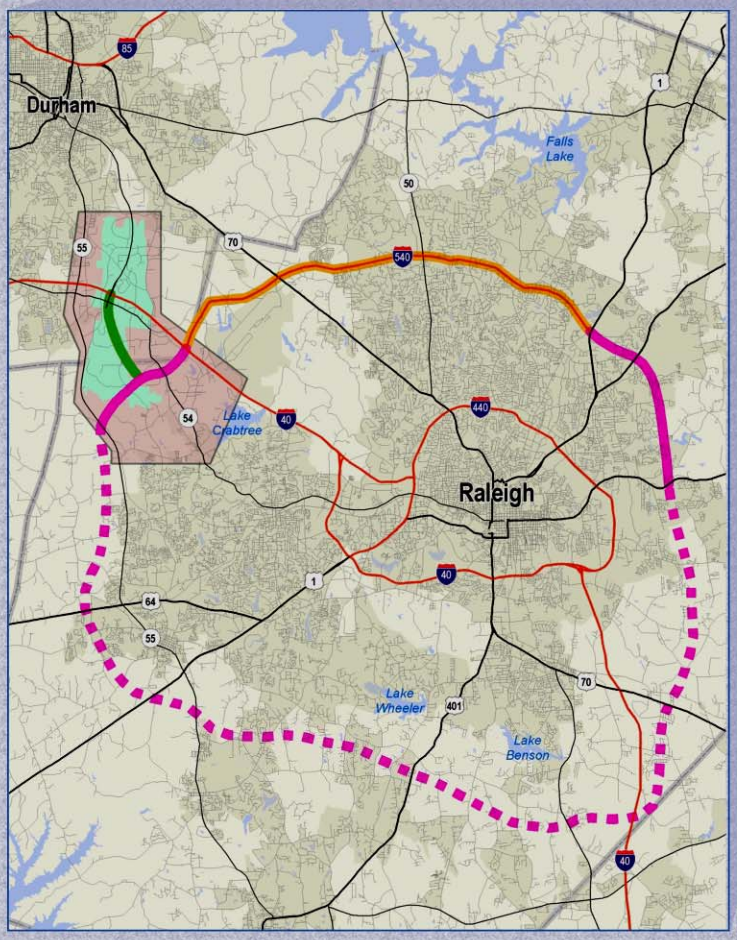
Proposed Triangle Parkway Preliminary Traffic and Revenue Study

Final Report

NORTH CAROLINA
Turnpike Authority



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Wilbur Smith Associates

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Final Report

Prepared for

NORTH CAROLINA
Turnpike Authority

Prepared by

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March 30, 2006

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March 30, 2006

Mr. David W. Joyner
Executive Director
North Carolina Turnpike Authority
Mail Service Center 1578
Raleigh, North Carolina 27699-1578

Re: Preliminary Traffic and Revenue Study – Proposed Triangle Parkway – Final Report

Dear Mr. Joyner:

We are most pleased to transmit herewith our final report summarizing the results of our preliminary traffic and revenue study for the proposed Triangle Parkway. The study was preliminary in nature, and not intended for use in support of actual project financing. More detailed studies would be required for that purpose.

Under its basic configuration, Triangle Parkway would extend approximately four miles, essentially extending the Durham Expressway from its current junction with I-40 to the new section of I-540 now under construction. An alternative would extend the project an additional 1.5 miles to a connection with McCrimmon Parkway.

The study made use of the most recent version of the Triangle Regional Travel Demand Model. WSA conducted extensive traffic counts and corridor reconnaissance. A toll sensitivity analysis was conducted, and traffic revenue forecast developed for three project alternatives, as described herein.

Our Project Manager, Mr. David Danforth, and other staff involved in the study gratefully acknowledge the valuable assistance received from NCTA, NCDOT, the GEC, HNTB Corporation, and State and local officials contacted during the course of this work. We sincerely appreciate the opportunity to perform this preliminary traffic and revenue study.

Respectfully submitted,

WILBUR SMITH ASSOCIATES

Edward J. Regan, III
Senior Vice President

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CHAPTER 1

INTRODUCTION

The proposed Triangle Parkway in the Raleigh-Durham area is one of several potential toll facility projects now under consideration by the North Carolina Turnpike Authority (NCTA). The primary objective of the study was to determine the extent to which tolls can be used to finance the proposed Parkway, and the amount of potential funding from other sources that might be needed to complete the project.

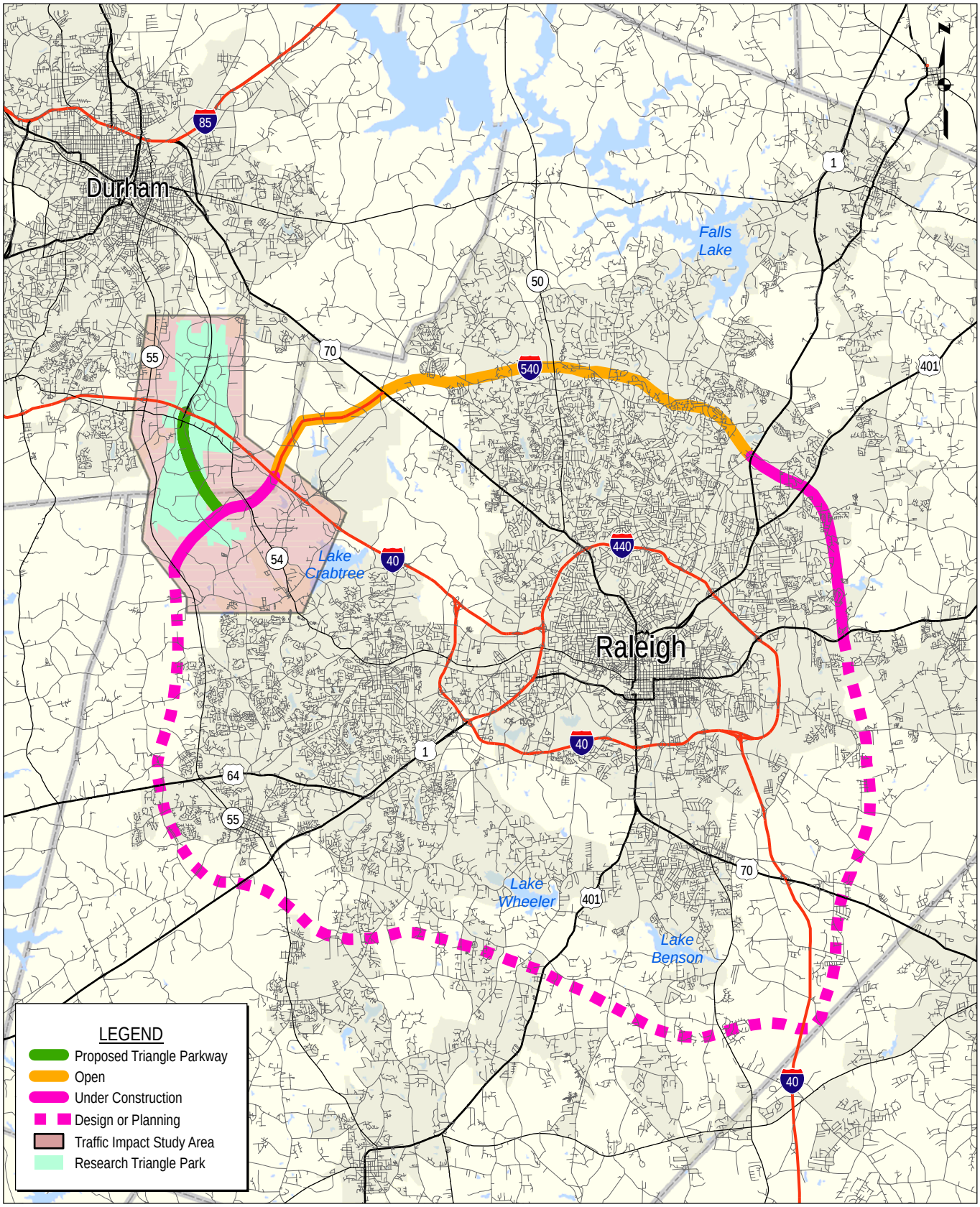
This preliminary traffic and revenue report is for the proposed Triangle Parkway in Durham and Wake Counties. The proposed toll road extends for approximately four miles south from the intersection of the Durham Freeway (NC 147) and I-40 to an interchange with I-540, which is presently under construction. It will have intermediate interchanges at Hopson Road and Davis Road. Opening year for the project will be 2010. Figures 1-1 and 1-2 depict the project location and its relationship to the surrounding transportation system.

The study was conducted at a preliminary feasibility study level, often 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, but it would not normally be used in direct support of project financing. Considerably more detailed, investment-grade traffic and revenue studies would be needed for that purpose.

SCOPE OF STUDY

The scope of services to conduct this study was approved by the North Carolina Turnpike Authority on December 2, 2005. The scope of work consists of seven tasks including:

- Task 1 – Data Collection and Mobilization;
- Task 2 – Traffic Model Development and Refinement;



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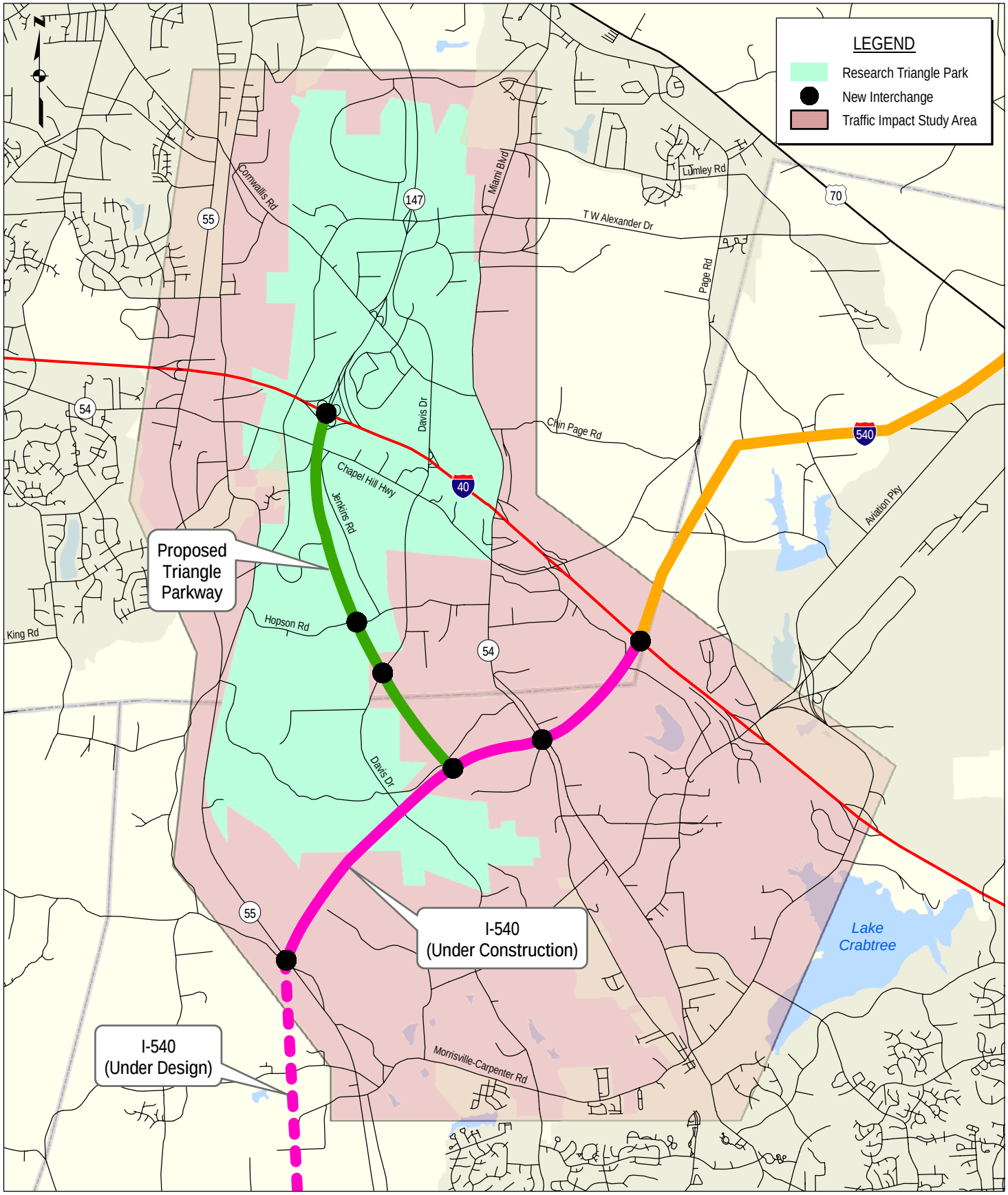
REGIONAL LOCATION MAP

FIGURE 1-1



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PROJECT LOCATION MAP

FIGURE 1-2

- Task 3 – Corridor Growth Review;
- Task 4 – Traffic and Revenue Analysis;
- Task 5 – Traffic Impact Assessment;
- Task 6 – Financial Feasibility Assessment; and
- Task 7 – Study Documentation and Coordination.

A more detailed discussion of each task follows.

TASK 1 – DATA COLLECTION AND MOBILIZATION

A kick-off meeting with NCTA and its General Engineering Consultant, HNTB Corporation staff was held early in the study. The purpose of the meeting was to thoroughly discuss the project, confirm project configurations and/or alternatives, refine the study work program and schedules, review anticipated deliverables, and establish lines of communication and documentation and other administrative items.

During this task, WSA staff conducted inventories of the corridor including speed and delay studies on all competing and complimentary routes within the traffic impact study area, as shown in Figure 1-2, plus other major feeder routes outside this area as needed. Information on the planned transportation improvement program, as might affect traffic and revenue potential on the Triangle Parkway were obtained and reviewed.

Previous reports and study material related to the proposed Triangle Parkway were obtained and reviewed. This information included previous traffic analysis and transportation model runs that had been prepared by the two Metropolitan Planning Organizations (MPOs) in the area, the Capital Area MPO (CAMPO) and the Durham-Chapel Hill-Carrboro MPO (DCHCMPO).

A supplemental traffic count program was undertaken in the project corridor. This information facilitated both the calibration of the travel demand model used in the analysis, as well as provide a strong "base case" count condition for use in the traffic impact analysis, described below in Task 5.

TASK 2 – TRAFFIC MODEL DEVELOPMENT AND REFINEMENT

The most recent version of the Triangle Regional Model (RTM) was obtained from the DCHCMPO. This extensive traffic model covers all of Wake, Durham, and Orange Counties as well as portions of Chatham, Johnston, Harnett, Granville, and Franklin Counties.

Data obtained for the RTM included highway networks and trip tables at 2002, 2005, 2010, 2015, 2020 and 2030 levels; and the underlying socio-economic forecasts for each year, by traffic analysis zone.

The base year model was calibrated in the immediate project area to get the best fit against observed traffic counts (obtained in Task 1). The model was also reviewed and updated, as required, to reflect both the proposed Triangle Parkway itself, as well as the I-540 Extension and other committed highway improvements.

A toll collection concept was developed in consultation with NCTA and HNTB staff. Appropriate zones or toll plazas were then included in the coding of the Triangle Parkway itself.

Information was also obtained regarding regional and corridor income characteristics to aid in the development of estimated values of time. This is a critical model parameter to be used in assessing motorists' willingness to pay tolls and in estimating toll sensitivity and optimum toll levels for the facility. Locally oriented vehicle operating cost parameters were also established.

This task also included the development/refinement of alternative future-year networks including further extensions of the I-540 project and other planned improvements, as required.

TASK 3 – CORRIDOR GROWTH ANALYSIS

Economic growth is particularly important for any new start-up toll facility such as the proposed Triangle Parkway. Given the strong nature of employment-related growth in this Research Triangle corridor, anticipated economic activity is particularly important.

The latest socioeconomic forecast developed by the MPOs and used in the model 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.

This task included a detailed review of the forecasts by major traffic zones or sectors within the project corridor. Aerial photographs were used to verify locations of existing major traffic generators to ensure proper centroid placement within the focused area of the travel demand model. In some cases traffic analysis zones contained in the RTM were determined to be too large to be used for an analysis to tolling in the corridor. Ac-

cordingly some traffic zones were disaggregated and new traffic model road links were established to reflect more closely travel behavior in the corridor.

TASK 4 – TRAFFIC AND REVENUE ANALYSIS

The refined models were used to run a series of traffic assignments, both with and without the proposed Triangle Parkway. 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 select link, corridor share and capture rate analytical evaluation techniques. In the base case assignments described above, wherever I-540 was included it was assumed to be a toll-free facility.

Toll sensitivity curves were developed at 2010 and 2030 levels to determine optimum toll levels. These optimum rates were then used to conduct the 2015 and 2020 traffic assignments.

Based on the results of the traffic modeling analysis, annual estimates of traffic and revenue on the proposed Triangle Parkway were developed for the base case condition from opening year in 2010 to 2030. The forecasts beyond 2030 were based on a simple extrapolation of modeling results from 2030.

The base case also assumed intermediate interchanges at Davis Drive and Hopson Road. In addition to the base case scenario described above, several sensitivity tests were performed. For each of these alternative conditions, an alternative set of revenue estimates were prepared for comparison to the base case.

Finally, in developing the 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 on new toll facilities. This reflects the fact that the full “stabilized” demand along a facility is not typically realized as soon as it opens, but gradually phases in over a period of two to four years.

TASK 5 – TRAFFIC IMPACT ASSESSMENT

Traffic impacts on various major routes within the Traffic Impact Study Area shown previously in Figure 1-2 were estimated. Impacts were determined by comparing the build vs. no-build assignment alternatives in 2010 and 2030. The build alternative was under a tolled condition, at the optimum toll levels. Any significant traffic impacts as a result of con-

struction of the facility were identified where typical weekday traffic at a competing or complimentary facility was impacted by at least 1,000 vehicles.

Information on traffic impacts was provided in a separate submittal.

TASK 6 – FINANCIAL FEASIBILITY ASSESSMENT

A very broad-brush financial feasibility assessment was undertaken to aid in estimating the extent to which tolls could be used to pay for the proposed Triangle Parkway project. Annual net revenues were determined by subtracting estimated operating and maintenance expenses from estimated toll revenues.

A generalized preliminary bonding capacity analysis was undertaken for the base case revenue forecasts and alternative scenarios. Bonding capacity under a traditional revenue bond arrangement was tested, together with alternative possible financing options, such as general obligation bonds or other arrangements.

It is emphasized that this was a very preliminary broad-brush financial analysis and was not intended to replace more extensive efforts which would be needed before actual project financing. The primary purpose was to determine any potential shortfalls in funding, which may need to be made up through state, local or federal sources.

TASK 7 – STUDY DOCUMENTATION AND COORDINATION

This task included development of the preliminary draft and final traffic and revenue study report as well as interim technical memoranda. In addition, a report of Interim Results was submitted and presented to the NCTA Board prior to submittal of the final report.

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 a preliminary financial assessment.

CHAPTER 2

EXISTING TRAFFIC CONDITIONS

A major part of the effort involved in this phase of the study included the collection of existing data to document the existing traffic conditions and travel behavior to:

- Understand the existing travel behavior as a context for the evolution of future travel behavior after the proposed Triangle Parkway is built, along with the other facilities planned for construction over the forecast period; and

- Calibrate the base year of the forecasting models to current/baseline observed conditions to assure the forecasting tools are adequately replicating current conditions in the study area prior to forecasting future levels.

To achieve these objectives, the latest corridor travel data on traffic speeds, traffic volumes, and vehicle type were compiled. In addition, WSA conducted extensive route reconnaissance and a review of all available traffic statistics on highways within the study area.

This current empirical documentation of the traffic network in the study area was augmented by WSA through the collection of available traffic trend data from NCDOT. All available information on programmed highway improvements scheduled in the study corridor were reviewed and incorporated into the analysis.

This chapter describes the collection of data used to characterize the operational performance of the existing competing facilities in the Triangle Parkway corridor. This approach is necessitated since the Triangle Parkway is not yet built, and the only available data to calibrate the travel models to be used are existing facilities which will compete with the proposed facility to accommodate corridor travel demand in the future.

EXISTING HIGHWAY SYSTEM

The proposed Triangle Parkway would facilitate traffic movement in a north-south direction between I-40 and I-540, which is presently under construction. It passes through or near major employment centers with the Research Triangle Park being the dominant location for employment in the corridor.

The Triangle Parkway would provide a new limited access link in an area currently served by the following major facilities:

- I-40 is the major east-west route in the Raleigh-Durham area. It extends from Wilmington on the coast across the State to the Tennessee line and provides access to major cites along its length. In the area of the project, I-40 is six and eight lanes with interchanges at I-540, Page Road, Miami Boulevard, Davis Drive, Durham Freeway (NC 147), and NC 55. Speed limits are 65 mph.

- NC 55 extends north-south along the western side of the study area with an interchange at I-40. Its cross section varies between two and five lanes with signalized and unsignalized intersections throughout its length. The majority of the road has a 45 mph speed limit.

- Durham Freeway (NC 147) provides north-south access from Durham to the Research Triangle Park. This four-lane facility presently terminates at I-40. The Triangle Parkway would extend this facility south as a toll road. Speed limits vary from 55 to 65 mph.

- Davis Drive serves the Research Triangle Park from north of I-40 through to the southern side of the Park and beyond. It currently has between two and five lanes with speed limits from 45 to 55. It will have an tolled interchange with the Triangle Parkway.

- Miami Boulevard provides north-south access in the corridor with an interchange at I-40. It has a five-lane cross section and a speed limit of 45 mph. It is generally signalized.

- Page Road provides east-west access to the corridor from an I-40 Interchange. On the southern side of I-40, it turns into Hopson Road, which would intersect with the Triangle Parkway. It has between three and five lanes with a speed limit of 45 mph.

- I-540 is part of a facility that eventually will provide an outer ring around Raleigh. The section north of I-40 is open. The section south of I-40 is under construction and will extend to NC 55 with more extensions around to I-40 south being planned. The Triangle Parkway would terminate at I-540. Speed limits are 65 mph for the existing section.

- NC 54 extends east-west from NC 55 and then turns south and becomes Miami Boulevard and Chapel Hill Road. It has between two and five lanes with a speed limit of 45 mph.

- Hopson Road is a continuation of Page Road. The section of the Triangle Park through which this road passes is less developed and the road's cross section is two lanes. It would have a tolled interchange with the Triangle Parkway.

TRAFFIC DATA

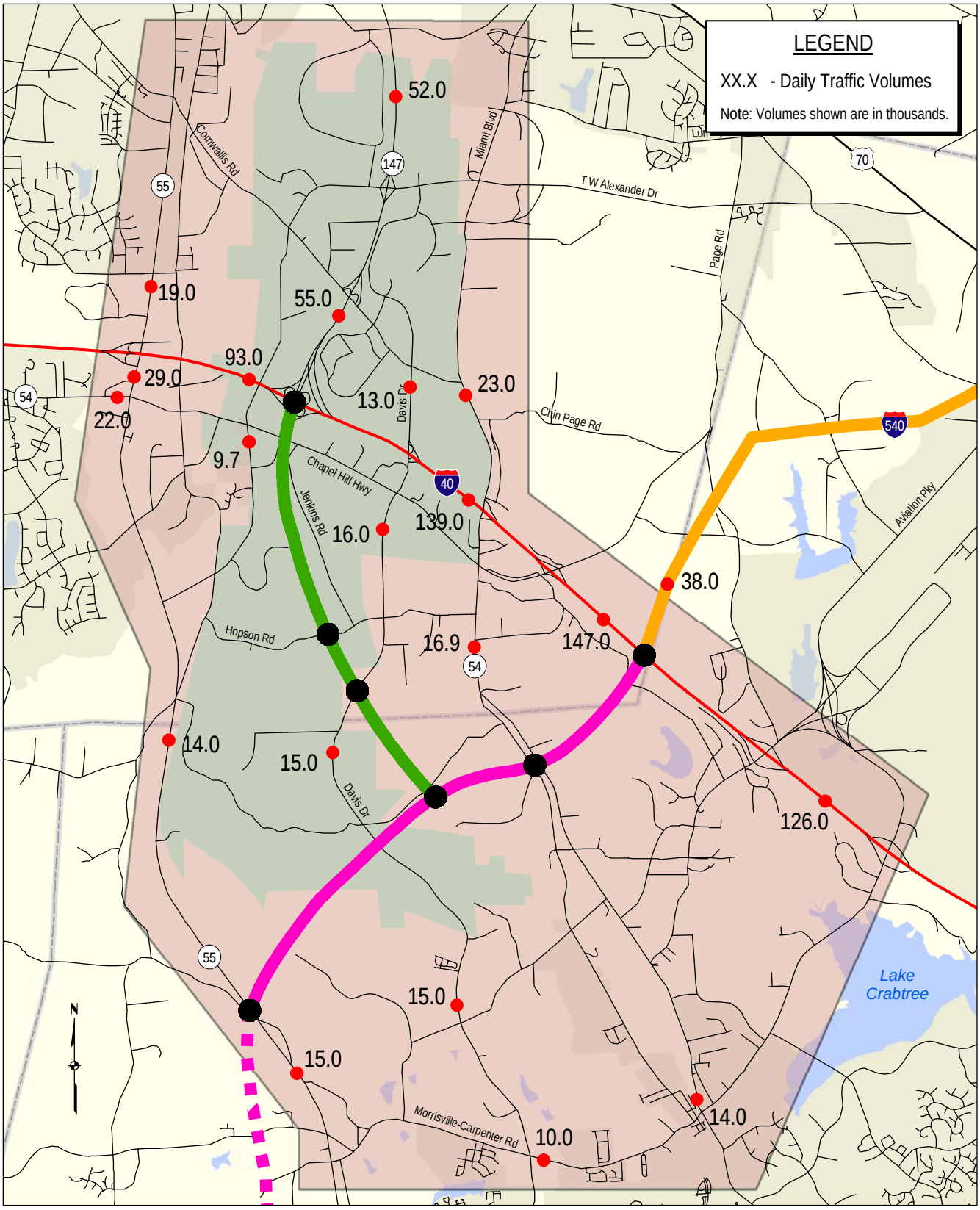
Existing traffic data from the NCDOT database and supplemental data from various reports were reviewed to aid in the traffic model calibration process. This information was then supplemented for this study by new traffic counts within the Triangle Parkway corridor and other key locations, conducted by WSA and our subconsultant, John Davenport Engineering.

DAILY TRAFFIC

Figure 2-1 provides a summary of daily counts within the corridor. All volumes are shown in thousands of vehicles. The dominant road within the study area is I-40 with daily volumes shown from 126,000 on the east to 147,000 west of the present interchange with I-540. To the west of the Durham Freeway, the daily I-40 traffic volumes were reported to be 93,000.

Major north-south traffic comes from several roads with a combined north-south volume just south of I-40 of 72,000 daily trips as indicated below:

- NC 55 29,000;
- TW Alexander 10,000;
- Davis Drive 16,000; and
- NC 54 17,000.



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DAILY TRAFFIC VOLUMES AT SELECTED STUDY AREA LOCATIONS (000)

FIGURE 2-1

Near the southern end of the corridor the daily traffic volumes for the three major roads are:

- NC 55 15,000;
- Davis Drive 15,000; and
- NC 54 14,000.

SUPPLEMENTAL TRAFFIC COUNTS

Traffic counts were obtained specifically for this study at the locations shown in Figure 2-2. The major purpose of this supplemental work was to obtain current traffic volumes at key locations as an aid in calibrating the RTM provided by the MPO's. The following types of counts were obtained:

- 7-day counts by day, hour, and vehicle class at three locations along a line north of the I-540 construction project;

- 48-hour counts by day, hour, and vehicle class on the ramps at four interchanges on I-40; and

- Intersection turning movement counts at ten key intersections.

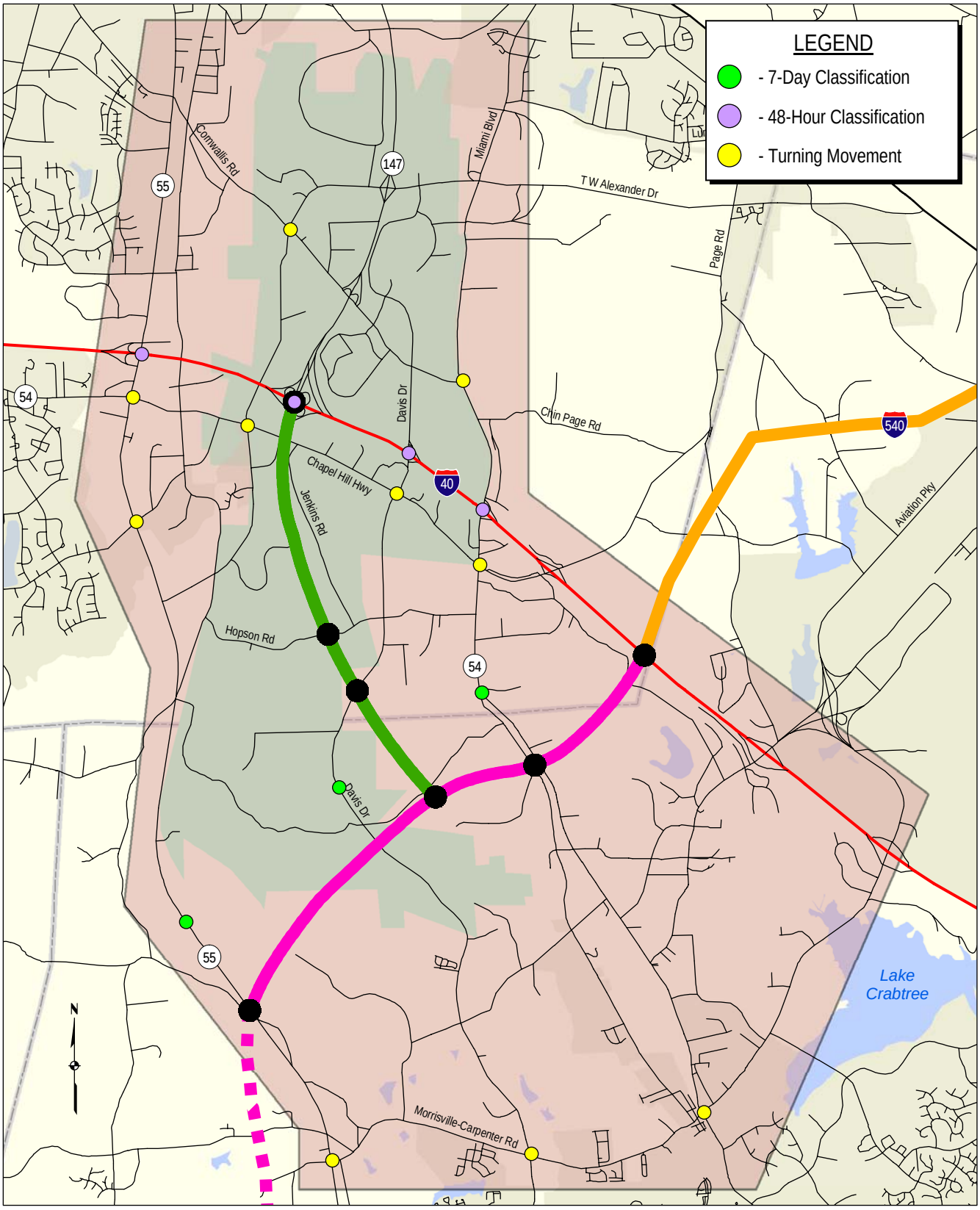
DAILY TRAFFIC VARIATIONS

The seven-day counts at the three locations indicated on Figure 2-2 provided important information used to estimate daily variations in traffic. Table 2-1 summarizes the daily variation, which illustrates the heavy commuter pattern of the corridor. As shown in the table, the weekday traffic represents between 118 and 133 percent of the average day of the week. The two weekend days were between 33 and 50 percent of the average day. The individual locations exhibit very similar patterns to the total.

HOURLY TRAFFIC VARIATIONS

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

- Morning Peak, 3 hours (7:00 to 10:00 a.m.) 23 percent;
- Midday Peak, 2 hours (Noon to 2:00 p.m.) 12 percent; and
- Afternoon Peak, 4 hours (4:00 to 8:00 p.m.) 32 percent.



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LOCATIONS OF SUPPLEMENTAL TRAFFIC COUNTS

FIGURE 2-2

Table 2-1
Daily Traffic Variations at Selected Locations
Proposed Triangle Parkway

	Daily Index (1)			
Day	**Davis Drive North of Kit Creek Road**	**NC 55 North of Alston Ave.**	**Miami Blvd. (NC 54) Between Surles Ct. and Emperor Blvd.**	**Screenline Total**
Sunday	36	30	31	33
Monday	119	126	114	118
Tuesday	124	122	121	123
Wednesday	128	109	127	124
Thursday	129	151	128	133
Friday	118	111	126	120
Saturday	46	51	52	50
Average Day	100	100	100	100

(1) Daily Index = Ratio of individual day's traffic to average daily traffic for the week.
SOURCE: WSA Counts in December 2005.

Table 2-2
Hourly Traffic Variations at Selected Locations
Proposed Triangle Parkway

	Percent of Total Day (7-day Counts)			
Beginning Hour	**Davis Drive North of Kit Creek Road**	**NC 55 North of Alston Ave.**	**Miami Blvd. (NC 54) Between Surles Ct. and Emperor Blvd.**	**Screenline Total**
0:00	1.0%	0.9%	1.0%	1.0%
1:00	0.5%	0.5%	0.7%	0.6%
2:00	0.2%	0.3%	0.3%	0.3%
3:00	0.2%	0.2%	0.2%	0.2%
4:00	0.1%	0.2%	0.2%	0.2%
5:00	0.2%	0.2%	0.3%	0.3%
6:00	1.2%	1.2%	1.1%	1.1%
7:00	4.4%	3.6%	3.9%	4.0%
8:00	9.6%	9.8%	7.3%	8.7%
9:00	10.8%	11.0%	8.4%	9.8%
10:00	7.6%	7.7%	5.7%	6.8%
11:00	4.3%	4.3%	4.9%	4.6%
12:00	4.8%	4.9%	6.5%	5.6%
13:00	5.5%	5.6%	7.2%	6.2%
14:00	4.9%	5.0%	5.8%	5.3%
15:00	4.7%	4.7%	5.7%	5.1%
16:00	5.9%	6.0%	6.1%	6.0%
17:00	8.9%	8.9%	8.9%	8.9%
18:00	9.4%	9.3%	11.5%	10.3%
19:00	6.9%	7.0%	5.9%	6.5%
20:00	3.5%	3.3%	3.3%	3.4%
21:00	2.3%	2.4%	2.2%	2.3%
22:00	1.8%	1.8%	1.6%	1.7%
23:00	1.4%	1.4%	1.2%	1.3%
Total Day	100.0%	100.0%	100.0%	100.0%

SOURCE: WSA Counts in December 2005.

VEHICLE CLASSIFICATIONS

As might be expected, passenger vehicles predominate in this heavy commuter corridor. Table 2-3 shows that nearly 98 percent of the vehicles counted over a 7-day period were passenger vehicles and light trucks such as pickups. Heavy trucks constituted about 2 percent of the vehicles.

Table 2-3
Vehicle Classifications at Selected Locations
Proposed Triangle Parkway

Location	Vehicle Type: Passenger Vehicles and Light Trucks	Vehicle Type: Heavy Trucks	Total Vehicles
Davis Drive North of Kit Creek Road	98.0%	2.0%	100.0%
NC 55 North of Alston Ave.	98.1%	1.9%	100.0%
Miami Blvd. (NC 54) Between Surles Ct. and Emperor Blvd.	97.6%	2.4%	100.0%
Screenline Total	97.9%	2.1%	100.0%

SOURCE: WSA Counts in December 2005.

SPEED AND DELAY ANALYSIS

Speed and delay runs using handheld global positioning system units were performed on key roads in the study area including:

- I-40 between Aviation Parkway and NC 55;
- NC 55 between Morrisville Carpenter Road and Cornwallis Road;
- TW Alexander Drive between NC 55 ant NC 147;
- Davis Drive between Morrisville Carpenter Road and Cornwallis Road;
- S. Miami Boulevard / Chapel Hill Road (NC 54) between TW Alexander Drive and Morrisville Carpenter Road;
- I-540 between I-40 and US 70;

- Cornwallis Road Between NC 55 and S. Miami Boulevard;
- NC 54 between NC 55 and Chapel Hill Road;
- Hopson Road between TW Alexander Drive and S. Miami Boulevard;
- McCrimmon Parkway between Davis Drive and Chapel Hill Road;
- Airport Boulevard between Chapel Hill Road and I-40;
- Morrisville Carpenter Road between NC 55 and Chapel Hill Road;
- Aviation Parkway between Chapel Hill Road and I-40; and
- Durham Expressway (NC 147) between I-40 and Ellis Road.

Runs were made during peak and off peak periods in order to provide information on average speeds for use in the traffic model. Speeds during off-peak periods were generally found to be up to the speed limits as listed earlier. However, during peak periods, the speeds were considerably lower particularly on I-40, I-540, Durham Expressway, and key north-south routes such as NC 55 and NC 54. Peak speeds on the limited access facilities were as low a 20 mph depending upon the direction of travel. On roads such as NC 55, the peak speeds were between 15 and 20 mph in contrast to off peak speeds up to the posted speed limits.

CHAPTER 3

CORRIDOR GROWTH REVIEW

Economic growth is particularly important for any new start-up toll facility such as the proposed Triangle Parkway. Given the strong nature of employment-related growth in this Research Triangle corridor, anticipated economic activity is particularly important.

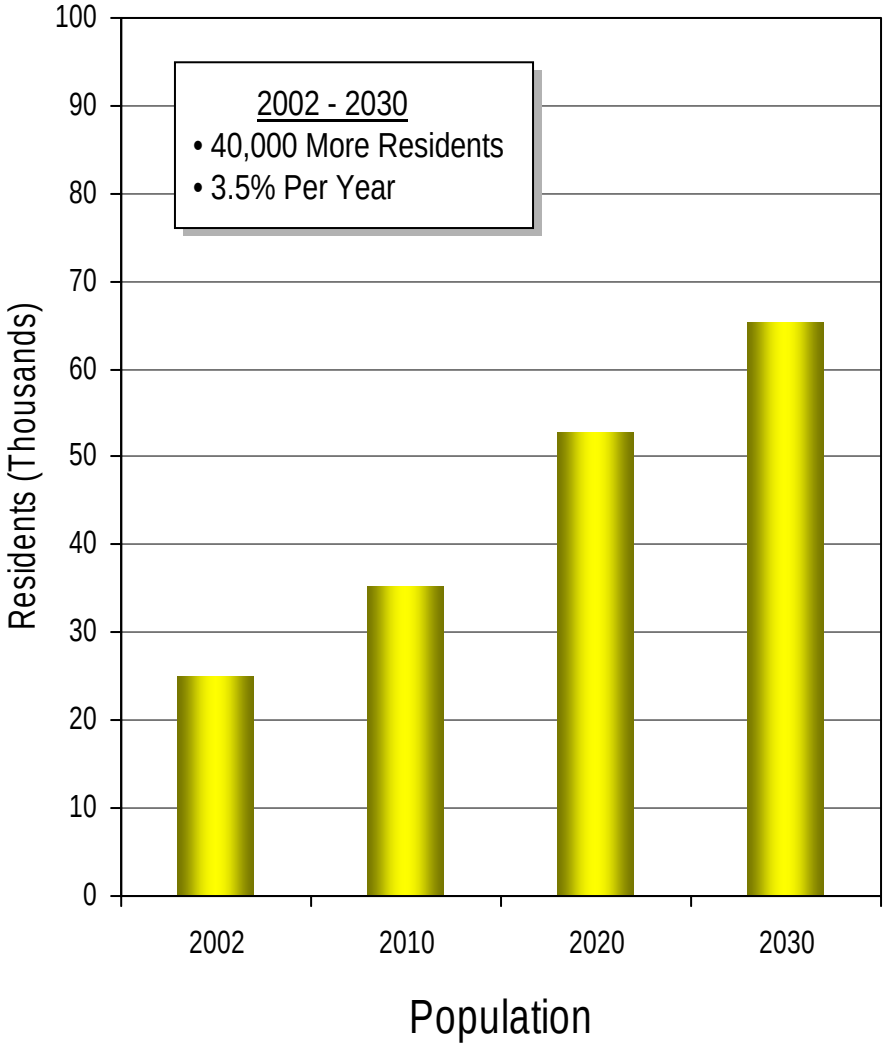
The latest socioeconomic forecast developed by the MPOs and used in the Regional Transportation Model (RTM) was used in the analysis. Since this was a preliminary traffic and revenue study, an independent economic analysis was not conducted; however, an independent economic analysis would be necessary for any later study that would be used in support of project financing.

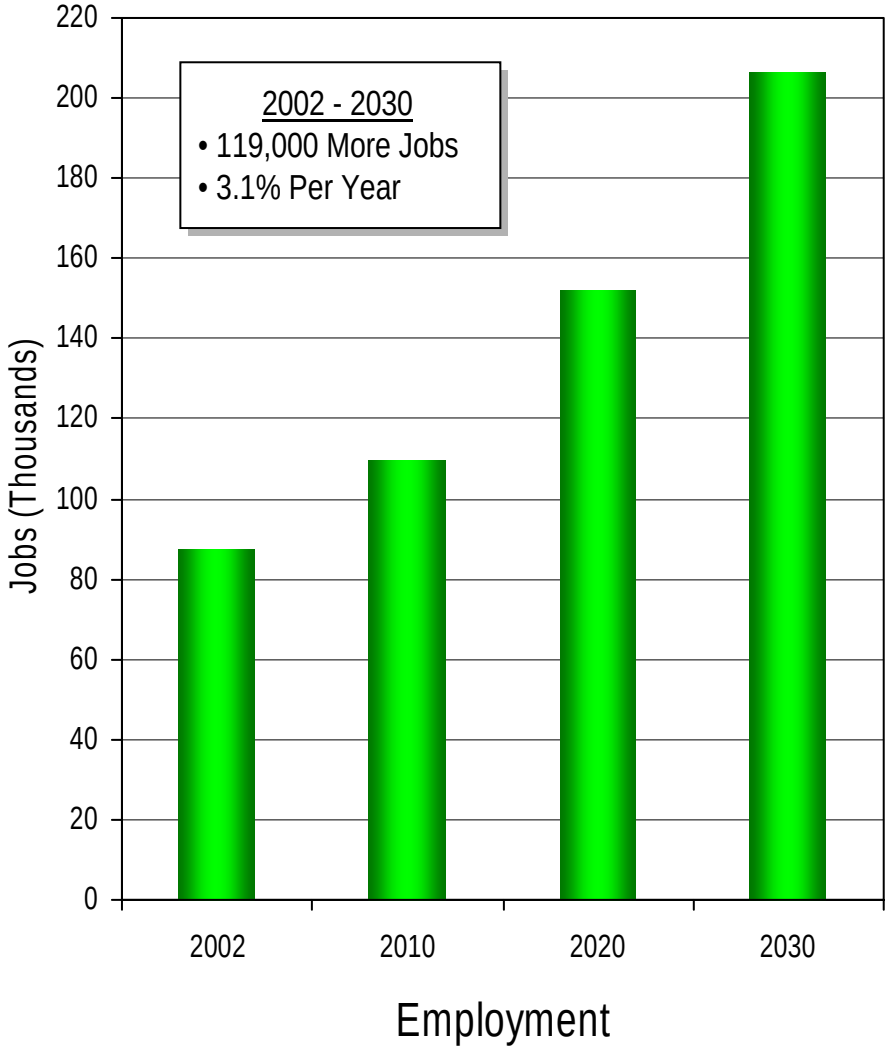
HISTORICAL GROWTH TRENDS

The population and employment within the Triangle Parkway corridor is expected to grow extensively over the next three decades. Within the study area, employment, according to forecasts contained in the RTM, is expected to grow from over 87,000 in 2002 to over 206,000 by 2030. Population over the same period is expected to grow from 25,000 to over 65,000. Figure 3-1 depicts this growth graphically.

This growth is very rapid and represents an average annual growth rate of 3.5 percent and 3.1 percent for population and employment, respectively. It is emphasized that the population and employment forecasts are contained in the RTM and directly relate to the model growth rates of traffic in the area.

For purposes of presentation of economic forecasts, the study area was divided into four quadrants based on the traffic analysis zones contained within the RTM. The northwest quadrant is generally to the west of the Durham Parkway and Davis Drive and extends to the Durham-Wake County line. The northeast quadrant extends eastwards nearly to Page





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STUDY AREA POPULATION AND EMPLOYMENT PROJECTIONS

FIGURE 3-1

Road and southward to the county line. The southwest quadrant extends south into Wake County to south of Morrisville-Carpenter Road. The southeast quadrant is in Wake County and extends to north of I-40 near the Raleigh-Durham Airport.

RESEARCH TRIANGLE PARK

The Research Triangle Park (RTP) covers much of the corridor, and the companies in the Park are major employers in the entire Triangle Region. The proposed Triangle Parkway would pass through the southern side of the Park, and employees of Park companies would be expected to be potential customers of the Parkway.

The RTP is approximately 7,000 acres with around two thirds of it lying south of I-40 and within the Triangle Parkway corridor. This southern portion is less developed than the northern section of RTP, and extensive growth is anticipated as the Park seeks to develop its remaining 1,100 acres.

The RTP reports that its corporate occupants have approximately 44,000 employees and contractors who work within the Park. This employment is expected to grow to 85,000 as the Park builds out its remaining space over the next 20 years.

Research Triangle Park operates on a “campus” basis with areas reserved as undeveloped buffers. As a result, the employment density is a relatively low 17 employees per acre on average. This density is in keeping with the Park’s intention of maintaining and fostering the “campus” atmosphere for its working conditions. This low employment density concept is expected to continue during the development of the remaining acreage of the RTP.

RTP officials provided additional insights on the Park’s operation and future development. The master plan for the southern portion of the RTP served as a guide in the refinement of the traffic model to locate appropriate feeder roads for each of the major development areas in the Triangle Parkway corridor. In addition, it was confirmed that the RTP provided input to the MPOs in the development of the future socioeconomic scenarios as contained in the Regional Traffic Model and that the socioeconomic forecasts reflect the anticipated growth in the southern section of the Park.

POPULATION FORECASTS

Table 3-1 summarizes population growth within the Triangle Parkway corridor and compares the corridor to the rest of the Triangle region.

In 2002, the Triangle region had approximately 1.1 million residents with 25,000 people (2.2 percent) residing within the Triangle Parkway corridor. By 2030, the regional population is forecast to grow to nearly 2.3 million people, and the corridor population will grow to 65,000. By that time the corridor share is expected to be 2.9 percent of the region which means that the corridor population is growing faster than the regional population. In fact the average annual growth rate for the corridor is expected to grow at 3.5 percent whereas the entire region is expected to grow at only 2.5 percent annually.

The growth rates in the Triangle Parkway corridor are significantly higher than the region throughout the time periods shown. For example, between 2010 and 2020 the Triangle Parkway corridor population is forecast to grow at an annual rate of 4.2 percent in comparison to the region's growth rate of 2.9 percent annually.

As shown in Table 3-1 and Figure 3-2, the southwestern quadrant of the Triangle Parkway corridor has the lowest population but is forecast to grow rapidly according to the model (12.2 percent annually between 2002 and 2007 and 12.7 percent annually between 2007 and 2010). The growth rate tapers in later years but during the study period of 2002 – 2030, the rate of growth in the southwestern quadrant is forecast to be 6.6 percent annually.

The northeast and southeast quadrants are also expected to grow rapidly with 3.6 percent and 3.7 percent annual growth forecast between 2002 and 2030, respectively.

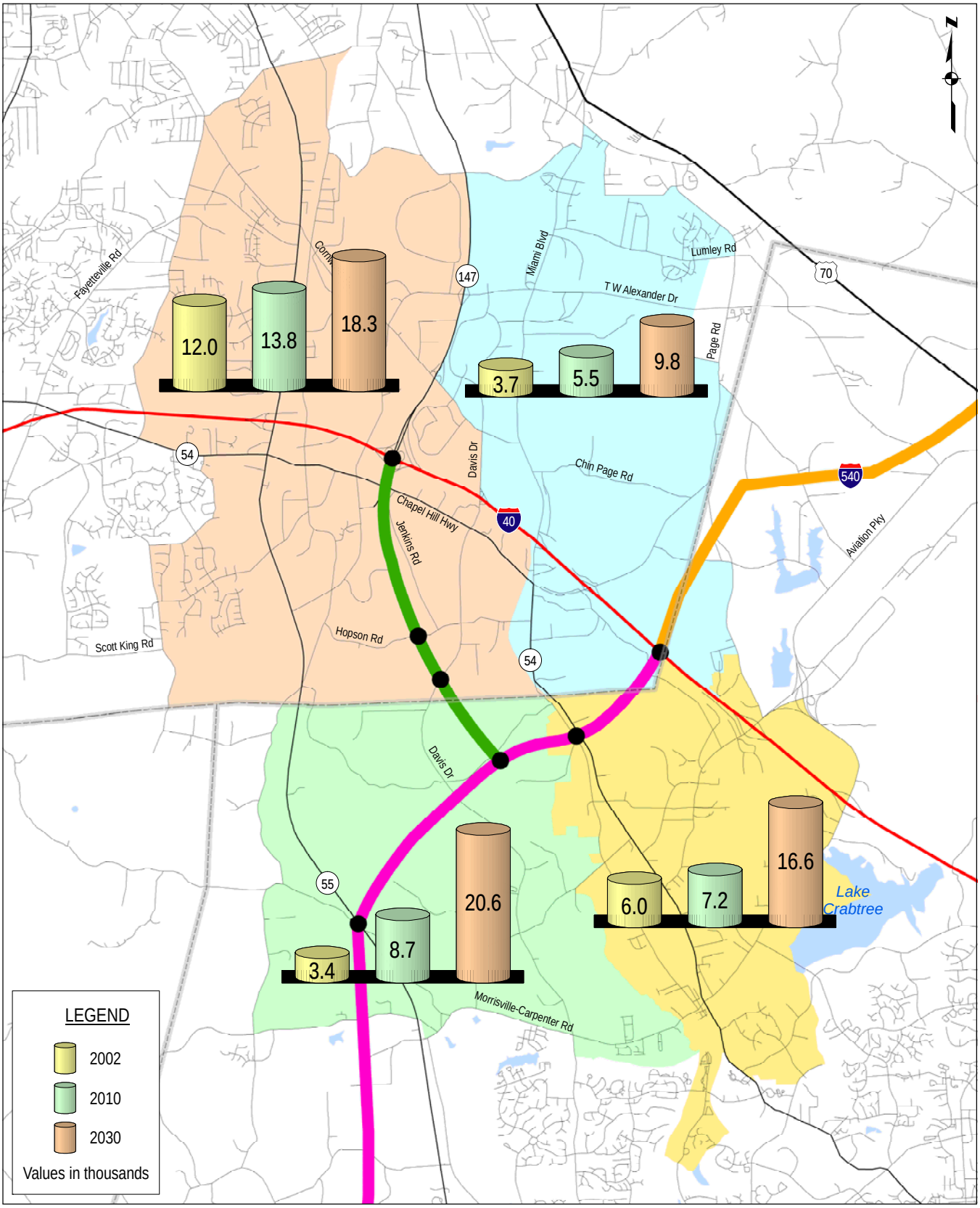
The northwest quadrant is shown to grow at a much lower rate which reflects the current mature population density of the area. Over the study period to 2030, this quadrant is expected to grow at only 1.5 percent annually.

Table 3-1
Study Area Population Projections
Proposed Triangle Parkway

Study Area Quadrant	2002	Average Annual Growth	2007	Average Annual Growth	2010	Average Annual Growth	2020	Average Annual Growth	2030	Average Annual Growth 2002-2030	Total Growth 2002-2030
Northwest	11,954	1.8%	13,094	1.7%	13,775	1.5%	16,059	1.3%	18,337	1.5%	53.4%
Northeast	3,705	5.3%	4,803	4.4%	5,460	3.4%	7,652	2.5%	9,843	3.6%	165.7%
Southwest	3,435	12.2%	6,104	12.7%	8,738	7.9%	18,627	1.0%	20,613	6.6%	500.1%
Southeast	5,996	2.2%	6,700	2.4%	7,197	3.9%	10,524	4.7%	16,600	3.7%	176.9%
Total Study Area Population	25,090	4.1%	30,701	4.6%	35,170	4.2%	52,862	2.2%	65,393	3.5%	160.6%
Percent of Triangle Region	2.2%		2.3%		2.5%		2.8%		2.9%		
Wake County	699,253	2.4%	788,357	2.8%	856,970	3.1%	1,160,658	1.8%	1,387,111	2.5%	98.4%
Durham County	235,007	1.9%	258,757	1.8%	273,080	1.6%	320,288	1.4%	366,512	1.6%	56.0%
Triangle Region Populaton	1,149,114	2.7%	1,315,142	2.9%	1,431,859	2.9%	1,901,600	1.8%	2,264,048	2.5%	97.0%

	Net Population Changes				
Study Area Quadrant	2002-2007	2007-2010	2010-2020	2020-2030	2002-2030
Northwest Change	1,140	681	2,284	2,278	6,383
Northeast Change	1,098	657	2,192	2,191	6,138
Southwest Change	2,669	2,634	9,889	1,986	17,178
Southeast Change	704	497	3,327	6,076	10,604
Total Study Area Population Change	5,611	4,469	17,692	12,531	40,303
Wake County Change	89,104	68,613	303,688	226,453	687,858
Durham County Change	23,750	14,323	47,208	46,224	131,505
Triangle Region Populaton Change	166,028	116,717	469,741	362,448	1,114,934

Source: Regional Transportation Model



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POPULATION GROWTH BY LOCATION

FIGURE 3-2

EMPLOYMENT FORECASTS

As shown in Table 3-2 and Figure 3-3, employment in the Triangle Parkway corridor area represented 14.8 percent of the region in 2002 and is expected to increase to 16.6 percent of the region by 2030. This growth from 87,000 employees in 2002 to nearly 207,000 employees in 2030 represents a 3.1 percent average annual growth rate in comparison to the regional growth rate of 2.7 percent per annum which is forecast to increase from 591,000 employees in 2002 to 1.2 million in 2030.

Within the corridor, the employment levels are expected to grow rapidly particularly in the southwest and southeast quadrant shown in Figure 3-3. The southwest quadrant, which contains the section of RTP with the most developable area, is expected to grow at or above double digit rates between 2002 and 2020 before leveling off. This high growth results in an estimated average annual growth of 8.4 percent between 2002 and 2030. The southeast quadrant is forecast to experience growth at an increasing rate over the study period. From 2002 to 2007, the growth rate in the transportation model is 2.7 percent annually, but it is expected to increase to 5.1 and 5.9 percent annually in the 2007-2010 and 2010-2020 periods, respectively. After 2020, the annual growth rate in the southeast quadrant is expected to grow at 8 percent annually for a total over the 2002-2030 time period of 6.2 percent per year.

NUMBER OF HOUSEHOLDS

The growth in the number of households in the corridor is related to the population growth as expected. Table 3-3 summarizes the households as contained in the RTM.

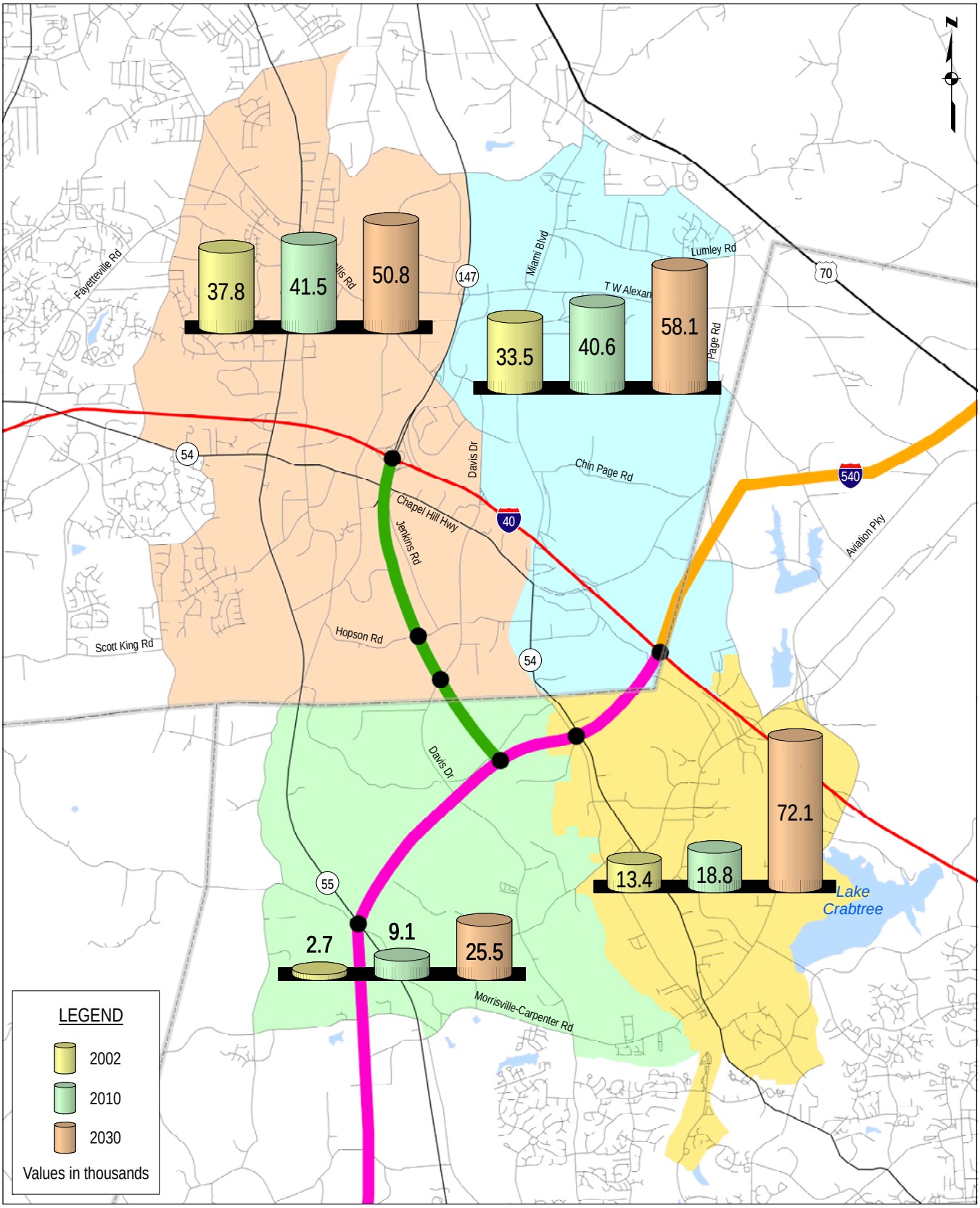
In 2002, the number of households in the corridor was estimated at nearly 11,000, which is a 2.2 percent share of the regional number of households. By 2030 the corridor is forecast to increase in households by nearly 28,000, which would be nearly 3 percent of the region's households. This growth rate of 3.4 percent annually between 2002 and 2030 is significantly higher than the 2.4 percent annual growth rate for the region.

Table 3-2
Study Area Total Employment Projections
Proposed Triangle Parkway

Study Area Quadrant	2002	Average Annual Growth	2007	Average Annual Growth	2010	Average Annual Growth	2020	Average Annual Growth	2030	Average Annual Growth 2002-2030	Total Growth 2002-2030
Northwest	37,800	1.2%	40,129	1.1%	41,522	1.1%	46,179	1.0%	50,834	1.1%	34.5%
Northeast	33,522	2.5%	37,913	2.3%	40,551	2.0%	49,338	1.7%	58,125	2.0%	73.4%
Southwest	2,672	16.6%	5,762	16.3%	9,066	9.8%	23,174	1.0%	25,488	8.4%	853.9%
Southeast	13,366	3.9%	16,221	5.1%	18,837	5.9%	33,384	8.0%	72,052	6.2%	439.1%
Total Study Area Employment	87,360	2.7%	100,025	3.2%	109,976	3.3%	152,075	3.1%	206,499	3.1%	136.4%
Percent of Triangle Region	14.8%		14.5%		14.5%		14.9%		16.6%		
Wake County	358,265	3.3%	420,635	3.9%	471,140	3.3%	654,758	2.2%	810,065	3.0%	126.1%
Durham County	159,240	2.8%	183,205	2.6%	197,697	2.1%	243,303	1.7%	288,409	2.1%	81.1%
Triangle Region Employment	591,389	3.1%	688,613	3.4%	760,664	3.0%	1,019,561	2.0%	1,244,214	2.7%	110.4%

	Net Employment Changes				
Study Area Quadrant	2002-2007	2007-2010	2010-2020	2020-2030	2002-2030
Northwest Change	2,329	1,393	4,657	4,655	13,034
Northeast Change	4,391	2,638	8,787	8,787	24,603
Southwest Change	3,090	3,304	14,108	2,314	22,816
Southeast Change	2,855	2,616	14,547	38,668	58,686
Total Study Area Employment Change	12,665	9,951	42,099	54,424	119,139
Wake County Change	62,370	50,505	183,618	155,307	451,800
Durham County Change	23,965	14,492	45,606	45,106	129,169
Triangle Region Employment Change	97,224	72,051	258,897	224,653	652,825

Source: Regional Transportation Model



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EMPLOYMENT GROWTH BY LOCATION

FIGURE 3-3

Table 3-3
Study Area Total Household Projections
Proposed Triangle Parkway

Study Area Quadrant	2002	Average Annual Growth	2007	Average Annual Growth	2010	Average Annual Growth	2020	Average Annual Growth	2030	Average Annual Growth 2002-2030	Total Growth 2002-2030
Northwest	5,350	1.8%	5,855	1.7%	6,160	1.5%	7,173	1.3%	8,182	1.5%	52.9%
Northeast	1,615	5.3%	2,090	4.4%	2,375	3.4%	3,323	2.5%	4,272	3.5%	164.5%
Southwest	1,423	12.1%	2,518	12.6%	3,593	7.8%	7,647	1.0%	8,459	6.6%	494.4%
Southeast	2,585	2.1%	2,871	2.3%	3,077	3.7%	4,441	4.5%	6,927	3.6%	168.0%
Total Study Area Number of Households	10,973	4.0%	13,334	4.5%	15,205	4.0%	22,584	2.1%	27,840	3.4%	153.7%
Percent of Triangle Region	2.2%		2.3%		2.4%		2.7%		2.9%		
Wake County	288,913	2.4%	325,638	2.8%	353,870	3.1%	478,690	1.8%	572,549	2.5%	98.2%
Durham County	111,833	1.9%	122,871	1.8%	129,540	1.6%	151,478	1.3%	172,998	1.6%	54.7%
Triangle Region Number of Households	505,857	2.6%	576,139	2.8%	625,152	2.8%	821,364	1.7%	973,214	2.4%	92.4%

Net Changes in Number of Households

Study Area Quadrant	2002-2007	2007-2010	2010-2020	2020-2030	2002-2030
Northwest Change	505	305	1,013	1,009	2,832
Northeast Change	475	285	948	949	2,657
Southwest Change	1,095	1,075	4,054	812	7,036
Southeast Change	286	206	1,364	2,486	4,342
Total Study Area Number of Households Change	2,361	1,871	7,379	5,256	16,867
Wake County Change	36,725	28,232	124,820	93,859	283,636
Durham County Change	11,038	6,669	21,938	21,520	61,165
Triangle Region Number of Households Change	70,282	49,013	196,212	151,850	467,357

Source: Regional Transportation Model

The highest growth rate in the number of households is expected to be in the southwest quadrant of the corridor with 6.6 percent annual growth between 2002 and 2030.

HOUSEHOLD INCOME

Average household incomes by location are summarized in Table 3-4. All of values shown are in 2002 dollars. In 2002, the average household income in the region covered by the Triangle Transportation Model was $54,411. The Triangle Parkway corridor area in contrast had a higher average household income that was 3.4 percent higher at $56,823. Of the four quadrants depicted earlier, all except the southeast quadrant had higher average incomes than the region. However, by 2030, the forecast average household income in the corridor is assumed in the model to be very similar to the regional average.

ADJUSTMENTS TO REGIONAL TRANSPORTATION MODEL

As discussed earlier, this study relied upon the socioeconomic forecasts contained within the RTM without adjustments that might have occurred had an independent economic review been performed as would be the case for an investment-grade study. For this preliminary traffic and revenue study, the socioeconomic forecasts were not adjusted.

However, the review of the structure and size of the transportation analysis zones (TAZs) contained in the model revealed that certain zones along the corridor were not adequate to provide reliable estimates of traffic through proposed toll plazas and from zones particularly in the southwest quadrant of the study area. As shown earlier, this quadrant has relatively low levels of economic activity in comparison to other quadrants but is expected to grow significantly as the area is developed. In effect, certain zones were deemed to be too large geographically to reflect traffic at the level of detail necessary for the traffic and revenue analysis.

Accordingly, certain zones in the southern end of the corridor were disaggregated into multiple zones. These new zones were coded into the network, and the original trip tables from the model were disaggregated on the basis of assumed employment levels within the disaggregated zones. This procedure is considered to be appropriate at this level of preliminary study. However, under an investment-grade study in support of potential project financing, both the underlying socioeconomic assumptions would

have to be reviewed independently and the transportation model modified accordingly to reflect the finer level of zone detail.

Table 3-4
Study Area Total Household Income
Proposed Triangle Parkway
2002 Dollars

Study Area Quadrant	2002	2007	2010	2020	2030
Northwest	$54,879	$54,620	$54,585	$54,457	$54,379
Northeast	60,510	59,425	59,215	59,129	59,332
Southwest	62,029	62,732	63,231	65,405	65,928
Southeast	53,384	53,693	54,078	53,696	53,635
Total Study Area	56,283	56,706	57,249	58,702	58,463
Percent of Triangle Region	103.4%	102.1%	102.2%	102.6%	101.0%
Wake County	58,157	59,104	59,486	60,233	60,650
Durham County	49,140	50,407	50,987	52,497	53,486
Total Triangle Region	54,411	55,529	56,042	57,234	57,899

Source: Regional Transportation Model

SOCIOECONOMIC CONCLUSIONS

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

In general, the study area is forecast to exhibit extremely strong economic growth based on the socioeconomic forecasts contained in the RTM. A prudent observer would therefore want to confirm if these basic socioeconomic growth rates can be sustained. As this study is considered to be preliminary in nature and not to be used in support of project financing, the socioeconomic forecasts (as well as other parameters and techniques) will be subject to considerable review in a later investment-grade study.

CHAPTER 4

TRAFFIC AND REVENUE ANALYSIS

Chapter 4 presents a summary of the traffic and revenue analysis conducted for the proposed Triangle Parkway. In addition to an overview of the travel demand modeling process, this chapter also presents information on the regional highway improvement program, certain basic assumptions upon which the traffic and revenue forecasts are based, a toll rate sensitivity analysis, traffic and revenue forecasts and a preliminary bonding analysis for the proposed Parkway. Finally, a limited number of sensitivity tests are also presented, which are intended to estimate the potential impact of certain hypothetical changes from basic assumptions used in this analysis.

TRAFFIC MODEL DEVELOPMENT AND REFINEMENT

The two Metropolitan Planning Organizations in the region maintain a RTM that was used for this preliminary traffic and revenue analysis. This model was used by the MPO's for the development of the Region's 2030 Transportation Plans, and contains all future highway projects identified in the plans.

Certain refinements and adjustments were made to the original model in order to provide appropriate information for the specific corridor being analyzed. This section describes the model refinement process.

This model was originally developed jointly by the Capital Area MPO, Durham Chapel Hill Carrboro MPO, North Carolina Department of Transportation and the Triangle Transit Authority. WSA obtained all model inputs for the base year of 2002, 2010, 2020 and 2030, including socioeconomic data, highway networks, trip tables, and specialized modeling software.

The networks were reviewed for future highway improvements and compared with the Transportation Improvement Plan and Long Range Plans developed by the two MPO's. Special attention was paid to the Triangle Parkway Corridor. Detailed coding was added to the Triangle Parkway to represent the interchanges and toll plaza locations.

As discussed in Chapter 3, some of the Traffic Analysis Zones (TAZ's) were disaggregated into smaller TAZ's to allow for a better representation of the roadway system within the corridor. Trip tables were disaggregated accordingly to fit the new zone structure.

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

After the best possible calibration was obtained, a series of traffic assignments were made at the future years of 2010, 2015, 2020 and 2030 under no build, a toll free Triangle Parkway and the Parkway tolled. Several toll rates were tested for the years 2010 and 2030 in order to estimate the optimum toll rates.

BASIC ASSUMPTIONS

These preliminary traffic and revenue estimates for the Triangle Parkway are predicated on the following basic assumptions, which are considered reasonable for purposes of this preliminary analysis:

1. Triangle Parkway would be opened to traffic by January 1, 2010;

2. The existing southern terminus of NC 147 at TW Alexander Drive would be closed when the Parkway was completed;

3. Improvements in the current Transportation Improvement Program, including some widening of competing routes and, by 2030, HOV lanes on I-40 were assumed to be implemented;

4. I-540 is assumed to be completed as a toll-free facility between I-40 and NC 55, prior to the opening of Triangle Parkway;

5. Other portions of I-540 are assumed to be completed as follows, for purposes of these scenarios:

   - 2010 – only to NC 55;
   - 2015 – to U.S. Route 64; and
   - 2020 – to NC 55 (south);

6. Toll rates and tolling zone locations would be as shown later in this chapter;

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

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

9. Economic growth in the project corridor, and associated travel demand will be as represented in the Triangle Transportation Model provided to WSA for use in this analysis;

10. For purposes of this study, it has been assumed that inflation will average 2.5 percent per year;

11. Operating costs for toll collection are included in net revenue estimates; however, roadway maintenance and rehabilitation costs have not been included;

12. The Triangle Parkway will be well maintained, efficiently operated, effectively signed, and promoted to encourage maximum usage.; and

13. Motor fuel will 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 Triangle Parkway.

ROADWAY IMPROVEMENTS

The actual traffic that will use the Parkway in the future will be heavily influenced by the other roadway improvements that will affect people's future travel behavior. The process of transportation project development and funding makes it impossible to know with certainty which transportation improvements will happen when. However, it is important that reasonable assumptions be made regarding future improvements, since such improvements could have a considerable effect on project traffic volumes.

The RTM contains all future highway improvements listed in the region's 2030 transportation plans. A list of planned road improvements considered to be potentially important to traffic on the Triangle Parkway project is provided in Table 4-1. The most significant of these improvements include:

- **2010**
  - I-540 to NC 55;
  - Widening of Alexander Drive, Davis Drive, NC 55;

- **2015**
  - I-540 to U.S. Route 64;

- **2020**
  - I-540 to NC 55 (south);
  - Other new roads – Airport Blvd. Extension., McCrimmon Parkway from Airport Blvd. to Aviation Parkway and from Davis Drive to NC 55, New section from US 70 to Leesville Rd. for T.W. Alexander;
  - Widening of Alexander Drive, Davis Drive, McCrimmon Parkway, Morrisville Parkway, NC 54;

- **2030**
  - I-540 – NC 55 Bypass to I-40 South;
  - I-40 –Widening and HOV/HOT Lanes;
  - Other new roads – Extensions of Kit Creek Road, extensions of McCrimmon Parkway; and
  - Widening of Morrisville Carpenter Road, NC 147, NC 54.

Table 4-1
Major Highway Improvements by Year of Implementation
Proposed Triangle Parkway

Name and Location	Project Description	Model Year
Alexander Drive	NC 147 to Miami Blvd., 2-lane to 4-lane	2010
Alexander Drive	Cornwallis Rd. to NC 147, 2-lane to 4-lane divided	2010
Davis Drive	NC 54 to Wake County line, 2-lane to 4-lane divided	2010
Davis Drive	Morrisville - Carpenter Rd. to Farm Pond Rd., 2-lane to 4-lane	2010
Davis Drive	Morrisville - Carpenter Rd. to Durham Co. line, 2-lane to 4-lane	2010
I-40	NC 147 to Wake Co. line, 6-lane freeway to 8-lane freeway	2010
I-40	US 15-501 to NC 147, 4-lane freeway to 6-lane freeway	2010
I-540	I-40 to NC 55 north, new 6-lane freeway	2010
Louis Stephens Drive	Hopson Rd. to Wake Co. line, new 2-lane	2010
Louis Stephens Drive Extension	Morrisville Parkway to High House Rd., new 2-lane	2010
NC 54/Page Road	Davis Dr. to Miami Blvd., 2-lane to 4-lane divided	2010
NC 55	Cornwallis Rd. to Wake Co. line, 2-lane to 4-lane divided	2010
NC 55	Carpenter Fire Station Rd. to Durham Co. line, 2-lane to 4-lane	2010
NC 55	Carpenter Fire Station Rd. to High House Rd., 2-lane to 4-lane	2010
NC 55	High House Rd. to US 64, 2-lane to 4-lane	2010
NC 55	Holly Springs Bypass to Wake Chapel Rd., 2-lane to 4-lane	2010
NC 55 (Alston Avenue)	NC 147 to NC 98, 2-lane to 4-lane divided	2010
Northeast Creek Parkway	Cornwallis Rd. to Ellis Rd., new 2-lane	2010
S.W. Durham Parkway	Watkins Rd. (old Chapel Rd. to US 15-501, 2-lane to 4-lane divided	2010
I-540, Western Wake Expressway	NC 55 to US 64, new 6-lane freeway	2015
Airport Boulevard Extension	NC 54 to Davis Dr., new 4-lane	2020
Alexander Drive	NC 54 to NC 55, 2-lane to 4-lane divided	2020
Alexander Drive	NC 54 to Cornwallis Road, 2-lane to 4-lane divided	2020
Davis Drive	Farm Pond Rd. to US 64, 2-lane to 4-lane	2020
I-540 Western Wake Expressway	NC 55 to US 1, new 6-lane freeway	2020
I-540 Western Wake Expressway	US 1 to NC 55 Bypass, new 6-lane freeway	2020
I-540, Western Wake	NC 64 to NC 55 south, new 6-lane freeway	2020
McCrimmon Parkway	Airport Blvd. to Town Hall Dr., 2-lane to 4-lane	2020
McCrimmon Parkway	Airport Blvd. to Aviation Pky, new 4-lane	2020
Morrrisville Parkway	Davis Dr. to NC 55, 2-lane to 4-lane	2020
NC 54	Miami Blvd. to Wake Co. line, 2-lane to 4-lane divided	2020

(continued)

Table 4-1 (cont'd.)
Major Highway Improvements by Year of Implementation
Proposed Triangle Parkway

Name and Location	Project Description	Model Year
NC 54	I-40 interchange to NC 55, 2-lane to 4-lane divided	2020
NC 54	I-40 to Barbee Chapel Rd, 4-lane to 6-lane divided	2020
NC 54	N.W. Maynard Rd. to South of Cary Parkway, 2-lane to 4-lane	2020
NC 54	MCCrimmon Parkway to Durham Co. line, 2-lane to 4-lane	2020
T.W. Alexander Drive	US 70 to Leesville Rd, new 4-lane	2020
I-40	County line to NC 86, 4-lane freeway to 6-lane freeway	2030
I-40 HOV	County line to NC 86, new HOV lane	2030
I-40 HOV/HOT	Durham Co. line to I-440/US 64, HOV/HOT lane	2030
I-40 HOV/HOT	I-440/US 64 to Johnston Co., HOV/HOT lane	2030
I-540 Southern Wake Expressway	NC 55 Bypass to US 401 South, new 6-lane freeway	2030
I-540 Southern Wake Expressway	401 South to I-40 South, new 6-lane freeway	2030
I-540 Southern Wake Expressway	NC 55 south to I-40, new 6-lane freeway	2030
Kit Creek Road	NC 55 to Green Level to Durham, new 4-lane	2030
Kit Creek Road	Davis Dr. to NC 54, 2-lane to 3-lane	2030
Louis Stephens Drive Extension	Durham Co. line to O'Kelly Chapel Rd, 2-Lane to 4-lane	2030
McCrimmon Parkway Extension	Townhall Dr. to Louis Stevens Rd., 2-lane to 4-lane	2030
McCrimmon Parkway Extension	Louis Stevens Rd. to NC 55, new 4-lane	2030
McCrimmon Parkway Extension	NC 55 to I-540, 2-lane to 4-lane	2030
McCrimmon Parkway Extension	I-540 to Green Level to Durham, new 4-lane	2030
McCrimmon Parkway Extension	Green Level to Durham to Durham Co. line, new 2-lane	2030
Morrisville - Carpenter Road	NC 54 to Davis Dr., 2-lane to 4-lane	2030
Morrisville - Carpenter Road	Davis Dr. to NC 55, 2-lane to 4-lane	2030
NC 147	Alston Ave. to I-40, 4-lane freeway to 6-lane freeway	2030
NC 54	Cary Parkway to MCCrimmon Pkwy., 2-lane to 4-lane	2030
Triangle Parkway - NC54 Connector	Triangle Parkway to Morrisville - Carpenter Rd., new 4-lane	2030

Source: North Carolina Capital Area Metropolitan Planning Organization, 2030 Long Range Transportation Plan, September, 15, 2004
Durham-Chapel Hill-Carrboro Metropolitan Planning Organization, FY 2006-2012 MetropolitanTransportation Improvement Program, August 10, 2005

TOLL SCENARIOS

A series of traffic and revenue forecasts for three alternative scenarios were prepared as described below and illustrated in Figure 4-1:

- **Scenario 1, Base Case**
  - Triangle Parkway will become operational in 2010 from I-40 to I-540. I-540 will extend from I-40 to NC 55;
  - The Parkway will have interchanges at I-40, Hopson Road, Davis Road, and I-540;
  - I-540 will not be tolled;
  - For purposes of this initial analysis, it is assumed that both electronic tolling and cash options will be provided at each toll plaza;
  - The Parkway will have one mainline tolling zone between I-40 and Hopson Road;
  - The interchanges at Hopson and Davis will have ramp tolls to and from the south. The Hopson Road and Davis Road Interchanges will be separated;

- **Scenario 2**
  - The second scenario will be similar to Scenario 1 except that it will have frontage roads between Hopson Road and Davis Road. This scenario reduces the number of ramp tolling locations from two in each direction to one in each direction; and

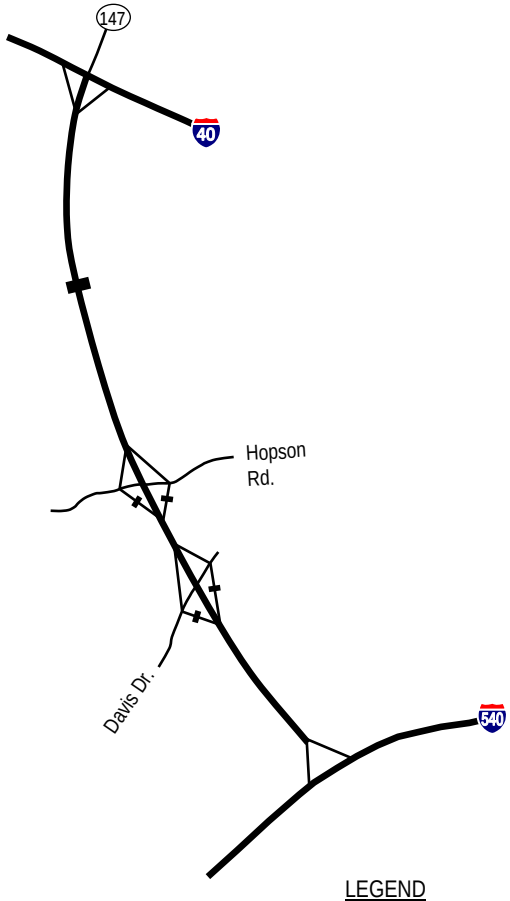
- **Scenario 3** [1]
  - The third scenario is the same as Scenario 2 except that the Triangle Parkway is extended south from I-540 to McCrimmon Parkway. This scenario is not in the current NCTA plan. However, this scenario was analyzed simply as a sensitivity test to determine potential local revenue impacts of providing improved access to the southern end of the corridor. For this reason, the scenario did not provide for access to and from I-540 via the extension to McCrimmon Parkway.

TOLL SENSITIVITY

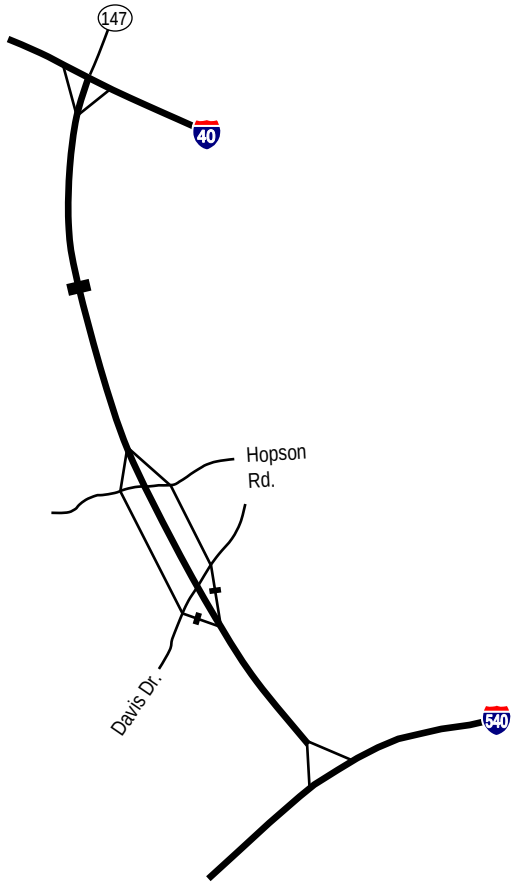
A series of alternative toll rates were tested from 2010, the assumed opening-year of the Triangle Parkway, through 2030. The results of the toll

[1] Scenarios 1 and 2 are so similar, that only one test of the extension to McCrimmon Parkway was conducted, Scenario 3. A hypothetical extension to McCrimmon Parkway using the Scenario 1 configuration was not tested.

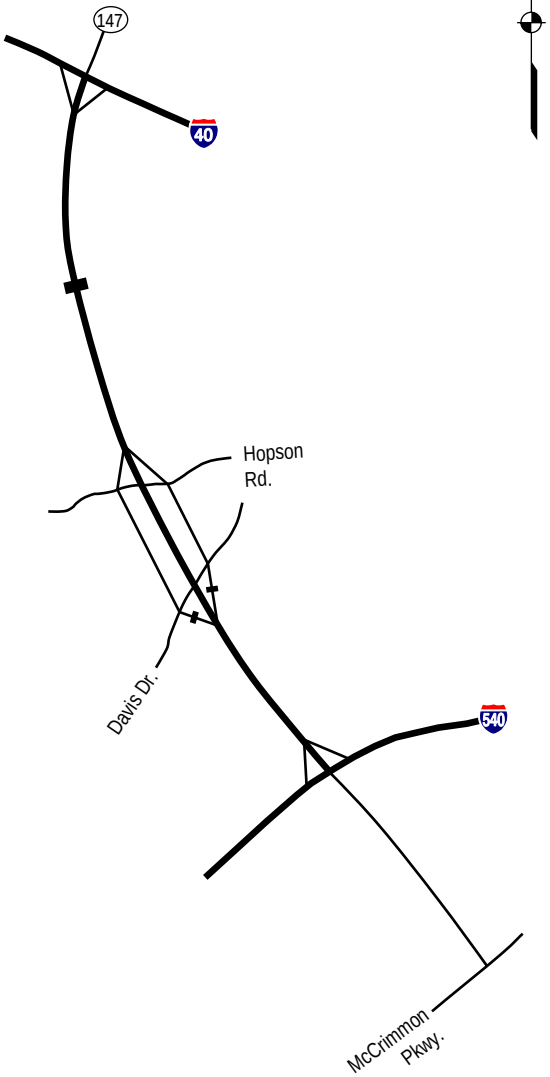
Scenario 1
Interchanges at
Hopson Rd. and Davis Dr.



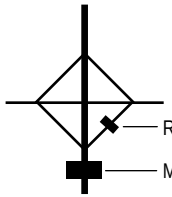
Scenario 2
Split Interchange at Hopson Rd.
and Davis Dr. with Frontage Roads



Scenario 3
Split Interchange With
Extension to McCrimmon Pkwy.



LEGEND



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TOLL SCENARIOS

FIGURE 4-1

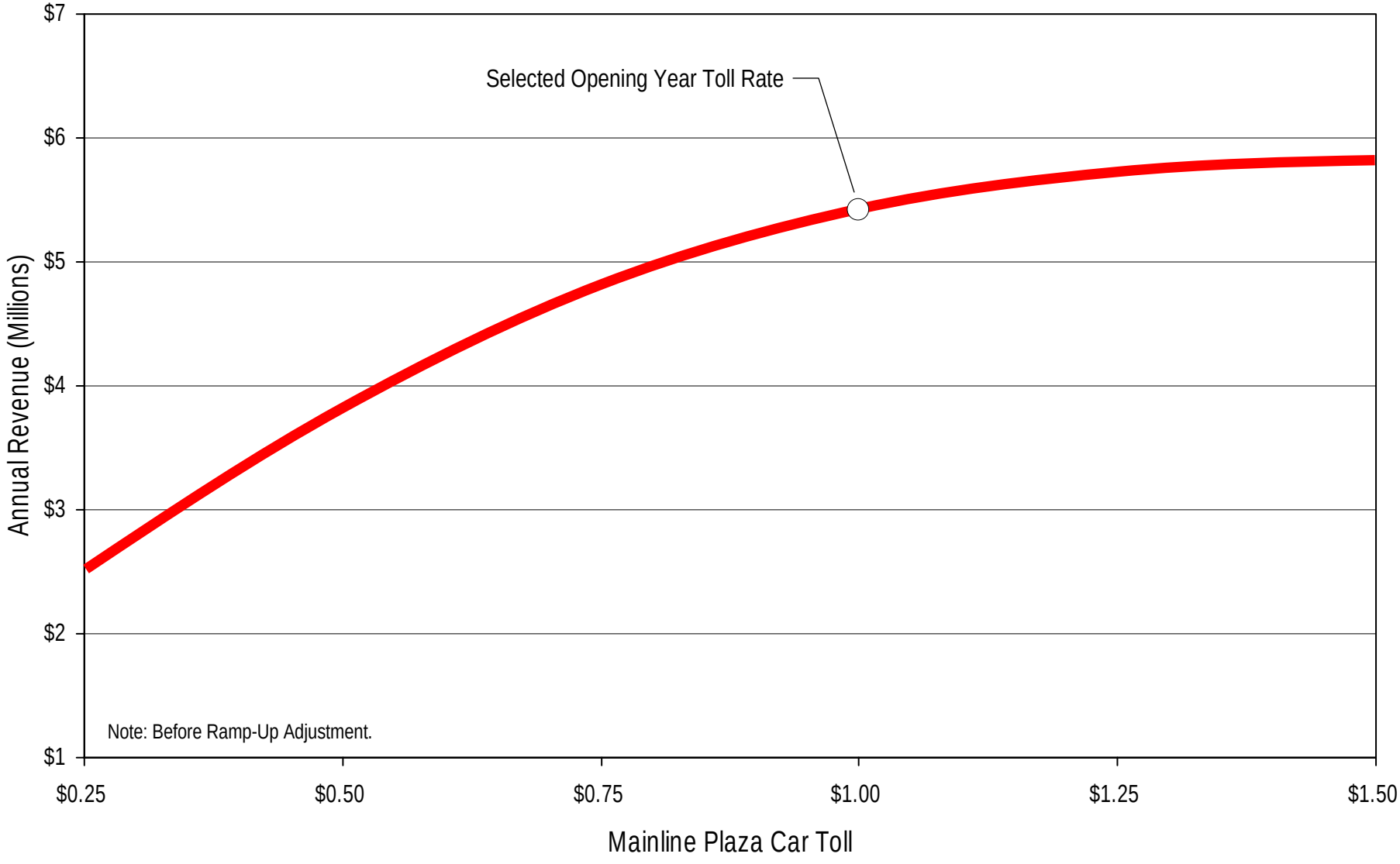
sensitivity analysis are shown in Figure 4-2. Toll rates at the Hopson Road and Davis Drive ramps were varied in proportion to the mainline toll rates assumed at each toll level. All tolls were also assumed to be rounded to $0.25 increments for purposes of the toll sensitivity analysis. Maximum revenue potential was shown to be in the range between $1.00 and $1.25, with declining revenue at higher toll levels.

WSA selected an opening-year toll rate at the mainline plaza of $1.00. This rate would allow some limited flexibility in future rate setting, in the event revenue enhancement would be necessary. This rate would be the equivalent of approximately $0.25 per mile for a full length trip on the Parkway, which is considered to be at the high end of average toll rates in urban areas. However, this rate is in 2010 dollars and would be a bit lower if implemented today.

TOLL SYSTEMS AND RATES

Figure 4-3 shows the proposed toll system to be used on Triangle Parkway. One mainline tolling zone would be established between I-40 and Hopson Road. Tolls would also be established on ramps to and from the south at Davis Drive and, where applicable, on the ramps to and from the south at Hopson Road. No tolls would be on the ramps to and from the north at these intermediate interchange locations, and there will be no additional toll collection facilities at I-540. For the Scenario 3 sensitivity test, in which the project was assumed to be extended to McCrimmon-Parkway, no additional toll collection facilities would be added. It was also assumed that no access would be provided between I-540 and the extension to McCrimmon Parkway to and from the south.

Alternative toll rates were tested at both 2010 and 2030 levels. In general, optimum reasonable tolls for passenger cars were selected at $1.00 at the mainline tolling zone and $0.50 at the ramp plazas. By 2030, the optimum toll was identified as $2.00 at the mainline plaza and $1.00 at the ramp plazas. All rates shown in Figure 4-3 represent rates in future-year conditions; that is, already adjusted for inflation, assumed for this study to average 2.5 percent per year. All model parameters were adjusted for inflation to reflect the respective future-year conditions. The increase in tolls between the opening year and the 20th year of operation is slightly greater than the direct affect of inflation, reflecting both inflationary pressures and significant increases in traffic demand resulting in the need for some level of “real increase” in rates beyond inflation.



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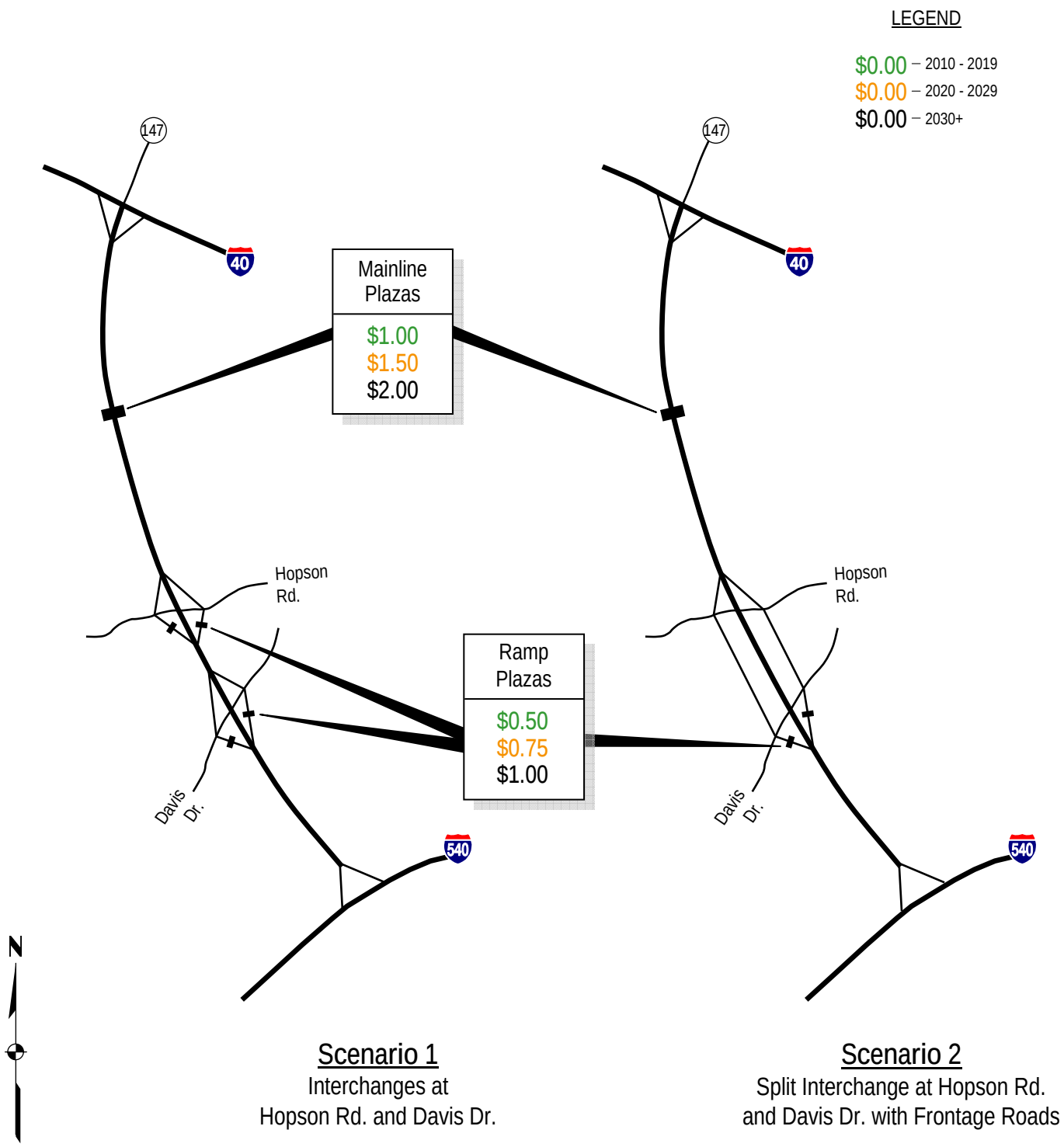
ESTIMATED 2010 TOLL REVENUE SENSITIVITY CURVE

FIGURE 4-2



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ASSUMED PASSENGER CAR TOLL RATES

FIGURE 4-3

Rates shown in Figure 4-3 are for passenger cars; trucks would have proportionally higher toll rates. In developing preliminary revenue estimates for these interim findings, it was assumed that truck rates would average 2.5 times passenger car rates at each toll plaza location.

ESTIMATED WEEKDAY TRAFFIC VOLUMES

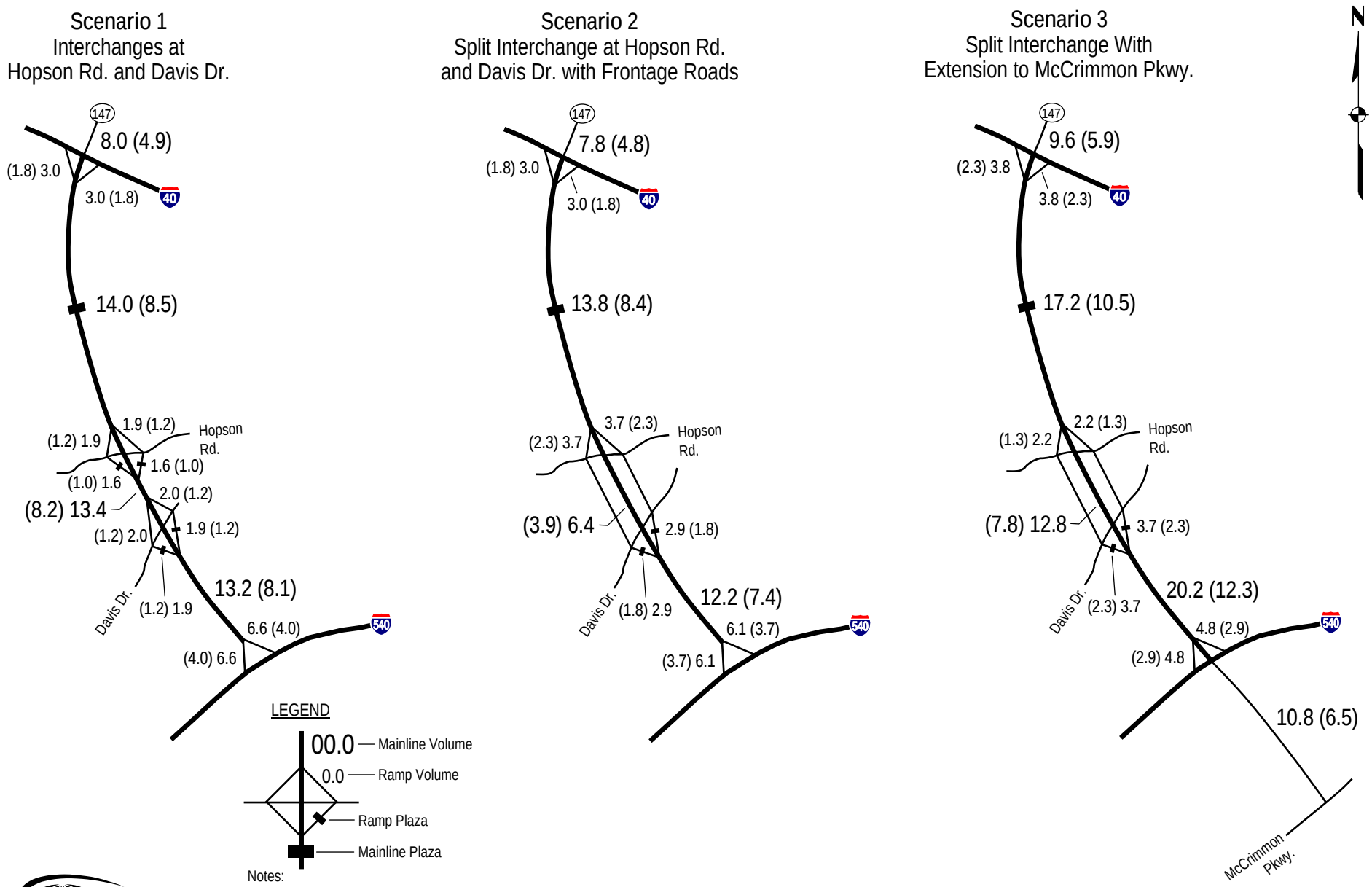
Preliminary estimates of weekday traffic on the Triangle Parkway for the three scenarios are shown, at 2010 levels, in Figure 4-4. These are under a toll condition, and recognize the toll of $1.00 for passenger cars at the mainline tolling zone. Toll-free traffic would be somewhat higher.

The traffic levels for 2010 – 2012 reflect an expected acceptance period in which the traffic on the toll road will not be at full potential because of unfamiliarity by the public. This ramp-up period is expected to last for three years from the opening date. Traffic estimates are shown without the ramp-up adjustment and with the adjustment in parentheses.

Traffic at the mainline plaza is estimated in the range of 13,800 – 14,000 (8,400 – 8,500 after ramp-up adjustments) for Scenarios 1 and 2. In the hypothetical condition of Scenario 3, in which the project would be extended to a connection with McCrimmon Parkway, traffic at the mainline plaza would be increased to an estimated 17,200 and (10,500), respectively. Traffic at the south end of the project would range from 12,200 to 20,200 (7,400 to 12,300) per weekday, depending on the scenario. The hypothetical connection to McCrimmon Parkway does significantly add to traffic potential to the southern end of the project. It also reduces demand on the ramps to and from the north at Davis Drive or Hopson Road; in the absence of the McCrimmon Parkway connection, motorists traveling to and from the southern portions of Research Triangle Park must use the Davis Drive Interchange for access.

The above figures in parentheses reflect downward adjustments for ramp-up. They represent an average weekday over the course of the first full year of operation; traffic in early months would likely be lower while traffic in later months would be higher.

It is noted that the volumes on the mainline sections reflect two-way volumes while ramp volumes reflect one-way volumes on each ramp. At the north end of the project, virtually all of the traffic interchanging with I-40 would be oriented to and from the west on I-40 with very little demand, if any, traveling to and from the east on I-40. This raises the potential of



Notes:

1. All volumes shown represent thousands of vehicles.
2. Traffic levels in parentheses reflect an assumed ramp-up period extending from 2010 - 2012.

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ESTIMATED 2010 WEEKDAY TRAFFIC VOLUMES

FIGURE 4-4

possibly building the Triangle Parkway, at least initially, without access in the southwest quadrant at I-40.

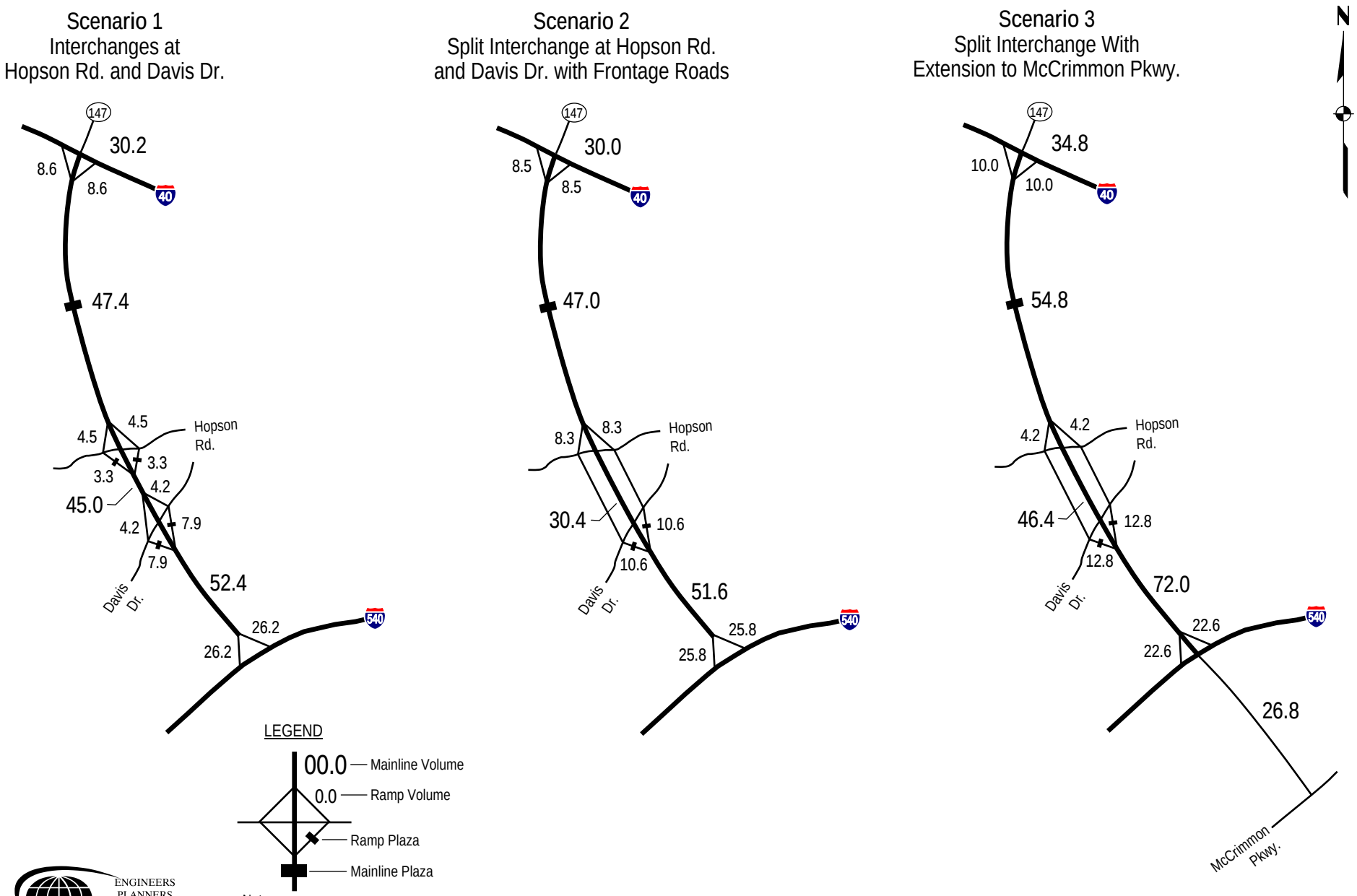
Similar estimates of traffic are shown at 2030 levels in Figure 4-5. Very high levels of traffic growth are estimated in this corridor, based on the significant ongoing level of employment growth forecasted. Traffic at the mainline plaza would reach between 47,000 and 55,000 vehicles per day. Even higher rates of growth are shown at the south end of the project, particularly if the McCrimmon Parkway connection is in place. Very high levels of development and employment, particularly employment related development, is scheduled to occur on a continuing basis between 2010 and 2030 in the southern portion of the Triangle Parkway corridor.

TRAFFIC AND REVENUE FORECASTING PROCEDURE

Table 4-2 shows computations of estimated opening year (2010) traffic and revenue, by toll plaza, for the three scenarios described earlier. Revenue values shown in this table are in current dollars; i.e., they include inflation, which is assumed to average 2.5 percent per year.

Weekday transactions and revenues were calculated separately for each tolling area (the mainline location and the ramps as shown earlier in Figure 4-1. The traffic for each tolling area was multiplied by the assumed average toll to develop estimates of typical weekday revenue at each tolling zone. Note that the average tolls at the mainlane plaza are slightly higher than those discussed previously; this is due to the assumption that approximately 2.5 percent of total traffic on the Parkway would be made by trucks which would be assessed higher tolls.

For Scenario 1 at opening year, the estimated weekday transactions on the Parkway were estimated at 21,000 of which 14,000 would be at the mainline tolling location. Using the assumed average toll rates for each location, the estimated weekday revenue would be approximately $18,000. In the opening-year 2005, transactions at the mainline plaza are estimated at 23,200 vehicles per weekday and would be expected to produce weekday revenue of nearly $21,000. This weekday traffic would be expected to produce about 6.5 million transactions and $5.6 million annually assuming



Note:
All volumes shown represent thousands of vehicles.

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ESTIMATED 2030 WEEKDAY TRAFFIC VOLUMES

FIGURE 4-5

Table 4-2
Estimated Opening-Year Transactions and Revenue
Proposed Triangle Parkway

Scenario 1 - Interchanges at Hopson Rd. and Davis Dr.

	Transactions		Average Toll	Revenue	
Weekday Transactions and Revenue					
Plaza Location					
Mainline	14,000		$1.030	$14,400	
Hopson Road	3,200		0.515	1,600	
Davis Drive	3,800		0.515	2,000	
Weekday Total	210,000			$18,000	
Annualization Factor	310	Days		310	Days
Opening-Year Transactions and Revenue Before Ramp-up	6,510,000			$5,582,000	
Ramp-up Factor	0.61	of Opening Year Before Ramp-up		0.61	of Opening Year Before Ramp-up
Scenario 1 Opening-Year Transactions and Revenue	**3,971,000**			**$3,404,000**	

Scenario 2 - Split Interchange at Hopson Rd. and Davis Dr. with Frontage Roads

	Transactions		Average Toll	Revenue	
Weekday Transactions and Revenue					
Plaza					
Mainline	13,800		$1.030	$14,200	
Hopson Road					
Davis Drive	5,800		0.515	3,000	
Weekday Total	19,600			17,200	
Annualization Factor	310	Days		310	Days
Opening-Year Transactions and Revenue Before Ramp-up	6,076,000			$5,328,000	
Ramp-up Factor	0.61	of Opening Year Before Ramp-up		0.61	of Opening Year Before Ramp-up
Scenario 2 Opening-Year Transactions and Revenue	**3,707,000**			**$3,252,000**	

Scenario 3 - Split Interchange With Extension to McCrimmon Pky

	Transactions		Average Toll	Revenue	
Weekday Transactions and Revenue					
Plaza					
Mainline	17,200		$1.030	$17,700	
Hopson Road					
Davis Drive	7,400		0.515	3,800	
Weekday Total	24,600			21,500	
Annualization Factor	310	Days		310	Days
Opening-Year Transactions and Revenue Before Ramp-up	7,626,000			$6,668,000	
Ramp-up Factor	0.61	of Opening Year Before Ramp-up		0.61	of Opening Year Before Ramp-up
Scenario 3 Opening-Year Transactions and Revenue	**4,650,000**			**$4,067,000**	

a full year of operation and no adjustment for ramp-up. This annualization is based on 310 equivalent weekdays per year to account for expected lower weekend and holiday traffic.

The annualized transactions and revenues at 2010 levels have been further adjusted to reflect "ramp-up." Ramp-up is the phenomenon experienced on most new start-up toll facilities in which 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 project is even there, 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 accustom to using the facility. The duration and level of ramp-up adjustments can be directly affected by 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 are 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 of nominal by the end of the third full year of operation.

The net adjustment for ramp-up in the first year amounts to a factor of 0.61. When applied to the annual revenue estimates, opening-year traffic and revenue is reduced to an estimated 4.0 million transactions and $3.4 million.

Table 4-2 also shows similar traffic and revenue calculations for Scenarios 2, and 3.

ESTIMATED ANNUAL TRAFFIC AND TOLL REVENUE

Preliminary estimates of annual toll revenue were prepared for each of the three scenarios between the nominal assumed opening year of 2010 and the 40th year of operation in 2050. These estimates were based on the toll rates shown previously and based on the modeling results from 2010, 2015, 2020 and 2030 levels and the assumed ramp-up between 2010 and 2012. Intermediate years between these control points were estimated

through interpolation. Beyond 2030, traffic and revenue growth was estimated nominally at 2 percent per year.

As shown in Table 4-3 under Scenario 1, opening-year revenue is estimated at about $3.4 million, growing to nearly $10 million by 2015 and reaching nearly $56 million by 2030. This is a very high level of sustained revenue growth, and is indicative of the long-term economic growth potential of the corridor. It should be noted, however, that this level of sustained future growth would be considered a significant risk factor in the ultimate financial analysis for the project. In essence, revenue potential on Triangle Parkway is heavily dependent on future development in the corridor which, in itself, would be market driven and subject to market fluctuations.

Scenario 2, which would use a combined single interchange at Hopson Road and Davis Drive, would have only slightly lower revenue potential in the opening year, at approximately $3.3 million, growing to $9.4 million by 2015. Revenue under Scenario 3 would be about 25 percent higher, reaching slightly more than $4 million in 2010 and increasing to almost $11 million by 2015.

It should be recognized that the growth in revenue for each scenario reflects both the significant increases in traffic demand and the effect of toll increases in 2020 and 2030.

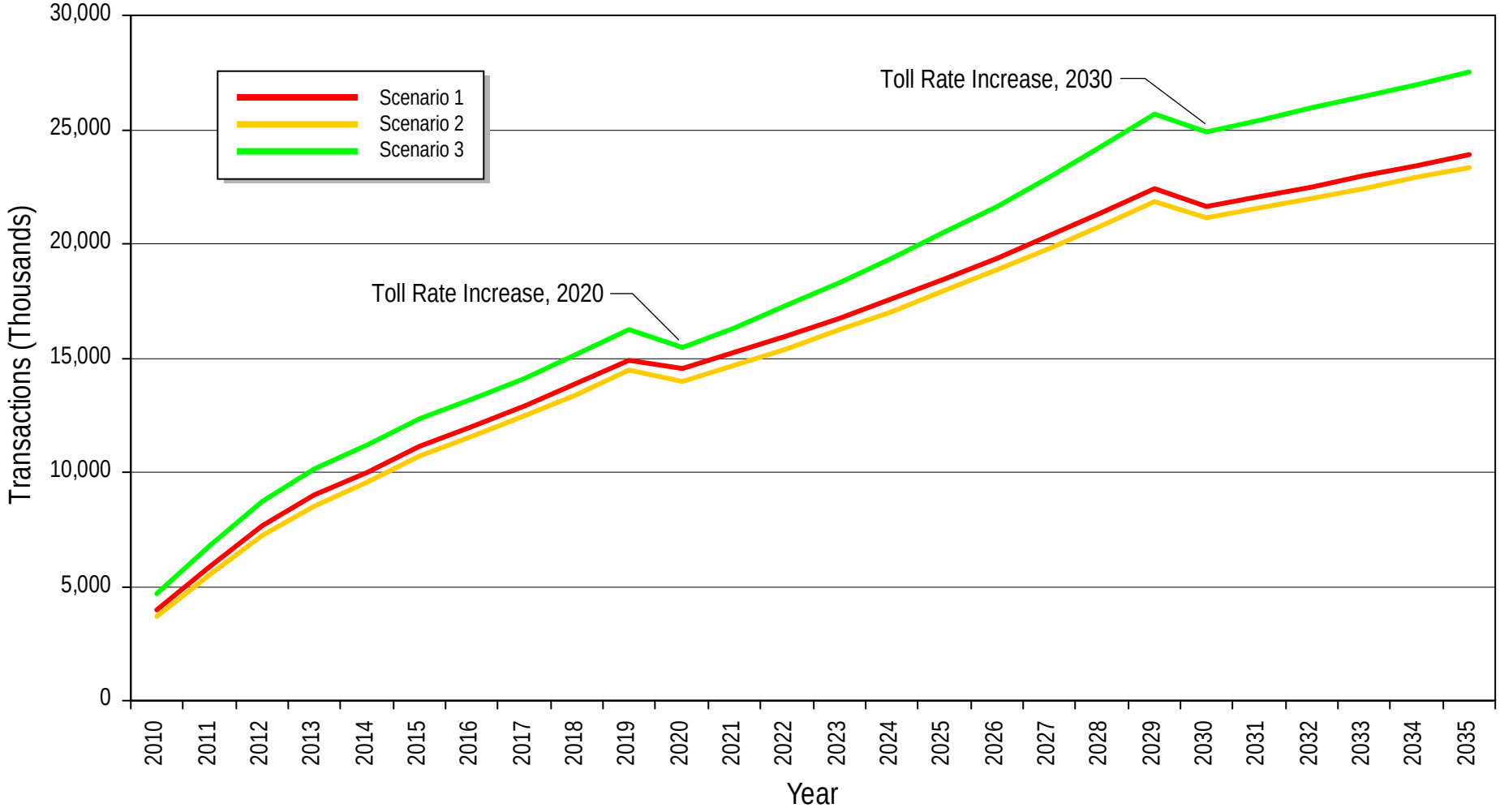
Figures 4-6 and 4-7 show the transaction and revenue estimates in graphic form. The estimates for each scenario are shown in different colors. In Figure 4-6, a slight decrease in transactions is shown in 2020 and 2030, reflecting the impact of assumed toll changes in these years. The toll increases would have a positive impact on revenues in the same years, as shown in Figure 4-7.

Table 4-4 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 transactions. 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.

Table 4-3
Annual Toll Transactions and Gross Revenue Forecasts
Proposed Triangle Parkway
(Thousands)

	Scenario 1		Scenario 2		Scenario 3	
Year	Total Transactions	Total Revenue	Total Transactions	Total Revenue	Total Transactions	Total Revenue
2010	3,971	$3,404	3,707	$3,252	4,650	$4,067
2011	5,897	5,066	5,537	4,860	6,828	5,976
2012	7,631	6,570	7,208	6,328	8,736	7,653
2013	8,995	7,761	8,545	7,505	10,177	8,928
2014	10,019	8,664	9,573	8,409	11,206	9,843
2015	11,160	9,672	10,726	9,424	12,338	10,850
2016	11,998	10,389	11,555	10,143	13,209	11,600
2017	12,898	11,157	12,447	10,916	14,142	12,402
2018	13,867	11,984	13,409	11,749	15,142	13,259
2019	14,907	12,872	14,446	12,644	16,212	14,178
2020	14,508	18,724	13,950	18,197	15,438	20,119
2021	15,224	19,666	14,665	19,139	16,335	21,288
2022	15,975	20,655	15,417	20,128	17,284	22,526
2023	16,764	21,694	16,208	21,170	18,288	23,836
2024	17,592	22,787	17,039	22,264	19,351	25,221
2025	18,461	23,933	17,912	23,416	20,475	26,688
2026	19,374	25,137	18,832	24,627	21,665	28,239
2027	20,331	26,404	19,797	25,901	22,923	29,881
2028	21,336	27,733	20,812	27,241	24,255	31,619
2029	22,391	29,130	21,879	28,650	25,665	33,457
2030	21,638	37,417	21,142	36,766	24,924	43,183
2031	22,071	38,165	21,564	37,501	25,423	44,047
2032	22,513	38,928	21,997	38,251	25,931	44,928
2033	22,962	39,707	22,436	39,017	26,450	45,826
2034	23,421	40,501	22,885	39,797	26,978	46,743
2035	23,890	41,311	23,342	40,592	27,518	47,678
2036	24,368	42,137	23,809	41,405	28,068	48,632
2037	24,855	42,981	24,285	42,233	28,630	49,604
2038	25,352	43,840	24,771	43,077	29,202	50,596
2039	25,860	44,717	25,266	43,938	29,786	51,608
2040	26,377	45,611	25,772	44,818	30,382	52,640
2041	26,904	46,524	26,287	45,714	30,989	53,693
2042	27,443	47,454	26,813	46,628	31,610	54,766
2043	27,991	48,403	27,350	47,561	32,242	55,862
2044	28,550	49,371	27,897	48,512	32,886	56,979
2045	29,122	50,359	28,454	49,482	33,545	58,119
2046	29,705	51,366	29,023	50,472	34,215	59,281
2047	30,298	52,393	29,604	51,481	34,899	60,467
2048	30,905	53,441	30,196	52,511	35,598	61,676
2049	31,522	54,509	30,800	53,561	36,309	62,910
2050	32,153	55,600	31,416	54,632	37,035	64,168

Note: Forecasts for 2010 - 2012 reflect an assumed ramp-up to full traffic levels beginning in 2013



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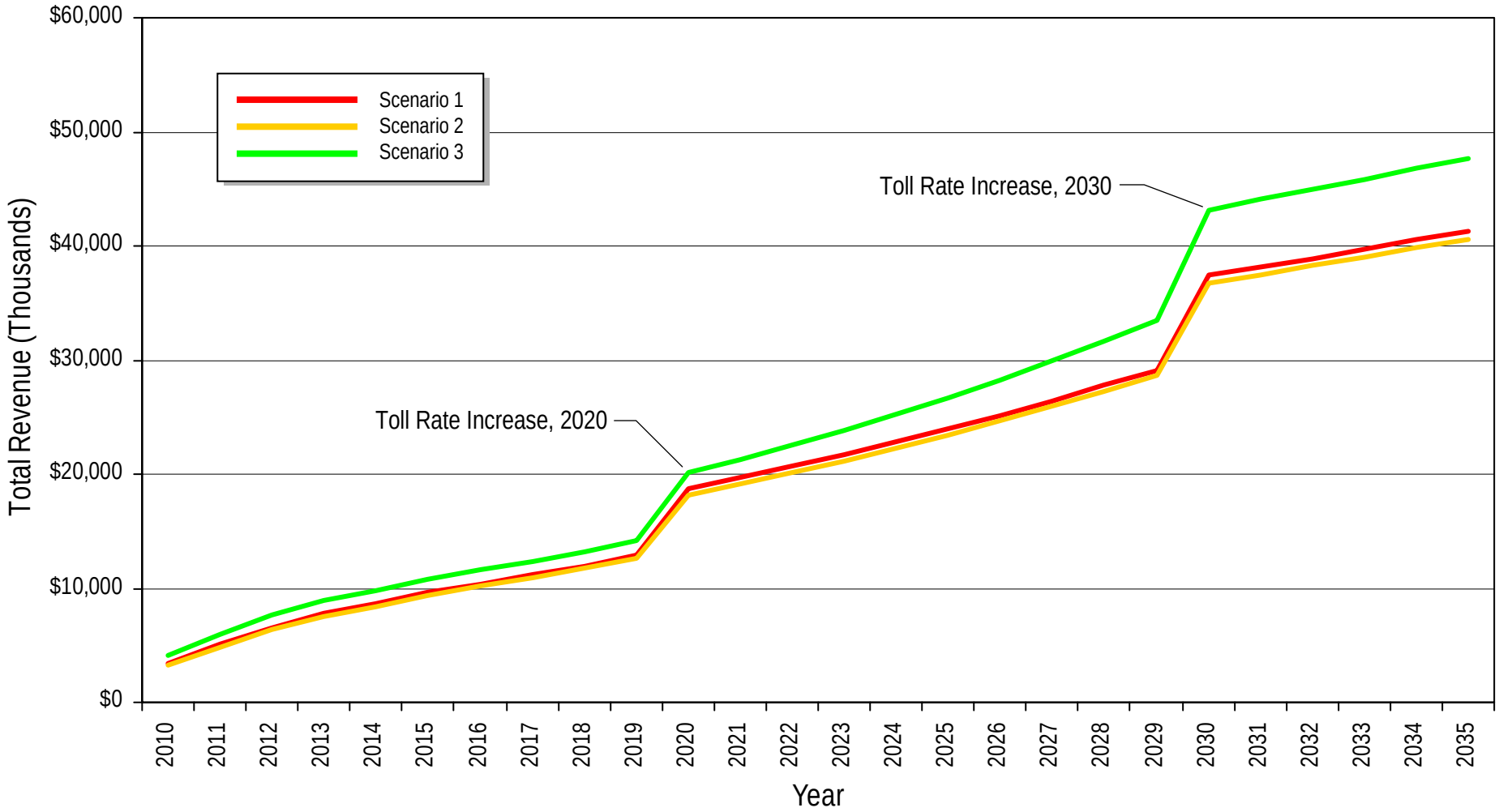
ANNUAL TOLL TRANSACTION FORECASTS

FIGURE 4-6



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ANNUAL GROSS TOLL REVENUE FORECASTS

FIGURE 4-7

Table 4-4
Annual Net Toll Operating Revenue Forecasts
Proposed Triangle Parkway
(Thousands)

	Scenario 1			Scenario 2			Scenario 3		
Year	**Gross Toll Revenue**	**Toll Operating Expense**	**Net Toll Operating Revenue**	**Gross Toll Revenue**	**Toll Operating Expense**	**Net Toll Operating Revenue**	**Gross Toll Revenue**	**Toll Operating Expense**	**Net Toll Operating Revenue**
2010	$3,404	$1,298	$2,106	$3,252	$1,282	$1,970	$4,067	$1,339	$2,728
2011	5,066	1,440	3,626	4,860	1,418	3,442	5,976	1,496	4,480
2012	6,570	1,571	4,999	6,328	1,546	4,782	7,653	1,637	6,016
2013	7,761	1,681	6,080	7,505	1,654	5,851	8,928	1,752	7,176
2014	8,664	1,771	6,893	8,409	1,744	6,665	9,843	1,842	8,001
2015	9,672	1,869	7,803	9,424	1,842	7,582	10,850	1,939	8,911
2016	10,389	1,949	8,440	10,143	1,922	8,221	11,600	2,021	9,579
2017	11,157	2,033	9,124	10,916	2,006	8,910	12,402	2,108	10,294
2018	11,984	2,123	9,861	11,749	2,096	9,653	13,259	2,200	11,059
2019	12,872	2,218	10,654	12,644	2,190	10,454	14,178	2,296	11,882
2020	18,724	2,227	16,497	18,197	2,193	16,004	20,119	2,283	17,836
2021	19,666	2,304	17,362	19,139	2,270	16,869	21,288	2,370	18,918
2022	20,655	2,384	18,271	20,128	2,350	17,778	22,526	2,462	20,064
2023	21,694	2,467	19,227	21,170	2,433	18,737	23,836	2,558	21,278
2024	22,787	2,553	20,234	22,264	2,520	19,744	25,221	2,658	22,563
2025	23,933	2,642	21,291	23,416	2,609	20,807	26,688	2,763	23,925
2026	25,137	2,736	22,401	24,627	2,703	21,924	28,239	2,873	25,366
2027	26,404	2,832	23,572	25,901	2,800	23,101	29,881	2,988	26,893
2028	27,733	2,933	24,800	27,241	2,901	24,340	31,619	3,108	28,511
2029	29,130	3,037	26,093	28,650	3,007	25,643	33,457	3,234	30,223
2030	37,417	3,035	34,382	36,766	3,005	33,761	43,183	3,232	39,951
2031	38,165	3,104	35,061	37,501	3,074	34,427	44,047	3,305	40,742
2032	38,928	3,175	35,753	38,251	3,144	35,107	44,928	3,380	41,548
2033	39,707	3,248	36,459	39,017	3,216	35,801	45,826	3,457	42,369
2034	40,501	3,322	37,179	39,797	3,290	36,507	46,743	3,535	43,208
2035	41,311	3,398	37,913	40,592	3,365	37,227	47,678	3,616	44,062
2036	42,137	3,476	38,661	41,405	3,442	37,963	48,632	3,698	44,934
2037	42,981	3,555	39,426	42,233	3,521	38,712	49,604	3,782	45,822
2038	43,840	3,637	40,203	43,077	3,602	39,475	50,596	3,868	46,728
2039	44,717	3,720	40,997	43,938	3,684	40,254	51,608	3,956	47,652
2040	45,611	3,805	41,806	44,818	3,769	41,049	52,640	4,046	48,594
2041	46,524	3,893	42,631	45,714	3,855	41,859	53,693	4,138	49,555
2042	47,454	3,982	43,472	46,628	3,944	42,684	54,766	4,232	50,534
2043	48,403	4,073	44,330	47,561	4,035	43,526	55,862	4,328	51,534
2044	49,371	4,166	45,205	48,512	4,127	44,385	56,979	4,427	52,552
2045	50,359	4,262	46,097	49,482	4,222	45,260	58,119	4,527	53,592
2046	51,366	4,360	47,006	50,472	4,319	46,153	59,281	4,631	54,650
2047	52,393	4,460	47,933	51,481	4,418	47,063	60,467	4,736	55,731
2048	53,441	4,562	48,879	52,511	4,520	47,991	61,676	4,844	56,832
2049	54,509	4,667	49,842	53,561	4,624	48,937	62,910	4,954	57,956
2050	55,600	4,774	50,826	54,632	4,730	49,902	64,168	5,067	59,101

Note: Forecasts for 2010 - 2012 reflect an assumed ramp-up to full traffic levels beginning in 2013

Under Scenario 1, net revenue is estimated at slightly more than $2 million in 2010, increasing to $16 million by 2020 and $34 million by 2030. Net revenue estimates would be slightly lower under Scenario 2, but relatively close to Scenario 1. Somewhat higher net revenue estimates are shown for Scenario 3, as might be expected.

PRELIMINARY FINANCIAL ASSESSMENT AND BONDING CAPACITY

A preliminary bonding capacity analysis was undertaken for this preliminary traffic and revenue study. This analysis was performed utilizing a bond sizing model typical of financings for other toll roads within the United States that have been recently issued by public authorities. The interest rate assumptions are indicative of WSA's understanding of current market conditions, which are subject to change based upon factors outside the control of either WSA or the NCTA. The bonding capacity analysis is provided for planning purposes only and is not intended to supplant the analysis that will be required by a financial advisor or underwriter as part of the financing process. Changes in financial market conditions and further refinements by a financial advisor could materially alter the results of the bond sizing model.

A preliminary bonding capacity analysis was undertaken for these interim findings. It should be recognized that these estimates would be subject to considerable refinement by a financial advisor in the future, based on alternative financing strategies that would not typically be addressed at this level of study. These preliminary estimates of bonding capacity were based on the following assumptions:

- Bonds are a combination of Current Interest Bonds and Capital Appreciation Bonds with 40-year maturities;
- Both Series of Bonds are Issued at parity (i.e., both are Senior Debt with equal claims to revenue);
- Bonds have debt service coverage ratios of 2X for both series;
- Both Series have investment-grade ratings;
- Current Interest Bonds have a 5.5 percent interest rate and the Capital Appreciation Bonds have a 100 basis point premium of 6.5 percent interest rate;
- Design and Construction period is 24 months;
- Bond sizing is net of operating expenses, but before funding of roadway maintenance, capital improvements and other reserves; and

- Net Bond Proceeds would be 80 percent of bond issue size, allowing for bond sales expenses, debt service reserve and capitalized interest during construction.

Preliminary estimates of bonding capacity and net proceeds are summarized in Table 4-5.

Table 4-5
Preliminary Bonding Capacity
Proposed Triangle Parkway
(thousands)

	Scenario 1	Scenario 2	Scenario 3
Bonding Capacity	$117,000	$111,000	$131,000
Net Bond Proceeds	94,000	89,000	105,000

Given the preliminary nature of these interim findings, it may be prudent to establish a range of bonding capacity for each scenario. The lower end of the range is simply 20 percent below the nominal values shown above. Hence, a reasonable range of bonding capacities would be:

- Scenario 1: $75 - $94 million;
- Scenario 2: $71 - $89 million; and
- Scenario 3: $84 - $105 million.

EFFECTS OF DELAYED I-540 COMPLETION

The traffic and revenue estimates previously presented as Scenario 2 in Table 4-2 represent the base case forecast for the project. In this scenario, the Triangle Parkway would be constructed by 2010 with interchanges at I-40, Davis Drive and Hopson Road combined, and I-540. I-540 would be complete from I-40 to NC 55. The Western and Southern Wake County Expressway I-540 project from NC 55 to NC 55 South would be completed from 2015 to 2020 and beyond to I-40 South by 2030.

Sensitivity tests were run to test the impact of changes in certain basic assumptions or inputs into the base case forecast. In this case, it is important to estimate the effects on Triangle Parkway if I-540 were not to be completed beyond its presently scheduled terminus at NC 55.

This sensitivity test is to provide a sense of the potential outcome, depending on potential unanticipated changes in basic assumptions. It does not in

and of itself represent a forecast, but rather a hypothetical estimate if this expressway were not completed.

Table 4-6 provides a summary of sensitivity test results. The transaction and revenue estimates under this alternative sensitivity test scenario are shown, together with an estimate of net impact and percent impact for the test. Figure 4-8 illustrates the differences between Scenario 2 and a sensitivity test in which the Western and Southern Wake County Expressway were not to be constructed.

The effects of a terminus of I-540 at NC 55 are significant because the completed expressway would provide greater access to a growing part of the Triangle region. Without it, travelers would have to use other, non-expressway facilities to reach their destinations. These trips using other facilities in many cases would also take the travelers off the Triangle Parkway with the resultant loss of traffic and toll revenue. The effects in the earlier years builds up as the traffic grows due to the high growth of the area particularly in the southern side the Triangle region. By 2030, for example, the traffic on the Triangle Parkway would be reduced by 4.65 million (22 percent) in comparison to the Scenario 2 configuration of the Parkway. Revenue would be $7.3 million less or 20 percent in comparison to Scenario 2.

CONCLUSIONS

The conclusions of this preliminary study of the proposed Triangle Parkway can be summarized as follows:

- **Short Project Length Limits Range of Possible Toll Rates** – The proposed Parkway would be about four miles long. The $1.00 toll is almost $0.25 per mile, which is considered to be a relatively high rate for such a short project in an urban area. Rates that are much higher than the selected rates would be difficult to implement without significant loss of traffic and revenue growth;

- **Extremely Strong Economic Growth Forecast for Study Area** – The growth rates of socioeconomic parameters contained in the RTM are high as discussed in Chapter 3. Some of the areas contained within the corridor have relatively small levels economic activity now. Growth is certainly occurring, but these growth rates will be subject to considerable review by the financial community before this proposed project were to receive financing. In an investment-grade study, the

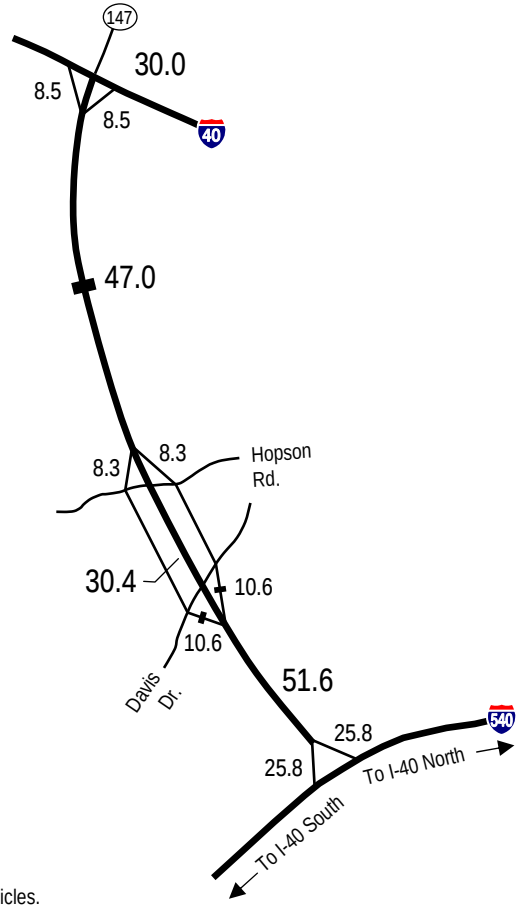
Table 4-6
Senstivity Test
Impact of I-540 Western and Southern Wake County Expressway Not Being Completed
Proposed Triangle Parkway
(Thousands)

	Annual Transactions				Annual Revenue			
Year	Scenario 2	No Build I-540	Net Difference	Percent Difference	Scenario 2	No Build I-540	Net Difference	Percent Difference
2010	3,707	3,707	0	0.0%	$3,252	$3,252	$11	0.3%
2011	5,537	5,358	-179	-3.2%	4,860	4,710	-150	-3.1%
2012	7,208	6,752	-456	-6.3%	6,328	5,943	-385	-6.1%
2013	8,545	7,748	-797	-9.3%	7,505	6,831	-674	-9.0%
2014	9,573	8,403	-1,170	-12.2%	8,409	7,420	-989	-11.8%
2015	10,726	9,114	-1,612	-15.0%	9,424	8,060	-1,364	-14.5%
2016	11,555	9,644	-1,911	-16.5%	10,143	8,534	-1,609	-15.9%
2017	12,447	10,205	-2,242	-18.0%	10,916	9,036	-1,880	-17.2%
2018	13,409	10,798	-2,611	-19.5%	11,749	9,567	-2,182	-18.6%
2019	14,446	11,426	-3,020	-20.9%	12,644	10,130	-2,514	-19.9%
2020	13,950	10,633	-3,317	-23.8%	18,197	14,105	-4,092	-22.5%
2021	14,665	11,208	-3,457	-23.6%	19,139	14,887	-4,252	-22.2%
2022	15,417	11,816	-3,601	-23.4%	20,128	15,711	-4,417	-21.9%
2023	16,208	12,457	-3,751	-23.1%	21,170	16,583	-4,587	-21.7%
2024	17,039	13,132	-3,907	-22.9%	22,264	17,503	-4,761	-21.4%
2025	17,912	13,846	-4,066	-22.7%	23,416	18,474	-4,942	-21.1%
2026	18,832	14,597	-4,235	-22.5%	24,627	19,500	-5,127	-20.8%
2027	19,797	15,391	-4,406	-22.3%	25,901	20,584	-5,317	-20.5%
2028	20,812	16,228	-4,584	-22.0%	27,241	21,727	-5,514	-20.2%
2029	21,879	17,111	-4,768	-21.8%	28,650	22,936	-5,714	-19.9%
2030	21,142	16,492	-4,650	-22.0%	36,766	29,419	-7,347	-20.0%
2031	21,564	16,822	-4,742	-22.0%	37,501	30,008	-7,493	-20.0%
2032	21,997	17,158	-4,839	-22.0%	38,251	30,608	-7,643	-20.0%
2033	22,436	17,501	-4,935	-22.0%	39,017	31,220	-7,797	-20.0%
2034	22,885	17,852	-5,033	-22.0%	39,797	31,844	-7,953	-20.0%
2035	23,342	18,208	-5,134	-22.0%	40,592	32,481	-8,111	-20.0%
2036	23,809	18,572	-5,237	-22.0%	41,405	33,131	-8,274	-20.0%
2037	24,285	18,945	-5,340	-22.0%	42,233	33,793	-8,440	-20.0%
2038	24,771	19,323	-5,448	-22.0%	43,077	34,469	-8,608	-20.0%
2039	25,266	19,710	-5,556	-22.0%	43,938	35,158	-8,780	-20.0%
2040	25,772	20,104	-5,668	-22.0%	44,818	35,861	-8,957	-20.0%
2041	26,287	20,505	-5,782	-22.0%	45,714	36,579	-9,135	-20.0%
2042	26,813	20,916	-5,897	-22.0%	46,628	37,310	-9,318	-20.0%
2043	27,350	21,334	-6,016	-22.0%	47,561	38,057	-9,504	-20.0%
2044	27,897	21,760	-6,137	-22.0%	48,512	38,818	-9,694	-20.0%
2045	28,454	22,197	-6,257	-22.0%	49,482	39,594	-9,888	-20.0%
2046	29,023	22,640	-6,383	-22.0%	50,472	40,386	-10,086	-20.0%
2047	29,604	23,093	-6,511	-22.0%	51,481	41,193	-10,288	-20.0%
2048	30,196	23,554	-6,642	-22.0%	52,511	42,017	-10,494	-20.0%
2049	30,800	24,026	-6,774	-22.0%	53,561	42,858	-10,703	-20.0%
2050	31,416	24,506	-6,910	-22.0%	54,632	43,715	-10,917	-20.0%

Note: Forecasts for 2010 - 2012 reflect an assumed ramp-up to full traffic levels beginning in 2013

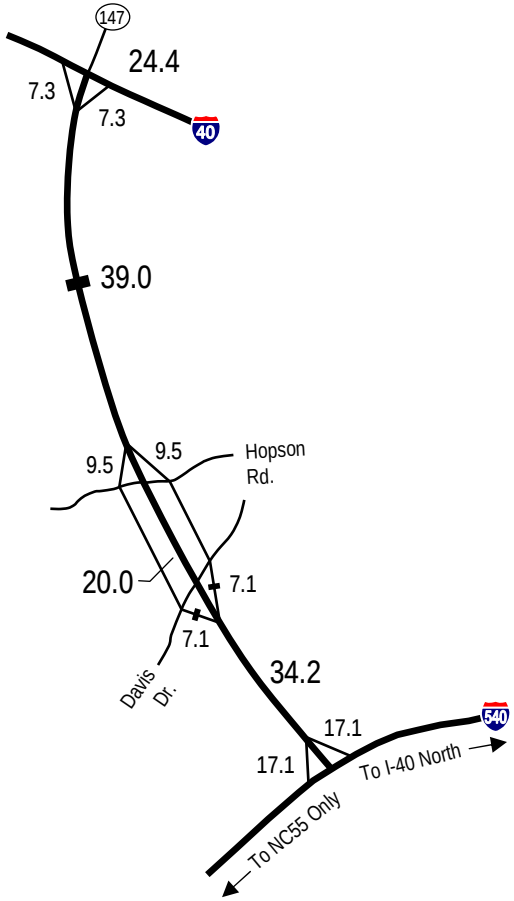
Scenario 2

Split Interchange at Hopson Rd. and Davis Dr. with Frontage Roads.
I-540 Extends from I-40 North to I-40 South.

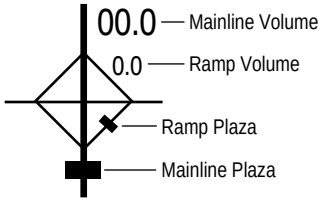


Sensitivity Test

No I-540 Beyond NC 55



LEGEND



Note:
All volumes shown represent thousands of vehicles.

ENGINEERS
PLANNERS
ECONOMISTS
Wilbur Smith Associates

ESTIMATED 2030 WEEKDAY BASE CASE TRAFFIC VOLUMES COMPARED TO I-540 WESTERN AND SOUTHERN WAKE COUNTY EXPRESSWAY NO BUILD

FIGURE 4-8

underlying socioeconomic parameters on which the traffic forecasts are based will have to be assessed by an independent economist;

- **Triangle Parkway Will Provide Major Traffic Benefits in Future** - The Parkway would be a critical link when I-540 is opened in western and southern Wake County because it will provide access that potentially could bypass the heavily-congested sections of I-40 between Raleigh and Durham;

- **Relatively Good Bonding Capacity** - Tolls potentially can cover a significant portion (but not all of) project cost. However, an independent financial assessment should be conducted to confirm the capacity; and

- **Extension to McCrimmon Parkway Increases Revenue by 10 - 20 Percent** – An extension of the Triangle Parkway south of I-540 to McCrimmon Parkway was tested because it would provide better access to the southern section of the corridor especially in later years when the area is developed more. Of course, the extension would also increase project cost, which should be analyzed in more detail before any decisions are made regarding this extension.

DISCLAIMER

Current professional practices and procedures were used in the development of these 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.