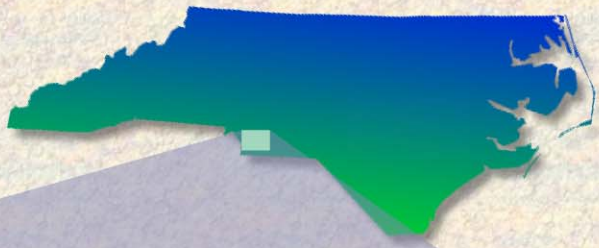
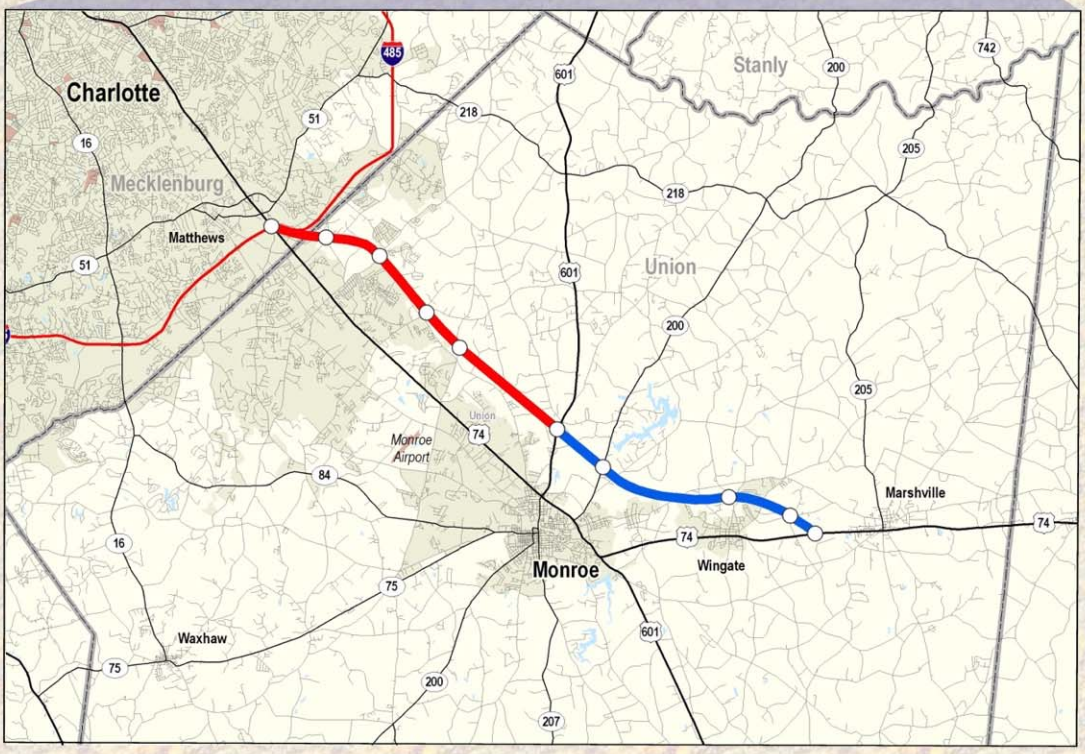
Proposed Monroe Connector Preliminary Traffic and Revenue Study

Final Report





NORTH CAROLINA
Turnpike Authority

Proposed Monroe Connector Preliminary Traffic and Revenue Study

Final Report

Prepared For

NORTH CAROLINA Turnpike Authority

Prepared By

ENGINEERS
PLANNERS
ECONOMISTS

Wilbur Smith Associates

October 11, 2006

ENGINEERS
PLANNERS
ECONOMISTS
Wilbur Smith Associates

900 Chapel St., Suite 1400
New Haven, CT 06510-2802
(203) 865-2191
(203) 624-0484 fax
www.wilbursmith.com

October 11, 2006

Mr. David Joyner
Executive Director
North Carolina Turnpike Authority
5400 Glenwood Avenue
Suite 400
Raleigh, NC 27612

Re: **Preliminary Traffic and Revenue Study – Proposed Monroe Connector**

Dear Mr. Joyner:

Wilbur Smith Associates (WSA) is most pleased to submit this report summarizing the results of our preliminary traffic and revenue study for the proposed Monroe Connector.

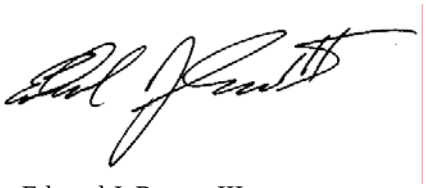
The proposed Monroe Connector would involve construction of approximately nine miles of a new toll facility that would extend the Monroe Bypass from US 74 east of Monroe to I-485. We also examined an alternative that would include the eleven-mile Monroe Bypass as a tolled facility. Under either alternative, the construction of the Monroe Connector and the Monroe Bypass would provide a significant improvement in traffic conditions for the heavily-congested US 74 through Monroe.

Please note that this study was conducted at a preliminary level of detail and is not sufficient to be used in support of actual project financing. The study was based on readily available information and the MPO's travel demand models. Its findings are subject to refinement in more detailed, comprehensive traffic and revenue studies before financing.

Our project manager, David Danforth, and other key members of the project team including Will Letchworth, Jannine Miller, Paul Marcella, and Jianhe Du gratefully acknowledge the assistance provided by NCTA staff, MUMPO, the City of Charlotte, and others contacted during the course of the study. We have appreciated this opportunity to be of service to the Authority.

Respectfully submitted,

WILBUR SMITH ASSOCIATES



Edward J. Regan, III
Senior Vice President

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CHAPTER 1
INTRODUCTION

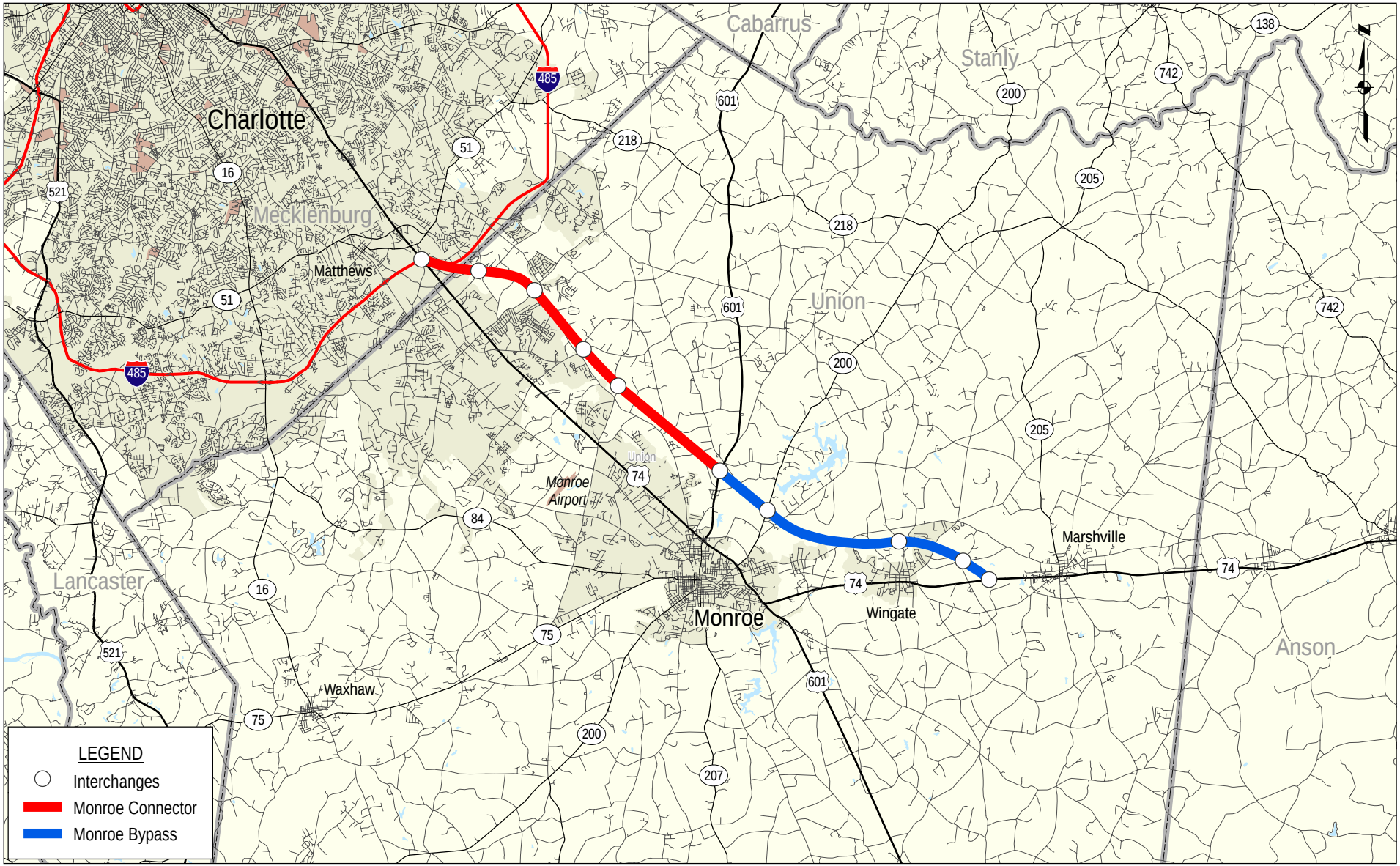
The proposed Monroe Connector in the Charlotte area is one of several candidate toll facility projects under consideration by the North Carolina Turnpike Authority (NCTA). The primary objective of this study was to determine on a preliminary basis the potential toll revenue that could be expected on the facility.

The study was conducted at a preliminary feasibility study level, commonly referred to as a "level 2" traffic and revenue analysis. This level of analysis is intended to provide preliminary estimates of traffic, revenue and toll rate sensitivity. This level of study is not intended for use in direct support of project financing. A more detailed, comprehensive traffic and revenue study would be required for that purpose.

PROJECT DESCRIPTION

Figure 1-1 depicts the project location and its relationship to the surrounding transportation system. The proposed Monroe Connector scenario, is shown in red; The proposed Monroe Bypass is shown in blue. The Monroe Bypass is assumed to be a toll-free facility in Scenario 1 and a toll facility in Scenario 2; the Monroe Connector would be a toll road in both scenarios.

The Monroe Connector would follow a generally northwest-southeast orientation, essentially paralleling US 74. US 74 is a major facility that connects southeastern North Carolina to the Charlotte metropolitan area. It provides access between the Port of Wilmington and the New Hanover and Brunswick County beaches and Charlotte and points west. With the Monroe Connector, drivers would have a high-speed, controlled access facility between Monroe and Charlotte, which would reduce congestion on the heavily-utilized US 74. This major signalized arterial route currently carries very high traffic volumes, particularly between I-485 and Monroe.



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PROJECT LOCATION MAP

FIGURE 1-1

Congestion levels are increasing during peak periods. The proposed Monroe Connector would provide significant time savings for travelers moving between I-485 south of Charlotte and Monroe or points south and east. US 74 would be the primary competing route to the Monroe Connector. Another competing route includes Secrest Shortcut Road, a minor arterial facility near the proposed Monroe Connector. Old Monroe Road, which runs from Monroe to downtown Charlotte is another competing facility, though to a lesser degree than US 74 and Secrest Shortcut Road.

The interrelationships of the various roadways depicted in Figure 1-1 are analyzed in this report in order to present sufficient information for decision makers regarding the toll revenue potential of these facilities. These roadways were analyzed in two scenarios:

- **Scenario 1 Configuration** – The proposed Monroe Connector is assumed to open to traffic as a toll facility beginning in 2014. The Monroe Bypass as a toll-free facility would be open in 2012.

- **Scenario 2 Configuration** – Both the proposed Monroe Connector and the Monroe Bypass would be constructed as a toll facility. The Bypass would open in 2012, and the Connector would open in 2014.

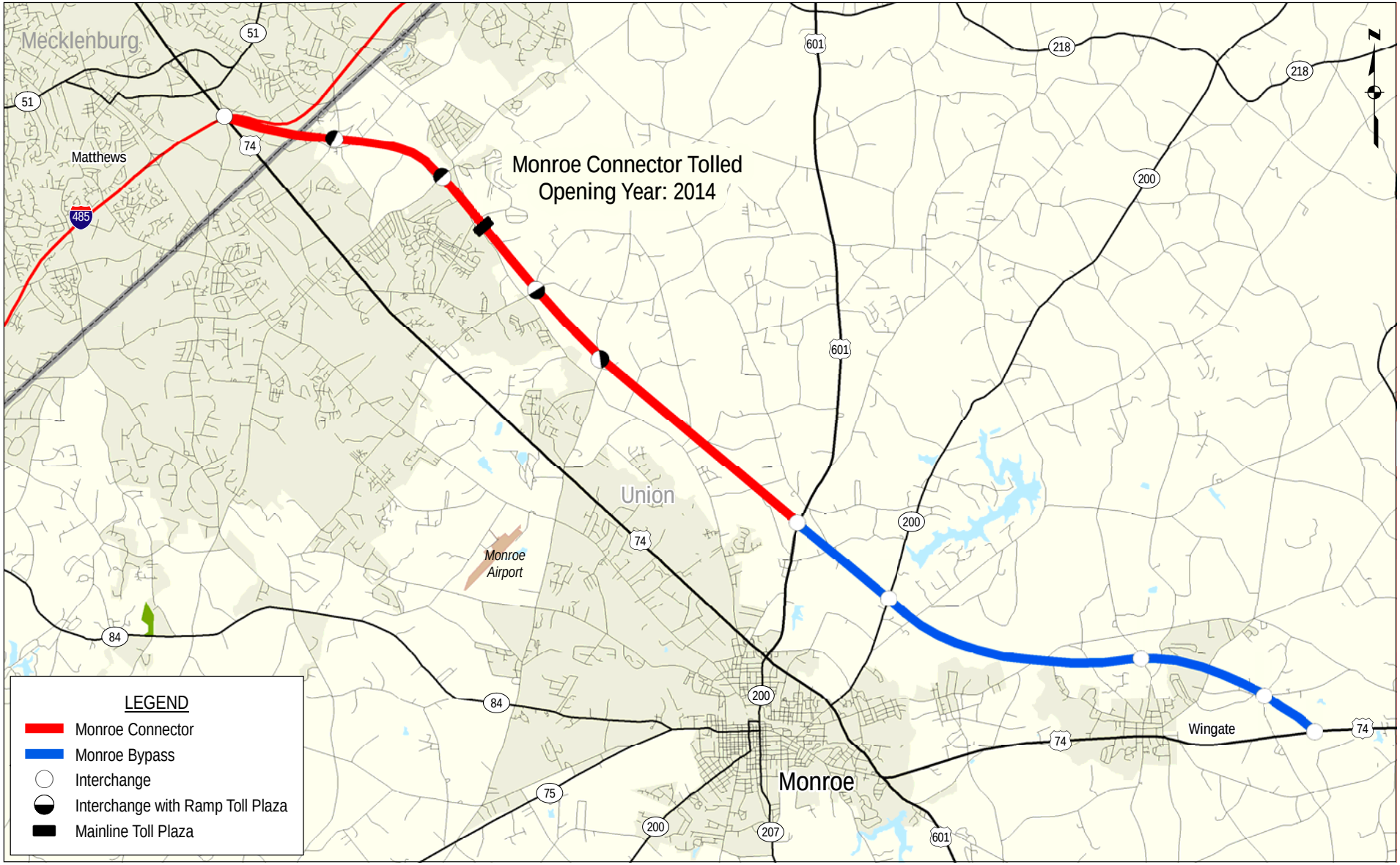
SCENARIO 1 CONFIGURATION

The proposed Monroe Connector, as shown in red in Figure 1-2, would extend for approximately 10.9 miles from the interchange of US 74/I-485 near Matthews, at the northern end of the project to US 601 at the southern end.

Scenario 1 would have five interchanges, including an interchange where existing US 74 currently interchanges with I-485, the Charlotte Outer Loop. Figure 1-2 also shows the conceptual location of the mainline toll plaza, just north of Unionville Indian Trail Road. Toll plazas would also be constructed on certain interchange ramps, to ensure no toll-free travel for users of the facility. Under this tolling concept, however, motorists using any portion of the nearly nine mile Monroe Connector would pass through one, and only one, toll plaza. The Monroe Bypass, depicted in blue, which extends for approximately 8.8 miles, would operate as a freeway.

SCENARIO 2 CONFIGURATION

Figure 1-3, a configuration in which the Monroe Bypass would be a toll facility also. The Monroe Bypass would continue southeastward from the



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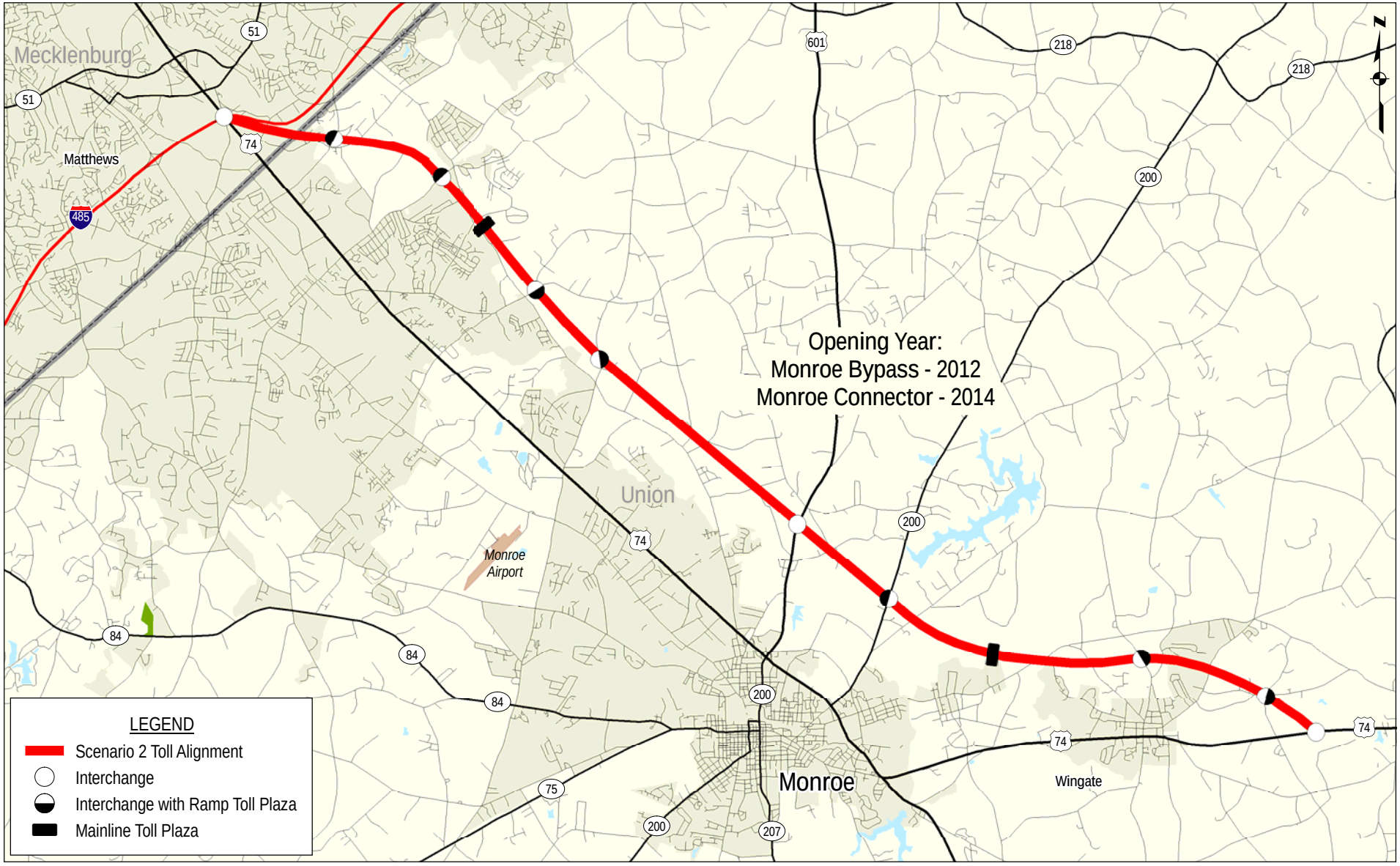
SCENARIO 1 TOLL SYSTEM CONFIGURATION

FIGURE 1-2



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SCENARIO 2 TOLL SYSTEM CONFIGURATION

FIGURE 1-3

Monroe Connector for 8.8 miles to a terminus at US 74 east of Wingate, North Carolina. The Bypass would open in 2012, and the Connector would open in 2014.

With both the Monroe Bypass and Monroe Connector operating as toll facilities, travelers using the entire facility would pass through two mainline toll plazas. Ramp toll facilities would be constructed on the ramps as indicated on Figure 1-3.

SCOPE OF WORK

As a part of this study, inventories of the corridor operating conditions were conducted including traffic counts and speed-delay studies on competing, complementary, and feeder routes within and outside of the traffic impact area. Information on the planned transportation improvement program was reviewed to determine its prospective impact on traffic and revenue potential on the proposed Monroe Connector.

Previous reports and study materials related to the proposed Monroe Bypass and the Monroe Connector were also reviewed. This information included previous traffic analysis and transportation modeling analysis prepared by the Mecklenburg-Union Metropolitan Planning Organization (MUMPO).

Supplemental traffic counts were conducted in the project corridor. This information facilitated both the calibration of the travel demand model used in the analysis and provided a "base case" count condition for use in the traffic impact analysis as described below. The proposed improvements to other roadways in the vicinity of the Monroe Connector were taken into consideration also.

TRAFFIC MODEL REFINEMENT

As part of this study, Wilbur Smith Associates (WSA) obtained the most recent version of the Metroline Regional Travel Demand Model (MRTDM). This traffic model covers all of Mecklenburg, Union, Gaston, and Cabarrus Counties as well as adjacent portions of Stanly County.

Data obtained for the MRTDM included highway networks and trip tables at 2000, 2006, 2015, 2020, and 2030 levels as well as socioeconomic forecasts for each year by traffic analysis zone. The base year model was calibrated in the immediate project area to achieve the best traffic volume assignments compared to observed traffic counts and observed speeds from speed-delay studies. The model network was updated to reflect all

committed highway improvements as well as the proposed Monroe Connector being constructed.

A toll collection concept was developed in consultation with NCTA and HNTB, and the facility was coded into the network as a toll road. Some centroid connectors were relocated to better capture the flow of traffic.

The project was coded in such a way that the project could be evaluated as separate configurations depicting the scenarios described earlier – the first configuration included the tolling of the Monroe Connector only; the second configuration included both the Monroe Connector and the Monroe Bypass as tolled facilities.

Information was also obtained regarding regional and corridor income characteristics to aid in the development of estimated values of time for potential users of the candidate toll facility. This is a critical model parameter used for assessing motorists' willingness to pay tolls and for estimating motorists' sensitivity to toll rates. Vehicle operating cost parameters were also established specific to the study corridor.

Corridor Growth Analysis

Economic growth is particularly important for a start-up toll facility such as the proposed Monroe Connector. The scenario configurations under study would provide significantly improved access to a rapidly developing area within the southeastern Charlotte region, which, as described further in Chapter 3, is projected to have notable increases in both population and employment over the next 25 years. As such, analysis and validation of the projected economic activity is particularly important**.**

The socioeconomic forecast incorporated in the MRTDM by the MPO was used in the analysis. Since this was a preliminary traffic and revenue study, an independent economic analysis was not conducted; however, an independent economic review would typically be necessary to support project financing.

Traffic and Revenue Analysis

The refined models were used to run a series of traffic assignments, both with and without the proposed Monroe Connector assumed to be cosntructed. In each case, traffic assignments were run at a.m. peak, p.m. peak and off-peak conditions. A review was made of the reasonableness of the travel demand estimates, particularly under a toll condition, using various evaluation techniques such as select link, corridor share, and capture rate.

Toll sensitivity curves were developed at 2014 levels to determine optimum toll levels. These optimum rates were then used to conduct traffic assignments for other years.

Based on the results of the traffic modeling analysis, annual estimates of traffic and revenue on the proposed Monroe Connector were developed for the base case condition from opening year 2014 through 2050.

Finally, to enable the formulation of annual traffic and revenue forecasts, revenue estimates in the early years of the projection period were adjusted to reflect "ramp-up," a pattern of gradual build-up in demand for new toll facilities. This reflects the fact that full demand along a facility is not typically realized on opening day but gradually phases in over a period of two to four years.

REPORT STRUCTURE

The remainder of this report consists of three chapters.

- Chapter 2 presents the traffic conditions in the corridor and surrounding area.
- Chapter 3 describes the socioeconomic characteristics of the corridor.
- Chapter 4 describes the development of the traffic forecast model, assumed roadway improvements, toll scenarios, toll sensitivity, traffic and revenue forecasts, and the net toll operating revenue analysis.

CHAPTER 2

EXISTING TRAFFIC CONDITIONS

To provide a strong basis for initiating the preliminary traffic and revenue analysis, an inventory of existing corridor characteristics and traffic levels was developed. Major competing and complementary routes to the proposed Connector were identified. Speed and delay characteristics were measured to determine existing typical operating conditions, which is important in terms of network calibration and estimating motorists' willingness to pay tolls.

Available traffic counts were obtained from a number of sources. These were supplemented by new counts, at key locations.

The traffic count profile was used in calibrating the regional travel demand model to accurately reflect existing conditions. This calibration was intended to reflect existing traffic volumes and to the extent possible, observed operating speeds on existing roadways.

This chapter describes the collection of data used to characterize the operational performance of the existing competing facilities in the Monroe Connector study area. This approach was necessary because the Monroe Connector is a future facility, and the only available data to calibrate the travel demand models are existing facilities which will compete with the proposed Connector.

EXISTING HIGHWAY SYSTEM

The proposed Monroe Connector would primarily facilitate traffic movement in an east-west direction between I-485 and Monroe. It passes through or near major employment centers in Monroe and Charlotte, which is the dominant location for employment in the area.

The Monroe Connector would provide a new limited access facility in an area currently served by the following major facilities:

- US 74 extends east-west along the northeastern side of Monroe, connecting Monroe and points east with I-485 and Charlotte. US 74 is a four-lane median divided roadway with signalized and unsignalized intersections throughout its length. The speed limits along US 74 vary between 35 and 55 mph, but typically operates at lower average speeds due to high traffic volumes and over 20 signalized intersections between I-485 and US 601.

- Old Charlotte Highway provides east to west travel south of US 74 extending into the Town of Monroe. It has numerous signalized intersections and is an undivided two-lane roadway with 35 and 45 mph speed limits.

- Secrest Short Cut Road provides east to west travel north of US 74 until intersecting with US 74 near Monroe. It is primarily a two-lane roadway with 35 and 45 mph speed limits.

- Weddington Road runs east to west extending out from the Town of Monroe. It is a two-lane roadway with 25, 35, and 45 mph speed limits.

- NC 200 / NC 601 (Morgan Mill Road) runs north and south, south of I-85. NC 200 varies from two to four lanes with 35, 45, and 55 mph speed limits.

- Waxhaw Indian Trail Road runs north to south, parallel to I-485 and intersects with US 74. Waxhaw Indian Trail is a two-lane roadway with 55 mph speed limits.

- Unionville Indian Trail Road runs parallel to I-485 and Waxhaw Indian Trail Road in a north to south fashion with a intersection at US 74. Unionville Indian Trail Road is a two-lane roadway with a 55 mph speed limit.

- North Rocky River Road is primarily a north to south route with an intersection at US 74 and is a two lane undivided roadway. The speed limit on North Rocky River Road is 45 mph.

TRAFFIC LEVELS

Existing traffic data from the NCDOT database and supplemental data from various reports were reviewed to aid in the traffic model calibration process. This information was supplemented by new traffic counts at key locations within the proposed Monroe Connector study area.

AVERAGE DAILY TRAFFIC

Figure 2-1 provides a summary of daily counts within the study area. All volumes are shown in thousands of vehicles. The dominant road within the study area is US 74 with volumes shown from 54,000 vehicles per day (vpd) east of I-485 to 22,000 vpd east of Wingate.

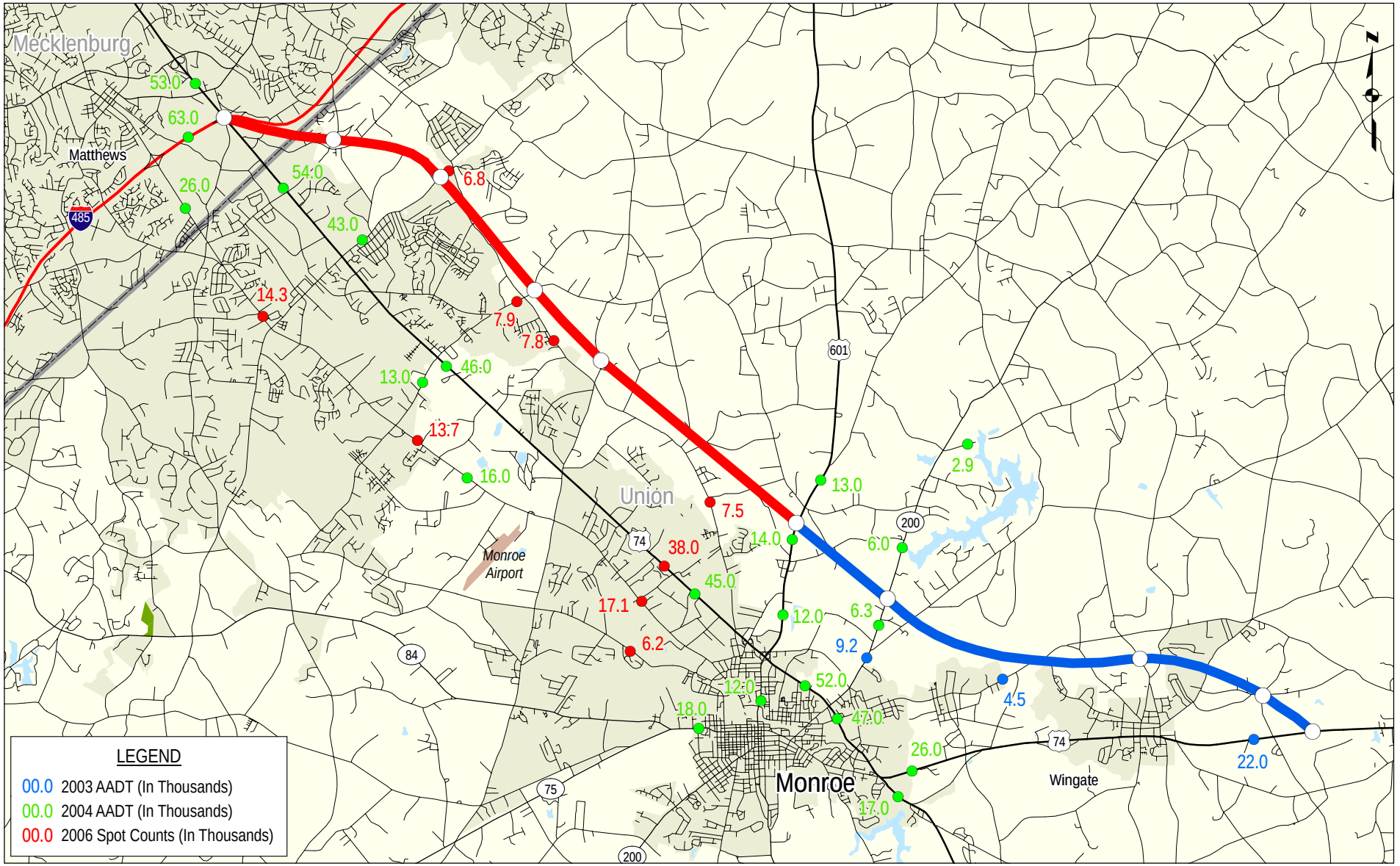
Volumes along US 74 are consistently in the range of 40,000 to 55,000 vpd between Charlotte and Monroe. The proposed Monroe Connector would generally serve traffic currently using this route. This shift is indicative of relatively strong levels of demand, and the fact that the Connector would provide significant reductions in travel time versus the heavily signalized arterial US 74.

Since the Connector would provide a direct connection to I-485, motorists traveling between the Charlotte Outer Loop and Monroe, or points east on US 74, could avoid considerable congestion and delay. However, as discussed later in this report, the imposition of tolls on the Connector would significantly reduce the amount of traffic shifting from US 74 to the Connector.

East of Monroe, volumes on US 74 dropped considerably, generally to about 22,000 vpd east of Wingate. Through trips, bypassing Monroe, would gain the most benefit from using the Connector, although motorists traveling to and from Monroe could find the Connector attractive also.

Other heavily utilized routes include Old Charlotte Highway which carries between 14,000 and 26,000 vpd. NC 84/75, also referred to as Weddington Road carried about 18,000 vpd in 2004. US 601 generally carries 12,000 to 14,000 vpd in the vicinity of the proposed Monroe Bypass, while NC 200 carried about 6,000 vpd in 2004.

Traffic counts were obtained specifically for this study at the locations shown in red in Figure 2-1. The major purpose of this supplemental work was to obtain current traffic volumes at key locations as an aid in calibrating the Metrolina Regional Travel Demand Model provided by the MPO.



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ANNUAL AVERAGE DAILY TRAFFIC COUNTS AT SELECTED STUDY AREA LOCATIONS

FIGURE 2-1

The information obtained included 48-hour traffic counts by day, hour, and vehicle class.

HOURLY TRAFFIC VARIATIONS

Table 2-1 summarizes hourly traffic levels at ten selected locations. The peak period share of the daily traffic is shown below:

- Morning Peak, 3 hours (7:00 to 10:00 a.m.) 18 percent
- Midday Peak, 2 hours (Noon to 2:00 p.m.) 12 percent
- Afternoon Peak, 4 hours (4:00 to 8:00 p.m.) 28 percent
- Total Peak Period Traffic 58 percent

VEHICLE CLASSIFICATIONS

As might be expected, passenger vehicles predominate in this heavy commuter corridor. Table 2-2 shows that 95.2 percent of the vehicles counted over a 7-day period were passenger vehicles and light trucks such as pickups.

While trucks constituted an overall average of 4.8 percent of the total vehicles counted at the eight locations shown in Table 2-2, on US 74 trucks amounted to 15 percent of the total traffic. About 9.4 percent of total counted vehicles were heavy trucks. US 74 currently carries most of the traffic which could be expected to divert to the proposed Connector. However, it should be noted that percent of trucks on urban toll facilities tends to be lower than that on adjacent free roads.

The heavy truck volumes along US 74 are, in part, indicative of its role in providing a major through-traffic corridor between the Metrolina area and the Port of Wilmington.

SPEED AND DELAY ANALYSIS

Speed and delay characteristics were measured on nine selected roads in the study area using handheld global positioning system units:

- US 74 from I-485 to NC 205 (N. Elm Street);
- Old Charlotte Highway at I-485 and E. Johns Street to NC 75/84;
- Secrest Shortcut Road at I-485 and Idlewild Road to Concord Avenue;
- NC 84 (Weddington Road) from Rocky River Road to North Charlotte Avenue;
- NC 75 from Morgan Mill Road to Old Williams Road in Wingate;
- US 601 from South Hayne Street and Church Street to Unionville Indian Trail Road;

Table 2-1
Hourly Traffic Variations at Selected Locations

Percent of Total Day (7-day Counts)

Beginning Hour	Goldmine Road between River Chase Drive and River Chase Drive	Old Charlotte Highway between Roland Drive and Hargette Road	Secrest Short Cut Road between Fowler Road and Cobblestone Parkway	US 74 (EB) between Rolling Hills Drive and Round Table Road	US 74 (WB) between Rolling Hills Drive and Round Table Road	Old Monroe Road between Chestnut Lane and Woodland Road	Old Charlotte Highway between Hayes Road and Wesley Chapel Stouts Road	Secrest Short Cut Road between Haywood Road and Suburban Lane	Unionville Indian Trail Road between Scott Long Road and Secrest Short Cut Road	Indian Trail-Fairview Road between Stinson-Harris Road and Idlewild Road/ Secrest Short Cut Road
0:00	0.5%	0.3%	0.5%	1.0%	0.9%	0.6%	0.8%	0.7%	0.5%	0.4%
1:00	0.2%	0.3%	0.2%	0.8%	0.5%	0.3%	0.2%	0.3%	0.2%	0.3%
2:00	0.2%	0.3%	0.1%	0.7%	0.5%	0.3%	0.3%	0.2%	0.3%	0.2%
3:00	0.3%	0.3%	0.1%	0.6%	0.7%	0.3%	0.2%	0.2%	0.2%	0.3%
4:00	0.3%	1.3%	0.2%	0.9%	1.2%	0.6%	0.4%	0.2%	0.3%	0.3%
5:00	2.2%	3.0%	1.5%	1.4%	2.6%	1.8%	1.2%	1.0%	1.4%	0.9%
6:00	5.3%	6.1%	4.4%	2.5%	5.5%	6.0%	4.5%	4.8%	5.8%	3.1%
7:00	7.8%	6.4%	8.1%	4.4%	5.5%	6.4%	6.7%	8.8%	9.4%	7.2%
8:00	3.9%	5.1%	7.2%	4.9%	5.0%	6.7%	6.8%	7.0%	6.8%	7.1%
9:00	2.6%	4.8%	4.5%	4.9%	5.3%	5.6%	5.3%	4.2%	4.9%	5.1%
10:00	3.0%	5.7%	3.8%	5.3%	5.6%	5.4%	5.1%	3.7%	3.9%	4.7%
11:00	4.6%	6.0%	4.2%	5.8%	5.9%	6.8%	5.8%	4.0%	4.9%	5.5%
12:00	6.5%	6.2%	3.9%	6.3%	6.8%	7.7%	6.5%	4.4%	4.7%	5.5%
13:00	5.2%	6.5%	3.9%	5.4%	6.4%	6.8%	6.2%	4.4%	5.7%	6.7%
14:00	5.4%	8.4%	5.1%	6.5%	6.2%	4.7%	6.4%	5.2%	6.4%	7.0%
15:00	7.4%	8.9%	7.4%	6.7%	6.9%	4.9%	7.2%	6.6%	8.8%	7.0%
16:00	8.6%	8.4%	10.1%	7.2%	6.3%	4.3%	7.1%	8.0%	7.7%	7.7%
17:00	9.5%	6.4%	10.3%	7.5%	6.8%	4.6%	7.4%	9.0%	7.8%	7.8%
18:00	7.1%	6.0%	9.0%	7.0%	5.5%	4.7%	6.4%	8.1%	6.6%	6.5%
19:00	5.8%	3.8%	7.0%	6.5%	5.0%	6.5%	5.6%	6.2%	4.5%	5.8%
20:00	5.7%	2.4%	3.8%	5.2%	4.0%	5.4%	3.7%	4.3%	2.9%	4.0%
21:00	4.3%	1.8%	2.3%	4.1%	3.2%	4.4%	2.6%	3.5%	2.4%	3.0%
22:00	2.6%	0.8%	1.5%	2.6%	2.2%	3.1%	2.0%	2.9%	2.2%	2.3%
23:00	1.0%	0.8%	0.9%	1.8%	1.5%	2.1%	1.6%	2.3%	1.7%	1.6%
Total Day	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%

Source: Counts in March and April 2006.

Table 2-2
Vehicle Classifications at Selected Locations

Location	Between	Passenger Vehicles	Light and Heavy Trucks	Heavy Trucks	Total Vehicles
US 74	Between Rolling Hills Drive and Round Table Road	85.1%	5.6%	9.4%	100.0%
Old Charlotte Highway	Between Roland Drive and Hargette Road	92.8%	5.1%	2.0%	100.0%
Old Charlotte Highway	Between Wesley Chapel Stouts Road and Hayes Road	97.1%	2.5%	0.4%	100.0%
Goldmine Road	Between River Chase Drive and River Chase Drive	95.5%	3.8%	0.8%	100.0%
Secrest Short Cut Road	Between Fowler Road and Cobblestone Parkway	94.5%	4.1%	1.4%	100.0%
Indian Trail-Fairview Road	Between Mill Grove Road and Beverly Drive	98.5%	1.1%	0.4%	100.0%
Old Monroe Road	Between Williams Rescue Road and Woodland Road	98.5%	1.2%	0.3%	100.0%
Unionville Indian Trail Road	Between Scott Long Road and Secrest Short Cut Road	99.6%	0.4%	0.0%	100.0%
	Average:	*95.2%*	*3.0%*	*1.8%*	

Source: Counts in March and April 2006

- Indian Trail-Fairview Road from Waxbaw Indian Trail Road and Old Monroe Road to Lawyers Road;
- Unionville Indian Trail Road at Wesley Chapel Stouts Road and Old Monroe Road to Rocky River Road; and
- North Rocky River Road from Old Charlotte Highway to Unionville Indian Trail Road.

Average speeds were calculated for the peak and off-peak periods for use in the traffic model. Speeds during off-peak periods were generally found to be near the posted speed limits for the various roadways.

Table 2-3 provides a summary of average observed speeds during peak periods on four competing roads near the proposed Monroe Connector. US 74 and Secrest Shortcut Road would be the primary competing routes for the Monroe Connector. Travel speeds along US 74 between I-485 and US 601, a distance of around 10 miles, were recorded. The average peak operating speed was around 38 mph in the eastbound direction but much slower westbound, averaging speeds in the mid-20 mph range. Observations indicate the primary contributors to these low travel speeds are likely capacity constraints and the multitude of traffic signals. The other major competitor, Secrest Shortcut Road, also averaged speeds in the mid-20 mph range, likely due to capacity constraints and road design.

It is important to recognize that US 74 between I-485 and Monroe is most critical in terms of time savings for the Monroe Connector. The Connector would generally accommodate trips between I-485 and US 601. Westbound speeds on existing US 74 generally average about 25 mph, a condition which is likely to worsen in the future with additional traffic growth. This would suggest a time savings of 10 to 15 minutes, depending on time of day, for motorists choosing to use the Connector between I-485 and US 601.

Operating speeds on US 74 east of Monroe tend to be much higher than those between Monroe and Charlotte. This would be a factor, to some extent, in motorists' willingness to pay tolls for the Monroe Bypass portion of the project, under the Scenario 2 configuration.

Table 2-3
Average Speeds on Selected Routes During Peak Periods

Fecility	Start Point	End Point	Direction	Distance	Average Observed Speed	
					AM Peak	PM Peak
US 74	I-485	US 601	Eastbound	10.5	38.4	-
US 74	US 601	I-485	Westbound	10.6	21.8	28.1
US 74	US 601	NC 205 (N. Elm Street)	Eastbound	11.1	48.6	-
US 74	NC 205 (N. Elm Street)	US 601	Westbound	11.2	46.0	41.3
Secrest Shortcut Road	Concord Avenue	Hook Road	Northbound	11.5	26.9	-
Secrest Shortcut Road	Hook Road	Concord Avenue	Southbound	10.9	28.3	-
Old Monroe Road	NC 75	I-485	Northbound	12.4	34.8	-

Source: Speed-delay runs in April 2006.

CHAPTER 3

CORRIDOR GROWTH REVIEW

Future economic growth potential is particularly important for the study of any new start-up toll facility such as the proposed Monroe Connector. The corridor's proximity to Charlotte in the growing Metrolina Region highlights the particular significance of an analysis of anticipated economic activity.

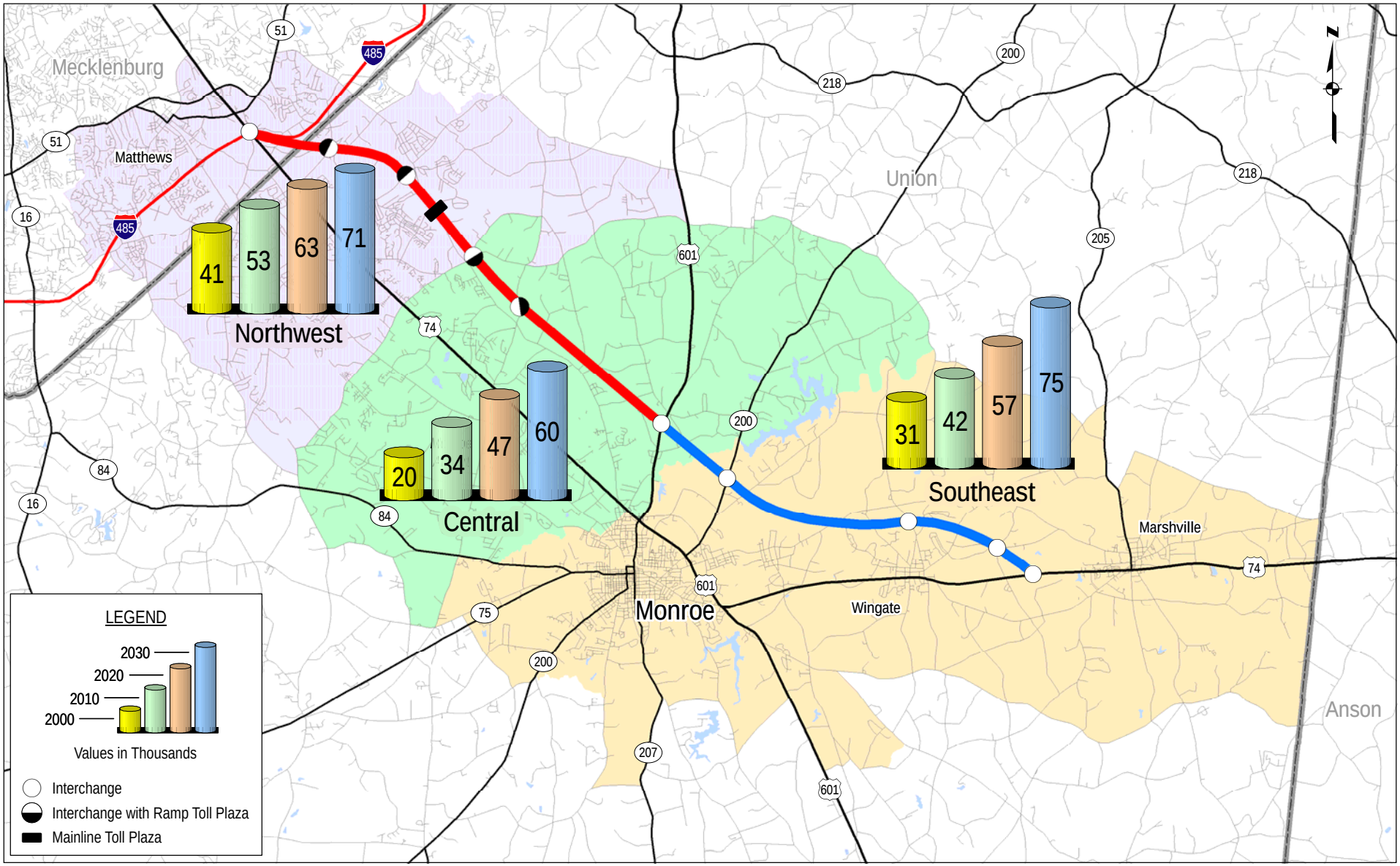
The latest socioeconomic forecast developed by the MUMPO found in the MRTDM was used in the analysis. Since this was a preliminary traffic and revenue study, an independent economic analysis was not conducted; however, an independent economic analysis would be necessary for any later study that would be used in support of project financing.

GROWTH TREND PROJECTIONS

The population and employment forecasts contained in the MRTDM are directly related to the growth rates of traffic predicated by the model. Of particular importance is that the proposed Monroe Connector is included in the model and influences the growth forecasts therein.

According to forecasts contained in the MRTDM, employment in the study area is expected to grow from about 48,000 in 2000 to nearly 115,000 by 2030. Population over the same period is expected to grow from around 92,000 to nearly 205,000.

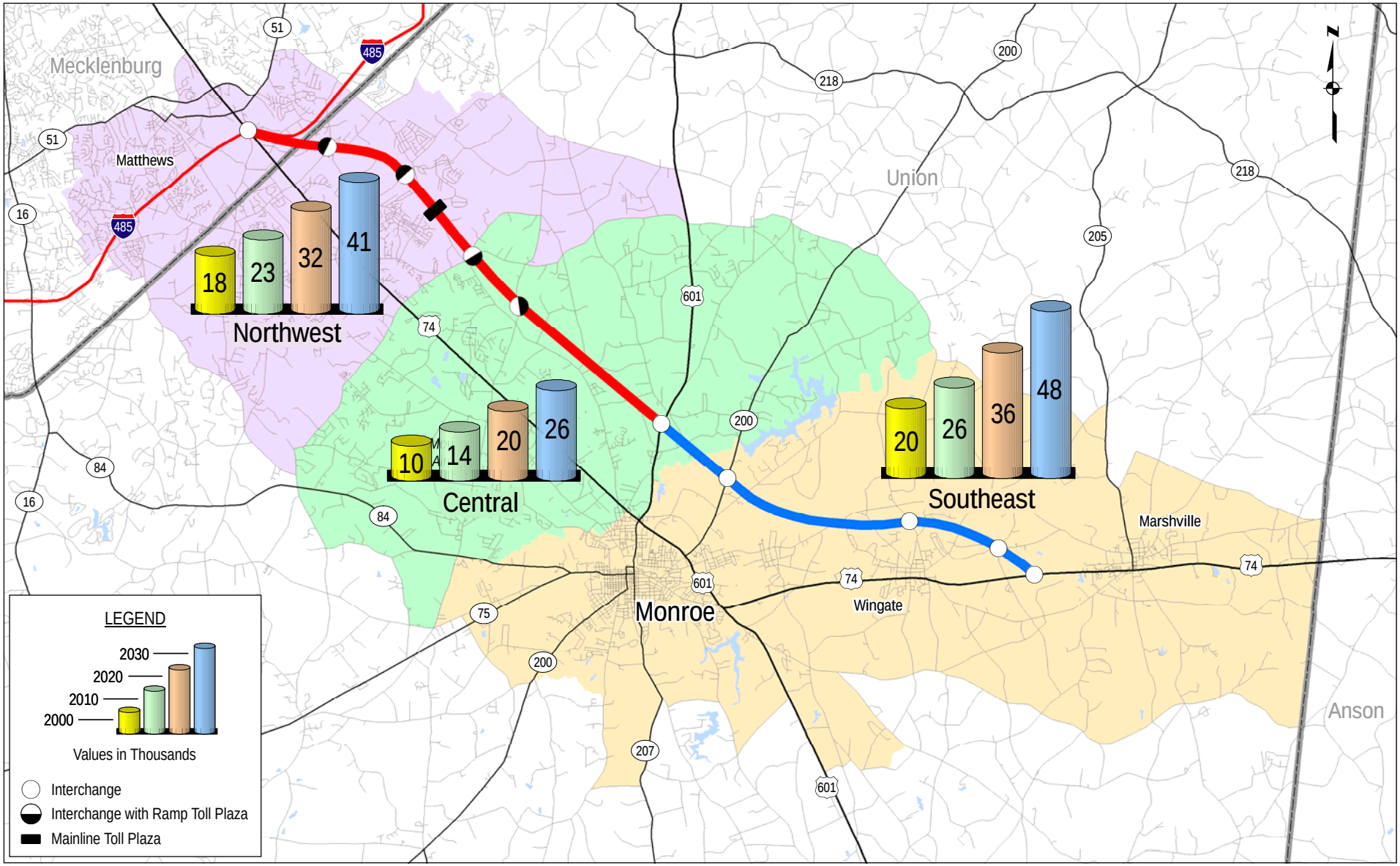
Population growth is expected to be spread relatively evenly, by decade, between 2000 and 2030. Much of the growth is expected to occur in the central and southeastern portions of the study area as discussed in more detail below. The increase of 113,000 residents in the next 30 years is equivalent to an average annual growth of about 2.7 percent. Figures 3-1 and 3-2 illustrate the population and employment growth rates by location within the study area.



NORTH CAROLINA Turnpike Authority

POPULATION GROWTH BY LOCATION

FIGURE 3-1



NORTH CAROLINA Turnpike Authority

EMPLOYMENT GROWTH BY LOCATION

FIGURE 3-2

The more significant levels of employment growth are expected late in the forecast period, after 2020. Much of this employment growth is expected to occur in the southeastern portion of the study area. The projected 67,000 new jobs represent a growth of almost 3 percent per year.

Economic Influence of Charlotte and Mecklenburg County

The proposed Monroe Connector would be located in the U.S. Census Bureau defined Metropolitan Statistical Area (MSA) of Charlotte-Gastonia-Salisbury, which is estimated to have a population of just over 2 million people. The eastern terminus of the proposed Monroe Connector is 6.5 miles from Charlotte's central business district.

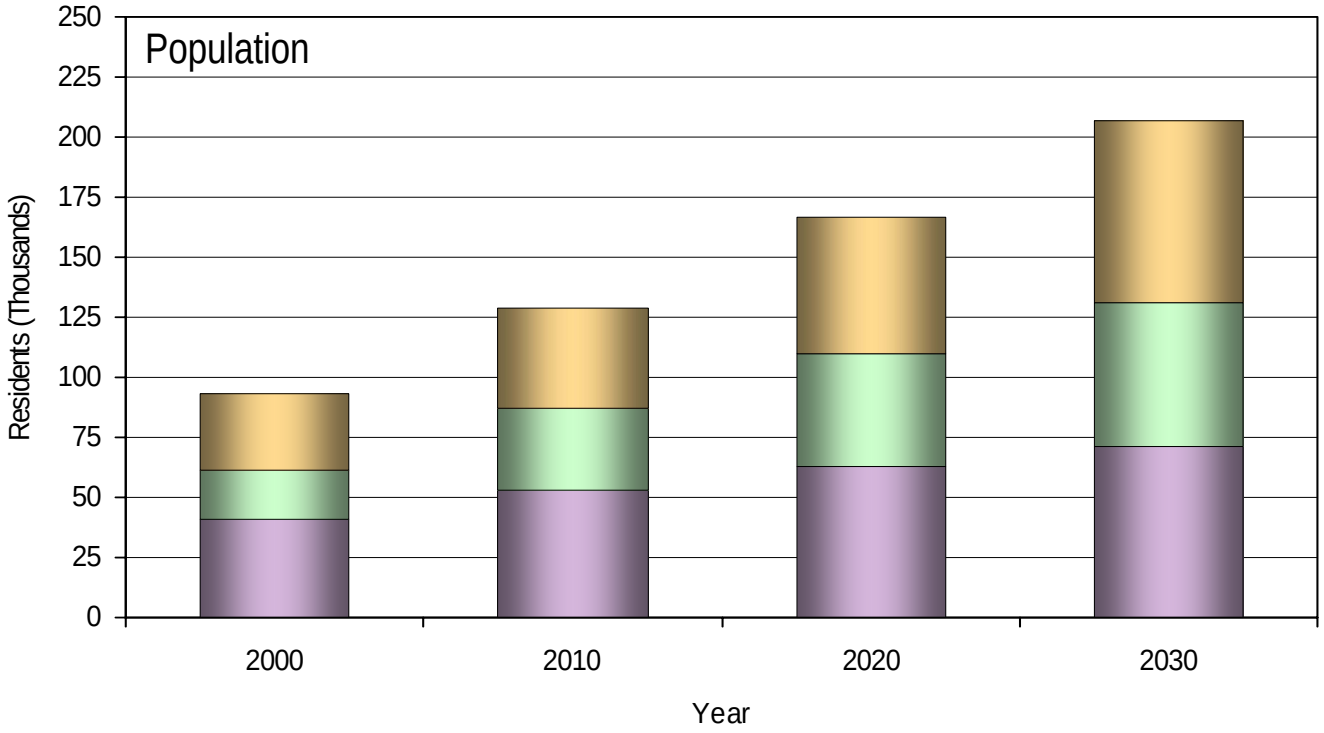
As major employment centers, the City of Charlotte and Mecklenburg County are the economic drivers in the region. The Economic Development Department of the combined city/county government reports that employment in Mecklenburg County reached more than 412,000 jobs in 2005. Employment in Mecklenburg County is anticipated to grow at an annual rate of 2.7 percent through 2030.

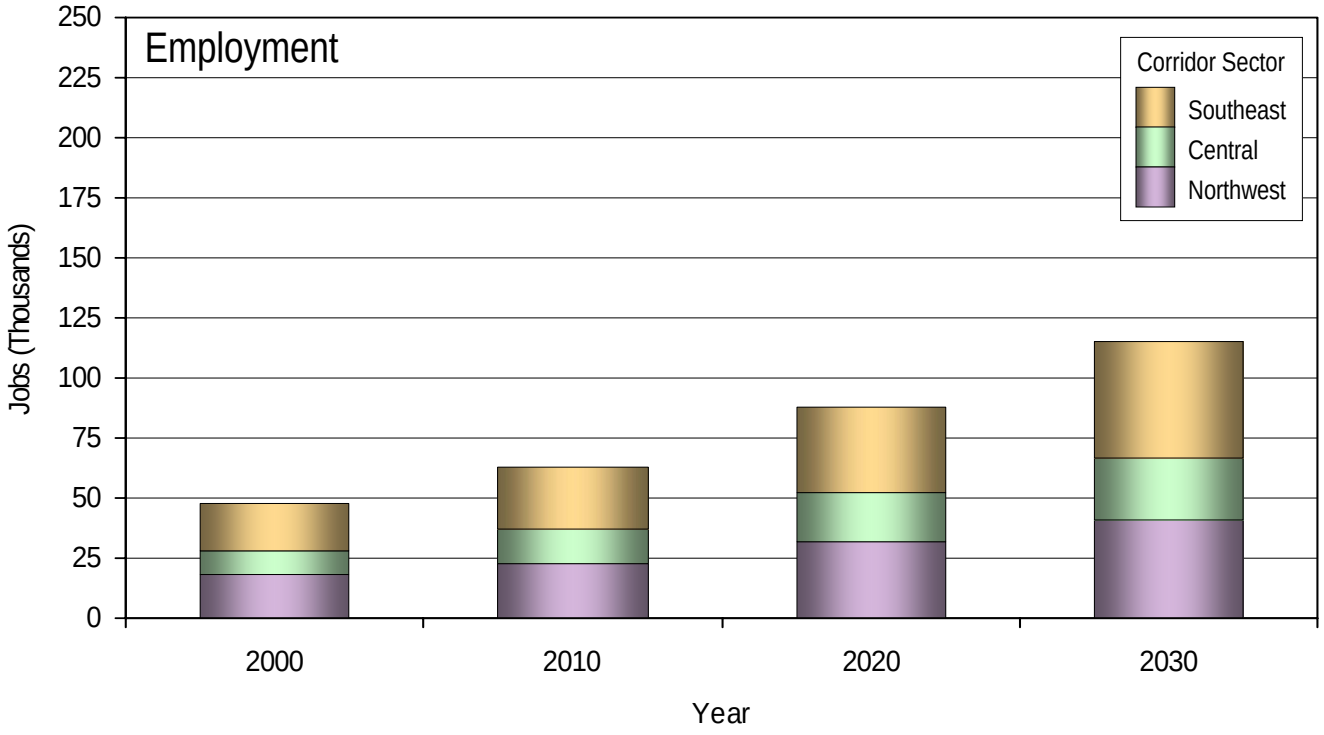
The City of Charlotte is the second largest banking center in the United States where, according to the Charlotte-Mecklenburg consolidated government, more than $1 trillion of assets is controlled. Charlotte is ranked sixth in the nation for number of headquarters of Fortune 500 companies. These companies generate a combined total of $157 billion of revenue annually and include the Bank of America, Lowe's, Wachovia Corporation, Duke Energy, and Goodrich Corporation.

The Charlotte-influenced growth in the Metrolina Region has been remarkable over the past several years. According to the U.S. Census Bureau population estimates, the Charlotte MSA has grown by a total of 10 percent between 2000 and 2004. As is exhibited in population forecasts for the Metrolina Region, this growth is expected to sustain at about 2 percent per year. This population growth is most likely the result of the high quality of life and economic opportunity in the region.

GEOGRAPHICAL SECTORS OF THE STUDY AREA

For purposes of presentation of economic forecasts, the study area was divided into three sectors based on the traffic analysis zones contained within the MRTDM. The boundary of the study area was drawn to incorporate potential users of the toll facility from Monroe and northern Union County. Figures 3-1 and 3-2 and 3-3 depict population and employment growth predicted for the three sectors of the study area.





NORTH CAROLINA Turnpike Authority

STUDY AREA POPULATION AND EMPLOYMENT PROJECTIONS

FIGURE 3-3

The northwest sector of the study area includes parts of Indian Trail, Stallings, and Lake Park as well as unincorporated portions of northern Union County. This sector also reaches into parts of southeastern Mecklenburg County and includes part of the Town of Matthews. This study sector includes the northern terminus of the proposed Monroe Connector, the Interchange of US 74 (Independence Boulevard) and I-485 (Charlotte Outer Loop), and Exits 49 through 52 of the Outer Loop. New retail development is occurring near these interchanges.

Situated in the central study sector is approximately 6.6 miles of US 74 and portions of roads such as NC 601 and Secrest Shortcut Road. Unionville and Monroe Airports are located in this sector.

The southeast sector of the corridor incorporates eastern portions of the cities of Monroe and Wingate. The eastern terminus of the Monroe Connector is in this study sector also as well as major thoroughfares such as a 15.3 mile stretch of US 74 and portions of NC 49, 160, 273, and 274 and SC 55 and 177.

POPULATION FORECASTS

Table 3-1 summarizes population growth within the Monroe Connector study area and compares the study area to the rest of the Metrolina Region. In 2000, the Metrolina Region had approximately 1.7 million residents with nearly 92,000 people (5.5 percent) residing within the Monroe Connector study area. By 2030, the regional population is forecast to grow to about 3.1 million people, and the Monroe Connector study area population will grow to nearly 206,000, increasing the study area share to 6.6 percent. The study area is expected to grow at an average rate of 2.7 percent per year, which is slightly higher than the rate of growth expected for the Metrolina Region (2.1 percent).

Figure 3-3 also provides a pictorial representation of the projected population growth by study sector. The northwest sector of the Monroe Connector is expected to have the lowest population expansion with a growth rate of 1.9 percent annually between 2000 and 2030. At an annual projected growth of 2.9 percent, the southeast sector is expected to exhibit growth rates just slightly higher than the area's average rate of 2.7 percent.

Table 3-1
Study Area Population Projections

Study Area Sector	2000	Average Annual Growth	2010	Average Annual Growth	2020	Average Annual Growth	2030	Average Annual Growth 2000-2030	Total Growth 2000-2030
Northwest	40,522	2.7%	52,701	1.8%	63,065	1.2%	70,966	1.9%	75.1%
Central	19,939	5.4%	33,829	3.3%	46,708	2.5%	59,589	3.7%	198.9%
Southeast	31,441	2.9%	41,777	3.1%	56,842	2.8%	74,816	2.9%	138.0%
Total Study Area Population	91,902	3.4%	128,307	2.6%	166,615	2.1%	205,371	2.7%	123.5%
Percent of Metrolina Region	5.5%		6.1%		6.4%		6.6%		
Union County	123,677	3.6%	176,684	3.1%	240,370	3.1%	327,377	3.3%	164.7%
Total Metrolina Region Population	1,683,668	2.3%	2,106,216	2.1%	2,603,825	1.8%	3,117,160	2.1%	85.1%

Study Area Sector	2000-2010	2010-2020	2020-2030	2000-2030
Northwest	12,179	10,364	7,901	30,444
Central	13,890	12,879	12,881	39,650
Southeast	10,336	15,065	17,974	43,375
Total Study Area Population Change	36,405	38,308	38,756	113,469
Union County Change	53,007	63,686	87,007	203,700
Metrolina Region Populaton Change	422,548	497,609	513,335	1,433,492

Source: Metrolina Regional Transportation Demand Model

The central sector, currently the least populous of the three, is anticipated to grow at the fastest rate with a projected 5.4 percent average annual increase during the initial period through 2010. This growth is expected to sustain with a 3.7 average annual growth rate throughout the study period. By 2030, the central sector's population is expected to triple from its 2000 level.

EMPLOYMENT FORECASTS

MUMPO is anticipating considerable employment growth in Union County through their plan horizon of 2030. As shown in Table 3-2 and Figure 3-2, employment in the Monroe Connector study area represented 5.4 percent of the region's total employment in 2000 and is expected to increase to 6.7 percent of the region by 2030. The 2000 employment level of around 48,000 employees in the study area is expected to more than double to approximately 115,000 employees in 2030. This represents a 2.9 percent average annual growth rate in comparison to the regional growth rate of 2.1 percent per annum. The regional employment is anticipated to increase from about 901,000 employees in 2000 to more than 1.7 million in 2030.

The rate of employment growth is distributed fairly evenly throughout the study area. Yet the most rapid rate of employment growth is predicted for the central sector of the study area (3.2 percent average annual growth over the period). Employment there is expected to more than double from around 10,000 in 2000 to more than 26,000 in 2030. The greatest annual employment expansion in the corridor is 3.6 percent per year and is expected for this central sector between the years 2010 and 2020. This coincides with the first decade of the proposed tollway being open to traffic.

Growth in the southeast sector is also expected to be strong during the 2010 to 2020 period with an average annual increase of 3.5 percent. While this sector continues to add jobs over the remainder of the period, this rate of expansion is forecast to decline slightly to 2.8 percent through 2030. Over the entire study period from 2000 to 2030, employment in the southeast sector is anticipated to grow by nearly 28,000 jobs.

The sector of the study area with the lowest employment growth is also the sector with the lowest rate of population growth, the northwest. Even so, employment there is expected to grow by 2.8 percent over the study period.

Table 3-2
Study Area Employment Projections

Study Area Sector	2000	Average Annual Growth	2010	Average Annual Growth	2020	Average Annual Growth	2030	Average Annual Growth 2002-2030	Total Growth 2002-2030
Northwest	17,613	2.7%	23,036	3.3%	31,731	2.5%	40,616	2.8%	130.6%
Central	10,307	3.2%	14,161	3.6%	20,120	2.7%	26,201	3.2%	154.2%
Southeast	20,351	2.4%	25,854	3.5%	36,390	2.8%	48,059	2.9%	136.2%
Total Study Area Employment	48,271	2.7%	63,051	3.4%	88,241	2.7%	114,876	2.9%	138.0%
Percent of Region	5.4%		5.8%		6.3%		6.7%		
Union County	44,390	3.3%	61,653	4.1%	92,522	3.2%	126,794	3.6%	185.6%
Total Metrolina Region Employment	901,814	1.9%	1,089,552	2.5%	1,394,951	2.0%	1,702,272	2.1%	88.8%

Study Area Sector	2000-2010	2010-2020	2020-2030	2000-2030
Northwest	5,423	8,695	8,885	23,003
Central	3,854	5,959	6,081	15,894
Souteast	5,503	10,536	11,669	27,708
Total Study Area Employment Change	14,780	25,190	26,635	66,605
Union County Change	17,263	30,869	34,272	82,404
Metrolina Region Employment Change	187,738	305,399	307,321	800,458

Source: Metrolina Regional Transportation Demand Model

NUMBER OF HOUSEHOLDS

The growth in the number of households in the corridor practically mirrors the population growth as expected. Table 3-3 summarizes the household data contained in the MRTDM.

In 2000, the number of households in the corridor was estimated at more than 32,000, which is a 5 percent share of the regional number of households. By 2030 the corridor is forecast to more than double in households by adding 40,000 residences. This equates to an annual average growth rate of 2.8 percent between 2000 and 2030, just above the 2.1 percent annual growth rate projected for the region. Persons-per-household is projected to remain steady at 2.8 throughout the study period.

The highest growth rate in the number of households is expected in the central sector of the Monroe Connector study area with 3.7 percent annual growth between 2000 and 2030. This equates to an addition of about 15,000 households, which is the same increase in households expected in the study area's southeast sector.

HOUSEHOLD INCOME

Average household incomes by location are summarized in Table 3-4. All the values shown are in 2000 dollars. In 2000, the average household income in the region covered by the Metrolina Regional Travel Demand Model (MRTDM) was $58,338. The Monroe Connector study area showed an average household income of $63,007 in 2000, which is 8 percent higher than the Metrolina Region average household income.

A closer look at the three sectors of the study area reveals the household income in the northwest sector, the one closest to Charlotte, is 25 percent higher than the regional average for the study period of 2000 to 2030. Household income in the southeast section, which includes Monroe, is about 15 percent lower than the region.

SOCIOECONOMIC CONCLUSIONS

This chapter summarized the socioeconomic forecasts that underlie the traffic and revenue forecasts that are presented in the next chapter.

Table 3-3
Study Area Household Projections

Study Area Sector	2000	Average Annual Growth	2010	Average Annual Growth	2020	Average Annual Growth	2030	Average Annual Growth 2000-2030	Total Growth 2000-2030
Northwest	14,321	2.7%	18,646	1.9%	22,465	1.2%	25,355	1.9%	77.0%
Central	7,382	5.4%	12,512	3.3%	17,303	2.4%	21,948	3.7%	197.3%
Southeast	10,401	2.9%	13,889	3.2%	19,107	2.9%	25,385	3.0%	144.1%
Total Study Area Number	32,104	3.4%	45,047	2.7%	58,875	2.1%	72,688	2.8%	126.4%
Percent of Metrolina Region	5.0%		5.6%		5.9%		6.1%		
Union County	43,390	3.6%	62,019	3.2%	84,895	3.2%	116,040	3.3%	167.4%
Total Metrolina Region Number of Households	646,204	2.3%	810,769	2.2%	1,003,850	1.8%	1,200,352	2.1%	85.8%

Study Area Sector	2000-2010	2010-2020	2020-2030	2000-2030
Northwest	4,325	3,819	2,890	11,034
Central	5,130	4,791	4,645	14,566
Southeast	3,488	5,218	6,278	14,984
Total Study Area Number of Households Change	12,943	13,828	13,813	40,584
Union County Change	18,629	22,876	31,145	72,650
Metrolina Region Number of Households Change	164,565	193,081	196,502	554,148

Source: Metrolina Regional Transportation Demand Model

Table 3-4
Study Area Household Income
2000 Dollars

Study Area Sector	2000	2010	2020	2030
Northwest	$75,078	$74,215	$73,755	$73,541
Central	59,101	60,322	59,790	59,356
Southeast	49,159	50,000	50,886	51,345
Total Study Area	63,007	62,890	62,229	61,506
Percent Difference of Metrolina Region	8.0%	5.6%	3.8%	2.4%
Union County	62,053	63,050	63,279	63,633
Total Metrolina Region	58,338	59,554	59,967	60,082

Source: Metrolina Regional Transportation Demand Model

In general, the study area is forecasted to exhibit strong economic growth based on the socioeconomic data contained in the MRTDM.

CHAPTER 4

TRAFFIC AND REVENUE ANALYSIS

Chapter 4 presents a summary of the traffic and revenue analysis conducted for the proposed Monroe Connector. In addition to an overview of the travel demand modeling process, this chapter also presents information on the regional highway improvement program, basic assumptions upon which the traffic and revenue forecasts are based, a toll rate sensitivity analysis, and traffic and revenue forecasts for the proposed Monroe Connector.

TRAFFIC MODEL DEVELOPMENT AND REFINEMENT

The Charlotte Department of Transportation maintains the MRTDM that was used for this preliminary traffic and revenue analysis. The MPO used this model to develop the region's 2030 Transportation Improvement Program (TIP) which contains the highway projects identified for construction. Certain refinements and adjustments were made to the original MRTDM in order to conduct this analysis. This section describes the model refinement process.

Data obtained for the MRTDM included highway networks and trip tables for 2000, 2006, 2015, 2020, and 2030 as well as socioeconomic forecasts for each year by traffic analysis zone. The base-year model was calibrated in the immediate project area to achieve the best traffic volume assignments compared to observed traffic counts and observed speeds from speed-delay studies. The model also was updated to reflect the proposed Monroe Connector as well as the other committed highway improvements.

Highways proposed for future improvement in the model were compared with proposed roadway improvements in the TIP and Long Range Transportation Plan (LRTP) developed by the MPO. Special attention was paid to proposed roadway improvements within the study area for the Monroe Connector. Detailed coding was added to represent the interchanges and toll plaza locations.

The base year 2002 model was run using inputs supplied by the MPO. A series of traffic assignments were compared with ground counts supplied by the NCDOT and those collected specifically for this study. Adjustments were made to input network speeds and trip tables in the study area in order to improve the calibration of the model in comparison with ground counts.

After calibration was obtained, a series of traffic assignments to the highway network were made for years 2010, 2015, 2020, and 2030 under no build, toll free, and tolled conditions. Several toll rates were tested for the 2010 opening year in order to estimate the optimum toll rates.

Traffic assignments to the proposed toll facility were made using a diversion assignment technique. This process involved comparing the travel time and distance for trips using the Monroe Connector with trips using the best toll-free alternative routes. The estimated share of total traffic that would be expected to use the facilities was a function of travel time and distance savings, a monetary value placed on these savings and the toll charges being tested in any given assignment. In general, as the total costs to use the proposed Monroe Connector increased, in comparison to the best alternative free routes, the share of traffic on the Monroe Connector decreased. At lower toll rates, a higher share would be estimated.

The model also recognized capacity constraints on roadways in the study area. Speeds were adjusted in future conditions to reflect increasing congestion on the toll facility and competing roads. The proposed Monroe Connector was assumed to be four lanes at all locations for purposes of this preliminary analysis.

BASIC ASSUMPTIONS

The preliminary traffic and revenue estimates for the Monroe Connector were predicated on the following basic assumptions, which are considered reasonable for purposes of this preliminary analysis:

1. The Monroe Connector would open to traffic by January 1, 2014, as a tolled facility in Scenarios 1 and 2. The Monroe Bypass would open to traffic by January 1, 2012 as a free facility in Scenario 1 and as a tolled facility in Scenario 2.

2. Roadway improvements included in the current TIP were assumed to be implemented, including the programmed widenings of competing routes.

3. The necessary environmental analyses for the Monroe Connector and the Monroe Bypass would be completed in sufficient time to allow for design and construction as a toll road.

4. Toll rates and toll plaza locations would be as shown in this chapter.

5. No other competing facilities or additional capacity would be constructed during the project period, other than those in the current Transportation Improvement Plan.

6. For purposes of this preliminary analysis, cash and electronic toll collection options would be available at all toll plaza locations, although it is assumed that at least 75 percent of users would use electronic toll collection.

7. Economic growth in the project study area, and associated travel demand would occur as represented in the MRTDM used in this analysis.

8. For purposes of this study, inflation was assumed to average 2.5 percent per year.

9. The Scenario 1 and Scenario 2 toll configurations would be signed and promoted effectively to encourage maximum usage.

10. Motor fuel would remain in adequate supply and no national or regional emergency would arise that would abnormally restrict the use of motor vehicles.

Any significant departure from these basic assumptions could materially affect traffic and revenue potential on the proposed Monroe Connector.

ROADWAY IMPROVEMENTS

People's travel behavior and the number of vehicles that would use the proposed Monroe Connector in the future would be heavily influenced by the operating conditions of other area roadways. The process of transportation project development and funding makes it impossible to know with certainty which proposed transportation improvements will be implemented and when. However, it is important that reasonable assumptions are made regarding future improvements, since such improvements could

have a considerable effect on the number of vehicles using the Monroe Connector.

The MRTDM contains all future highway improvements listed in the MPO's fiscally constrained 2030 Transportation Improvement Program. A list of the planned road improvements that could affect traffic volumes on the Monroe Connector is provided in Table 4-1. The improvements that would have the most impact on the operations of the Monroe Connector and the year that they are programmed in the MRTDM include:

- **Model Year 2014**
  - Monroe Bypass;
  - Widening of US 601 north and south of US 74;

- **Model Year 2020**
  - Widening of US 74 from I-485 towards Charlotte, I-485 from US 74 to Albemarle Road;

- **Model Year 2030**
  - New Road – Monroe Northern Loop from Dickerson Road to US 601, Eastern Circumferential from Lawyers Road to NC 24/27; and
  - Widening of US 601 north of Monroe, I-485 from I-77 to NC 16.

Several of these highway improvements would either compete directly with or complement the proposed Monroe Connector. For example, the construction of the Monroe Bypass from US 74 to west of US 601 as either a free road or a toll road is critical for the Monroe Connector. The widening of I-485 and US 601 will provide improved access to the toll road.

TOLL RATES AND CONFIGURATIONS

Scenario 1, which would toll only the Monroe Connector, includes a single mainline plaza and ramp plazas at four interchange locations. The total length of the toll facility would be approximately 10.9 miles.

Table 4-1
Major Highway Improvements Contained in
Metrolina Regional Travel Demand Model

Name and Location	Project Description	Model Year
Monroe Bypass	US 74 in Marshville to US 601 (Concord Hwy), New Freeway (4)	2014
US 601 (Pageland Highway)	US 74 (Roosevelt Boulevard) to South Carolina Line, Widening (4)	2014
Martin Luther King Jr. Boulevard	NC 200 (Lancaster Highway) to Charlotte Avenue, New Road (2)	2014
Starlings Road	Old Monroe Road to US 74	2014
NC 51 (Rock Hill Pineville Road)	Downs Circle To South Carolina State Line, Widening (4)	2014
US 601	US 74 (Roosevelt Boulevard) to Monroe Bypass, Widening (4), Median	2014
US 74 Expressway (Independence Boulevard)	Sharon Amity Road to I-485 (6 Lanes plus HOV or Busway)	2020
NC 51 (Matthews-Mint Hill Road)	Matthews township Parkway to Lawyers Road, Widening (4), Median, Bike Lanes	2020
Independence Point Pkwy	Matthews-Mint Hill Road To Campus Ridge Road, New Road (2), Median, Bike Lanes	2020
Idlewild Road	Mecklenburg/Union County line to Stevens Mill Road, Widening (4), Median, Bike Lanes	2020
John Street/Old Monroe Road	I-485 to Indian Trail Road, Widening (4), Median, Bike Lanes	2020
Old Monroe Road	Indian Trail Road to Wesley Chapel-Stouts Road, Widening (4), Median, Bike Lanes	2020
Independence Point Parkway	Windsor Square Drive to NC 51, New Road (2)	2020
Chestnut Lane/US 74 Connector	Old Monroe Road to US 74, New Road (4), Median	2020
Indian Trail Road	Old Monroe Road to US 74 (Independence Boulevard), Widening (3), Bike Lanes	2020
I-485	US 74 to Albemarle Road, Widening (6)	2020
Monroe Northern Loop	Dickerson Boulevard to US 601 N, New Road (4)	2030
Eastern Circumferential	Idlewild Road to US 74, Widening (4)/New (4), Median, Bike Lanes	2030
NC 84	NC 84 Relocation to Waxhaw-Indian Trail Road, Widening (4), Median, Bike Lanes	2030
Wesley Chapel-Stouts Road/Potter Road	Old Charlotte Hway. to NC 84, Widening (4), Median, Bike Lanes	2030
Wesley Chapei-Stouts Road	US 74 to Old Charlotte Highway, Widening (4), Median, Bike Lanes	2030
US 601 (Concord Highway)	Ridge Road to Lawyers Road, Widening (4), Median, Bike Lanes	2030

(continued)

Table 4-1 (cont'd.)
Major Highway Improvements Contained in
Metrolina Regional Travel Demand Model

Name and Location	Project Description	Model Year
Sardis Church Road/ Unionville-Indian Trail Road	Secrest Shortcut Road to US 74	2030
NC 218 (Fairview Road)	Brief Road to US 601, Widening (4), Median, Bike Lanes	2030
Chestnut Lane	Matthews-Weddington Road to Old Monroe Road, New Road (4), Widening (4), Bike Lanes	2030
I-485	NC 16 (Providance Road) to US 74, Widening (6)	2030
Bryant Farms Road	Johnson Road to Community House Road, New Road (4), Median, Bike Lanes	2030
Secrest Avenue Extension	Secrest Avenue to Olive Branch Road, New Road (5), Median, Bike Lanes	2030
Eastern Circumferential	Lawyers Road to NC 24/27 New Road (4), Median, Bike Lanes	2030
US 601 (Concord Highway)	Lawyers Road to Cabarrus County Line, Widening (4), Median, Bike Lanes	2030
Rockey River Road (Monroe)	Old Charlotte Highway to US 74, Widening (4), Median	2030
Rockey River Road (Monroe)	US 74 to Monroe Bypass Connector, Widening (4), Median	2030
McKee Road	NC 16 to Tilley Morris Road, Widening (4), Median, Bike Lanes	2030
Charlotte Avenue	Dickerson Boulevard to Rocky River Road, Widening, Median, Bike Lanes	2030
NC 84 Relocation	NC 16 to NC 84, New Road (2) on 4 Lane ROW, Wide Outside Lanes	2030
Lawyers Road	NC 51 to I-485, Widening (4), Median, Bike Lanes	2030
Lawyers Road	McAlpine Creek to NC 51, Widening (4), Median, Bike Lanes	2030
McKee Road	Tilley Morris Road to Pleasant Plain Road, Widening (4), Median, Bike Lanes	2030
Faith Church Road Extension	US 74 to Monroe Road, New Road (2)	2030
Ardrey Kell Road Extension	Nc 16 (Providance Road) to Tilley Morris Road, New Road (2), Median, Bike Lanes	2030
I-485	I-77 to NC 16 (Providance Road), Widening (6/8)	2030

Source: 2030 Long Range Transportation Plan Amendment, September, 2005

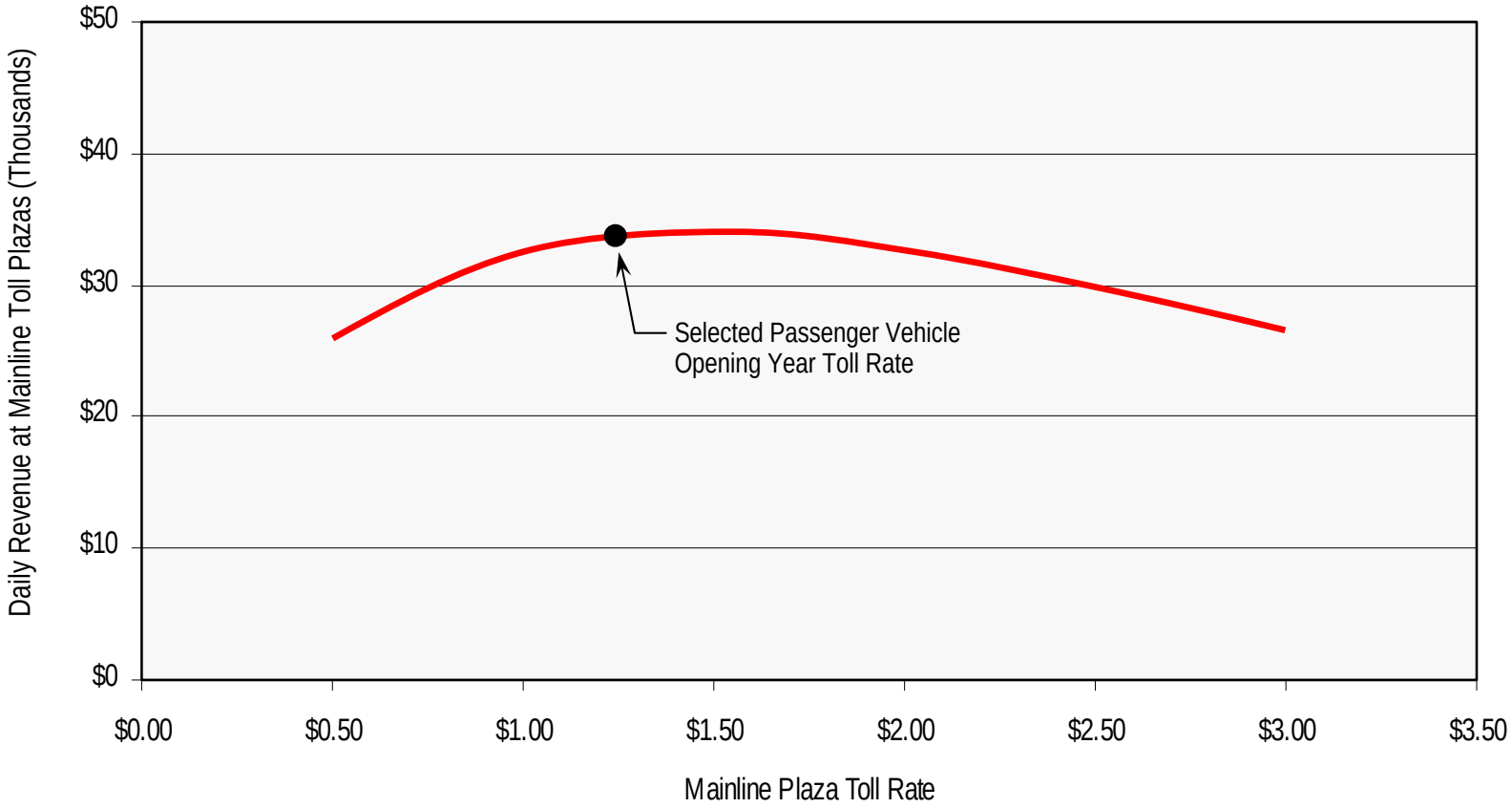
Various toll rates were tested at 2014 levels for Scenario 1. Mainline plaza passenger car rates ranging from $0.50 to $3.00 were analyzed.

A toll sensitivity curve for the mainline plaza is shown in Figure 4-1. Generally, maximum revenue potential would result at a toll of approximately $1.50. However, only slightly lower revenue would be expected at a toll of $1.25, which was selected as the optimum rate for the 2014 opening year.

Note that the original toll sensitivity analysis was conducted at 2010 levels, since the opening year for the project was initially considered to be that year. For purposes of this preliminary study, the optimum opening toll rate of $1.25 was selected, although future increases in tolls were assumed to begin at 2020 and continue at five-year increments thereafter.

Selecting an opening toll rate slightly below the maximum point on the toll sensitivity curve allows some flexibility in setting future rates. The $1.25 rate is equivalent to $0.1147 per mile for drivers using the toll road over its entire length in Scenario 1. As shown in Table 4-2 the opening year toll rate is on the low end of the range of rates for existing urban toll facilities throughout the United States. This is especially true considering that it represents 2014 levels, or about eight years in the future. Many of the other toll facilities shown in Table 4-2 will likely have toll increases by 2014.

The relatively low optimum toll is a function of the level of competition provided by US 74 and other roads in the study area. In addition, it is influenced by the fact that a large portion of demand for the Connector is oriented to and from the City of Monroe. The Connector would provide significant through trip time savings and some time savings for traffic oriented to and from Monroe; however these savings are reduced somewhat by the need to use US 601 or other streets to access the central business district of Monroe from the Connector and Bypass. Through trip users should be willing to pay a higher toll than $1.25 for the benefits they receive, which include bypassing the Town of Monroe and the most highly congested sections of US 74. However, through trips tend to represent less than half of the total traffic on US 74 between Monroe and Charlotte.



NORTH CAROLINA Turnpike Authority

ESTIMATED 2014 MAINLINE PLAZA TOLL SENSITIVITY CURVE
SCENARIO 1

FIGURE 4-1

Table 4-2
Comparison of Per-Mile Rates for Selected Urban Toll Roads
Passenger Car Toll Rates

Facility	Length (1) (miles)	Cash	ETC	Per Mile Rate: Cash	Per Mile Rate: ETC
Barrier Systems					
San Joaquin Hills Transportation Corridor - CA (Peak)	15.0	$4.25	$3.50	$0.2833	$0.2330
San Joaquin Hills Transportation Corridor - CA (Off-Peak)	15.0	$3.75	$3.00	$0.2500	$0.2000
Eastern Transportation Corridor (East Leg) - CA	16.9	$4.00	$3.50	$0.2367	$0.2071
Gratigny Expressway	5.4	$1.25	$1.00	$0.2315	$0.1852
E-470 - Colorado	46.1	$9.75		$0.2115	
Northwest Parkway - CO	9.5	$2.00		$0.2105	
Foothill Transportation Corridor - CA	13.5	$2.75	$2.50	$0.2037	$0.1852
Dulles Greenway - Virginia	14.0	$2.70		$0.1929	
Richmond Expressway- Downtown	2.6	$0.50		$0.1923	
Holland East West Expressway - Florida	21.0	$3.75		$0.1786	
Don Shula Expressway	7.3	$1.25	$1.00	$0.1712	$0.1366
Richmond Expressway - Virginia	6.3	$1.00		$0.1587	
Airport Expressway - Florida (2)	4.1	$1.25	$1.00	$0.1520	$0.1219
Tampa South Crosstown Expressway -Florida	15.5	$2.25	$1.75	$0.1452	$0.1129
Richmond Expressway Powhite Pkwy	3.8	$0.50		$0.1316	
Sam Houston Tollway - Texas (5)	60.0	$7.50	$6.00	$0.1250	$0.1000
President George Bush Turnpike - Texas	30.5	$3.75	$3.00	$0.1230	$0.0984
Hardy Toll Road - Texas	21.7	$2.50	$2.00	$0.1152	$0.0922
Monroe Connector (Scenario 1 in 2014)	**10.9**	**$1.25**		**$0.1147**	
Dallas North Tollway	22.0	$2.25	$1.80	$0.1023	$0.0818
Dulles Toll Road - Virginia	13.0	$1.25		$0.0961	
Kilpatrick Turnpike - Oklahoma City, Oklahoma	24.5	$2.00	$1.90	$0.0816	$0.0776
Creek Turnpike - Tulsa, Oklahoma	35.2	$2.45	$2.30	$0.0696	$0.0653
East-West Expressway (2)	11.8	$1.25	$1.00	$0.0530	$0.0847

(1) Full-length trip on the facility
(2) Round-trip toll and distance (one-way toll system).

TOLL CONCEPTS AND RATES

For Scenario 1, one mainline toll plaza would be established between Indian Trail-Fairview Road and Unionville Indian Trail Road. Tolls would also be collected at eastbound off and westbound on ramps at Stallings Road and Indian Trail Fairview Road and at westbound off and eastbound on ramps at Unionville Indian Trail Road and North Rocky River Road. Tolls would not be collected at the project terminus at I-485 and the junction of the Connector and the Bypass.

Under Scenario 2, the Monroe Bypass would be tolled to its junction with US 74 east of Monroe to US 601. The Bypass would have a mainline plaza between Morgan Mill Road and Austin Chaney Road. The interchange at Morgan Mill Road would have tolls on the westbound on and eastbound off ramps. Austin Chaney Road and Forest Hills School Road would have tolls on the westbound off and eastbound on ramps. Tolls would not be collected at the interchange at US 601 (Concord Highway) and the project termini at US 74 and I-485.

Table 4-3 shows the rates proposed for the mainline plazas for the two scenarios. Rates for Scenario 1 would start at $1.25 and increase to $2.00 by 2030 with increases assumed in 2020, 2025 and 2030. Travelers would pay two tolls for Scenario 2. In this case, the mainline toll rates would begin at $1.25 at each mainline plaza and rise to $2.00 each by 2030.

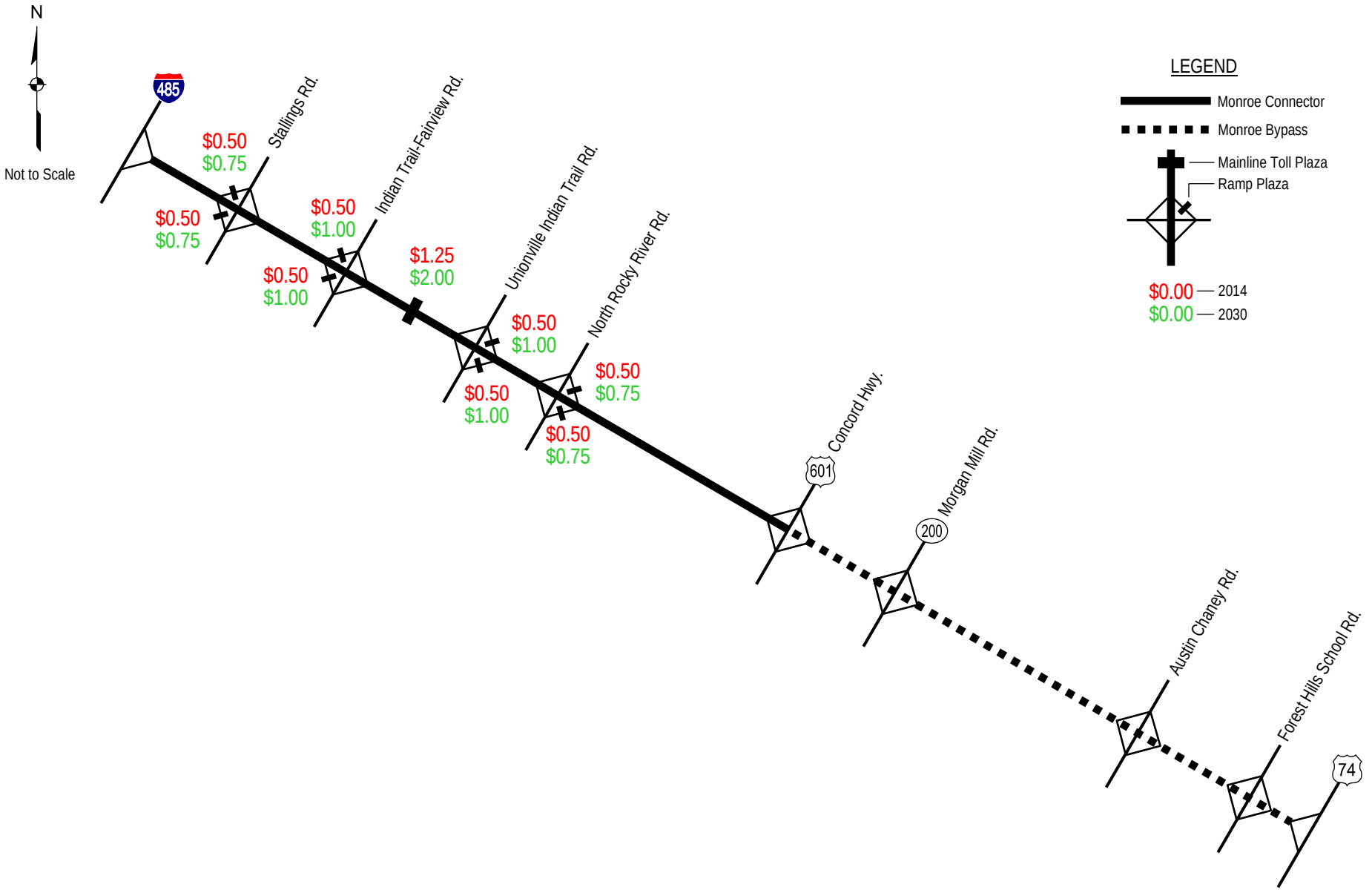
Table 4-3
Comparison of Toll Rates at Mainline Plazas
Passenger Cars

Year	Western Plaza	Eastern Plaza (1)
2014	$1.25	$1.25
2020	$1.50	$1.50
2025	$1.75	$1.75
2030	$2.00	$2.00

(1) Scenario 2 only

Rates for the ramp plazas would be proportionately lower. Figures 4-2 and 4-3 show the rates for each toll plaza for Scenarios 1 and 2, respectively, for the opening year and 2030. All rates are in future-year dollars and adjusted for inflation, which is assumed for this study to average 2.5 percent per year. The increase in tolls between the opening year and the later years of operation is slightly greater than inflation, reflecting the significant increases in traffic demand which would require some level of "real increase" in rates beyond inflation.

Rates shown in these figures are for passenger cars; trucks would have proportionally higher toll rates. In developing revenue estimates for these preliminary study findings, it was assumed that truck rates would average three times passenger car rates at each toll plaza location.



NORTH CAROLINA Turnpike Authority

TOLL RATE ASSUMPTIONS – SCENARIO 1

FIGURE 4-2

NORTH CAROLINA Turnpike Authority

TOLL RATE ASSUMPTIONS – SCENARIO 2

FIGURE 4-3

ESTIMATED WEEKDAY TRAFFIC VOLUMES

Preliminary estimates of weekday traffic for the Scenario 1 configuration are shown for years 2014 and 2030 in Figure 4-4. Toll-free traffic would be higher. The traffic volumes shown do not reflect ramp-up effects, which were incorporated into the annual forecasts.

Traffic at the mainline plaza for Scenario 1 is estimated at 30,400 vpd in 2014. By 2030 the traffic at the mainline plaza would rise to 52,200 vpd, an average growth of about 3.4 percent per year.

Relatively heavy volumes are shown at several interchanges, including Stallings Road, Indian Trail-Fairview Road and North Rocky River Road. While not shown in Figure 4-4, relatively heavy volumes are also expected to use the US 601 Interchange in Monroe.

The peak load point for Scenario 1, is between Stallings Road and Indian Trail-Fairview Road. By 2030, average weekday traffic is estimated at more than 57,000 vpd.

Similarly, toll traffic forecasts for the longer Scenario 2 are presented in Figure 4-5 for years 2014 and 2030. Traffic volumes at the western mainline plaza are forecast to begin at 27,400 vpd in 2014 and rise to 46,000 vpd by 2030. The eastern mainline plaza would begin in 2014 with 11,400 vpd and would grow to 22,200 vpd by 2030.

In general, volumes along the Monroe Bypass portion of the toll road are considerably lower than those along the Monroe Connector. This is largely attributable to the significant development that has occurred and continues to occur along existing US 74 in Union County between Monroe and Charlotte.

In addition, traffic on the Monroe Bypass was found to be somewhat more sensitive to toll charges. This is due to the fact that operating speeds on US 74 east of Monroe are considerably better than west of Monroe. Hence, from a toll standpoint, the competing routes are more competitive with the Bypass than with the Connector.

ESTIMATED WEEKDAY TRANSACTIONS AND REVENUE

Table 4-4 shows estimated weekday transactions and revenues for Scenarios 1 and 2 in years 2014 and 2030.

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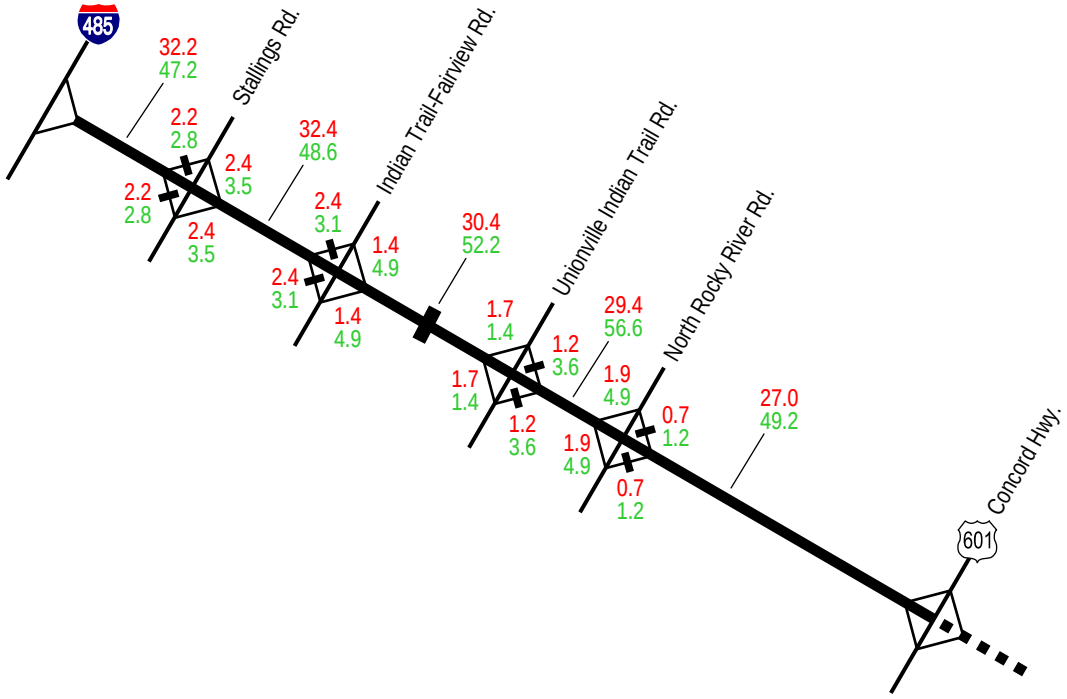


LEGEND

Monroe Connector

Monroe Bypass

Mainline Toll Plaza

Ramp Plaza

00.0 — 2014

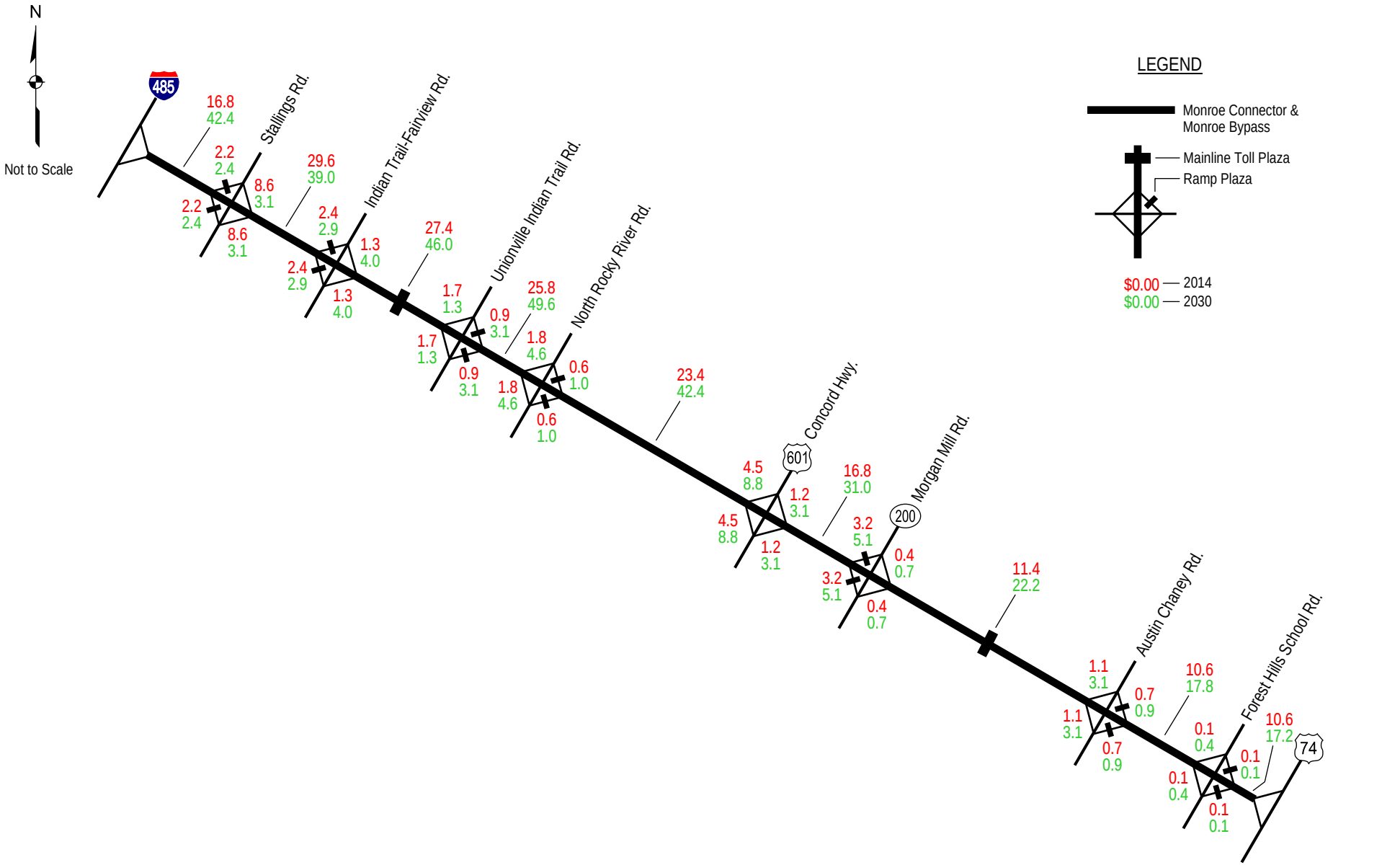
00.0 — 2030

Note: All traffic volumes shown represent thousands of vehicles.

NORTH CAROLINA Turnpike Authority

ESTIMATED 2014 AND 2030 WEEKDAY TRAFFIC VOLUMES SCENARIO 1

FIGURE 4-4



NORTH CAROLINA Turnpike Authority

ESTIMATED 2014 AND 2030 WEEKDAY TRAFFIC VOLUMES SCENARIO 2

FIGURE 4-5

Table 4-4
Estimated Weekday Transactions and Revenue

2014

Toll Plaza Location	Scenario 1 Weekday Traffic	Scenario 1 Average Toll *	Scenario 1 Weekday Revenue	Scenario 2 Weekday Traffic	Scenario 2 Average Toll *	Scenario 2 Weekday Revenue
Stallings Road	4,300	$0.5375	2,304	4,300	$0.5375	2,304
Indian Trail-Fairview Road	4,800	$0.5375	2,569	4,700	0.5375	2,551
West Mainline	30,400	$1.3438	40,907	27,400	1.3438	36,772
Unionville Indian Trail Road	2,300	$0.5375	1,231	1,900	0.5375	1,017
North Rocky River Road	1,500	$0.5375	787	1,300	0.5375	697
Morgan Mill Road				6,400	0.5375	3,452
East Mainline				11,400	1.3438	15,310
Austin Chaney Road				1,400	0.5375	753
Forest Hlls School Road				200	0.2688	46
Total Weekday Traffic and Revenue	43,300		$47,799	59,000		$65,206
Annualization Factor (Days)	319		319	319		319
Annual Traffic and Revenue Before Ramp-up	13,813,000		$15,248,000	18,821,000		$20,801,000
Ramp-up Factor	0.61		0.61	0.70 **		0.70 **
Annual Traffic and Revenue After Ramp-up - 2014	**8,419,000**		**$9,301,000**	**13,548,000**		**$14,331,000**

2030

Toll Plaza Location	Scenario 1 Weekday Traffic	Scenario 1 Average Toll *	Scenario 1 Weekday Revenue	Scenario 2 Weekday Traffic	Scenario 2 Average Toll *	Scenario 2 Weekday Revenue
Stallings Road	4,800	$0.8063	$3,870	4,800	$0.8063	$3,870
Indian Trail-Fairview Road	5,600	1.0750	6,020	5,800	1.0750	6,235
West Mainline	50,000	2.1500	107,500	46,000	2.1500	98,900
Unionville Indian Trail Road	6,800	1.0750	7,310	6,200	1.0750	6,665
North Rocky River Road	2,200	0.8063	1,774	2,000	0.8063	1,613
Morgan Mill Road				10,200	1.0750	10,965
East Mainline				22,200	2.1500	47,730
Austin Chaney Road				1,800	1.0750	1,935
Forest Hlls School Road				200	0.2688	54
Total Weekday Traffic and Revenue	69,400		$126,474	99,200		$177,967
Annualization Factor (Days)	319		319	319		319
Annual Traffic and Revenue - 2030	**22,139,000**		**$40,345,000**	**31,645,000**		**$56,771,000**

* Average toll based on following assumptions:
Percent Truck = 5 % of total traffic.
Truck Tolls = 2.5 times higher than car toll.

** Ramp-up factor for Scenario 2 is different than for Scenario 1 because part of Scenario 2 is assumed to be open in 2012.

Total weekday transactions are estimated at 43,300, resulting in average weekday revenue of nearly $48,000 for Scenario 1. Average weekday conditions are brought to "annual" levels by using a factor of 319 equivalent weekdays. This reflects the fact that weekend and holiday conditions generally have lower traffic and revenue than weekday conditions on most new toll facilities. Annual revenue, before adjusting for ramp-up, is estimated at $15.2 million. The ramp-up factor in the opening year was 0.61 indicating a 39 percent reduction from nominal revenue estimates. This results in an adjusted opening year revenue estimate of just over $9.3 million in 2014.

Scenario 2 would have somewhat higher weekday traffic and revenue. This facility would add a second mainline toll plaza, increasing annual transactions to nearly 19 million. Annual revenue is estimated at $20.1 million, before ramp-up and $14.3 million after ramp-up adjustment.

Similar information is shown for the two scenarios in year 2030. By 2030, annual revenue is estimated at $40.3 million in Scenario 1 and $56.8 million in Scenario 2.

ESTIMATED ANNUAL TRANSACTIONS AND REVENUE

Preliminary estimates of annual toll revenues were prepared for each of the Scenarios between 2014 and 2050. These estimates were based on the toll rates shown previously; the modeling results for years 2015, 2020, 2025 and 2030 levels; and the assumed ramp-up years. Intermediate years, including 2014 were estimated through interpolation. Traffic and revenue between 2030 and 2040 and 2040 and 2050 were assumed to grow at constant annual rates.

As shown in Table 4-5, the Scenario 1 revenue is estimated at about $9.3 million after ramp-up increasing to $40.3 million by 2030.

The annualized transactions and revenues from 2014 to 2016 were further adjusted to reflect "ramp-up." Ramp-up is a phenomenon that occurs on most new start-up toll facilities. High levels of growth may be experienced over the first three years or so of operation as the motoring public gradually becomes aware of the facility and begins using it.

There are a number of reasons for the "ramp-up" phenomenon. For example, since not all motorists who will use the facility are from the local area, it may take several months before certain travelers are aware that the facility is open, or where the facility goes. It will also take several months

for the project to begin to appear on new maps and for motorists to become accustomed to using the facility. The duration and level of ramp-up adjustments can be directly affected by a well-conceived promotion and signing program.

For purposes of this study, a 36-month ramp-up period was assumed. The nominal traffic and revenue estimates prepared for the opening three years were adjusted downward to reflect the time it will take to gradually build up demand. For example, in the first year of operation, traffic is estimated to be 61 percent of the baseline estimated result, increasing to about 95 percent by the end of the third full year of operation.

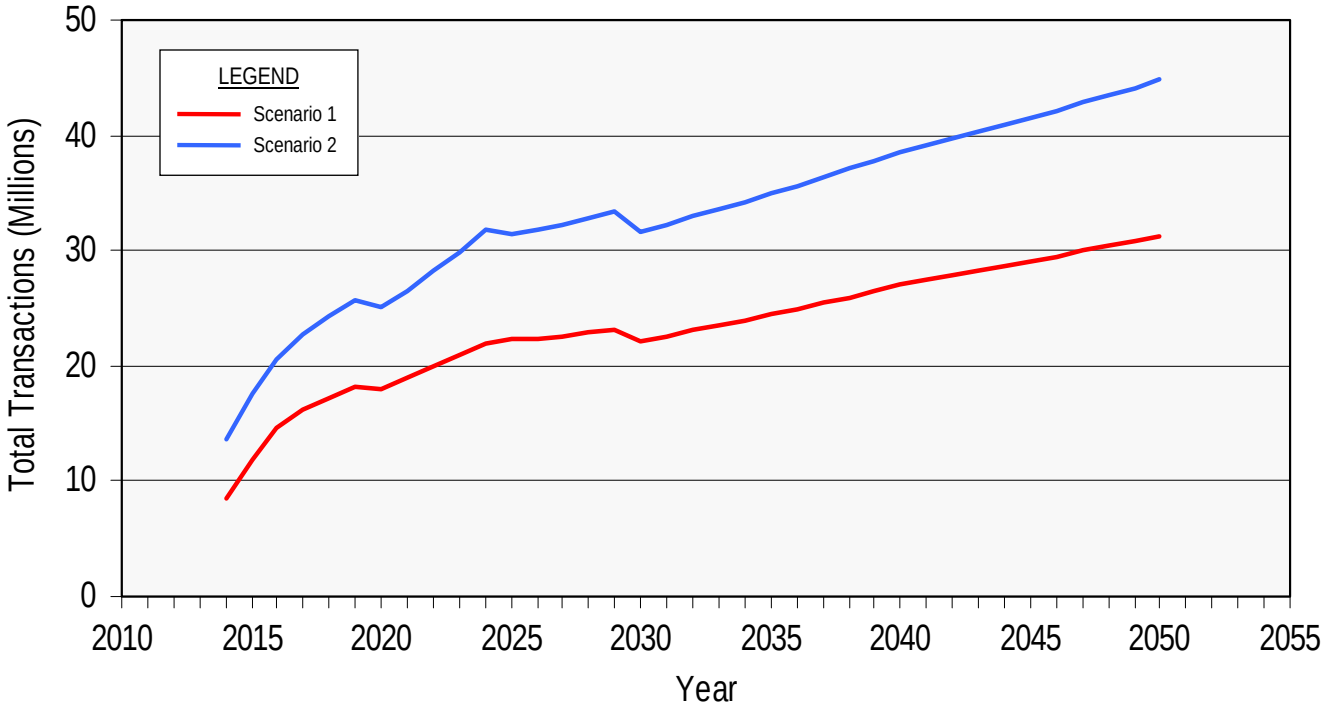
Under the Scenario 2, revenue is forecast to increase from $14.3 million in 2014 to $56.7 million by 2030. The effects of the longer toll road are apparent in the traffic and revenue forecasts, which are lower for Scenario 1.

Figures 4-6 and 4-7 show the transaction and revenue forecasts in graphical form for the recommended toll rates for Scenarios 1 and 2. As tolls increase, traffic decreases as fewer drivers are willing to pay higher tolls. However, total system revenue would continue to rise until the increasing toll rates resulted in enough drivers choosing the free alternatives to cause a decrease in total revenue.

ESTIMATED NET REVENUE

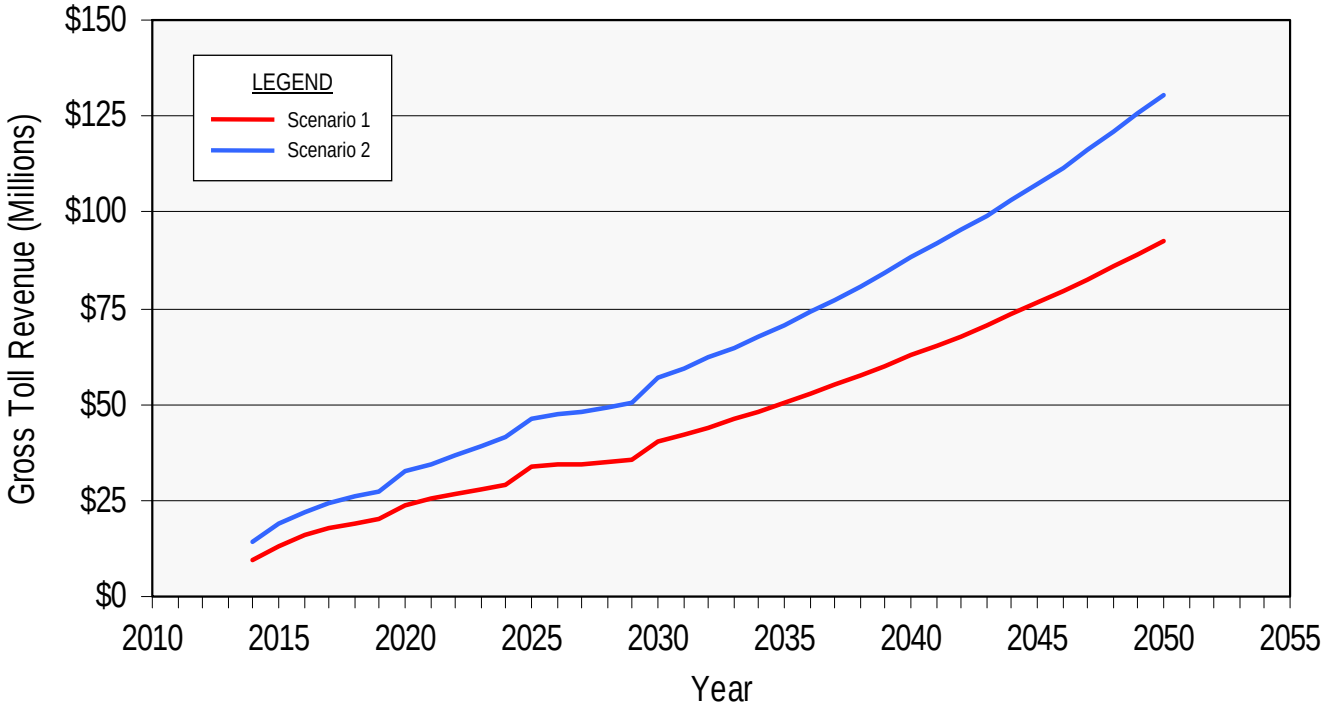
Table 4-6 provides estimates of annual net revenue. Preliminary estimates of operating costs related to toll collection were developed for the analysis, including a nominal fixed component and a variable component per transaction. The nominal fixed component was assumed to increase at 2.5 percent per year for inflation, while a variable component of operating cost increased in proportion with traffic growth. Note, these operating costs do not include costs for roadway maintenance and rehabilitation.

Under Scenario 1, net revenue is estimated at $6.2 million in 2014, increasing to $19.9 million by 2020 and $35.2 million by 2030. Net revenue estimates would be significantly higher for the longer Scenario 2 configuration due to the greater length of the toll facility.



ANNUAL TRANSACTION FORECAST

FIGURE 4-6



ANNUAL GROSS REVENUE FORECAST

FIGURE 4-7

Table 4-5
Annual Toll Transactions and Gross Revenue Forecasts
(Thousands)

	Scenario 1		Scenario 2	
Year	Total Transactions	Total Revenue	Total Transactions	Total Revenue
2014	8,419	$9,301	13,548	$14,331
2015	11,883	13,123	17,584	18,680
2016	14,571	16,085	20,595	21,938
2017	16,274	17,958	22,751	24,256
2018	17,177	18,946	24,212	25,806
2019	18,131	19,989	25,771	27,458
2020	18,055	23,988	25,073	32,406
2021	18,941	25,220	26,579	34,475
2022	19,873	26,516	28,186	36,686
2023	20,853	27,881	29,901	39,048
2024	21,884	29,317	31,732	41,573
2025	22,266	33,830	31,326	46,192
2026	22,417	34,215	31,761	47,173
2027	22,609	34,636	32,254	48,217
2028	22,846	35,095	32,810	49,329
2029	23,134	35,596	33,434	50,515
2030	22,139	40,345	31,645	56,771
2031	22,581	42,161	32,278	59,326
2032	23,033	44,058	32,923	61,996
2033	23,494	46,040	33,582	64,785
2034	23,964	48,112	34,253	67,701
2035	24,443	50,277	34,938	70,747
2036	24,932	52,540	35,637	73,931
2037	25,430	54,904	36,350	77,258
2038	25,939	57,375	37,077	80,734
2039	26,458	59,957	37,818	84,367
2040	26,987	62,655	38,575	88,164
2041	27,392	65,161	39,153	91,691
2042	27,803	67,767	39,741	95,358
2043	28,220	70,478	40,337	99,172
2044	28,643	73,297	40,942	103,139
2045	29,072	76,229	41,556	107,265
2046	29,509	79,278	42,179	111,556
2047	29,951	82,449	42,812	116,018
2048	30,400	85,747	43,454	120,659
2049	30,856	89,177	44,106	125,485
2050	31,319	92,744	44,768	130,504

Note: Forecasts for 2014 - 2016 reflect an assumed ramp-up to full traffic levels beginning beginning in 2017.

Table 4-6
Annual Net Toll Revenue Forecasts
(Thousands)

	Scenario 1			Scenario 2		
Year	Gross Toll Revenue	Toll Operating Expense	Net Toll Operating Revenue	Gross Toll Revenue	Toll Operating Expense	Net Toll Operating Revenue
2014	$9,301	$3,056	$6,245	$14,331	$4,718	$9,613
2015	13,123	3,328	9,795	18,680	5,058	13,622
2016	16,085	3,555	12,530	21,938	5,338	16,600
2017	17,958	3,724	14,234	24,256	5,570	18,686
2018	18,946	3,847	15,099	25,806	5,763	20,043
2019	19,989	3,974	16,015	27,458	5,964	21,494
2020	23,988	4,042	19,946	32,406	6,033	26,373
2021	25,220	4,169	21,051	34,475	6,236	28,239
2022	26,516	4,301	22,215	36,686	6,449	30,237
2023	27,881	4,437	23,444	39,048	6,671	32,377
2024	29,317	4,579	24,738	41,573	6,902	34,671
2025	33,830	4,684	29,146	46,192	7,003	39,189
2026	34,215	4,776	29,439	47,173	7,157	40,016
2027	34,636	4,874	29,762	48,217	7,318	40,899
2028	35,095	4,976	30,119	49,329	7,486	41,843
2029	35,596	5,083	30,513	50,515	7,661	42,854
2030	40,345	5,116	35,229	56,771	7,696	49,075
2031	42,161	5,237	36,924	59,326	7,878	51,448
2032	44,058	5,361	38,697	61,996	8,066	53,930
2033	46,040	5,488	40,552	64,785	8,257	56,528
2034	48,112	5,618	42,494	67,701	8,454	59,247
2035	50,277	5,752	44,525	70,747	8,655	62,092
2036	52,540	5,888	46,652	73,931	8,861	65,070
2037	54,904	6,028	48,876	77,258	9,072	68,186
2038	57,375	6,171	51,204	80,734	9,287	71,447
2039	59,957	6,317	53,640	84,367	9,509	74,858
2040	62,655	6,467	56,188	88,164	9,735	78,429
2041	65,161	6,613	58,548	91,691	9,955	81,736
2042	67,767	6,762	61,005	95,358	10,181	85,177
2043	70,478	6,914	63,564	99,172	10,411	88,761
2044	73,297	7,070	66,227	103,139	10,647	92,492
2045	76,229	7,230	68,999	107,265	10,889	96,376
2046	79,278	7,393	71,885	111,556	11,136	100,420
2047	82,449	7,560	74,889	116,018	11,389	104,629
2048	85,747	7,731	78,016	120,659	11,648	109,011
2049	89,177	7,906	81,271	125,485	11,913	113,572
2050	92,744	8,085	84,659	130,504	12,185	118,319

Note: Forecasts for 2014 - 2016 reflect an assumed ramp-up to full traffic levels beginning in 2017.

CONCLUSIONS

The conclusions of this preliminary study of the proposed Monroe Connector can be summarized as follows:

- **Scenario 2 Generates Significantly More Revenue** – The effects of combining the Monroe Connector and the Monroe Bypass into a single tolled facility are apparent from the analysis contained in this report. The combined projects generate significantly more revenue than the Monroe Connector alone.

- **Monroe Bypass Could Help Reduce Congestion in the Study Area** – US 74 between Monroe and Charlotte is heavily congested, and traffic volumes are expected to increase significantly during the next 30 years. The planned widening of US 74 will help reduce congestion, but the Monroe Connector in combination with the Monroe Bypass would reduce congestion further by providing a good alternative to US 74.

- **Monroe Bypass is an Essential Component** – The Monroe Bypass, either as a toll-free facility or a tolled facility, is essential for the success of the Monroe Connector toll road. If the Bypass is not constructed, then the Connector would not be justified.

DISCLAIMER

Current professional practices and procedures were used in the development of these preliminary traffic and revenue study findings. However, there is considerable uncertainty inherent in future traffic and revenue forecasts for any toll facility. There may sometimes be differences between forecasted and actual results caused by events and circumstances beyond the control of the forecasters. These differences could be material. Also, it should be recognized that traffic and revenue forecasts in this document are intended to reflect the overall estimated long-term trend. Actual experience in any given year may vary due to economic conditions and other factors.

It is also emphasized that this study is considered preliminary and findings are subject to considerable refinement. It was not performed at a sufficient level of detail to be used in project financing and is not intended for that purpose. Considerably more detailed studies would be required prior to project financing.