail line between Wingate and Marshville.

This site has an objective of developing the park in parcels, including major rail-served tracts of between 150 and 250 acres and smaller tracts of approximately 50 acres each. Non-rail-served tracts of between 15 and 50 acres are also planned. Light industrial and flex space projects are being planned, as well as sections of the park devoted to high-tech operations. An intermodal facility of about 250 acres is planned adjacent to the existing east/west rail line.

As currently envisioned, Phase 1 would encompass up to 1750 acres. A rail facility would be developed adjacent to the existing CSX rail line to serve as the park's transportation backbone and give businesses an attractive competitive advantage. The plan for Legacy Park is shown in Figure 3-25 [21].

Figure 3-25: Legacy Park Plan

3.2.3 Union County Rail Network

Figure 3-26 shows the current rail infrastructure in place within or around the Monroe area. As shown in the figure, CSX has the only lines that run directly through Monroe coming east from the Atlantic coast and northern areas, and west towards Charlotte and South Carolina areas. A switching station currently in existence in Union County is within close proximity to the planned Legacy Park location.

Immediately to the west of the rail switching station is the main split in the rail line for that area, sending traffic southwest towards Atlanta and northwest towards Charlotte. Figure 3-27 is an aerial view of this current infrastructure in the heart of downtown Monroe. As seen in the figure, the rail line splits to the left of the switching yard.

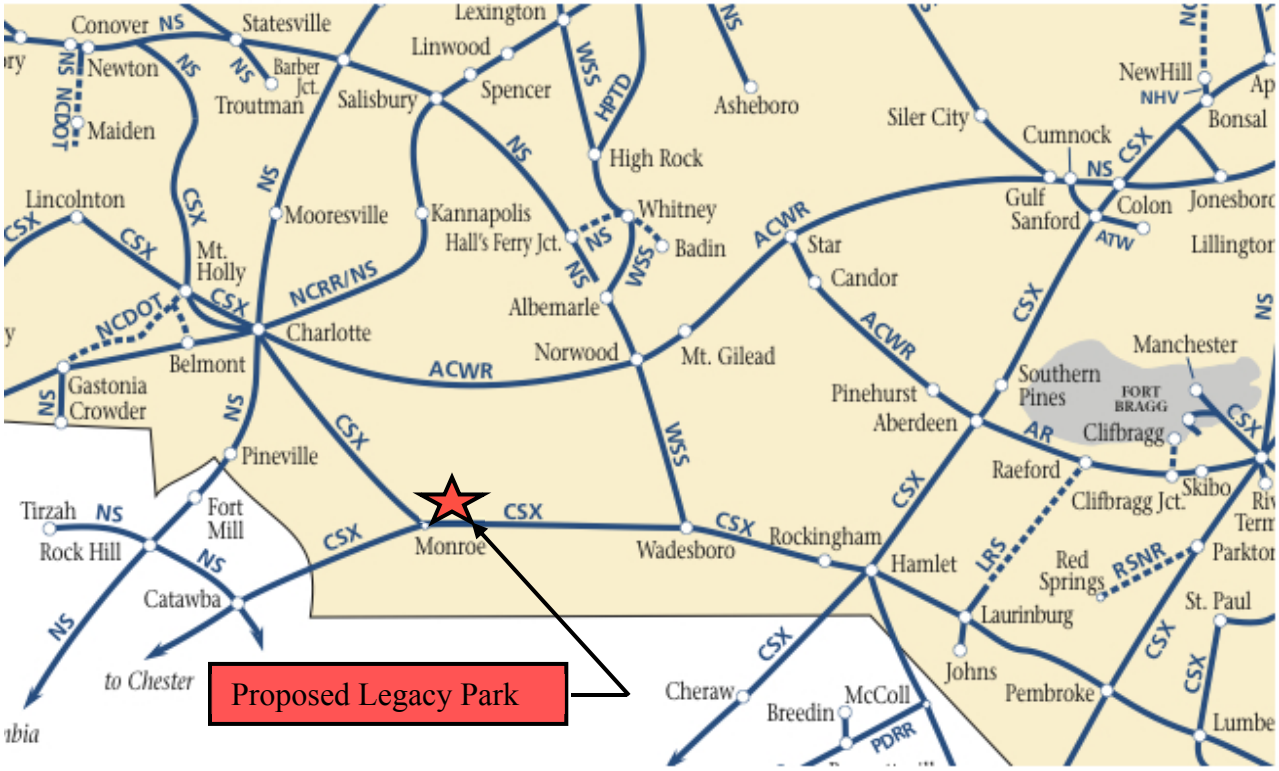

Figure 3-26: Current Rail Infrastructure in Monroe Area

Figure 3-27: Aerial View of Current Rail Infrastructure Near Monroe Downtown

If CSX chooses to go forward with the Legacy Park project, this rail switching yard would be re-located from its current home in downtown Monroe to Legacy Park [21]. If the switching yard is re-located to the Legacy park location, CSX would likely build a new intermodal terminal there and would make rail freight deliveries from the Wilmington port more efficient.

In May 2008, CSX announced their "National Gateway" project in an effort to improve the flow of freight between Mid-Atlantic ports and the Mid-West. This $700 million dollar project will improve the existing public-private infrastructure in segments through Maryland, Virginia, Pennsylvania, Ohio, West Virginia and North Carolina. One of these rail segments includes the rail running between Wilmington and Charlotte, named the Carolina Corridor [13]. This project is significant to the area because it involves an initiative by CSX to expand intermodal terminal along these rail lines, create and support job growth, and decrease the amount of truck traffic on the highways.

If CSX intermodal terminal is not a part of Legacy Park, the alternative for rail infrastructure improvement in the area could be to finance the investment of a stand-alone rail switching yard on-site. Management developing this logistics site indicates, however, that the success of their venture will depend very much on the completion of the Monroe Bypass, a project of the NC Turnpike Authority that will be described in section 3.2.5.

3.2.4 Union County Highway Network

Monroe is located 7 miles from the Mecklenburg-Union County Line via US Highway 74, which runs east-west through the heart of Monroe. US 74 is the main corridor for freight between Charlotte and the Ports of Wilmington and Morehead City. It is also the main connector to I-485, 7 miles from the City of Monroe. US Highway 601 is the north-south corridor for the community. This route links North Carolina and South Carolina and creates a very important conduit for the movement of the skilled workforce throughout the eastern portion of the Charlotte region.

The interchange of the I-485 outer loop with US 74 and connections on both I-77 and I-85, direct access to Charlotte Douglas is approximately a 45 minute trip from Monroe. I-77 and I-85 provide the means for goods to reach nearly 57% of the US market within 2 days travel by truck. One major development in highway access in this area is the construction of the Monroe Bypass.

3.2.5 Monroe Area Major Road Projects

a) Monroe Bypass – NC Turnpike Authority Project [17]

The Monroe Connector/Bypass is a project planned by the North Carolina Turnpike Authority (NCTA) as a controlled access toll road connecting US 74 near I-485 to US 74 west of Marshville. This connector/bypass route of approximately 20 miles will provide a high-speed toll alternative to the heavily congested current route on US 74. The approved route begins and ends on US 74 to maintain the continuity of the US 74 corridor, while still allowing access to and use of the existing US 74 commercial corridor in Mecklenburg and Union County. Financing for the project will come from a variety of sources including federal loans, state funding, and toll revenue bonds. The Monroe Bypass is scheduled to be open in late 2014 with final project completion in early 2015.

The Monroe Bypass and Legacy Park both took giant steps forward with the awarding of a $368 million construction contract to contractors on October 28, 2010. Three design/build

teams provided bids and technical presentations to the North Carolina Turnpike Authority. The contract was awarded to the joint venture comprised of Boggs Paving of Monroe; United Infrastructure Group of Great Falls, South Carolina; Anderson Columbia Co. of Lake City, Florida; and Rummel, Klepper and Kahl, of Baltimore, with offices in Charlotte and Raleigh [22]. In the Final Environmental Impact Statement (EIS) from the NC Turnpike Authority, Alternative D was selected as the Preferred Alternative route as shown in Figure 3-28.

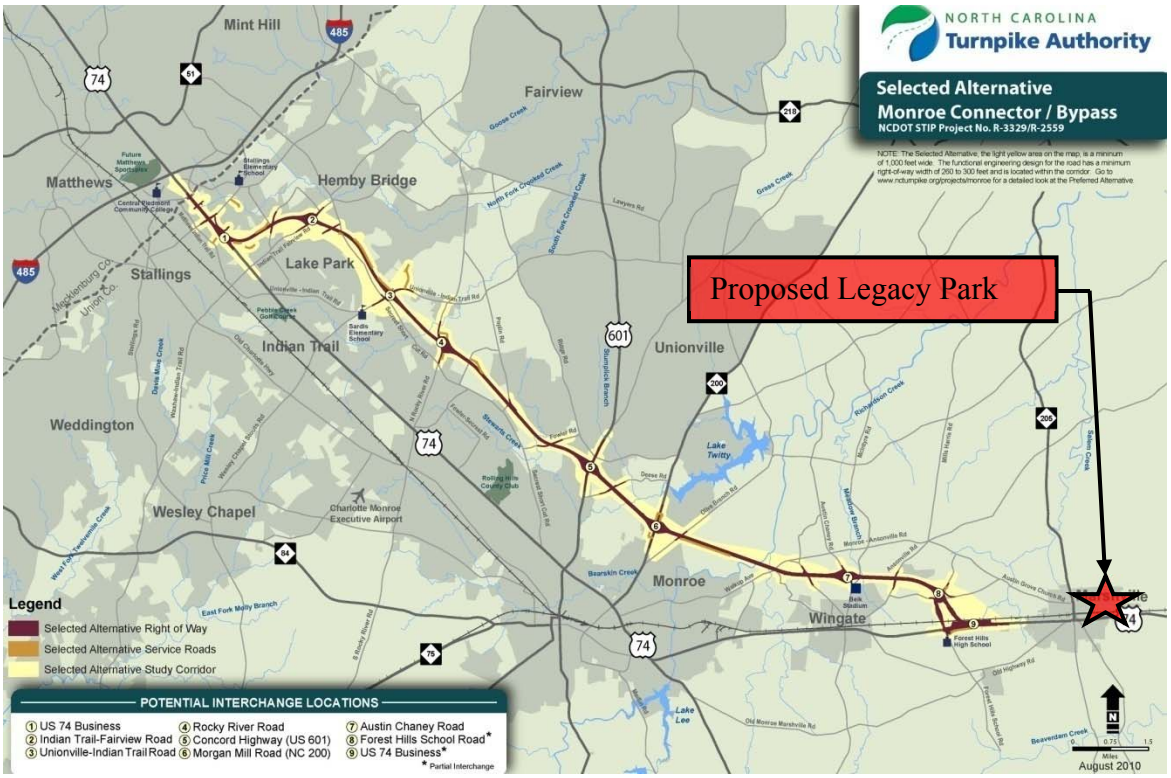

Figure 3-28: Selected Alternative Monroe Bypass Route

The selected D route is a 19.7 mile bypass around the heavily congested sections of US-74 and is one of the shortest alternatives. Based on the results from a comprehensive traffic study, travel time savings are estimated to be 17 minutes on average over the Bypass length. Drivers traveling the entirety of the Bypass will avoid 26 traffic lights on the current US 74 route [11]. Considering the estimated values of time shown in Table 3-7, the value per commercial vehicle, generated by time saved using the Monroe Bypass, can have significant impact on the cost of the future Legacy Park's operations. [23]

Estimated Values of Time
Monroe Connector/Bypass Stated Preference Survey
2010 Dollars

Commercial Vehicles

Number of Axles	Value of Time Per Hour
2	$7.41
3	$12.55
4	$15.55
5	$17.69
6	$19.34
7	$20.69
8	$21.84

Average axles in sample: 4.7

Table 3-7: Estimated Values of Time - Monroe Bypass

Total travel time to and from CLT was another major consideration in the Monroe logistics village's link to the major airport in the region as an integral part of the logistics system. Both the Monroe Executive Airpark and Legacy Park are situated approximately 45 miles from Charlotte Douglas, with an approximate travel time of one hour and five minutes. Taking into consideration the expected time savings of the Monroe Bypass, the travel time to CLT would be reduced to 48 minutes.

The estimated capacity of the proposed Monroe Bypass will also support Legacy Park as a logistics site. Traffic studies on the existing US 74 route conducted by the NCDOT Traffic Survey Group found Average Annual Daily Traffic (AADT) counts of up to 57,000 vehicles on the western end, with counts of less than 25,000 on the eastern end. Estimated weekday traffic volumes for the Bypass have been forecasted to start around 31,600 at opening and grow to an anticipated 58,400 by 2035 [12]. Considering that the existing US 74 route will remain in place and the anticipated volumes by 2035 without expansion, the Monroe Bypass will provide ample capacity to support the Monroe logistics village.

b) US 601 widening from US 74 to South Carolina Line [24]

The $53 million US 601 project extends from north of the South Carolina state line to State Road (Marion Lee Road) in Union County with a distance of about 10.8 miles. The proposed improvements consist of widening US-601 to a 4-lane divided highway.

In conjunction with the Monroe Bypass, the complete I-485 loop will provide easy access to Legacy Park from northern Charlotte interstates, I-85 and I-77. The I-485 widening projects on

the south side of Charlotte could play an important role in the ability to easily transport goods from the southern and western corridors through Monroe. Currently during peak travel times, I-485 becomes heavily congested between the I-77 interchange and Johnston Road. This has a significant potential impact on travel times to the proposed Monroe logistics village for commercial truck traffic connecting from I-85 in Gastonia and I-77 in South Carolina. The congestion in this stretch of I-485 would likely impact traffic to and from CLT and has the potential to cancel out the time saved using the Monroe Bypass.

While the construction of the Monroe Connector/Bypass is underway, the existing and planned highway and interstate infrastructure would support the development of Legacy Park as an inland port for the Charlotte/Mecklenburg and Monroe/Union County Logistics Villages. With the completion of the connector/bypass, Legacy Park will be well connected to the major hubs in the southeast including Atlanta, Charleston, and the eastern seaboard via I-77 and I-85.

One drawback to Legacy Park is its eastern location with respect to Charlotte Douglas and the main interstates. Because of this, truck traffic will need to be directed to use the I-485 beltway, which can become congested during peak travel hours. However, after taking all factors into consideration, the findings of this research support Legacy Park as an inland port for the Charlotte region.

3.2.6 Union County Employment

The top industries and employers in Monroe areas include the following types of industries:

- Aerospace/Defense
- Metals and Specialty Alloys
- Plastics
- Medical Manufacturing
- Automotive
- Machine Building
- Construction Materials
- Food Processing

For the past three years, Monroe and the other communities that make up the Charlotte region have been recognized by Fortune Magazine as #1 in "pro-business" attitude and have the second lowest industrial building cost. Monroe and Union County are proactively pursuing the growth and development of high-technology businesses. The strategy for the development of Legacy Park is to attract small to medium size companies to establish manufacturing operations there. The following table provides the overview of Union County employment trend in the past two years.

Overall, Table 3-8 indicates that manufacturing in Union County is the largest employment sector, but manufacturing employment decreased from 10,348 to 9,805, a 5.25 percent decrease between 2009 and 2010.

	09 establishments	09 annual employment	10 establishments	10 annual employment	% change (est.)	% change (emp.)
Total All Industries	4,583	52,961	4,521	50,587	-1.35%	-4.48%
Total Government	125	9,940	129	9,955	3.20%	0.15%
Total Private Industry	4,460	41,822	4,392	39,390	-1.52%	-5.82%
Agriculture Forestry Fishing & Hunting	48	0	51	0	6.25%	.
Mining	3	0	2	0	-33.33%	.
Utilities	4	170	4	167	0.00%	-1.76%
Construction	832	6,102	802	5,193	-3.61%	-14.90%
Manufacturing	254	10,348	257	9,805	1.18%	-5.25%
Wholesale Trade	435	2,638	420	2,505	-3.45%	-5.04%
Retail Trade	464	5,940	469	5,785	1.08%	-2.61%
Transportation	122	1,439	122	1,433	0.00%	-0.42%
Information	50	568	53	602	6.00%	5.99%
Finance and Insurance	195	832	200	753	2.56%	-9.50%
Real Estate and Rental and Leasing	158	459	155	452	-1.90%	-1.53%
Professional and Technical Services	419	1,284	435	1,280	3.82%	-0.31%
Management of Companies and Enterprises	17	83	18	71	5.88%	-14.46%
Administrative and Waste Services	317	2,827	325	2,577	2.52%	-8.84%
Educational Services	89	6,567	91	6,637	2.25%	1.07%
Health Care and Social Assistance	236	4,741	245	4,692	3.81%	-1.03%
Arts, Entertainment and Recreation	41	535	40	445	-2.44%	-16.82%
Accommodation and Food Services	220	3,377	232	3,314	5.45%	-1.87%
Other Services Ex. Public Admin	294	1,274	314	1,251	6.80%	-1.81%
Public Administration	34	2,394	35	2,295	2.94%	-4.14%
Unclassified	353	184	251	87	-28.90%	-52.72%

Table 3-8: Union County Employment Overview

(source: EDIS Report)

For Monroe logistics village, there is Charlotte-Monroe Executive Airport that can serve the proposed 5000-acre industrial and commercial park, Legacy Park, in addition to CLT. The Monroe area connects Wilmington and Charlotte areas with highway access of US 74, US 601, I-485, I-77, and I-85 makes it a good location for logistics village development. In addition, two major road projects which include Monroe Bypass and US 601 widening from US 74 to South Carolina Line are moving forward and can make the area traffic flow better. With the proposed CSX intermodal facility on site, this proposed logistics village will absolutely establish a good business environment and bring a lot of opportunities to Monroe and Charlotte areas. However, it is strictly based on the decision of CSX to build the intermodal terminal at this location. So, it

is very critical to this logistics village project that CSX relocates its current rail switching yard to the proposed Legacy Park location and expand it into an intermodal terminal.

3.3 Logistics Village 3 – Salisbury and Rowan County

Salisbury is located about half way between Charlotte and Greensboro along I-85. Its location provides a strategic position as the interface of two NC metropolitan areas. The logistics operations and the operational base established in Salisbury can serve Charlotte and Greensboro well and can integrate their logistics operations into one well connected logistics network. In addition to Rowan County Airport, Salisbury has quick and easy access to three major international airports in the State.

3.3.1 Rowan County Airport

Rowan County Airport (Figure 3-29) has a runway that is 5,500 ft long and 100 ft wide. It is a general aviation airport and mainly serves companies like Food Lion which has its headquarters in Salisbury and its vendors. The airport is currently securing funding for improvements to extend its runway from 5,500 ft to 6,500 ft and for the improvement of the roads in the airport area. Figure 3-30 shows the Rowan County Airport improvement plan.

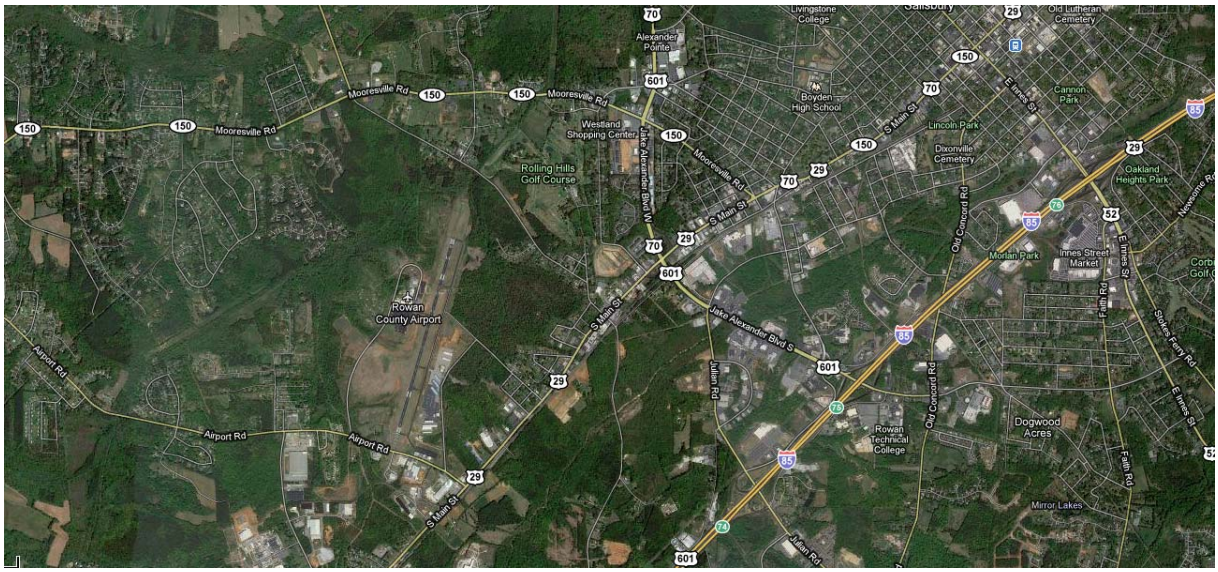

Figure 3-29: Aerial View of Rowan County Airport

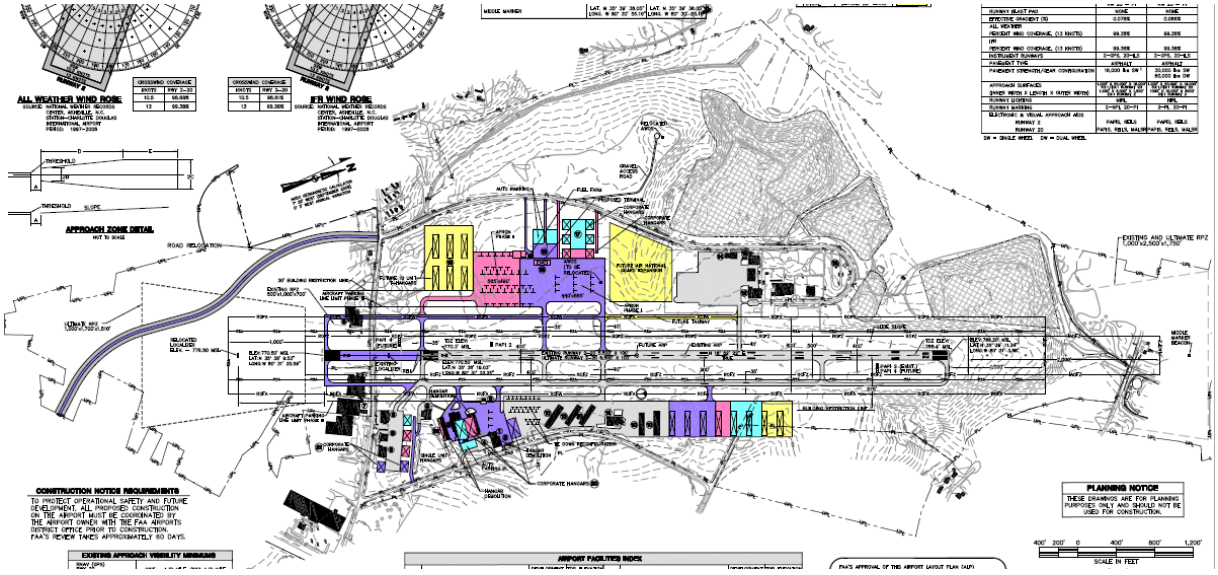

Figure 3-30: Rowan County Airport Improvement Plan

3.3.2 Site at Summit Corporate Center

Available land for the development of a site in Salisbury is the Summit Corporate Center [25]. This development site consists of 612 acres located on Interstate 85 and Julian Road (Exit 74) in Salisbury. It is bordered by Julian, Ritchie, Old Concord and Heilig Roads. Summit Corporate Center is designed for medium to large acreage users in the 10 to 34 acre range with just a few smaller parcels as small as two acres. Figure 3-31 shows the aerial view of Summit Corporate Center site. In the figure, I-85 Exit 74 is located at the upper left side and north of Julian Road is the north campus of Rowan-Cabarrus Community College. Figure 3-32 reveals the master plan map of Summit Corporate Center site.

Figure 3-31: Aerial View of Summit Corporate Center Site

Figure 3-32: Master Plan Map of Summit Corporate Center Site

3.3.3 Rail Network

Rail access to the container port at Wilmington is accessible via a Norfolk Southern rail line passing through Rowan County. However, there is limited freight transportation between this site and the coast. Going northward from Charlotte to Washington, Amtrak makes scheduled stops in Salisbury through the Crescent route, which connects to New York, Atlanta and New Orleans with passenger services.

3.3.4 Rowan County Highway Network

The main highway access for Salisbury/Rowan is I-85. The site is located at Exit 74 off I-85. Its location provides easy access to I-40 and I-77. By traveling on Interstates I-40 and I-85, there is the potential for same-day delivery time to Eastern markets from New York to Florida.

Salisbury Area Major Road Projects

a) **I-85 widening** in Mecklenburg, Cabarrus and Rowan Counties [15, 20]. One of the major highway issues in the area is the congestion of I-85. NCDOT plans to widen I-85 in Cabarrus, Davidson and Rowan Counties to deal with recurring congestion. This project will provide safety and mobility benefits by constructing additional lanes and safety features on I-85. It has regional and national significance because I-85 is a critical route in North Carolina and is very

important to efficiency of the NC logistics network. This project covers 7.2 miles of I-85 with an estimated cost of more than $300 million dollars. Most of I-85 through Rowan is completed as an eight lane facility, but there are four lane bottlenecks at each end – the China Grove interchange on the south end in Cabarrus County, and at the Yadkin River bridge between Rowan and Davidson County on the north end of the segment. This project includes the following activities:

- Upgrade 6.8 miles of I-85 in Davidson and Rowan counties including widen interstate from 4 to 8 lanes, realign roadway to eliminate sharp curves, and improve interchanges.
- Replace 3 major bridges over Yadkin River.
- Complete rail improvements in the vicinity of I-85.

b) **NC 49 widening** from Harrisburg to the Yadkin River [15,20]

This project consists of widening of NC 49 from east of SR 2630 (Cline Road) to east of NC 73 in Cabarrus County. It is a segment of a larger project to widen NC 49 to multi-lanes from Harrisburg to the Yadkin River.

NC 49 is part of the North Carolina Department of Transportation's Strategic Highway Corridor Program and is considered to play a critical role in regional and statewide mobility. In addition to local traffic using NC 49, many travelers use NC 49 and US 64 as an alternative to traveling the interstate between Raleigh and Charlotte. Expansion of the roadway will provide a greater level of service and enhance the safety of the facility. The estimated project is 2 million dollars.

3.3.5 Salisbury/Rowan County Employment

Company Name	# of Employees	Type of Product/ Business
1. Food Lion	2,300+	HQ / Call Center / Dist. / Retail
2. Rowan Regional Medical Center	1,250+	Health Services
3. Daimler Trucks NA – Freightliner LLC	700+	Vehicle Manufacturing
4 .PGT Windows	520	Manufacturing
5. Performance Fibers	378	Manufacturing
6. Magna Manufacturing	381	Manufacturing
7. Catawba College	250	Private College
8. Harmony Labs	235	Pharmaceutical Manufacturing
9. Aldi Distribution Center	230	Warehouse / Distribution
10. AkzoNobel	141	Chemical Manufacturing

Table 3-9: Rowan County Major Employers and Industries

Tables 3-9 and 3-10 show the major employers and industries in the Salisbury area and Rowan County employment overview data. There is one major facility that is not included in Table 3-9, the Veterans Affairs Medical Center in Salisbury. VAMC-Salisbury is serving over 81,000 patients annually and has clinics in three other cities in the State. There is a significant increase in the number of patients being served by VAMC-Salisbury in the past few years. Therefore, health services become a major industry in the Salisbury area in addition to Food Lion and Freightliner's truck assembly facility. The economic development in Salisbury also will be influenced by its close proximity to the North Carolina Research Campus in Kannapolis.

	09 establishments	09 annual employment	10 establishments	10 annual employment	% change (est.)	% change (emp.)
Total All Industries	2688	45785	2627	43756	-2.27%	-4.43%
Total Government	109	5069	110	4889	0.92%	-3.55%
Total Private Industry	2580	33683	2517	31661	-2.44%	-6.00%
Agriculture Forestry Fishing & Hunting	17	287	16	248	-5.88%	-13.59%
Mining	9	223	9	223	0.00%	0.00%
Utilities	7	187	6	173	-14.29%	-7.49%
Construction	329	2251	325	1773	-1.22%	-21.24%
Manufacturing	195	8183	191	7363	-2.05%	-10.02%
Wholesale Trade	162	1901	171	1883	5.56%	-0.95%
Retail Trade	395	4265	390	4147	-1.27%	-2.77%
Transportation	116	3250	118	3144	1.72%	-3.26%
Information	22	437	18	366	-18.18%	-16.25%
Finance and Insurance	134	632	131	612	-2.24%	-3.16%
Real Estate and Rental and Leasing	82	205	85	195	3.66%	-4.88%
Professional and Technical Services	195	0	192	0	-1.54%	.
Management of Companies and Enterprises	13	0	12	0	-7.69%	.
Administrative and Waste Services	159	1255	156	1253	-1.89%	-0.16%
Educational Services	60	766	58	787	-3.33%	2.74%
Health Care and Social Assistance	218	7145	220	7033	0.92%	-1.57%
Arts, Entertainment and Recreation	45	640	42	540	-6.67%	-15.63%
Accommodation and Food Services	210	3435	206	3269	-1.90%	-4.83%
Other Services Ex. Public Admin	182	821	178	796	-2.20%	-3.05%
Public Administration	40	2816	40	2729	0.00%	-3.09%
Unclassified	99	53	63	16	-36.36%	-69.81%

Table 3-10: Rowan County Employment Overview
(source: EDIS Report)

Salisbury logistics village with the service of Rowan County Airport can link the Piedmont Triad area and Charlotte area. It has quick and easy access to three major international airports in the State. The available land for potential Logistics village, the Summit Corporate Center, includes 612 acres, and is located conveniently on Interstate 85 and Julian Road. Salisbury has only very limited freight transportation. The area is accessible via I-85, I-40, and I-77. The location provides an ideal link between Charlotte, Piedmont Triad, and Research Triangle areas.

3.4 Logistics Village 4 – Statesville and Iredell County

The fourth potential logistics site included in this study is Statesville and Iredell County. This proposed village is composed of a 500-acre development at the Statesville Regional Airport (SVH). City of Statesville has a well developed plan in the expansion of the airport area to establish a logistics center based on the airport's operations. Figure 3-33 is the aerial view of the Statesville airport. It is located approximately 38 miles north of Charlotte and 39 miles west of Piedmont Triad International Airport.

Figure 3-33: Aerial View of Logistics Village 4 Site---SVH

(Source: GoogleEarth, Inc.)

3.4.1 Site at Statesville Regional Airport

The Statesville Regional Airport (FAA code SVH will be used in this section) is a major regional transportation hub and home to corporate aviation facilities for two Fortune 500 companies as well as several NASCAR racing teams. It features full instrumentation landing, no landing fees, a recent $14 million expansion, and a 7,005 ft reinforced runway. Its air space is controlled from Atlanta (not Charlotte) for faster take-off and landing authorization---saving time and fuel.

The services provided by SVH include charter aircraft, general aviation, aircraft rental, aircraft sales, aircraft parts sales, jet fuel, avgas, aircraft repair, flight instruction, car rental, vending,

hangar rental, tie down, and observation points. SVH has strong support from the City of Statesville, Iredell County, the Greater Statesville Development Corporation, and, the Statesville Chamber of Commerce. SVH currently holds 8 corporate hangers (including Lowe's, Newell Rubbermaid, and Dale Earnhardt Inc.) The following companies from the motorsports industry and other industries that use SVH as their base airport include:

- Greg Biffle
- Kurt Busch
- Kyle Busch
- Dale Earnhardt Inc.
- Dale Earnhardt Jr.
- Gillett Evernham Motorsports
- Robby Gordon
- Denny Hamlin
- Dale Jarrett, Inc.
- Kasey Kahne
- Matt Kenseth
- Jamie McMurray
- Elliott Sadler
- Reed Sorenson
- Michael Waltrip Racing

Support industries include:

- Autec
- CPI Security
- Daetwyler
- Dycom Industries
- G.L. Wilson
- Lowe's
- Nelson Sigmon
- Newell Rubbermaid
- Strategic Moves
- Tony Greene & Associates

Available land for the development of this logistics site is at the airport. Figures 3-34 shows the TIP projects and the development plan in SVH area. This proposed logistics village has an SVH centered development plan. The plan includes the improvement of the airport with 500 plus acres land development.

The current completed improvement of the airport included the completion of an extended north parallel taxiway and the construction of 72,000 square feet of new hangar space. In the meantime, there is plan for a new south parallel taxiway. This new taxiway will allow exclusive access to the corporate hangar area of 'Taxiway F'. These new taxiways will provide safe and convenient access to each end of the runway from anywhere on the airfield and increase the capacity of the airfield to accommodate more landings and takeoffs. Additional parking is also planned with construction of a new terminal. Improvements to the Terminal Area will include a new entrance road from Airport Road (see Figure 3-35).

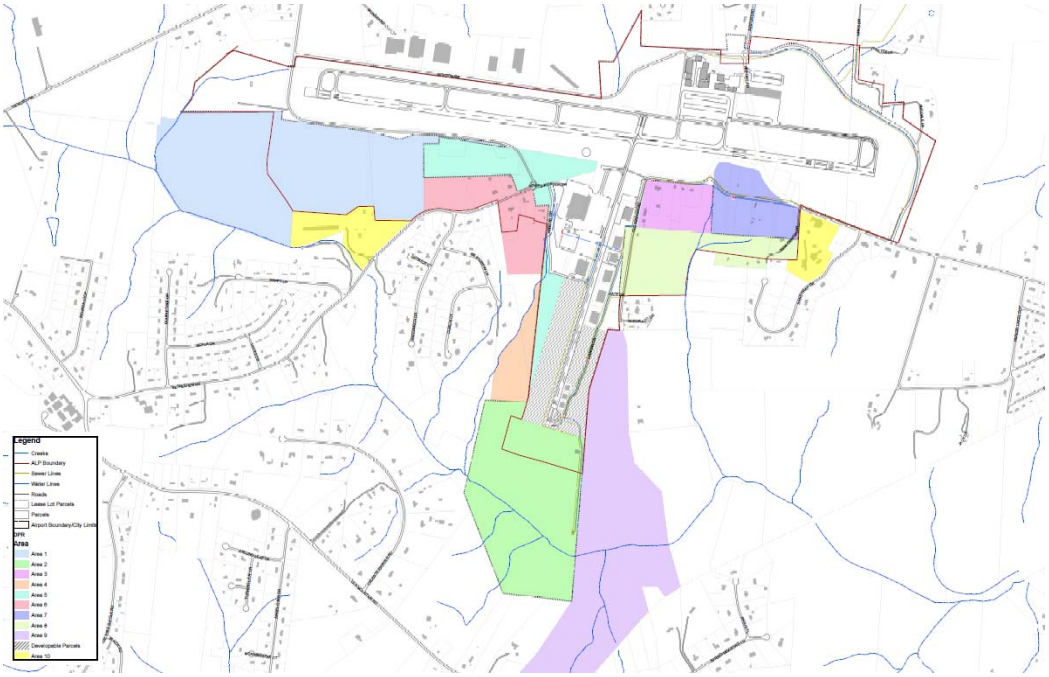

Figure 3-34: SVH Area Development Plan

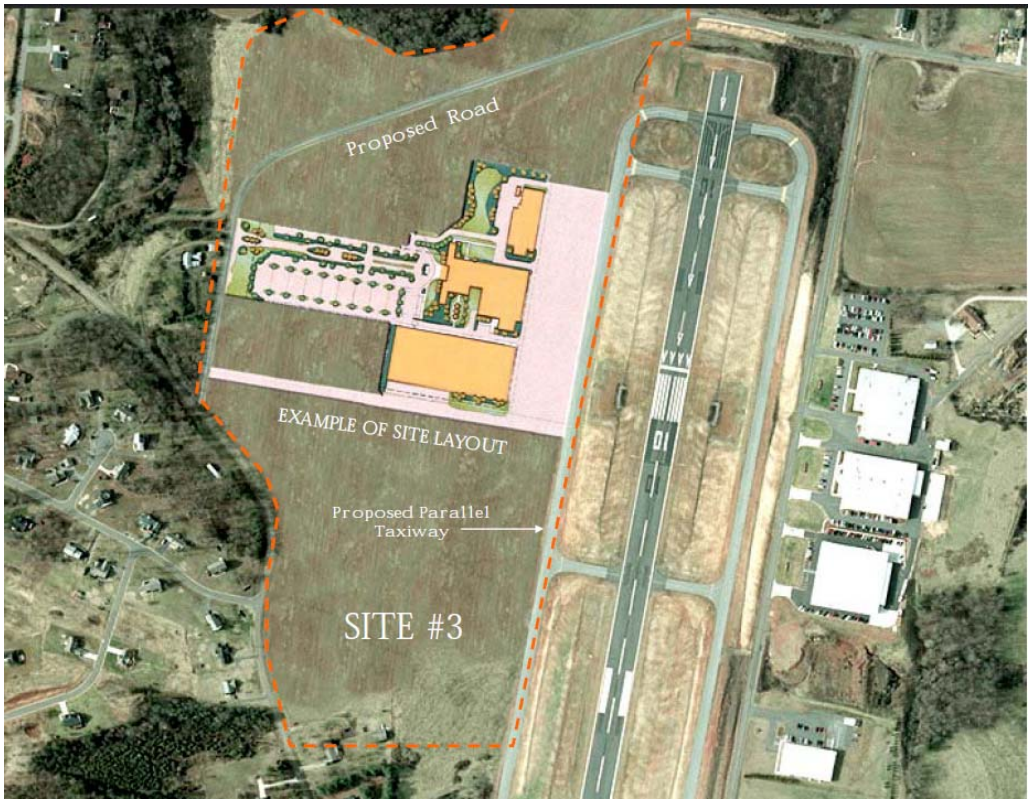

Figure 3-35: SVH Improvement Layout

3.4.2 Iredell County Rail Access

Rail access is the weak point of this logistics site since Statesville has no direct access to the rail terminal even though there are rail lines passing through the area.

3.4.3 Regional Highway Network

SVH is located close two interstate highways. It is 1 mile away from I-40 and 8 miles away from I-77, and also, US 70 is less than a mile way. I-77 runs north and south while I-40 runs east and west (see Figure 3-36). Additionally, I-85 is only thirty minutes away from SVH area.

Figure 3-36: Regional Highway Map for Western Piedmont and Appalachian Foothills

Statesville Area Major Road Projects

a) **I-77 widening** from Brookshire Freeway in Charlotte to I-40 in Statesville [15,26] was shown in the Mecklenburg County section of this report.

b) **I-40/I-77 Interchange modification** - in TIP [26]

This I-40/I-77 in Statesville interchange improvements project intends to improve the interface between I-40 and I-77. The goal is to improve the mobility in the area and to enhance the flow of the Interstate highway network. The construction work of this interchange improvement project has been delayed due to its roadway design which needs additional time to revise plans. The expected start time is May 01, 2011 and the estimated cost is $97,700,000.

c) **US 70 widening** from Salisbury to Statesville - in TIP [20,26]

This project intends to widen and partially relocate US 70 to a multi-lane facility from Fanjoy Road east of Statesville to just west of US 601 in Salisbury. The improvements to US 70 will be made in five parts.

Section A begins at Fanjoy Road (SR 23182) east of Statesville and ends at the Iredell-Rowan County line. Section B begins at the Iredell-Rowan County line and ends at Main Street (SR 1743). Section C begins at Main Street (SR 1743) and ends at Hilderbrand Road (SR 1739). Section D begins at Hilderbrand Road (SR 1739) and ends at Kepley Road (SR 1953). Section E begins at Kepley Road and ends at the existing multi-lanes just west of US 601 in Salisbury.

The total estimated cost of the proposed project is $80,233,675 including $10,064,000 for right of way acquisition, $68,100,000 for construction, $1,757,675 for stream mitigation, and $312,000 for wetland mitigation. Statesville uses I-77 and I-40 to obtain good interfaces between its logistics operations and the sea port component. Statesville area's connection to sea ports includes connecting to the Ports of Wilmington, Morehead City, and Charleston.

3.4.4 Iredell County Employment

The following list shows the largest employers in the greater Statesville area.

- Iredell-Statesville Schools
- Iredell Memorial Hospital
- Iredell County Government
- Piedmont HealthCare
- Statesville Auto Auction
- Davis Regional Medical Center
- Kewaunee Scientific
- Doosan Infracore-Portable Power
- J.C.P. Logistics Distribution Center
- Lowe's Regional Distribution Center

Tables 3-11 and 3-12 reveal the type of industries operating in the Statesville area.

Industry	Emp.
Agriculture, Forestry, Fishing, Mining	1,054
Construction	5,971
Manufacturing	13,278
Transportation, Utilities	3,583
Information	913
Wholesale Trade	3,302
Retail Trade	8,430
Fire	3,723
Services	27,890
Public Administration	2,108

Table 3-11: Statesville Area Employer by Industry

	09 establishments	09 annual employment	10 establishments	10 annual employment	% change (est.)	% change (emp.)
Total All Industries	4777	60818	4736	59606	-0.86%	-1.99%
Total Government	76	1198	78	1183	2.63%	-1.25%
Total Private Industry	4704	51579	4658	50419	-0.98%	-2.25%
Agriculture Forestry Fishing & Hunting	38	0	39	0	2.63%	.
Mining	1	0	1	0	0.00%	.
Utilities	9	167	9	152	0.00%	-8.98%
Construction	603	3393	594	3147	-1.49%	-7.25%
Manufacturing	296	9179	295	9021	-0.34%	-1.72%
Wholesale Trade	416	3219	427	2991	2.64%	-7.08%
Retail Trade	598	7827	601	7582	0.50%	-3.13%
Transportation	130	2043	136	2136	4.62%	4.55%
Information	42	485	40	469	-4.76%	-3.30%
Finance and Insurance	222	1103	223	1050	0.45%	-4.81%
Real Estate and Rental and Leasing	201	595	191	530	-4.98%	-10.92%
Professional and Technical Services	428	1607	443	1534	3.50%	-4.54%
Management of Companies and Enterprises	30	2565	26	2827	-13.33%	10.21%
Administrative and Waste Services	238	2687	258	2862	8.40%	6.51%
Educational Services	51	1040	52	1057	1.96%	1.63%
Health Care and Social Assistance	421	6834	437	6763	3.80%	-1.04%
Arts, Entertainment and Recreation	116	1992	106	1718	-8.62%	-13.76%
Accommodation and Food Services	323	5839	328	5758	1.55%	-1.39%
Other Services Ex. Public Admin	296	1564	304	1451	2.70%	-7.23%
Public Administration	34	499	35	485	2.94%	-2.81%
Unclassified	287	139	191	69	-33.45%	-50.36%

Table 3-12: Iredell County Employment Overview

(source: EDIS Report)

There are some local features and strengths related to economic development and in attracting business to the Statesville area.

- The area was ranked the No. 1 "Micropolitan" Area by *Site Selection Magazine* seven times since 2000.
- Iredell County is the 10th fastest growing county in the State.
- The Greater Statesville area has more than 180 industrial operations that include plastics, transportation equipment, metal working, and distribution.

- The area is 38 miles north of Charlotte, the largest MSA in the Carolinas: 15 minutes from Lake Norman, the largest lake in North Carolina; and 45 minutes from the Blue Ridge Parkway.
- It needs less than one hour's interstate drive to CLT and to Piedmont Triad International Airport in Greensboro.

The area expects that the growth of SVH site will create job growth, tourism business and other new business, and help recruit relocating businesses.
Statesville logistics village includes Statesville Regional Airport which is a major regional transportation hub. It has a well developed plan (with 500 plus acres land) in the expansion of the airport area to establish a logistics center based on the airport's operations. The plan is strongly supported by the local government and other organizations. However, there is no rail access at the Statesville logistics village location. The highway accesses of I-77 and I-40 makes this logistics village a strategic location to link the western Carolina region with the Charlotte and Piedmont Triad areas. In addition, this logistics village is also only 30 minutes away from I-85.

4 Environmental Concerns and Security Issues

There are some critical issues that commonly affect these four logistics villages. There are approximately 40 different Federal laws and regulations that protect the environment, such as the Clean Air Act, Clean Water Act, Endangered Species Act, National Historic Preservation Act, and the Executive Order on Protection of Wetlands. [27] Airports are not regulated in the same manner as industrial plants. Industrial plants must comply with state and local air quality regulations and permitting policies; however, airports are regulated on the federal level. The primary environmental concerns related to airport expansions and operations are air quality, water quality, and aircraft noise.

Security issues become critical with the integration of proposed Norfolk Southern intermodal terminal also. In addition to environment concerns, the design of the Charlotte logistics village has to consider the security issues for the interface of airport and intermodal terminal operations. The objective moving forward is to minimize the potential security threats caused by the new rail-air interconnectivity at CLT.

4.1 Air Quality Issues

In April of 2004, the United States Environmental Protection Agency (USEPA) designated Charlotte as non-attainment due to exceeding of the 8-hour ozone National Ambient Air Quality Standard (NAAQS) [28]. The 8-hour ozone nonattainment areas are shown in Figure 4-1.

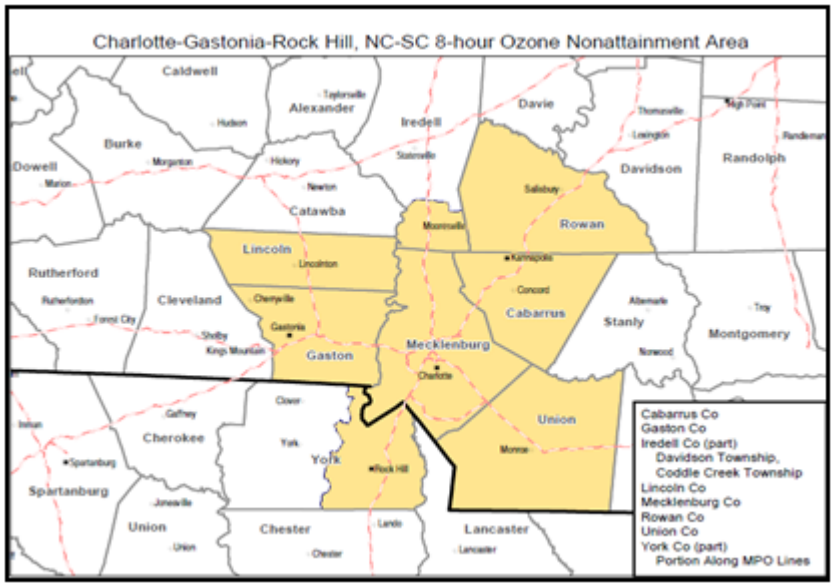

Figure 4-1: Ground Level Ozone Non-attainment Area

Ground level ozone, the primary component of smog is formed from reactions between the air pollutants, volatile organic compounds (VOCs) and nitrogen oxides (NOx) in the presence of heat and sunlight [28]. Airports are significant sources of VOCs and NOx emissions. The arriving and departing planes at an airport can create as much VOCs and NOx as many of its largest industrial neighbors. Airplanes are not the only sources that emit these pollutants. Engine emissions from gasoline and diesel powered automobiles, trucks and aircraft service equipment associated with the CLT expansion are also expected to increase NOx and VOC emissions; thereby, increasing ozone emissions.

Other pollutants that may be emitted are particulate matter (PM), sulfur dioxide (SO_2) and carbon monoxide (CO). When calculating air pollutant emissions, commercial aircraft activity is measured in landing and takeoff (LTO) cycles. During the 2009 calendar year, the airport averaged over 640 daily flights. In February 2010, CLT opened a third parallel runway. The new runway is estimated to increase the number of planes that can land and take off from the airport by 33%. This growth in airport activity along with the proposed logistics village activities is expected to cause an associated increase in the air pollutant emissions [29].

CLT is already taking measures to reduce air emissions. In 2007, the Charlotte City Council purchased their first pair of hybrid electric buses to transport passengers around the airport and is planning to order more hybrid buses in the near future. These buses were built by Charlotte-based Design Line and run in full-electric, zero-emissions mode over a third of the time. The hybrid buses are expected to reduce tailpipe emissions by 4.5 to 5 times below California Air Resources Board 2010 and USEPA 2010 requirements [30]

The following observations are made as methods to help minimize the impact on land-side and plane-side operations at the airports.

- Follow through with plans to purchase additional hybrid shuttle buses;
- Convert gasoline powered airport fleet vehicles and ground service equipment to alternative fuels;
- Minimize aircraft engine use while idling and taxiing;
- Avoid “topping off” tanks during re-fueling;
- Install and use electric ground auxiliary power units (APUs) at the gates to replace diesel-powered auxiliary power units;
- Provide incentives that encourage the use of mass transit to and from the airport;
- Avoid the open burning of land clearing debris; and
- Use water trucks to provide wet suppression of fugitive dust emissions on construction sites.

It is important to consider these recommendations while designing the logistics village.

4.2 Water Quality Issues

Whenever there is an airport expansion, short-term impacts to surface water quality are expected to occur from storm water runoff from cleared areas void of vegetation during construction, which could result in temporary increases in turbidity within surface waters. An increased demand of potable and wastewater is also expected.

The following recommendations are made to help minimize the impacts to water quality in Charlotte:

- Implement Best Management Practices (BMPs) during construction to minimize erosion and sediment transport into surface waters;
- Create storm water detention ponds to treat non-point source water pollution by removing total suspended solids;
- Implement measures to control glycol runoff associated with plane de-icing;
- Reduce water usage associated with aircraft washing;
- Install water efficient plumbing fixtures; and
- Design landscaping that includes water efficient plants and reduces impervious surfaces.

With these recommendations in mind while designing the logistics village, the village would be not only efficient but also environmental friendly.

4.3 Noise Issues

Noise is a major issue associated with expanding air cargo operations in CLT. Since most air cargo are shipped during nighttime, citizens become concerned that the increase of loud noise during nighttime flights could disturb their sleep. Airport expansions and the construction of the logistics village also have the potential to increase noise levels from highways during road and village construction, taxiing aircrafts and ground support equipment. Since 1982, CLT has received funds to purchase noise sensitive land and for noise mitigation. CLT has also implemented a noise monitoring program that includes the monitoring of aircraft flight tracks. In February of 2010, the airport requested proposals for a new flight monitoring system. The new monitoring system will be web-based and will identify all aircraft that fly in the vicinity of CLT, while capturing detailed information about the aircraft (i.e., type, owner, flight number, altitude, speed, etc.). The captured data will be used to plot the aircraft's track as it approaches or departs CLT. This new system will enable the airport to more accurately respond to noise complaints by identifying individual flights that have flown over a particular address or location during any selected time frame.

The airport also implemented an FAR Part 150 Noise Compatibility Program (NCP) in 1989 in an effort to mitigate aircraft noise in the areas surrounding of the airport. For more than thirty years, CLT has undertaken the NCP, which is aimed at providing balance between an airport's operational needs and its impact on the neighboring community. The purpose of the program is to reduce existing non-compatible land uses and to prevent the introduction of new non-compatible land uses in areas impacted by aircraft noise. The NCP was updated in 1997 and again in 2008. Figure 4-2 shows the projected 2014 Noise Exposure Map (NEM).
The noise exposure environment around the Airport is presented in terms of contours of the yearly average Day-Night Sound Level (DNL). The yearly average DNL is the measure adopted

by the Federal Aviation Administration (FAA) to describe noise exposure around airports. DNL calculates the noise exposure with a 10 decibel (dB) penalty on noise occurring during the night (10:00 p.m. to 7:00 a.m.) and no penalty placed on noise during the daytime. The FAA requires that NEMs include contours for DNL values of 65, 70 and 75 dB. The NEMs for CLT also includes noise contours for a DNL value of 60 dB. Under FAA guidelines, all land uses, including residential use are regarded as being compatible with DNL values below 65 dB. The 2010 NCP estimates that there are approximately 629 people and 262 homes with noise exposure levels of 65 db or higher [31].

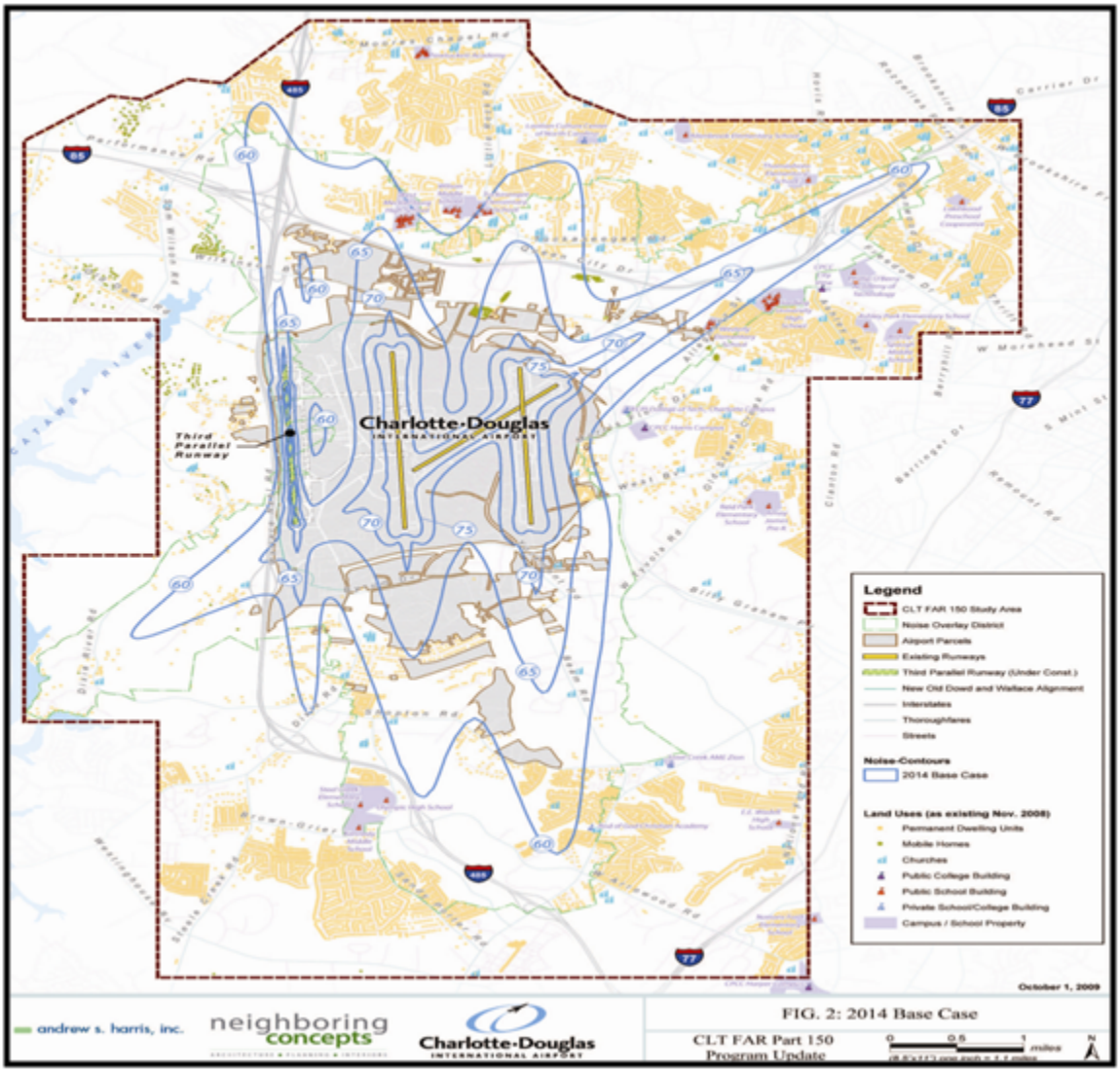

Figure 4-2: CLT 2014 Noise Contour Map

The following observations are being made in an effort to minimize noise impacts in the areas surrounding the airport:

- Develop a 5-year land acquisition plan for areas within the 70 db and higher contours of the 2014 NEM;
- Install sound insulation in all existing homes, public institutions and business structures located in areas with noise levels of 60–70 db or higher as indicated in the 2014 NEM;
- Plan routes for night time flights over areas with the least amount of residential structures between 9pm and 7am;
- Create a web-based noise complaint system, that enables citizens to submit complaints more conveniently and provides historical complaint data;
- Review the proposals requested by the City Council for a new monitoring system. Then purchase and install the new monitoring system;
- Evaluate flight monitoring system data annually to determine what modifications should be made to NCP and what actions should be taken immediately to minimize noise exposure;
- Install roadway noise barriers as deemed necessary;
- Conduct a feasibility study for the installation and use of ground run-up enclosures; and
- Develop an outreach program that educates citizens, businesses and real estate agencies about the potential noise problems associated with the airport expansion and the potential impact on property values.

Since CLT is expected to encounter the expected significant increase in air cargo volume, it is critical to follow the recommendations to minimize noise impacts caused by Airport expansions and by the increased nighttime cargo flights.

4.4 Security Issues

Aviation expansion and partnership with other modes of transportation are beneficial for the economy and the transportation industry as a whole and for the efficiency of the logistics system operations, but it does create issues from a security perspective.

Since the proposed Charlotte logistics village includes CLT and the new intermodal terminal at CLT, security for this part of the logistics village becomes extremely important. This section will discuss the security issues involved and what shall be followed to maintain adequate security level in airport and intermodal terminal operations.

While rail-air interconnectivity improves operational efficiencies at an airport, it may also increase the attractiveness of the airport as a target for terrorism, and expose the airport to new vulnerabilities introduced with the rail station. To meet these threats, and to address congressional mandates, the FAA has taken the lead in developing security requirements for all facilities within airport property, including air operations, land access, and passenger terminals. The FAA has continued on-going implementation of recommendations from the White House Commission on Aviation Safety and Security [32].

To fulfill FAA security requirements, as well as to address its own unique vulnerabilities, the rail transit agency serving an airport must develop a security program for the intermodal facility. To address the FAA requirements and also global security concerns at the rail transit station, CLT and intermodal terminal administrators should perform risk assessment during planning, design, and construction [32].

It is recommended that the following security technologies and methods be implemented at the intermodal freight facility at CLT.

- Electronic Access Control Systems
- Closed Circuit Television
- Procedural Access Control
- Contingency Planning
- Design and Operation to Manage Criminal Activity
- Baggage Check-in Facilities
- On-going Threat and Vulnerability Management Program
- Coordination and Partnership for Emergency Response

The above technologies and methods should help prevent security breaches at CLT. According to an FBI report, terrorist attack directed against a U.S. airline, airport, or passenger terminal is likely to occur in the next decade. With the addition of an intermodal terminal located on airport property enhances the chances that the terrorist attack could involved chemical, biological, or nuclear weapons and must be addressed [32].

To address this type of situation the FAA implemented new regulations that the airport tenant security must follow including [32]:

- A description and a map of the boundaries and pertinent features of each area over which the airport rail freight tenant will exercise security responsibilities.
- A description of the systems, measures, and procedures the airport rail freight tenant has assumed.
- Systems, measures, and procedures by which the airport operator will monitor and audit the rail freight tenant's compliance with the security program.
- Monetary and other penalties to which the rail freight tenant may be subject if it fails to carry out the airport rail freight tenant security program.
- Circumstances under which the airport operator will terminate the airport rail freight tenant security program for cause.
- A provision acknowledging that the rail freight tenant is subject to inspection by the Airport Administrator.
- A provision acknowledging that individuals who carry out the rail freight tenant security program are contracted to or acting for the airport operator and are required to protect sensitive information.
- Procedures by which the rail freight will immediately notify the airport operator and provide for alternative security measures for changed conditions.

5 Summary and Conclusions

In review, the purpose of this study ways to provide information on Charlotte region's logistics system development and how it can enhance the region's economic development for the State's logistics operations and economic growth. The logistics village sites proposed here are with different features to fulfill the needs of the region and the State. The intention is not to have them compete with each other within the region, or with sites in other regions, but to show their potential contributions to the State's integrated logistics operations.

5.1 Strengths, Weaknesses and Needs for Logistics Villages

One way to demonstrate the feasibility of each proposed logistics village is to discuss its strengths, weaknesses, and needs. The following lists show the features of each village in the region based on these factors.

Village 1 – Charlotte and Mecklenburg County

- **Strengths**
  - Land (more than 5,000-Acre of Industrial and Commercial Park)
    - Dixie Berryhill Area (Around 5,000 to 5,700-acre area) & Steele Creek Area (Around 2,266-acre Arrowood-Westinghouse Industrial Area)
  - Rail access (CSX & Norfolk Southern 200-acre intermodal facility in airport)
  - Highway/freeway access:
    - I-485, I-77, I-85, US 74
    - Monroe Bypass scheduled for construction later this year by Turnpike Authority
    - US 601 widening from US 74 to South Carolina Line is under construction
  - Air access:
    - Charlotte Douglas International Airport
  - Over 327 trucking firms located within Charlotte

- **Weaknesses**
  - Highway improvements-congestion issues

- **Needs**
  - Charlotte area transit system improvement
  - Railroad and highway improvements
    - Completion of N-S intermodal terminal
    - Completion of Charlotte Outer Loop last section
    - Completion of Monroe Bypass
    - Completion of Garden Parkway
    - I-85 widening in Mecklenburg, Cabarrus and Rowan Counties
    - I-77 widening from Brookshire Freeway in Charlotte to I-40 in Statesville
    - NC 49 widening from Harrisburg to the Yadkin River
    - US 74 (Independence Boulevard) Albemarle Road to Outer Loop

Village 2 – Monroe and Union County

- **Strengths**
  - Land (5,000-Acre Industrial and Commercial Park-Project Legacy)
  - Rail access (CSX Intermodal handling facility if implemented)
  - Highway/freeway access:
    - US 74, US 601, I-485, I-77, I-85
    - Monroe Bypass scheduled for construction later this year by Turnpike Authority
    - US 601 widening from US 74 to South Carolina Line is under construction
  - Air access:
    - Charlotte-Monroe Executive Airport, Charlotte Douglas International Airport

- **Weaknesses**
  - CSX commitment-risk
  - Highway improvements

- **Needs**
  - Railway and highway improvements
    - Completion of Monroe Bypass
    - Completion of US 601 widening from US 74 to South Carolina Line
    - CSX intermodal terminal

Village 3 – Salisbury and Rowan County

- **Strengths**
  - Land (612-Acre Industrial Park-Summit Corporate Center)
  - Close to the North Carolina Research Campus in Kannapolis
  - Highway/freeway access:
    - I-85, I-77, I-40
  - Air access:
    - Rowan County Airport, Charlotte Douglas International Airport

- **Weaknesses**
  - No rail access
  - Highway improvements

- **Needs**
  - Rail industrial access and highway improvements
    - Widening I-85 from NC 49 / US 29 to NC 73 and to exit 68 in China Grove (I-85 widening in Mecklenburg, Cabarrus and Rowan Counties)
    - NC 49 widening from Harrisburg to the Yadkin River

Village 4 – Statesville and Iredell County

- **Strengths**
  - Land (500-Acre surrounding airport area)
  - Good planning for the development of airport area
  - Highway/freeway access:
    - I-40, I-77, US-70, I-85
  - Air access:
    - Statesville Regional Airport, Charlotte Douglas International Airport
    - Currently holds 8 corporate hangers (including Lowe's, Newell Rubbermaid, Dale Earnhardt Inc.)

- **Weaknesses**
  - No rail access
  - Highway improvements

- **Needs**
  - I-40/I-77 interchange modification
  - I-77 widening from Brookshire Freeway in Charlotte to I-40 in Statesville
  - US 70 widening from Salisbury to Statesville

5.2 Logistics Villages Compared

Table 4-1 is the assessment matrix that provides a summary of the eight logistics sites located in four counties included in this study. Concord and Cabarrus County are listed in this comparison of possible near-term developments, although not included in the detailed study,.

	Charlotte/ Mecklenburg	**Concord/ Cabarrus**	**Monroe/ Union**	**Salisbury/ Rowan**	**Statesville/ Iredell**
Geographic Reach	Charlotte Douglas International Airport	Concord Regional Airport; GA; reliever for CLT	General Aviation; Charlotte-Monroe Executive Airport	General Aviation; Rowan Co. Airport	Statesville Regional Airport; Corp. Jets; General Aviation
Economic Sector	**Major Target Sector**; 32 % growth last decade	Among Target Sectors; 36 % growth last decade	Among Target Sectors – (**63 %** growth last decade – highest in NC)	Not among target sectors, but is only county in region with adequate capacity on I-85	Among target sectors; 30% growth last decade
Agriculture	Agri-business, ADM location near Downtown	N/A	Historically a major economic sector but being rapidly replaced by urban development	N/A	In transition – formerly major tobacco farm county
Tourism	Multi-faceted opportunities - Downtown; Major League Sports venues; NASCAR Museum; Carowinds; National Whitewater Center;	Charlotte/Concord / Lowes Motor Speedway; Great Wolf Lodge; Concord Mills	N/A	NC Transportation Museum in Spencer; High Rock Lake	NASCAR shops and fan attractions in Mooresville; Lake Norman

	Lake Norman & Lake Wylie				
Health & Wellness	Two Major Medical Center chains – CMS and Novant Health	CMC-NorthEast	CMC and Novant locations	VA Medical Center-Salisbury and Rowan Regional Medical Center	Davis Regional Medical Center and Iredell Memorial Hospital
Military Support	Military use of field; NC Air National Guard	N/A	N/A	N/A	N/A
Aerospace Manufacturing	Headquarters of Goodrich, General Dynamics Armament and Technical Products, and SPX	N/A	Goodrich manufacturing facility	N/A	N/A
Other Advanced Manufacturing	Moderate; Manufacturing is 8th largest employer in county	Manufacturing is largest employer in county	Manufacturing is largest employer	Manufacturing is largest employer	Manufacturing is largest employer
Retail	Major retail chains; several "mega-malls"	Concord Mills (part of Mills chain – a major tourist attraction in NC)	N/A	N/A	N/A
Preparedness					
Highway	N/S and E/W through NC - Interstate 85; NS Interstate 77; I-485 outer loop 95% complete	I-85; I-485 close proximity	E/W U.S. 74 ; several years behind on needed development; current plans for Monroe Bypass (critical for new development)	N/S and E/W through NC - Interstate 85	E/W Interstate 40; N/S Interstate 77; major under-promoted and under-developed
Rail	Norfolk Southern and CSX service	No service	CSX	No service	No service
Air	10,000 ft. longest runway; 3 total (CLT)	7,400 ft. runway (JQF)	5,500 ft. runway, plans for 7,000 ft. (EQY)	5,500 ft. runway, plans for 6,500 ft. (RUQ)	7,000 ft. runway (SVH)
Maritime Support	Intermodal Terminal at CLT (under development)	N/A	N/A	N/A	N/A
Developable Land	Adequate on-airport space; off-airport land available; 7,000 Acres	Over 500 Acres	5,000 Acre site	Over 600 Acres	Over 500 Acres
Power/Gas	Available on site	Available on site	Available at site boundary	Good	Adequate
Information Technology/ Communications	Available on site	Good	Adequate	Good	Adequate
Water/Sewer	Available on site	Good	Adequate	Adequate	Adequate
Environmental Issues	Wetlands may limit real estate development	Wetlands may limit real estate development	Wetlands may limit real estate development	Wetlands may limit real estate development	
Tax Incentives	N/A				
Education and Research	UNC Charlotte; Central Piedmont CC; Queens Univ.; Johnson C. Smith Univ. ; Johnson &	Rowan – Cabarrus Comm. Coll. ; NC Research Campus	South Piedmont Comm. Coll – Polkton, but serving Union Co.	Rowan – Cabarrus Comm. Coll.; Catawba College	Mitchell Comm. Coll. (Statesville campus)

	Wales; Charlotte Law School				
Inter-Institutional Organizations	Charlotte Regional Partnership serves all five counties	CRP	CRP	CRP	CRP
Labor Pool	Good in all five counties	Good	Good	Good	Good
Upfit Cost	Low	Low	Moderate	Moderate	Moderate
Nearest Port	Charleston; Inland Port	Charleston	Charleston	Norfolk; Accessible to Inland Port at Greensboro	Charleston; Accessible to Inland Port at Greensboro

Table 5-1: Assessment Measures for Five Potential Logistical Villages

	Charlotte/ Mecklenburg	Concord/ Cabarrus	Monroe/ Union	Salisbury/ Rowan	Statesville/ Iredell
Logistics Village	Already established – 6th largest trading area in US: 2.6 M residents and 1.1 M in labor force	Rapidly becoming established; high population growth area	Excellent potential with 5,000 Acre Legacy Park being developed in eastern part of county	612 Acre Summit Corp. Center under development on I-85	500 Acres developable around Statesville Regional Airport
Regional Portal	Already established				
Inland Port	Operational	N/A	N/A	Accessible to Inland Port at Greensboro	Accessible to Inland Port at Greensboro
General Aviation Airport	Primarily Corporate Jets; GA aircraft have separate terminal	Corporate Jets and General Aviation (JQF)	(EQY)	(ROQ)	Corporate Jets, Charters, and GA (SVH)
Specialized Logistics Facility	Norfolk Southern partnership with Charlotte Douglas International Airport for 200 Acre Intermodal Facility on Airport property				Lowe's Distribution Center

Table 5-2: Charlotte Portal Site Summaries: Alternative Functions

5.3 Conclusions

Within the Charlotte region, there are a large number of potentially available properties of 500 to 6,000 acres that are actively planned for development. Many are being developed with elements that are aimed at improving overall freight movements in the State and region. There are also a large, significant number of available, previously developed logistics sites, suitable for warehousing operations and/or light industry. The majority of these previously developed sites are surrounding Charlotte Douglas International Airport. These sites make the region attractive to industries in establishing operational facilities here.

Freight volume in North Carolina and the Charlotte region is expected to double by 2020. Both existing and planned industrial and business developments must consider rail, air, and highway movements, and integrated, intermodal facilities. A logistics system to accommodate future freight volumes is an important element of future development. An improved logistics system will enhance economic growth and help the State and region achieve a higher level of economic growth.

Each of the seven NC Department of Commerce regions must be an integral part of the State logistics system. State and regional agencies and the private sector have indicated that a statewide approach, with regional "building blocks," would more adequately address the broad range of challenges shape our freight and logistics systems in the future. Regional freight mobility plans should integrate the following components of any of the logistics villages (i.e., counties): (1) urban street design that accommodates trucks; (2) "interstate standard" highways , toll roads, and other major arterial improvements to accommodate trucks; (3) transit systems designed and built on a regional basis; (4) high speed rail connecting major logistical regions or "villages"; and (5) air cargo terminals, taking into account existing warehousing/industrial infrastructure already in place. To accommodate most of these approaches to improved logistics and freight mobility, the NCDOT should also encourage MPOs and RPOs to be actively involved in planning and programming such improvements.

The logistics village concept for the counties included in this report should also be carried forward to interface with other regions in the two Carolinas and all other markets on the East Coast. Within the greater Charlotte Region, for example, an Iredell County logistics village should link with Western Carolina and the Piedmont Triad. A Rowan/Cabarrus village will also link with the Triad. Union County will link with Wilmington, as well as other East Coast ports, particularly Charleston. The Charlotte/Mecklenburg village will not only link with each of the other villages in the Greater Charlotte Region, but also link with the automotive manufacturing industry in the Greenville-Spartanburg area. These links will offer the State an integrated logistics network that can supply effective and efficient logistics operations and boost the State's economic growth.

6 References

1. Orr, J., "Charlotte Douglas International Airport - Connecting the Carolinas to the World," *Governor's Logistics Task Force Meeting*, Charlotte, NC, March 2010.

2. Hauser, E., and Swartz, N., "Economic Impact Assessment of Charlotte Douglas International Airport," *UNC Charlotte Center for Transportation Policy Studies*, September 2005.

3. Charlotte Regional Partnership, "Regional Initiatives," http://charlotteusa.com/target-sectors/energy/regional-initiatives/.

4. Airport-data.com, "Charlotte/Douglas International Airport (CLT) Information," *http://www.airport-data.com/airport/CLT/*, 2010.

5. Charlotte-Douglas International Airport, "CLT Traffic and Activity Reports," *http://charmeck.org/city/charlotte/Airport/AboutCLT/Pages/CLT%20Traffic%20and%20Activity%20Reports%20new.aspx*, City of Charlotte, 2010.

6. Freight Analysis Framework Version 3, "Freight Analysis Framework Data Extraction Tool," *http://cta-gis.ornl.gov/faf/Extraction1.aspx*, Center for Transportation Analysis, 2010.

7. Freight Management and Operations, "Freight Analysis Framework," *http://ops.fhwa.dot.gov/freight/freight_analysis/faf/index.htm*, Federal Highway Administration, 2010.

8. Wikimapia, "Arrowwood-Westinghouse Industrial Area," *http://wikimapia.org/9560563/Arrowood-Westinghouse-Industrial-Area*, 2008.

9. Charlotte-Mecklenburg Planning Department, "Steele Creek Area Plan Community Workshop," *http://ww.charmeck.org/Planning/Land%20Use%20Planning/SteeleCreek/Presentation%282010_03_Mar_25%29.pdf*, March 2010.

10. Charlotte-Mecklenburg Planning Department, "Dixie Berryhill Strategic Plan," *http://charmeck.org/city/charlotte/planning/AreaPlanning/Plans/Pages/Dixie%20Berryhill.aspx*, April 2003.

11. NC Turnpike Authority, "Gaston East-West Connector, Gaston and Mecklenburg Counties - Final Updated Purpose and Need Statement," *http://www.ncturnpike.org/pdf/FINAL%20Purpose&%20Need%20Update%20101508.pdf*, October 2008.

12. Insight Research Corporation, "Economic, Employment and Tax Impacts: Potential Expansion of Norfolk Southern Railroad's Intermodal Service in Charlotte, NC," June 2005.

13. Elkins, K., "Charlotte/Douglas airport moving closer to landing intermodal shipping facility," *Charlotte Business Journal*, June 2010.

14. Darrell, W., "The Charlotte Regional Intermodal Facility: The Future of Freight Logistics," *http://www.charlottechamber.com/clientuploads/2010TransportationSummit/Darrell.pdf*, Charlotte Chamber of Commerce, April 2010.

15. NCDOT, "State Transportation Improvement Program 2009-2015-Division 10," *http://www.ncdot.gov/planning/development/TIP/TIP/Trans/pdf/div10.pdf*.

16. NCDOT, "I-485 Charlotte Outer Loop," *http://www.ncdot.gov/projects/charlotteouterloop/*, NCDOT High Profile Projects & Studies.

17. NC Turnpike Authority, "Monroe Connector/Bypass," *http://www.ncturnpike.org/projects/monroe/*

18. NC Turnpike Authority, "Garden Parkway," *http://www.ncturnpike.org/projects/gaston/*

19. NCDOT, "HOV Lanes," *http://www.ncdot.org/projects/hov/*, NCDOT High Profile Projects & Studies.

20. NCDOT, "State Transportation Improvement Program 2009-2015-Division 9," *http://www.ncdot.gov/planning/development/TIP/TIP/Trans/pdf/div9.pdf*.

21. Union County Partnership for Progress, "Project Legacy Plans," *http://www.unioncpp.com/legacy/index.html*

22. Bell, A., "Apparent Winner Named for Big Bypass Contract," *Charlotte Observer.* October 2010.

23. Wilbur Smith Associates , "Final Report: Proposed Monroe Connector/Bypass Comprehensive Traffic and Revenue Study," *North Carolina Turnpike Authority*, September 2010.

24. Blythe Construction, "US601 widening," *http://www.us601widening.com/*.

25. Rowan Works, "Summit Corporate Center," *http://www.rowanedc.com/MainNavigation/IndustrialParks/SummitCorporateCenter.aspx*

26. NCDOT, "State Transportation Improvement Program 2009-2015-Division 12," *http://www.ncdot.gov/planning/development/TIP/TIP/Trans/pdf/div12.pdf*.

27. Federal Aviation Administration, "Report to Congress on the Environmental Review of Airport Improvement Projects," *http://www.faa.gov/airports/environmental/*, May 2001.

28. EPA, *http://www.epa.gov/ozonedesignations/1997standards/areamaps/Charlotte.pdf*.

29. City of Charlotte, "Government Services and Information," *http://www.charmeck.org*.

30. NC Solar Center "Clean Fuel Advanced Technology Success Story: Charlotte-Douglas International Airport," *http://www.ncsc.ncsu.edu/cleantransportation/success_stories/Charlotte_Airport_6-26-09.pdf*, July 2009.

31. Federal Aviation Administration, "Record of Decision for Proposed New Parallel Runway, Runway Extension and Associated Work at Charlotte Douglas International Airport," *http://www.faa.gov/airports/environmental/records_decision/media/rod_charlotte.pdf* April 2000.

32. Boyd, A., and Caton, J., "Securing Intermodal Connections: Meeting the Challenges of Rail-Aviation Passenger Facilities," *Facility Security: Protecting Infrastructure and Special Events*, September 2001.

7 Bibliography

1. MUMPO, "2035 Long Range Transportation Plan," http://www.mumpo.org/2035_LRTP.htm, March 2010.

2. Hauser, E., Walton, C.M., Swartz, N., "Integrated Proceedings: North Carolina Forums on Freight Mobility and Economic Prosperity," *UNC Charlotte Center for Transportation Policy Studies*, September 2005.

3. List, G., Foyle, R., Canipe, H., Cameron, J., and Stromberg, E., "Statewide Logistics Plan for North Carolina, An Investigation of the Issues with Recommendations for Action," North Carolina Office of State Budget and Management, May 2008.

4. Couture, B., Martin, R., Church, W., Brooks, B., and Seigler, E., "Legacy Park: Potential Inland Commerce Port in the Charlotte Area?," UNCC EMGT6950 Class Project, December 2010.

5. Lu, Y., Thammavongsa, J., Terry, C., and Viglione, R., "Analysis of System Components Required for the Creation of a Charlotte Inland Port," UNCC EMGT6950 Class Project, December 2010.

6. Diehl, S., Williamson, D., Harrell, M., and Withers, S., "Charlotte Port Logistics Feasibility Study," UNCC EMGT6950 Class Project, December 2010.

7. Bullington, S., Liu, E., Jones, J., Blackburn, J., and Isenhour, M., "Roadway Transportation Systems: Support for Charlotte's Inland Port Development," UNCC EMGT6950 Class Project, December 2010.

8. Williams, R., Dawson, T., Dunn, D., and Eruotor, O., "The Expansion of Charlotte Airport as a Potential Hub for Foreign Trade Activity: The Sky is the Limit," UNCC EMGT6950 Class Project, December 2010.

9. Contents from several meetings and interviews with the following people:

   - Jerry Orr – CLT
   - Jack Christine – CLT
   - Bob Morgan – Charlotte Chamber of Commerce
   - Tony Crumbley – Charlotte Chamber of Commerce
   - Al Sharp – Centralina Council of Governments
   - Bjorn Hansen – Centralina Council of Governments
   - Laura Mundell – Centralina Council of Governments
   - Maurice Ewing – Union County Partnership for Progress
   - Thad Howell – Rowan County Airport
   - Phillip Collins – City of Statesville
   - Ronnie Bryant – Charlotte Regional Partnership
   - Atwell Shull, III – City of Charlotte

- Kent Main – City of Charlotte
- Ruchi Agarwal – City of Charlotte
- Steve Patterson – City of Charlotte
- Richard Lewis – City of Concord
- Bob Cook – MUMPO
- Phil Conrad – Cabarrus-Rowan MPO
- Blair Israel – Lake Norman RPO
- Dana Stoogenke & Technical Advisory Committee – Rocky River RPO
- Barry Moose – Division 10, NCDOT
- Mike Holder – Division 12, NCDOT