DCHC
Durham-Chapel Hill-Carrboro
METROPOLITAN
Planning Organization

FARRINGTON ROAD CORRIDOR STUDY

Prepared for:

DURHAM · CHAPEL HILL · CARRBORO
METROPOLITAN PLANNING ORGANIZATION

Prepared by:

Kimley-Horn and Associates, Inc.

URBAN RESOURCE GROUP
A DIVISION OF KIMLEY-HORN AND ASSOCIATES, INC.

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1 introduction

The Raleigh-Durham-Chapel Hill "Research Triangle" area, with its favorable weather, affordable housing, great schools and universities, and presence of high tech jobs, has long been a desirable place to live and work in the region. The metropolitan area is one of the fastest growing areas in the country, expanding from a 1970 population of 537,000 to a 2006 population of 1,400,000.

Growth in the Triangle has spread from the traditional urban centers in Raleigh, Durham, and Chapel Hill to neighboring municipalities including Cary and Hillsborough, and beyond into rural areas of Chatham, Durham, Orange, and Wake Counties. Large tracts of rural, undeveloped land, combined with proximity to the Research Triangle area and Research Triangle Park make land surrounding Jordan Lake particularly desirable for another wave of new development. The focus of the Farrington Road Corridor Study is to identify the type and extent of growth patterns and development intensities anticipated for the area, and the associated traffic impacts likely to result.

Recommended improvements from the Corridor Study will be considered by DCHC MPO staff preparing the 2035 Long Range Transportation Plan. Member jurisdictions represented in the study area are encouraged to act collaboratively on opportunities to improve land use, urban design, and transportation decision-making discussed in this report; highlighting the demand factors (i.e., trip generation, trip length, and travel mode) influenced by local land use decisions to improve the safety and efficiency of the proposed transportation system.

Building the Case for Urgency

The Research Triangle area experienced considerable growth in housing and employment over the past three decades. Demographers forecast a continuation of this trend for the foreseeable future. Much of the growth is forecasted to occur in undeveloped areas of the region that have large tracts of vacant, unprotected land available for development — including areas influencing the Farrington Road Corridor.

As a result of population growth and development pressures, traffic congestion steadily increased in the area over the past ten years. A recent report from the Texas Transportation Institute indicated the amount of time an average commuter spends in congestion for the

1 introduction

Research Triangle area increased from 26 hours to 35 hours per week, an increase of 35 percent over the past ten years. Automobile travel slowed by congestion in the same period increased from 34 percent to 47 percent for all peak period trips.

The majority of observed congestion in the study area is on freeways and major arterials; however, as development continues to expand outward into rural areas surrounding Jordan Lake, traffic on the rural road network is also expected to increase. These traffic volumes will increase both as a result of development in the immediate area and as travelers from outside of the study area look for ways to access Durham, Chapel Hill, and Research Triangle Park by circumventing larger, more congested freeways and arterials. Future year forecasts in the 2035 Triangle Area Regional Travel Demand Model predict that increased congestion will continue to degrade the rural road system if changes are not made to better integrate land use, urban design, and transportation decision-making.

Study Area

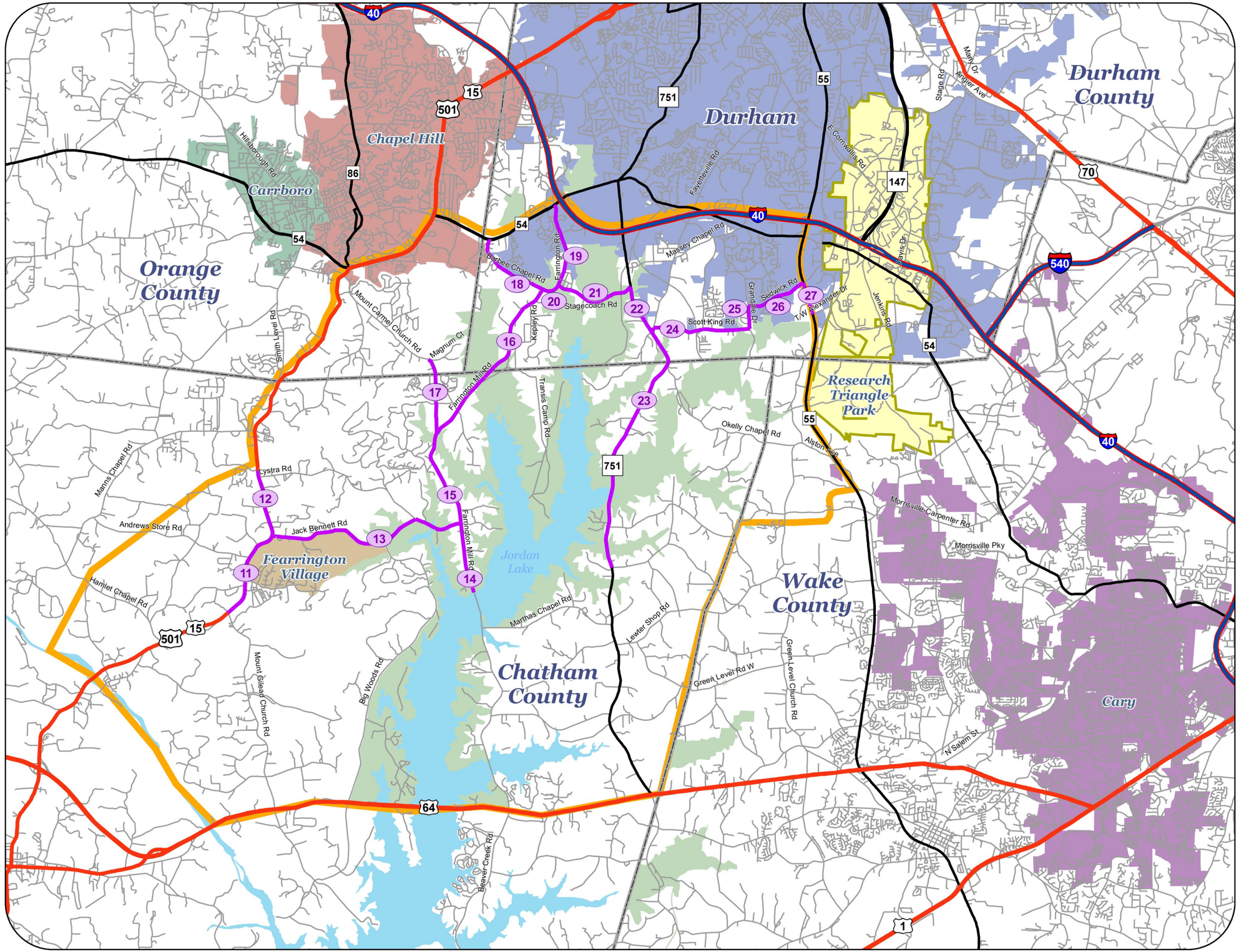
The study area for the Farrington Road Corridor Study focuses on the potential high-growth area emerging at the convergence of four counties — Chatham, Durham, Orange, and Wake — and three cities — Cary, Chapel Hill, and Durham — immediately south and west of Research Triangle Park (see **Figure 1**). B. Everett Jordan Reservoir (Jordan Lake) and surrounding environmentally-sensitive lands occupy a significant portion of the study area and help define its uniqueness within the region. Recent growth pressures highlight the strain on communities to manage sometimes conflicting goals related to growing population and employment centers, rural preservation initiatives, environmental stewardship, and regional transportation mobility.

Regional mobility in the study area is limited to a sparse network of federal and state highways. US 15-501, NC 55, and NC 751 run north to south. US 64 and NC 54 run east to west. Other major roads serving the study area include Farrington Road, Farrington Point Road, Old Farrington Point Road, Grande Drive, Jack Bennett Road, and Scott King Road. Connections between roads in the study area are limited by the presence of Jordan Lake.

Farrington Road Corridor Study

Figure 1

Study Area



1 introduction

Working farms, residential homes, businesses, and permanent conservation areas are all present in the study area. A concentration of businesses and high-density residential uses in the northeastern portion of the study area have resulted in the emergence of a regional activity center anchored by a 1.3-million regional shopping mall (i.e., Streets at South Point) and supporting residential and non-residential uses. Critical watershed areas and other environmentally-sensitive lands observed in the study area make it unique in terms of the quantity and quality of development that should be expected.

Vision Statement

The Farrington Road corridor is uniquely situated at the intersection of Wake, Chatham, Orange, and Durham counties. The characteristics of this location are a composite of those in the greater region. As such, the vision for this corridor is drawn from the goals of the plans and policies that govern the region's land use and transportation:

> *To celebrate rural and environmentally-sensitive lands unique to this emerging growth area, and support local smart growth initiatives underway by local governments, by recommending appropriate future transportation improvements to the regional transportation system.*

Guiding Principles

The consultant team prepared a set of guiding principles for the corridor study based on a review of locally adopted plans, programs, and policies administered in the study area. These principles generally support, encourage, and implement a vision that celebrates protection of rural and environmentally-sensitive lands unique to the study area while recommending necessary and appropriate improvements to the regional transportation system.

Guiding principles for the corridor study include:

- Protect environmentally-sensitive lands in the study area from encroaching development.
- Prepare for future growth anticipated for the study area following the principles of smart growth, favoring compact

development nodes over continued single-use, suburban sprawl development patterns.

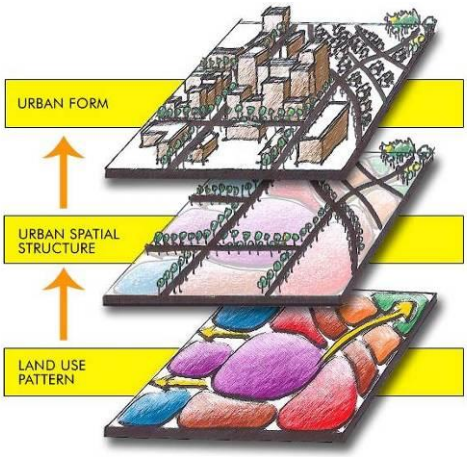
- Identify improvements to the transportation system that balance regional mobility with community livability, highlighting corridor (road-widening) improvements, intersection treatments, and opportunities to promote non-vehicular travel.

- Protect expensive transportation investments in the study area with locally-adopted development controls, such as access management standards or corridor protection ordinances that better coordinate future land use and transportation decisions.

2 transportation/land use connection

In recent years, planners and community leaders across the country have observed increased public interest for reducing or reversing the trend of suburban sprawl and its consequences. These efforts are largely motivated by the impacts associated with suburban development patterns: consumption of sensitive land for development, costly expansion of public infrastructure, and increasing traffic congestion. In emerging suburban development centers, the physical distance between complementary land uses (e.g., between home and work, home and school, or home and shopping) and a lack of overall street connectivity leads to increased vehicle miles traveled and energy consumption, longer commute times, increased air pollution, heightened infrastructure and public service costs, and decreased resource lands. Future year forecasts in the 2035 Triangle Regional Model (TRM) predict that these unintended consequences will continue for the region if changes are not made to better integrate land use, urban design, and transportation decision-making.

Land Use & Urban Form



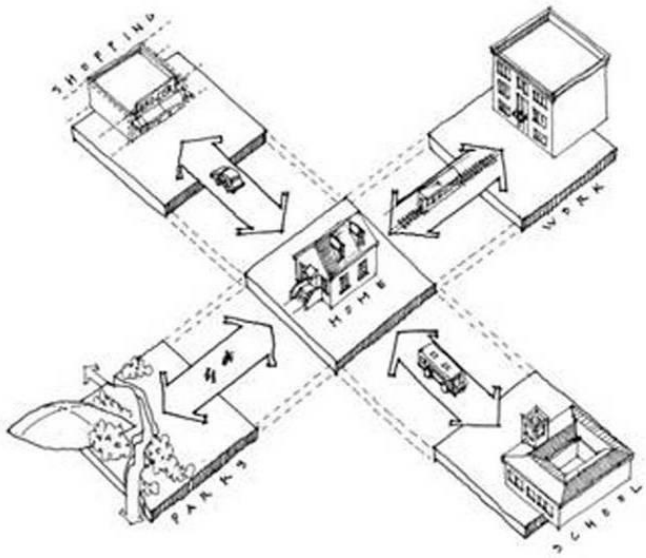
Land use serves as the foundation of the built environment. It defines the type, mix, and general location of uses within communities, and ultimately defines the boundaries for neighborhoods, commercial nodes, and employment centers. Communities make efforts to influence patterns of land use when they develop a future land use map or goals, objectives, and policies within a comprehensive plan. (See **Chapter 3** of this report for an overview of comprehensive plans administered by local governments in the study area).

Typically, a comprehensive plan represents the community's vision for how to promote local growth and prosperity. Urban form is the land use vision as it becomes reality in the physical world. It is commonly measured by street patterns, block lengths, building heights, building setbacks, average residential density, and average non-residential intensity. Putting these design elements in categories allows for the

region's form to be measured, and identifies a natural progression from rural to suburban to urban areas. The components of urban form are traditionally regulated through the community's zoning ordinance, subdivision ordinance, engineering specifications, or architectural design standards.

Urban Form & Travel Behavior

These physical elements of urban form can influence the comfort, speed, cost, convenience, attractiveness, and safety of movement between complementary land uses. Elements of the transportation system — including road, pedestrian, bicycle, and transit facilities — impact how land is developed in terms of size, shape, density, and mix of land uses. Where land uses fall and how they are designed (i.e., urban form) can favor one mode of travel over others, and may influence overall travel behavior by changing the ease of use or accessibility of various modes of travel for meeting daily needs. For example, if low-density development is spread out, the residents of such areas must rely almost entirely on automobiles to get from one location or land use to another. On the other hand, denser urban centers that combine complementary land uses near each other enable greater choice in transportation.



Bringing It All Together

Evaluating the relationship between land use, urban design, and regional travel behavior produces several benefits. When considered together, decisions and investments regarding all three elements could have a significant bearing on the DCHC MPO and its member jurisdictions represented in the study area:

- The impacts to sensitive land uses (such as environmentally-sensitive areas) can be minimized when facilities identified for transportation investments are

located *after* considering appropriate land use patterns and development intensities for the area.

- Development can be stimulated in prime locations if transportation investments consider available capacity or appropriate mobility options.

- Complementary activities can be placed next to existing or planned transportation infrastructure, making the most of land use opportunities and dedicated transportation investments.

- The quantity and location of travel demand can be influenced by land use decisions, highlighting the factors (i.e., trip generation, trip length, and travel mode) that influence the efficiency of a proposed transportation system.

- Context-sensitive design elements can transform transportation corridors from vehicle-dominated thoroughfares into community-oriented streets that safely and conveniently accommodate all modes of travel.

3 existing conditions

This section represents a comprehensive inventory and assessment of transportation conditions, the built environment, and the natural environment in the study area. It communicates how land is organized, used, and supported by the regional transportation system. A review of plans, programs, and policies administered in the study area acknowledges the forces that could affect the planning process or resulting recommendations for the Farrington Road Corridor Study.

Transportation

This section of the report inventories existing roads in the study area and current operational characteristics. As part of this assessment, the current roadway facilities were categorized in terms of operational characteristics and functional classification designation. Transit route, bicycle route, and available pedestrian information for these roads are also presented. The results of this task are presented in a series of maps that were used to identify operational capacities.

Existing Facilities

Portions of the following roads were inside the study area and were analyzed for this corridor study.

1. NC 55
2. US 15-501
3. Barbee Chapel Road
4. Farrington Road
5. Farrington Mill Road
6. Farrington Point Road
7. Grandale Drive
8. Hope Valley Road (NC 751)
9. Jack Bennett Road
10. Mount Carmel Church Road
11. Scott King Road
12. Sedwick Road
13. Stagecoach Road

Operational Characteristics

Operational characteristics included in this study are the functional classification, roadway attributes, and non-motorized facilities. These characteristics are briefly described in the sections below.

Functional Classification

Roadways are categorized into functional classification groups according to the character of service they provide. The four functional classification groups for urbanizing areas are principal arterials, minor arterials, collectors, and local streets. The length of the segment and degree of access control is a significant factor in defining the functional classification of a roadway. Regulated access (or limited access) is necessary on arterials to enhance their primary function of mobility, while the primary function of local streets is to provide access to adjacent land uses.

The functional classification of roads inside the study area was assigned using information available from the Triangle Regional Model (TRM).

Figure 2 shows the federal functional classification for facilities in the corridor analysis.

Roadway Attributes

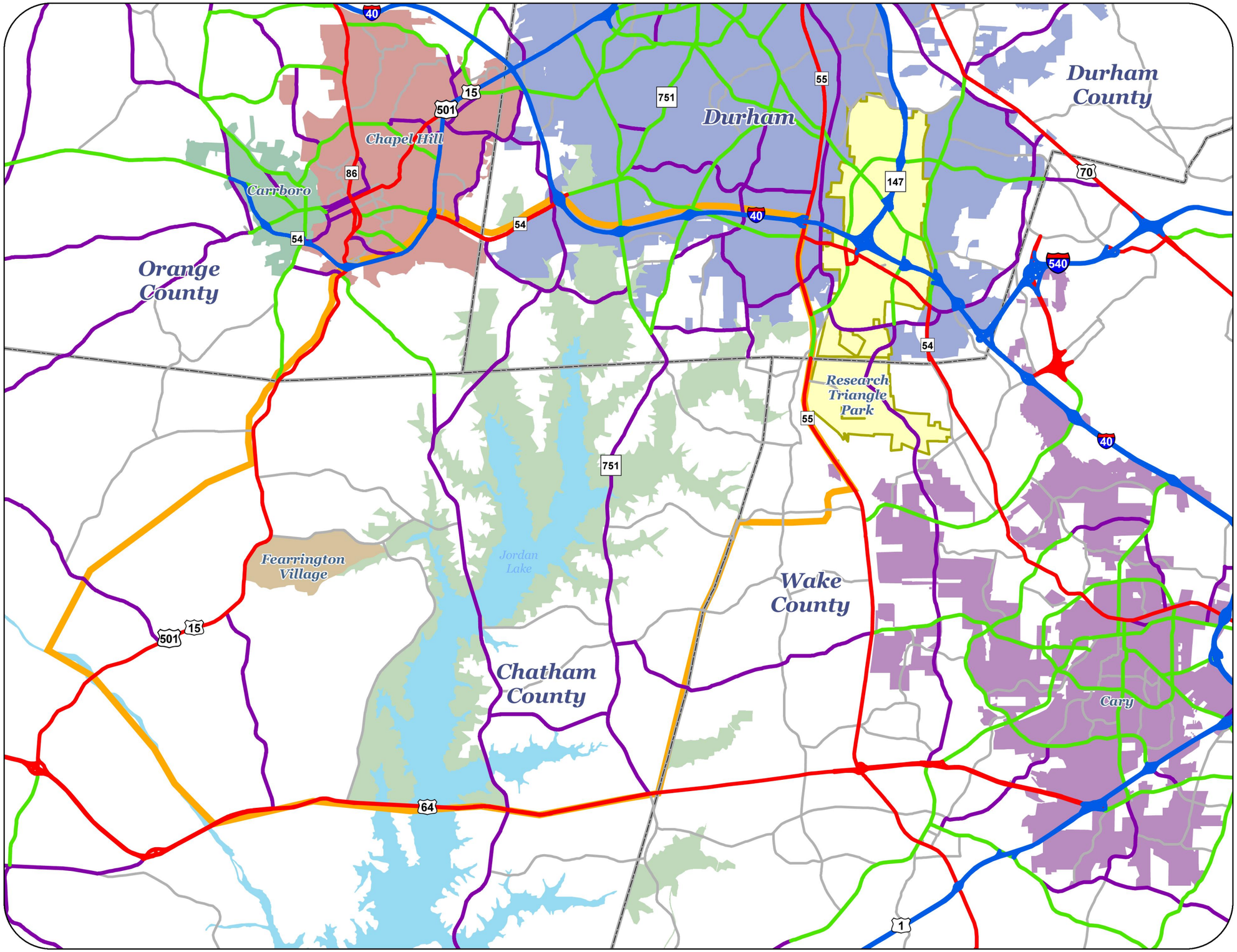
The Triangle Regional Model (TRM) was used to determine major roadway attributes for facilities within the study area. These attributes include the number of lanes, speed limit, and median type. The model also accounts for 2005 NCDOT Average Annual Daily Traffic (AADT) counts. These attributes are shown in **Figures 3 – 6**.

Farrington Road Corridor Study

Figure 2

Triangle Model Attributes

Functional Classification



Functional Classification

- Interstate/Freeway
- Principal Arterial
- Minor Arterial
- Collector
- Local
- Study Area
- Lakes
- Durham
- Chapel Hill
- Fearrington Village
- Cary
- Carrboro
- Counties
- Corps of Engineers Land
- Research Triangle Park

November 25, 2008

N W E S

1 0.5 0 1 2 Miles

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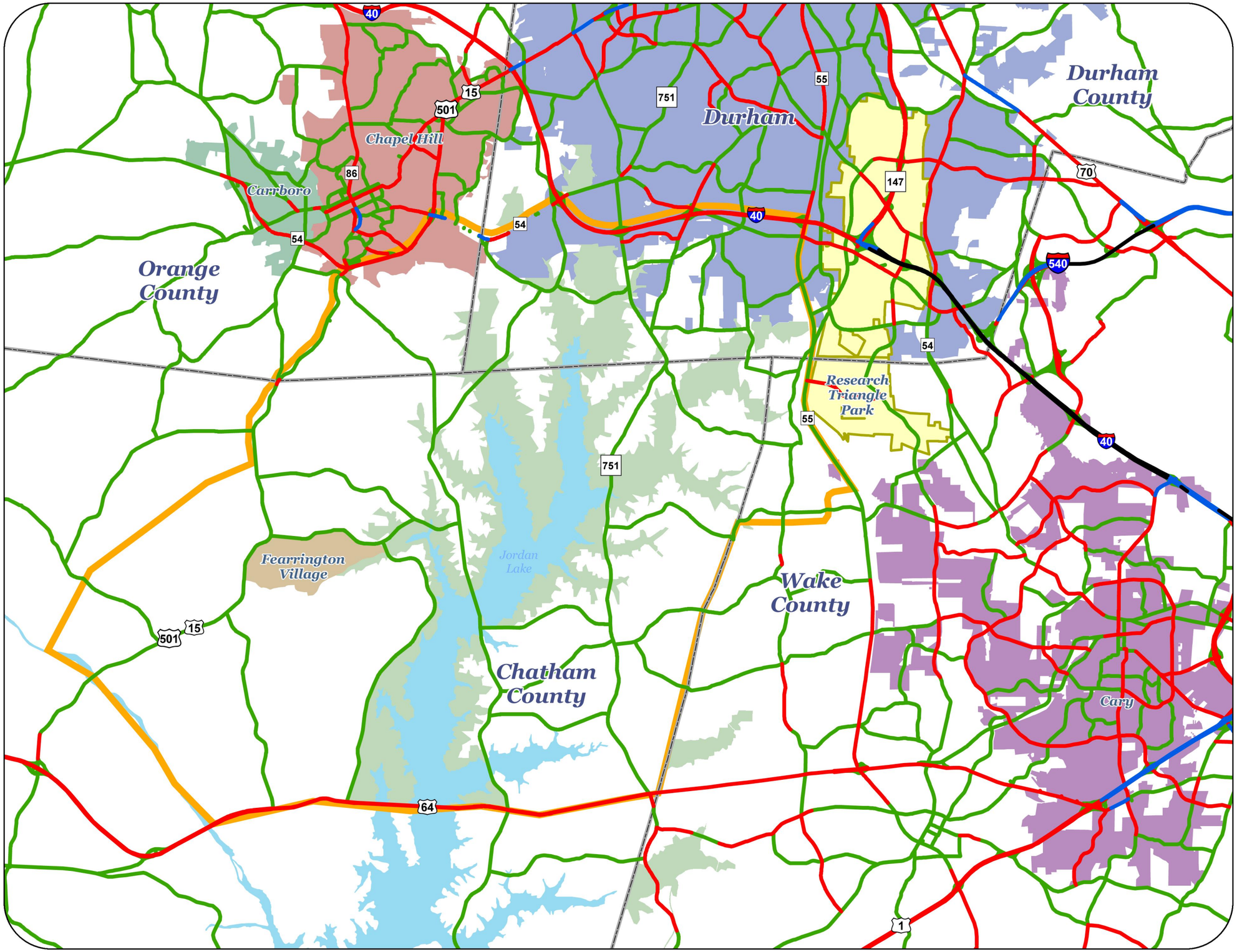
Farrington Road Corridor Study

Figure 3

Triangle Model Attributes

Number of Lanes Per Direction



Lanes Per Direction

- 1 Lane per Direction
- 2 Lanes per Direction
- 3 Lanes per Direction
- 4 Lanes per Direction
- Study Area
- Lakes
- Durham
- Chapel Hill
- Fearrington Village
- Cary
- Carrboro
- Counties
- Corps of Engineers Land
- Research Triangle Park

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N W E S

0 0.5 1 2 3 Miles

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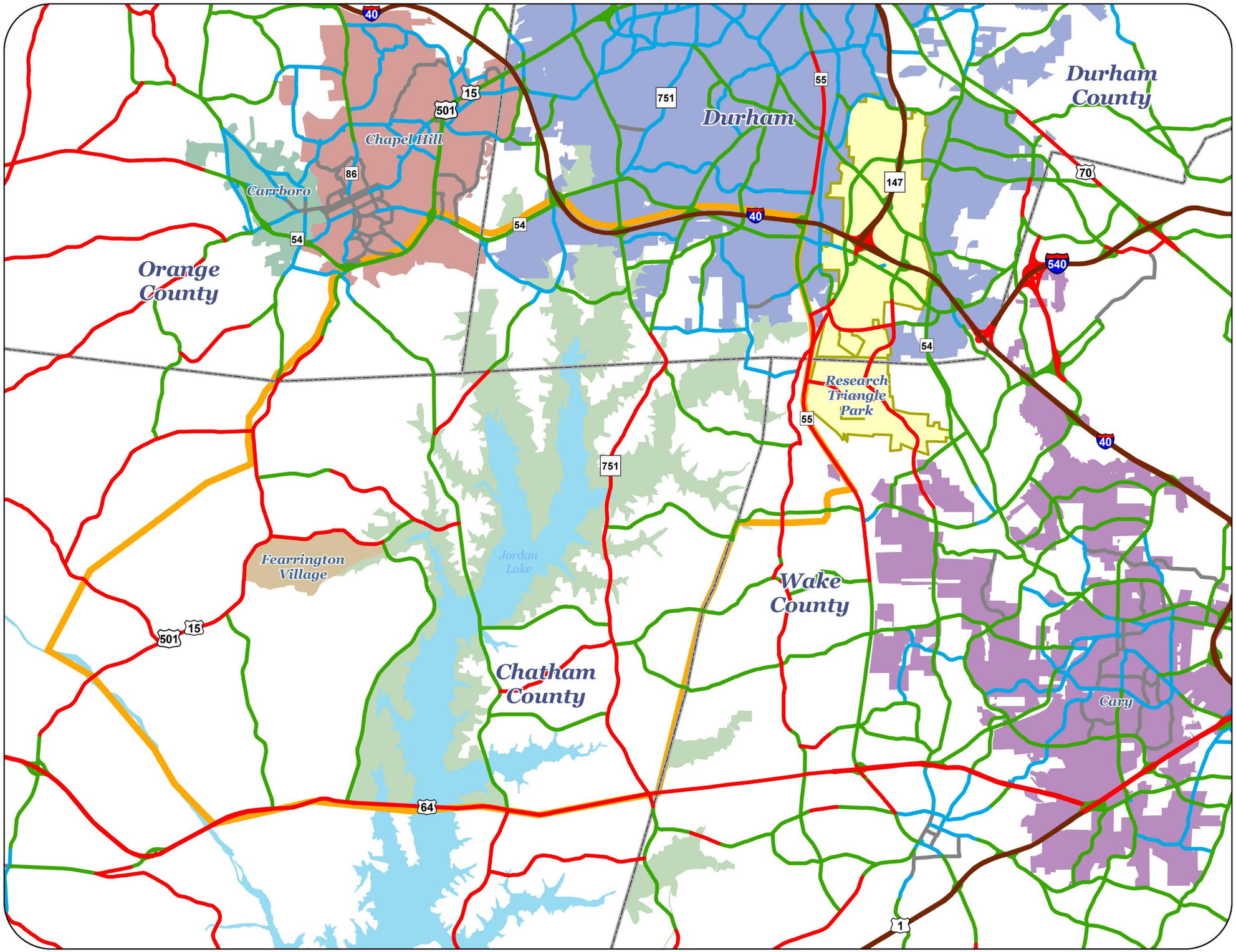
Figure 4

Triangle Model Attributes

Posted Speeds



Posted Speed (MPH)

- 25
- 35
- 45
- 55
- 65

- Study Area
- Lakes
- Durham
- Chapel Hill
- Fearrington Village
- Cary
- Carrboro
- Counties
- Corps of Engineers Land
- Research Triangle Park

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N W E S

1 0.5 0 1 2 Miles

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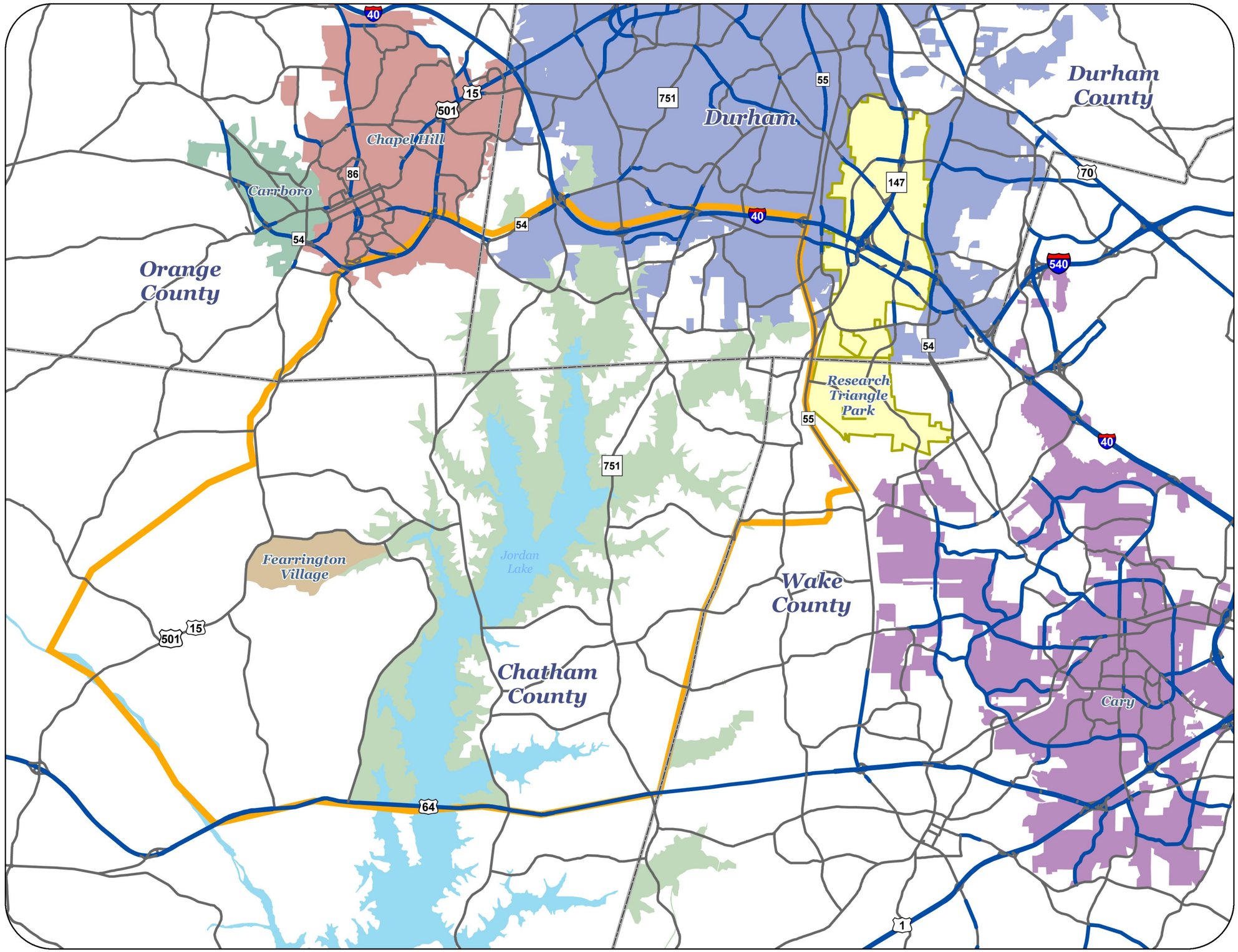
Figure 5

Triangle Model Attributes

Median



- Median or Continuous Left Turn lane
- No Median or Median Treatment not used for Capacity
- Study Area
- Lakes
- Durham
- Chapel Hill
- Fearrington Village
- Cary
- Carrboro
- Counties
- Corps of Engineers Land
- Research Triangle Park

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N W E S

0 0.5 1 2 3 Miles

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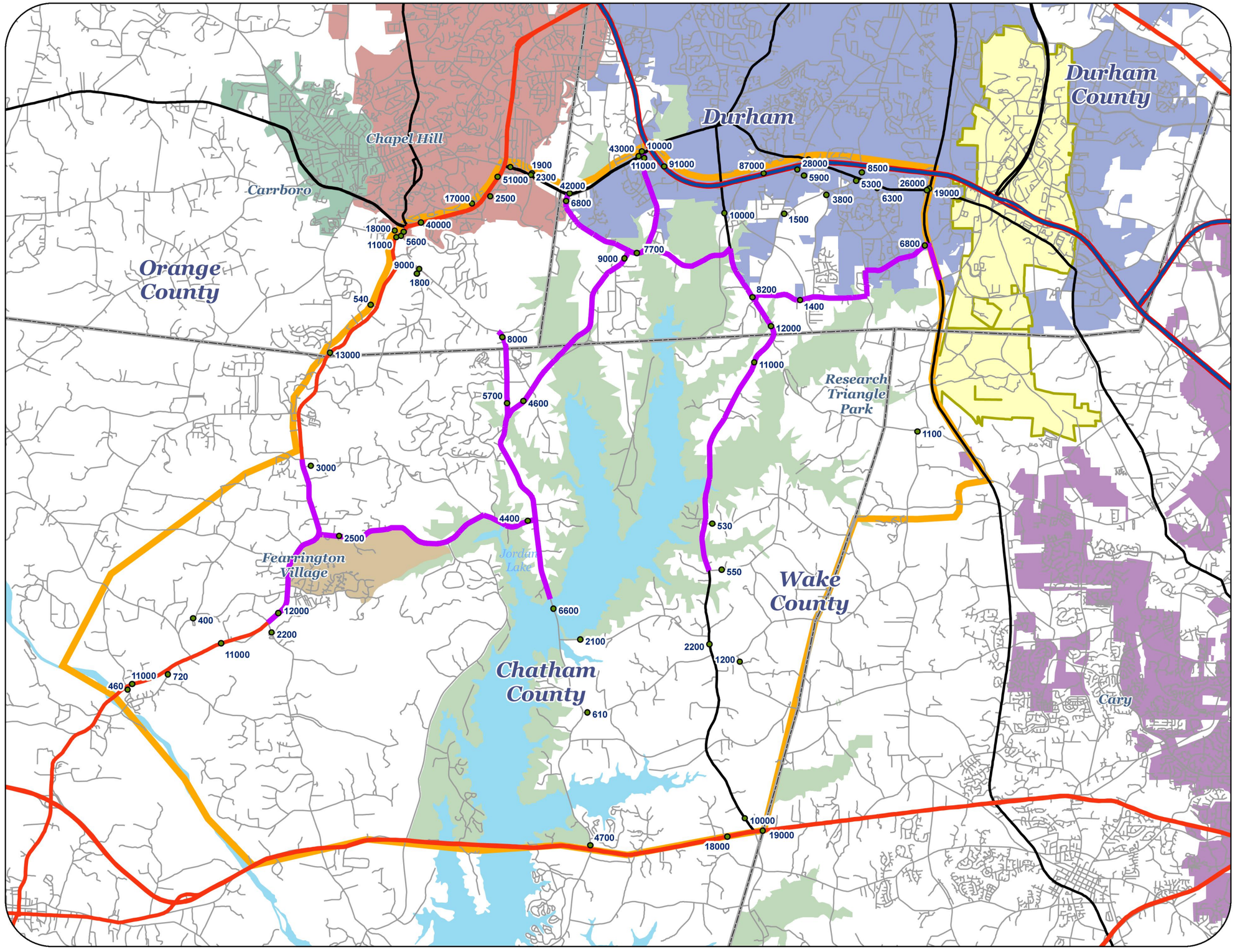
Farrington Road Corridor Study

Figure 6

2005 NCDOT AADT Traffic Count Locations



2005 AADT's
Study Corridors
Interstates
US Highways
State Highways
State Roads
Counties
Study Area
Research Triangle Park
Lakes
Durham
Chapel Hill
Fearrington Village
Cary
Carrboro
Corps of Engineers Land

November 25, 2008

N
W E
S

0 0.5 1 2 3 Miles

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Non-Motorized Facilities

Non-motorized facilities include bicycle and pedestrian routes as well as transit services. There are a limited number of these facilities and services in the corridor study area. This characteristic is consistent with the area's predominantly rural and undeveloped character.

The Durham Area Transit Authority (DATA) operates one route that runs along Sedwick Road and NC 55 in the northeastern portion of the study area. Although the Triangle Transit Authority (TTA) does not have any routes inside the study area, they do operate four routes along NC 54, just to the north of the corridor. The Chatham Transit Network (CTN) operates an "on-demand" service in Chatham County. They also operate one route that makes three trips daily to UNC Hospitals from Pittsboro and Siler City.

As mentioned, due to the rural nature of the study area, bicycle and pedestrian facilities are not common. A portion of the American Tobacco Trail runs through the study area and this facility accommodates bicyclists and pedestrians.

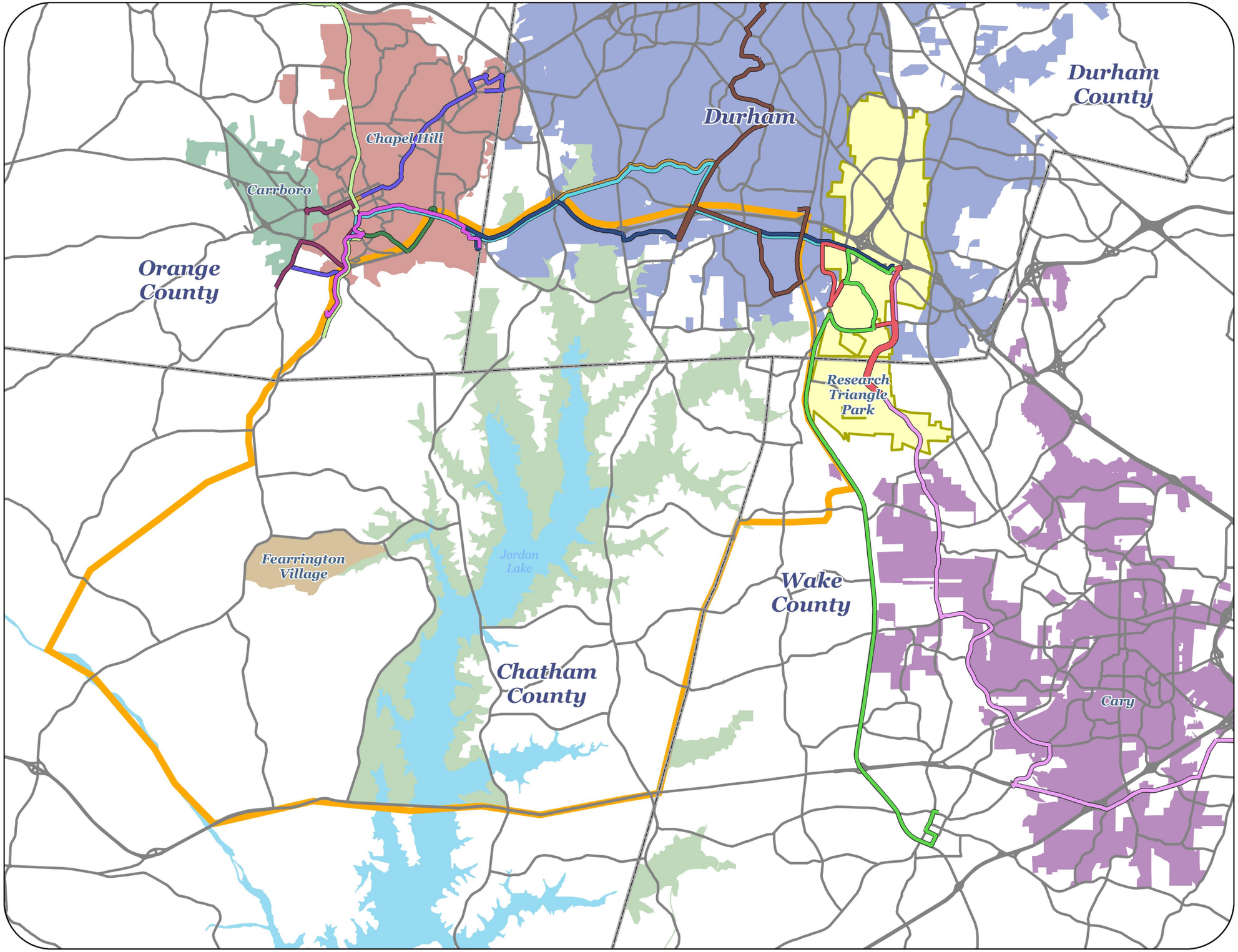
Figures 7-8 show local transit routes and bicycle and pedestrian facilities in the study area.

Farrington Road Corridor Study

Figure 7

Triangle Model Attributes

Study Area Transit Routes



- Transit Routes
- Model Roads
- Counties
- Study Area
- Research Triangle Park
- Lakes
- Durham
- Chapel Hill
- Fearrington Village
- Cary
- Carrboro
- Corps of Engineers Land

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N W E S

0 0.5 1 2 3 Miles

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Farrington Road Corridor Study

Figure 8

Triangle Model Attributes

Bicycle and Pedestrian Facilities

Durham
Durham County
Chapel Hill
Carrboro
Orange County
Research Triangle Park
Fearrington Village
Jordan Lake
Wake County
Chatham County
Cary

- Trails and Greenways
- Off-Road Trail Network
- 2006 Bicycle Plan Network
- Model Roads
- Counties
- Study Area
- Research Triangle Park
- Lakes
- Durham
- Chapel Hill
- Fearrington Village
- Cary
- Carrboro
- Corps of Engineers Land

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N
W E
S

0 0.5 1 2 3 Miles

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Level of Service

Level of service (LOS) is a standard used to determine the quality of service on transportation facilities. The level of service characterizes the operating conditions on a facility through traffic performance measures related to speed and travel time, freedom to maneuver, traffic interruptions, and comfort and convenience. LOS is represented by the letters "A" through "F", with "A" representing the most favorable driving conditions and "F" representing the least favorable.

Level of service criteria vary depending on the type of facility being analyzed. Examples of criteria include percent time spent following, average travel speed, control delay per vehicle, maximum density, and maximum volume-to-capacity ratio (V/C). V/C represents congestion on a roadway and is calculated by dividing the volume (average daily traffic) of that roadway by the capacity.

For this study, two individual "types" of LOS analysis were performed: corridor LOS analysis and intersection LOS analysis.

Corridor Level-of-Service

Seventeen roadway sections were identified for corridor LOS traffic analysis for existing (and projected future) conditions. This analysis includes the collection of roadway characteristics (lanes, speeds, development type), along with current traffic counts.

Figure 1 shows corridors that were studied as part of this analysis, as well as a reference Section ID that will be used throughout the report. These corridors are also listed in **Table 1**. For each section, 48-hour traffic count data and roadway characteristic data were collected in September 2007. Field visits were also used to observe traffic patterns and issues.

The majority of the corridors in the study area are operating at LOS B or better. These results are consistent with the rural character of the area. Two corridors are operating at LOS C. The only road section whose level of service is below LOS C is Section No. 23, NC 751 (Hope Valley Road) between Scott King Road and the southern planning area boundary (PAB). This corridor has a 2007 capacity of 11,800 and a 2007 average daily traffic flow (ADT) of 10,900 for a resulting V/C ratio of 0.92, which corresponds to LOS D.

Table 1. Study Corridors

Section	Road	From	To	Functional Classification	Distance (miles)	Lanes	Median Type	Speed Limit (mph)	LOS D Traffic Capacity	2007 Traffic (average vehicles / day)	2007 V/c	2007 LOS
11	US 15-501	Southern PAB	Jack Bennett Road	Rural Principal Arterial	1.9	4	Divided	55	62,600	15,700	0.25	A
12	US 15-501	Jack Bennett Road	Northern PAB	Rural Principal Arterial	1.4	4	Divided	55	62,600	17,300	0.28	A
13	Jack Bennett Rd	US 15-501	Farrington Point Road	Rural Local	4.1	2	None	45/55	11,900	3,300	0.28	A
14	Farrington Rd	Southern PAB	Lystra Road	Rural Major Collector	1.4	2	None	55	11,800	5,900	0.5	B
15	Farrington Point Rd	Lystra Road	Mt. Carmel Church Rd.	Rural Major Collector	2	2	None	45/55	10,500	6,000*	0.57	B
16	Old Farrington Pt Rd	Mt. Carmel Church Rd.	Barbee Chapel Road	Rural Major Collector	3.7	2	None	45/55	9,400	4,300	0.46	B
17	Mt Carmel Rd	Farrington Mill Road	Downing Creek Pkwy	Rural Major Collector	1.5	2	None	45	12,400	5,700	0.46	B
18	Barbee Chapel Rd	Farrington Mill Road	NC 54	Rural Major Collector	1.6	2	None	45	9,500	5,300	0.56	B
19	Farrington Rd	Stagecoach Road	Ridgefield Drive	Urban Collector	1.7	2	None	45	15,300	8,000	0.52	B
20	Farrington Rd	Barbee Chapel Road	Stagecoach Road	Urban Collector	0.4	2	None	45	15,300	7,700	0.5	B
21	Stagecoach Rd	Farrington Road	NC 751	Rural Major Collector	1.6	2	None	45	9,500	6,700	0.71	C
22	NC 751 (Hope Valley Rd)	Stagecoach Road	Scott King Road	Urban Minor Arterial	1	2	None	55	12,800	9,000	0.7	C
23	NC 751 (Hope Valley Rd)	Scott King Road	Southern PAB	Rural Major Collector	5.2	2	None	55	11,800	10,900	**0.92**	**D**
24	Scott King Road	NC 751	Grandale Drive	Urban Collector	2.1	2	None	35/45	9,500	1,700	0.18	A
25	Grandale Dr	Scott King Road	Sedwick Road	Urban Collector	0.5	2	None	35	9,500	4,000	0.42	B
26	Sedwick Rd	Grandale Drive	NC 55	Urban Collector	1.2	2	None	25	12,500	6,800	0.54	B
27	NC 55	Sedwick Road	Alexander Drive	Urban Principal Arterial	0.7	5	TWLTL	50	39,700	15,400	0.39	B

V/C is volume-to-capacity (ADT/Capacity). TWLT is a two-way left turn lane (center lane in roadway). *

Historic Traffic Growth

NCDOT traffic counts from 1990 through 2005 were analyzed in this study to better understand traffic growth in the area. These counts are presented in **Table 2**. Historical patterns indicate that the study corridors have experienced significant traffic growth since 1990, with traffic on many small rural roads increasing over 5% a year and traffic in some locations increasing over 10%. Since this area is expected to continue to experience significant growth in housing, there is no reason to believe that traffic demand will dramatically slow or reduce in the future.

Table 2. Historic AADT Growth in Study Corridors

Section	Road	From	To	Count Location	NCDOT Traffic Survey Count ID	Average Yearly Growth* (1990-2005)	1990	1992	1994	1997	1999	2001	2003	2005
11	US 15-501	Southern PAB	Jack Bennett Road	South of Jack Bennett Road	1800069	3.80%	--	10,000	12,000	13,000	13,000	14,000	--	--
12	US 15-501	Jack Bennett Road	Northern PAB	North of Manns Chapel Road	1800921	2.20%	15,000	15,000	18,000	18,000	19,000	20,000	20,000	--
13	Jack Bennett Rd	US 15-501	Farrington Point Road	East of 15-501	1800923	**5.00%**	1,200	1,500	2,100	2,300	2,300	2,400	2,400	2,500
14	Farrington Rd	Southern PAB	Lystra Road	South of Jack Bennett Road	1800918	**8.10%**	--	2,400	2,700	3,500	4,600	5,700	5,800	6,600
15	Farrington Point Rd	Lystra Road	Mt. Carmel Church Rd.	N/A	N/A	N/A	No historic count on or near this corridor section							
16	Farrington Pt Rd	Mt. Carmel Church Rd.	Barbee Chapel Road	North of Farrington Road	1800917	**7.80%**	1,500	2,300	2,700	3,300	3,200	3,300	3,800	4,600
17	Mt Carmel Rd	Farrington Mill Road	Downing Creek Pkwy	North of Farrington Road	1800920	**7.20%**	2,000	2,200	2,500	3,800	4,000	5,000	5,000	5,700
18	Barbee Chapel Rd	Farrington Mill Road	NC 54	N/A	N/A	N/A	No historic count on or near this corridor section							
19	Farrington Rd	Stagecoach Road	Ridgefield Drive	South of NC 54	3100499	**8.80%**	3,100	3,400	5,600	--	7,200	8,200	--	11,000
20	Farrington Rd	Barbee Chapel Road	Stagecoach Road	West of Stagecoach Road	3100505	**8.70%**	2,200	2,400	4,200	5,500	7,200	7,900	--	7,700
21	Stagecoach Rd	Farrington Road	NC 751	N/A	N/A	N/A	No historic count on or near this corridor section							
22	NC 751 (Hope Valley Rd)	Stagecoach Road	Scott King Road	North of Scott King Road	3100734	**10.60%**	1,800	2,200	2,500	3,400	5,500	7,200	8,200	8,200
23	NC 751 (Hope Valley Rd)	Scott King Road	Southern PAB	South of Scott King Road	3100514	**10.40%**	3,600	3,500	3,400	5,200	7,000	8,800	9,900	12,000
24	Scott King Road	NC 751	Grandale Drive	East of NC 751	3100515	**10.80%**	300	300	520	600	1,100	1,500	1,400	1,400
25	Grandale Dr	Scott King Road	Sedwick Road	N/A	N/A	N/A	No historic count on or near this corridor section							
26	Sedwick Rd	Grandale Drive	NC 55	West of NC 55	3100528	**6.60%**	2,600	3,700	4,500	5,300	6,300	7,200	7,900	--
27	NC 55	Sedwick Road	Alexander Drive	South of Sedwick Road	3100726	**5.80%**	6,700	7,200	9,800	--	12,000	14,000	14,000	--

Based on average annual increase using available counts

Intersection Level-of-Service (LOS) Analysis

Nine intersections were identified for intersection operational analysis. Commute period data were collected in the morning (AM) and afternoon (PM) peak hours. Turning movement counts were performed by Traffic Survey Services, Inc. on typical weekdays in the morning (7:00 to 9:00 a.m.) and afternoon (4:00 to 6:00 p.m.) time periods at the following intersections:

- US 15-501 at Jack Bennett Road — September 18, 2007
- Farrington Point Road at Lystra Road — September 18, 2007
- Farrington Point Road/Old Farrington Point Road at Mt. Carmel Road — September 13, 2007
- Farrington Mill Road/Farrington Road at Barbee Chapel Road — September 13, 2007
- Farrington Road at Stagecoach Road — September 13, 2007
- Stagecoach Road at Hope Valley Road (NC 751) — September 11, 2007
- Hope Valley Road (NC 751) at Fayetteville Road — September 11, 2007
- NC 55 at Sedwick Road — September 12, 2007
- NC 55 at T.W. Alexander Drive — September 12, 2007

All turning movement counts were performed while public schools in Durham and Chatham County were in session. For these intersections, operational and geometric data were collected in the field in September 2007. This data was used to analyze current intersection LOS for study intersections in *SYNCHRO* software.

Capacity analyses were performed for the AM and PM peak hours for existing (2007) traffic conditions using *SYNCHRO* (Version 7) software to determine the operating characteristics of the adjacent road network.

For intersection analysis, capacity is combined with LOS in a relationship table to describe the operating characteristics of a road segment or intersection. LOS D is the typically accepted standard for signalized intersections in urbanized areas. For signalized intersections, LOS is defined for the overall intersection operation.

For unsignalized intersections, only the movements that must yield right-of-way experience control delay. Therefore, LOS criteria for the overall intersection is not reported by *SYNCHRO* Version 7 or computable using methodology published in the *Highway Capacity Manual.* Results between LOS A and LOS C for the side street approach are assumed to represent short delays. For descriptive purposes, results between LOS D and LOS E for the side street approach are assumed to represent moderate delays, and LOS F for the side street approach is assumed to represent long delays. It is typical for stop sign controlled side streets and driveways intersecting major streets to experience long delays during peak hours, while the majority of the traffic moving through the intersection on the major street experiences little or no delay. **Table 3** lists the LOS control delay thresholds published in the *Highway Capacity Manual* for signalized and unsignalized intersections, as well as the unsignalized operational descriptions assumed herein.

Table 3. Level-Of-Service (LOS) Control Delay Thresholds

Level-of-Service	Signalized Intersections – Control Delay Per Vehicle [seconds of delay per vehicle]	Unsignalized Intersections – Average Control Delay [seconds of delay per vehicle]	
A	≤ 10	≤ 10	
B	> 10 – 20	> 10 – 15	
C	> 20 – 35	> 15 – 25	Short Delays
D	> 35 – 55	> 25 – 35	
E	> 55 – 80	> 35 – 50	Moderate Delays
F	> 80	> 50	Long Delays

Capacity analyses were performed for the existing (2007) traffic conditions for the following intersections:

- US 15-501 at Jack Bennett Road
- Farrington Point Road at Lystra Road
- Farrington Road and Stagecoach Road at Mt. Carmel Road

- Farrington Mill Road/Farrington Road at Barbee Chapel Road
- Hope Valley Road (NC 751) at Fayetteville Road
- Stagecoach Road at Hope Valley Road (NC 751)
- Farrington Road at Stagecoach Road
- NC 55 at T.W. Alexander Drive
- NC 55 at Sedwick Road

Table 4 summarizes the LOS and delay (seconds per vehicle) for all of the study intersections for the existing traffic conditions.

Table 4. Existing (2007) Level-of-Service (LOS) Summary

Intersection	Signalized	AM Peak-Hour LOS (Delay in seconds)	PM Peak-Hour LOS (Delay in seconds)
US 15-501 and Jack Bennett Road	Yes	A (9.0)	B (10.1)
Farrington Point Road and Lystra Road	Yes	C (20.6)	B (14.5)
Farrington Point Road/Old Farrington Point Road and Mt. Carmel Road	No	Short delays for minor street approach	Moderate delays for minor street approach
Farrington Mill Road/Farrington Road and Barbee-Chapel Road	No	Moderate delays for minor street approach	Long delays for minor street approach
Farrington Road and Stagecoach Road	No	Long delays for minor street approach	Long delays for minor street approach
Stagecoach Road and Hope Valley Road (NC 751)	Yes	D (43.0)	B (19.8)
Hope Valley Road (NC 751) and Fayetteville Road	Yes	B (10.7)	C (21.4)
NC 55 and Sedwick Road	Yes	B (19.6)	C (29.8)
NC 55 and T.W. Alexander Drive	Yes	C (24.3)	C (24.5)

Summary of Existing Intersection Deficiencies

All of the studied intersections operate at an acceptable LOS. The following signalized intersections have significant queuing and may need additional vehicle storage (i.e. longer the turn lanes) to decrease vehicle queue lengths:

US 15-501 and Jack Bennett Road

- The westbound left-turn lane queue on Jack Bennett Road exceeds existing storage lengths during the PM peak hour.

Farrington Point Road and Lystra Road

- The eastbound left-turn lane queue on Lystra Road exceeds existing storage lengths during the AM peak hour

Farrington Point Road and Stagecoach Road

- Westbound Stagecoach Road has queuing problems during peak hours due to poor sight distance for left-turning vehicles (of oncoming traffic from northbound Farrington Road).

Stagecoach Road and Hope Valley Road (751)

- The eastbound left-turn lane queue on Stagecoach Road exceeds existing storage lengths during the AM and PM peak hours.

NC 55 and T.W. Alexander Drive

- The northbound right-turn lane and southbound left lane queues on NC 55 exceed existing storage lengths during the AM peak hour.
- The westbound left-turn lane queue on T.W. Alexander Drive exceeds existing storage length during the PM peak hour.

Travel Pattern Analysis

Travel patterns in the study area were reviewed to identify prevalent traffic movements that currently affect the roads in the study area. This analysis drew from available resources from the Census, DCHC

Metropolitan Planning Organization (MPO), and the Triangle Regional Model (TRM) to determine regional traffic patterns from western Chatham County and the Jordan Lake area to Research Triangle Park (RTP). Specific data included in the review are:

- County-to-County Work Flows from the 2000 Census journey-to-work supplemental survey (i.e. "Census long form"),
- Travel patterns identified in the 2006 Triangle Cordon Survey (conducted on US 64 west of Pittsboro),
- TRM base year (2005) model traffic flows from Chatham County,
- TRM base year (2005) model select link analysis (to be prepared and provided by DCHC MPO), and
- 2006 Triangle Household Survey work-trip flows and all-trip flows (to be prepared and provided by DCHC MPO).

The shape and location of Jordan Lake affects the intensity of travel patterns in the few east-west corridors that cross or neighbor it. Interstate 40 and NC 54 are the predominant east-west routes north of the watershed, while U.S. Highway 64 crosses Jordan Lake via a bridge at the southern edge of the study area. Stagecoach Road and connecting streets cross through the watershed at the north end of the lake. There are no roads crossing Jordan Lake in the three miles separating Stagecoach Road and Highway 64. The gap in the roadway network, combined with the urbanization of northwest Chatham County, is intensifying vehicle traffic on Stagecoach Road.

County-to-County Work Flows

County-to-County work flow data were compiled from Census 2000 responses to the long-form (sample) questions about where people work. These files describe the county-to-county work travel patterns, detailing the counties people live and work in. Analysis of this data can help identify some of the predominant travel patterns through the region and the study area.

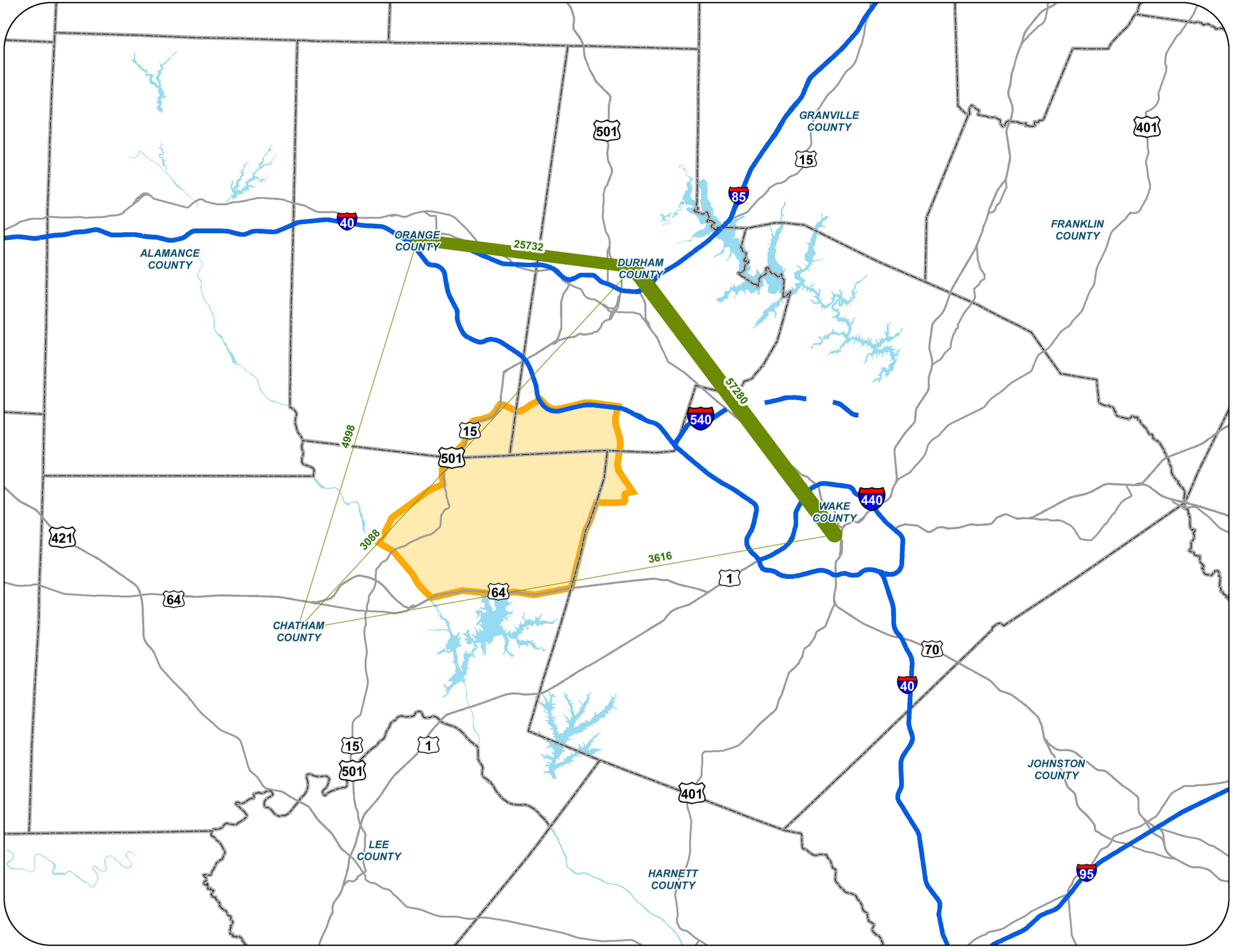
According to Census 2000 County-to-County worker flow files, Chatham County "produces" (those people living in Chatham County and going to work either in Chatham County or elsewhere) 24,657 work trips, and "attracts" (those people working in Chatham County and living in Chatham County or elsewhere) 16,901 work trips. 28% of the produced trips (6,945) travel to Durham or Orange Counties from Chatham County, out of a total of 13,639 (55%) that travel outside of the County. For the work "attractions", 5,883 (or 35%) travel into Chatham County for work, and, of that total, 1,141 (or 7%) come from Durham or Orange Counties.

Figure 9 shows the Journey-to-Work flows for the study area.

Farrington Road Corridor Study

Figure 9

Journey to Work Flows



Total Work Trips To/From

- 0 - 5000
- 5001 - 10000
- 10001 - 20000
- 20001 - 40000
- 40001 - 60000
- Study Area
- Interstates
- US Highways
- Lakes
- Counties

November 25, 2008

N W E S

0 2 4 8 12 Miles

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Triangle Cordon Survey Flows

A cordon survey collects travel pattern information including origins and destinations at the perimeter of the study area. A cordon survey provides more detailed information for specific highway corridors than is normally possible using other survey methods.

The Institute for Transportation Research and Education (ITRE) worked with ETC Institute consultants in fall 2006 to conduct 13 cordon station surveys surrounding the Raleigh-Durham-Chapel Hill metropolitan planning area. Survey data collected at the cordon stations included trip purpose, origin and destination information, and traffic characteristics of travelers entering the region via major non-interstate facilities.

Of these 13 locations, two survey stations are particularly relevant to the Farrington Road Corridor Study: 1 south of Pittsboro and US 64 west of Pittsboro. Outside of local traffic (i.e., Fearrington Village) and traffic from Pittsboro, these two locations capture the primary sources of any external traffic from the south and west into the Farrington Road Corridor study area.

Tables 5 and 6 show the primary destinations (greater than 1% of total traffic) of travelers entering the Triangle Region at US 64 and US 15-501. **Figures 10 and 11** display the major destinations graphically. The majority of traffic from US 64 would not use the Farrington Road corridor because the travel patterns of the corridor make reaching desired destinations difficult. The most probable destinations requiring use of the corridor are Northern Chatham County and the Durham area, which make up approximately 8% (500 vehicles) of the 6,500 daily vehicles entering/exiting the region at this location. Trips entering the region from US 15-501 are more likely to use the corridor, based on their destinations, but these trips, which are destined for Durham and Western Chatham County, only comprise 12% (333 vehicles) of the 2,800 daily vehicles using this location

Based on this information, trips from outside the area are not expected to create significant demand on the Farrington Road Corridor. Therefore, future travel patterns and improvements should focus on trips that are generated within the region.

Table 5. Destination of Trips Entering the Region via US 64 West of Pittsboro

Destination	US 15 Trips
Chapel Hill Area	31%
Pittsboro Area	30%
Alamance	14%
Durham Area	7%
West Chatham	5%
Northern Chatham County	4%
US 64 West of Pittsboro	3%

Table 6. Destination of Trips Entering the Region via US 15-501 South of Pittsboro

Destination	US 64 Trips
Pittsboro Area	30%
Raleigh Area	13%
Chapel Hill Area	12%
US 64 East of Raleigh	11%
Cary/Apex	9%
Durham Area	4%
Northern Chatham County	4%
Lee County/Sanford	3%
North Wake County	3%
Area east of Jordan Lake	3%

Figure 10. Triangle External Trip Survey – US 64 West of Pittsboro

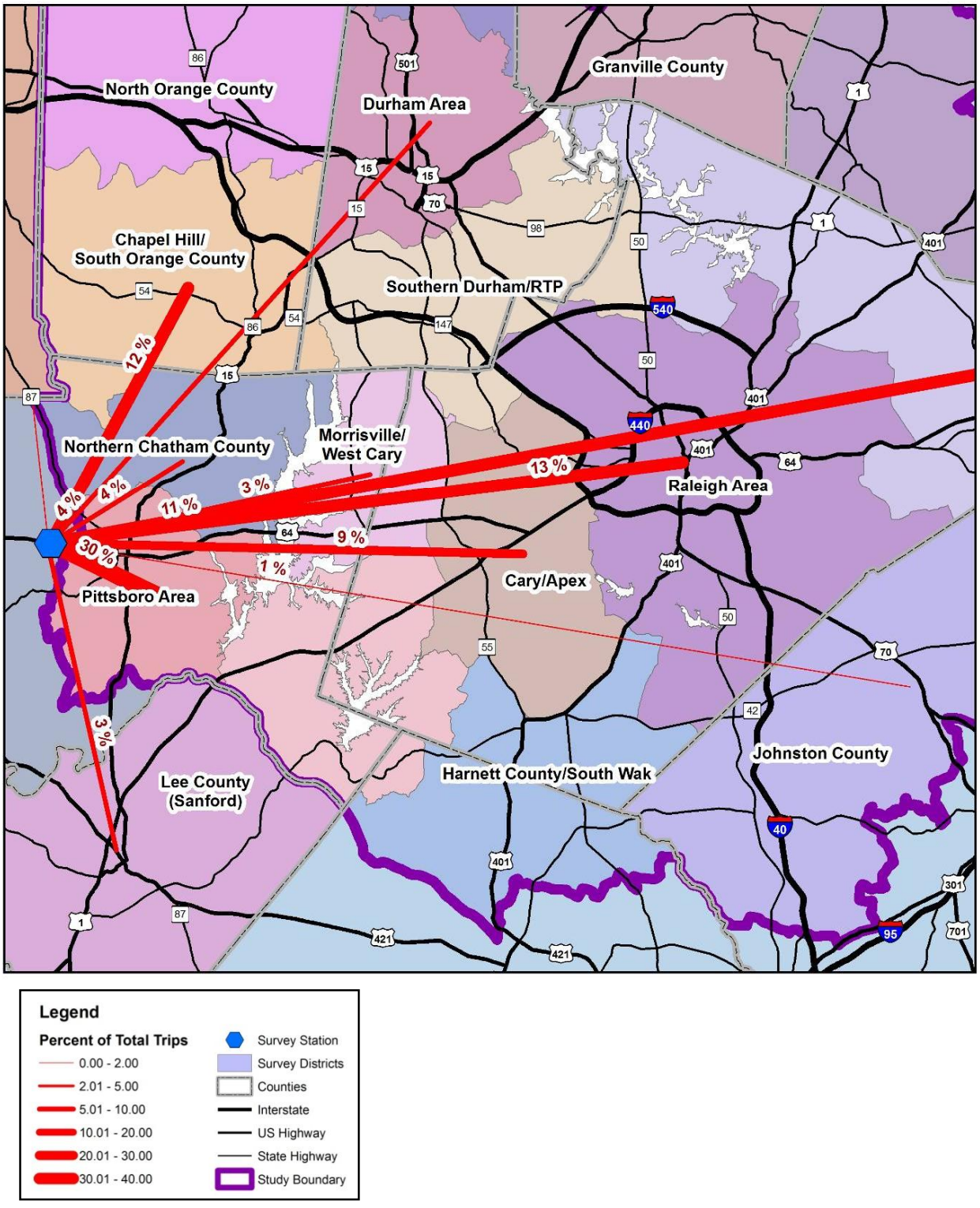
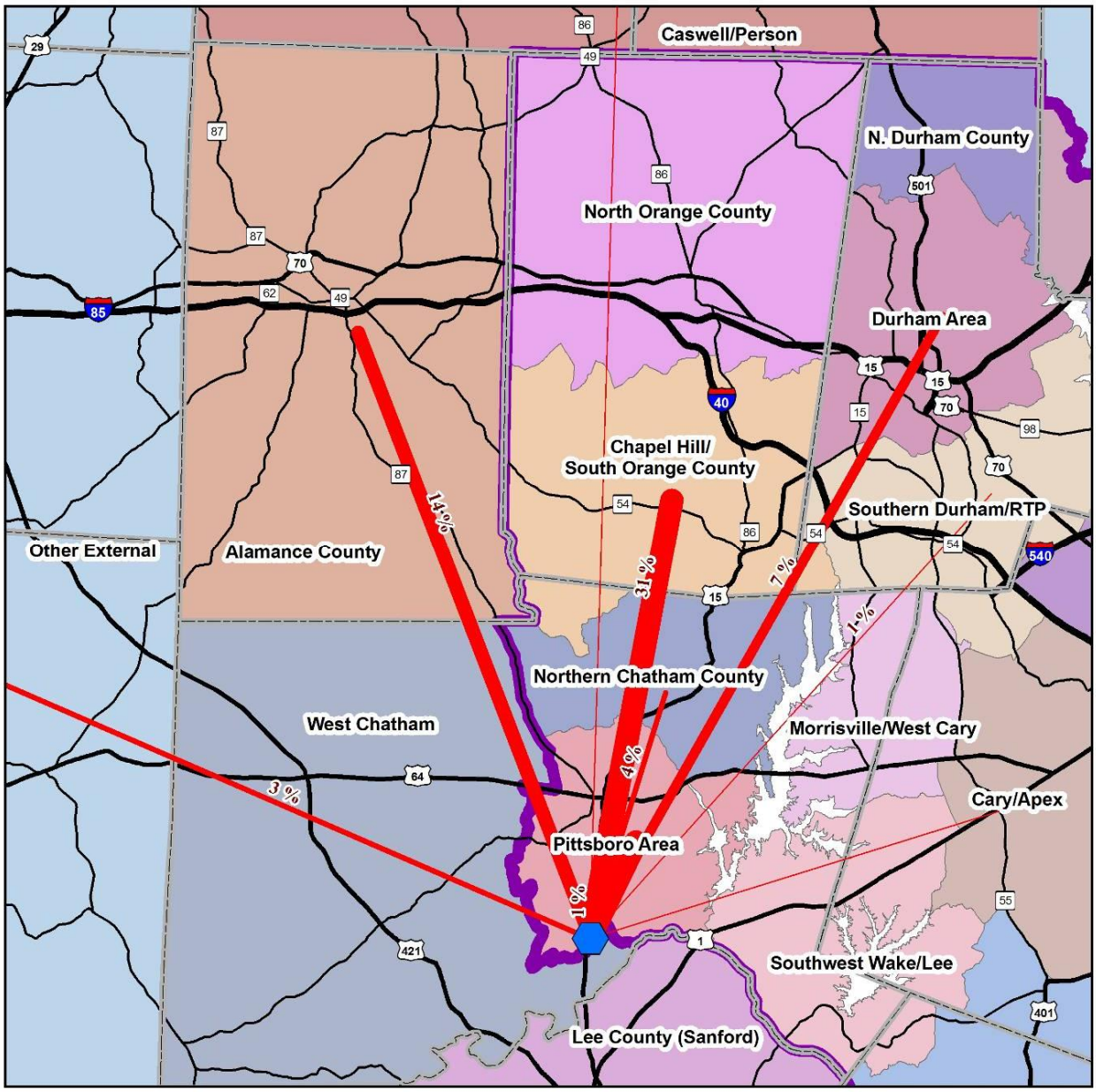
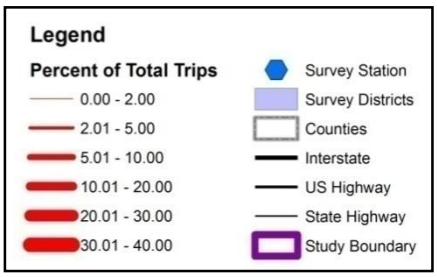


Figure 11. Triangle External Trip Survey – US 15/501 South of Pittsboro





Select Link Analysis

Select link analysis is a tool used to determine where traffic is coming from and going to on a select road segment or link. It is used to retrieve information about network conditions (on a 24-hour basis). It does not present the total volume for model links, only those which pass through a particular section.

DCHC MPO and Kimley-Horn prepared a number of Select Link Analysis model runs using the Triangle Regional Model (TRM) for roadway segments in the study area. Segments that corresponded to corridors in this study include:

- Farrington Mill Road
- Farrington Road
- US 15-501
- Jack Bennett Road
- Scott King Road
- NC 55.

Figures 12-17 on the following pages show the results of the select link analysis for each corridor. These figures show the location of each of the select link analysis and the distribution of trips (by percentage of total trips on the subject link). For example, in **Figure 13**, the select link analysis is Farrington Road between Stagecoach Road and Barbee Chapel Road. By definition, 100% of the select link volume goes through this section. Looking to the East, 66% of this traffic is either coming from or going to Stagecoach Road. The other 34% is heading North on Farrington Road. Of the 66% using Stagecoach Road, 22% heads south on NC 55.

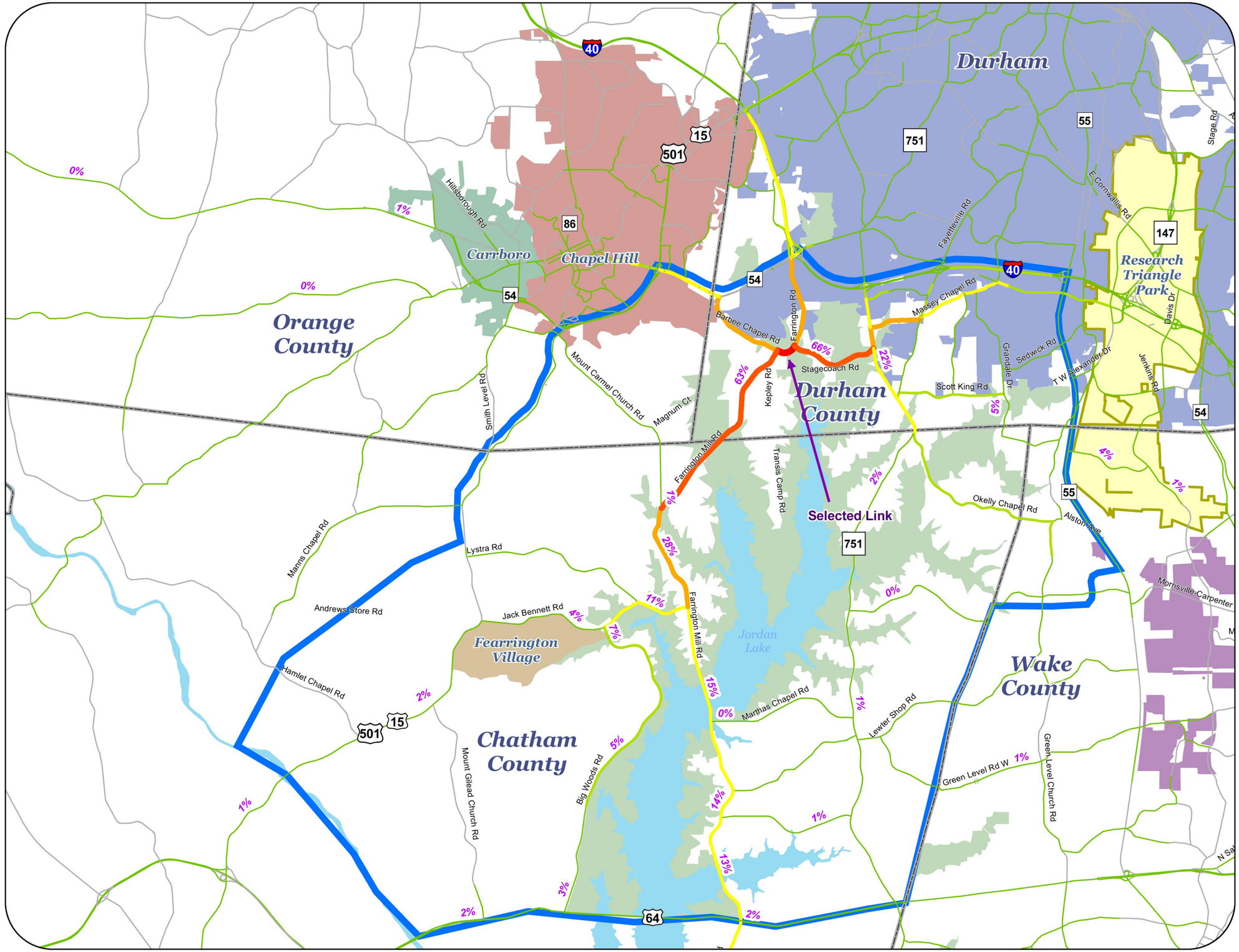
In general, the results of the select link analysis indicate that the majority of traffic traveling on the Farrington Road/Farrington Mill Road corridors is local in nature. For example, in **Figure 14**, traffic to/from the south is mostly from the area north of US 64, west of Cary, and east of Jordan Lake. Traffic to/from the North is nearly equally split between Farrington Mill Road and Mount Carmel Church Road, with the primary destinations being Chapel Hill and southwest Durham. A very small percentage of traffic from major highways (US 15-501, NC 55) traveled the study corridors, consistent with the results of the Triangle Cordon Survey Flow analysis.

Based on this analysis, the majority of impact on these facilities will be caused by local development pressures within the study area. Future Year (2035) Corridor Analysis will test the effect of local development on the transportation system, and present additional select link analyses to determine the magnitude of shifts in traffic as major highways bordering the study area experience increases in traffic.

Farrington Road Corridor Study

Figure 12

Select Link Analysis Farrington Rd.



Select Link Volumes
Percent of Trips

- 0.0
- 0.1 - 5
- 5 - 10
- 10 - 25
- 25 - 50
- 50 - 75
- 75 - 100
- Counties
- Study Area
- Research Triangle Park
- Lakes
- Durham
- Chapel Hill
- Fearrington Village
- Cary
- Carrboro
- Corps of Engineers Land

November 25, 2008

N W E S

0 0.5 1 2 3 Miles

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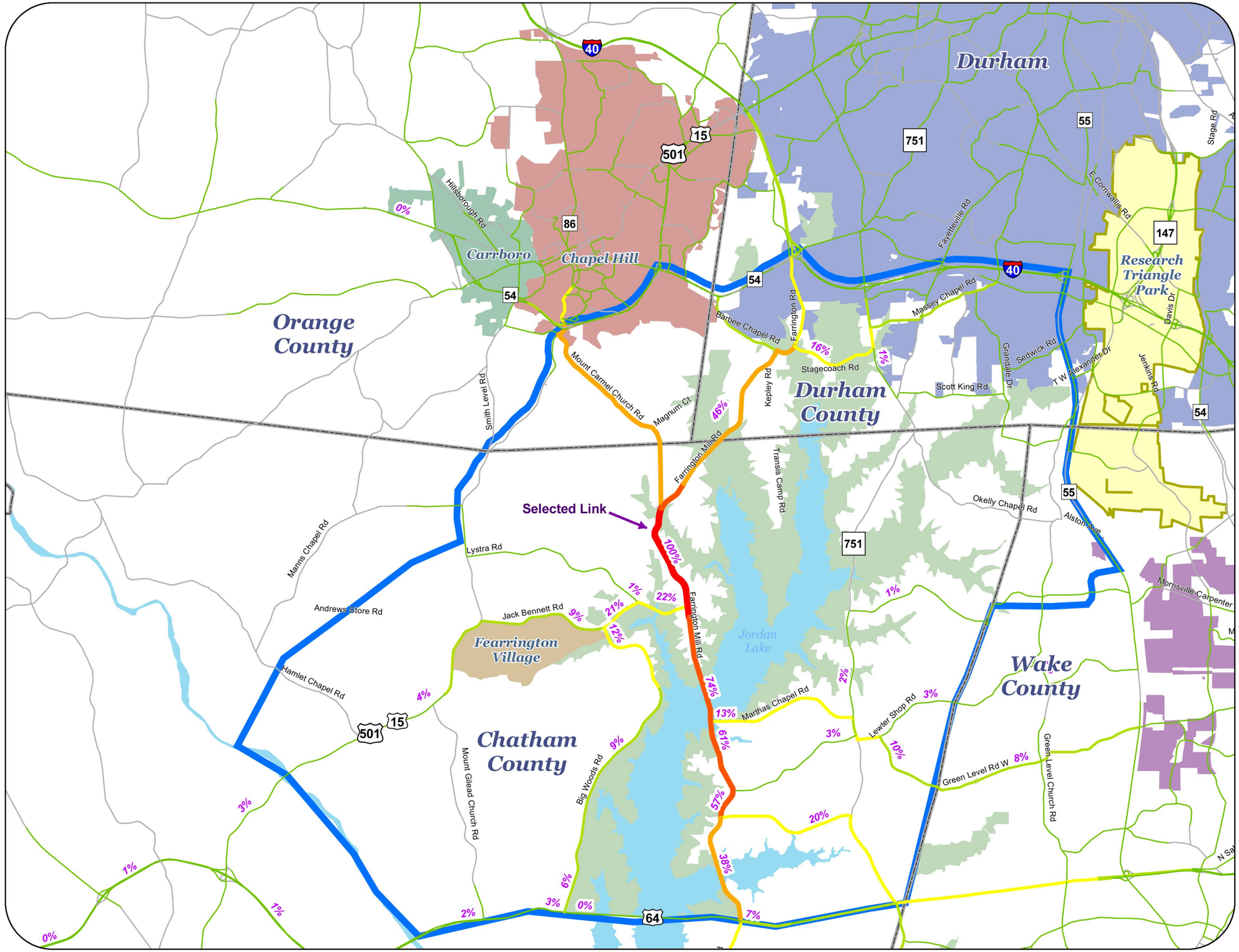
Farrington Road Corridor Study

Figure 13

Select Link Analysis
Farrington Mill Rd



Select Link Volumes
Percent of Trips

- 0.0
- 0.1 - 5
- 5 - 10
- 10 - 25
- 25 - 50
- 50 - 75
- 75 - 100
- Counties
- Study Area
- Research Triangle Park
- Lakes
- Durham
- Chapel Hill
- Fearrington Village
- Cary
- Carrboro
- Corps of Engineers Land

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N W E S

0 0.5 1 2 3 Miles

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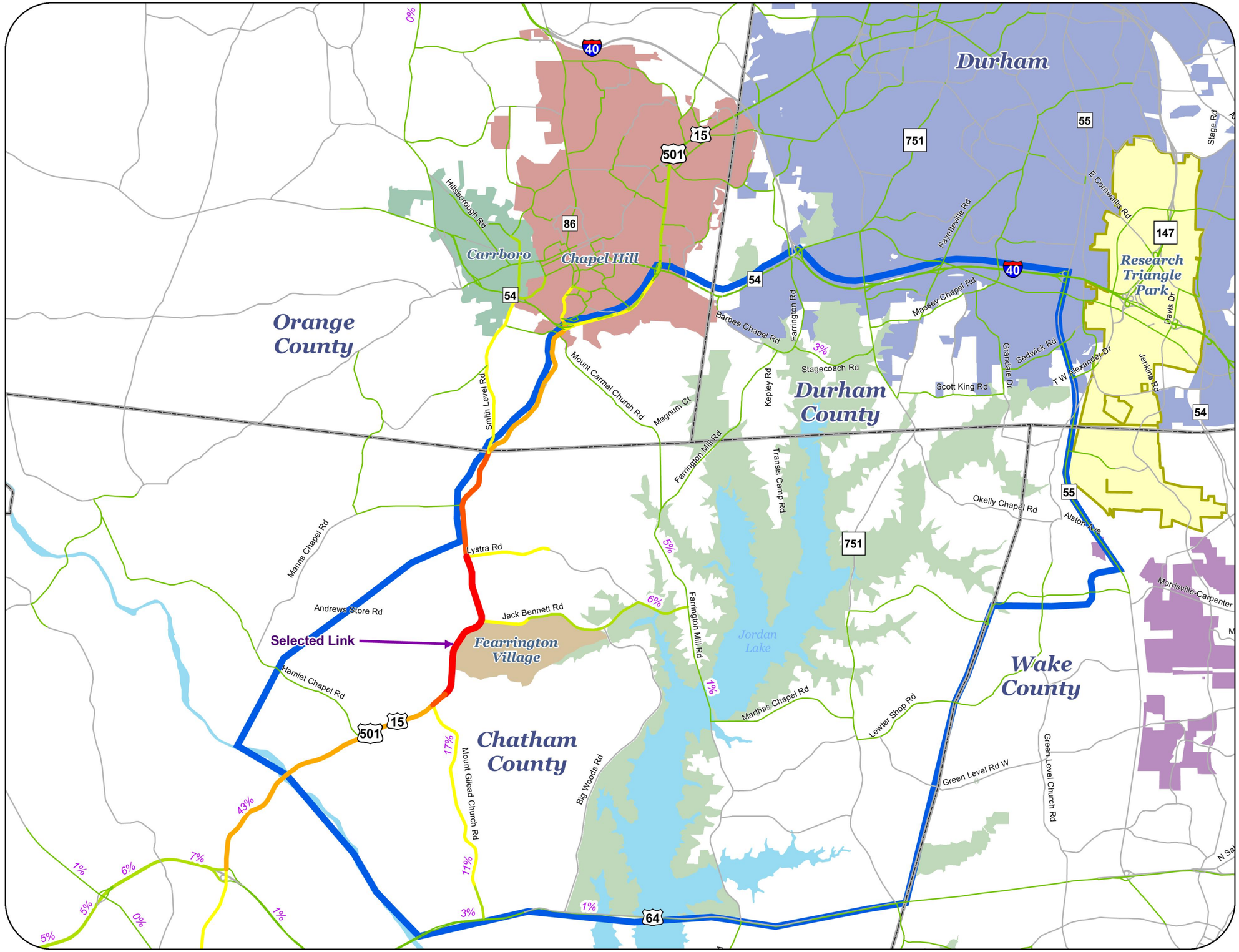
Farrington Road Corridor Study

Figure 14

Select Link Analysis
US 15/501



Select Link Volumes
Percent of Trips

- 0.0
- 0.1 - 5
- 5 - 10
- 10 - 25
- 25 - 50
- 50 - 75
- 75 - 100
- Counties
- Study Area
- Research Triangle Park
- Lakes
- Durham
- Chapel Hill
- Fearrington Village
- Cary
- Carrboro
- Corps of Engineers Land

November 25, 2008

N W E S

0 0.5 1 2 3 Miles

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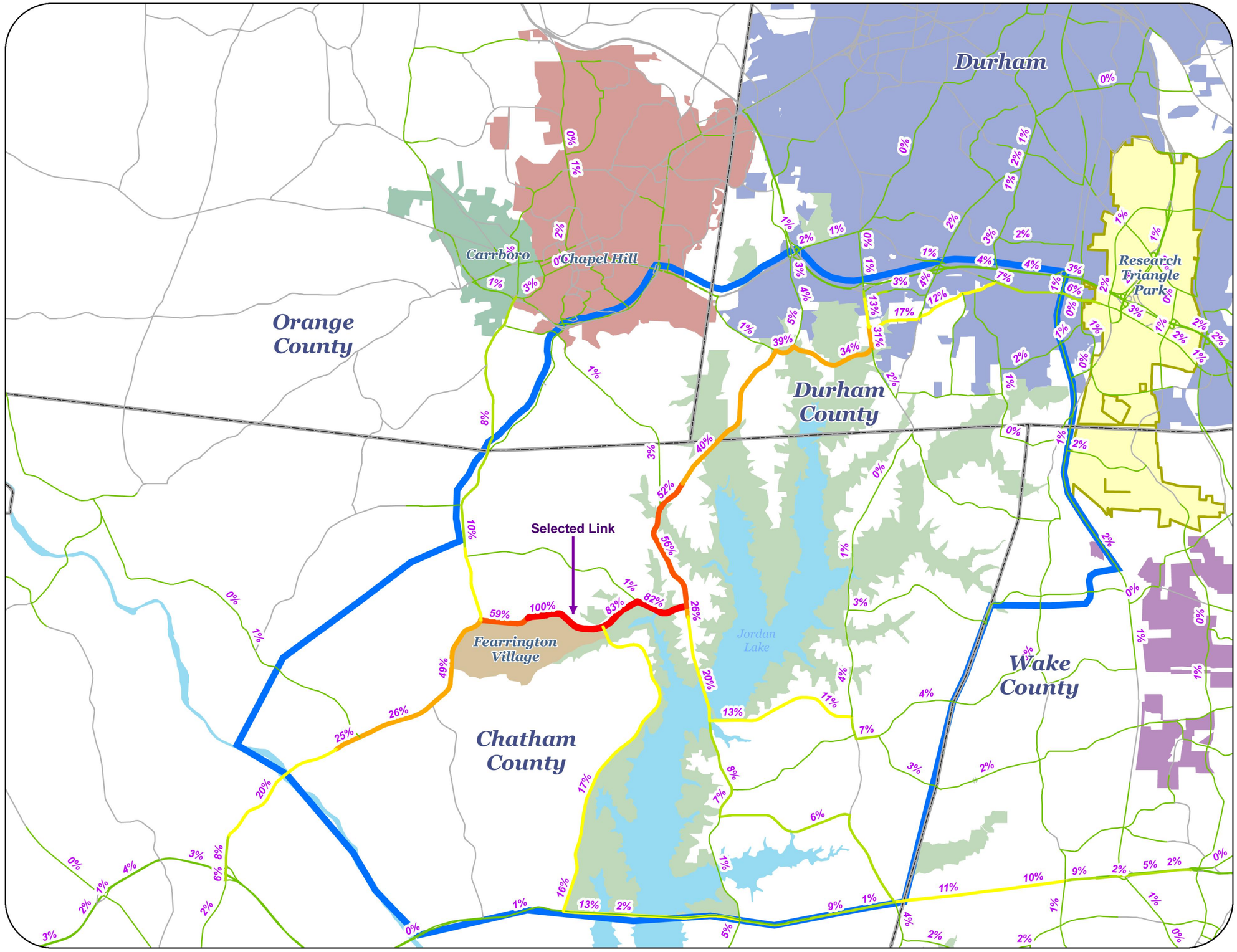
Farrington Road Corridor Study

Figure 15

Select Link Analysis
Jack Bennett Rd



Select Link Volumes
Percent of Trips

- 0.0
- 0.1 - 5
- 5 - 10
- 10 - 25
- 25 - 50
- 50 - 75
- 75 - 100
- Counties
- Study Area
- Research Triangle Park
- Lakes
- Durham
- Chapel Hill
- Fearrington Village
- Cary
- Carrboro
- Corps of Engineers Land

November 25, 2008

N W E S

0 0.5 1 2 3 Miles

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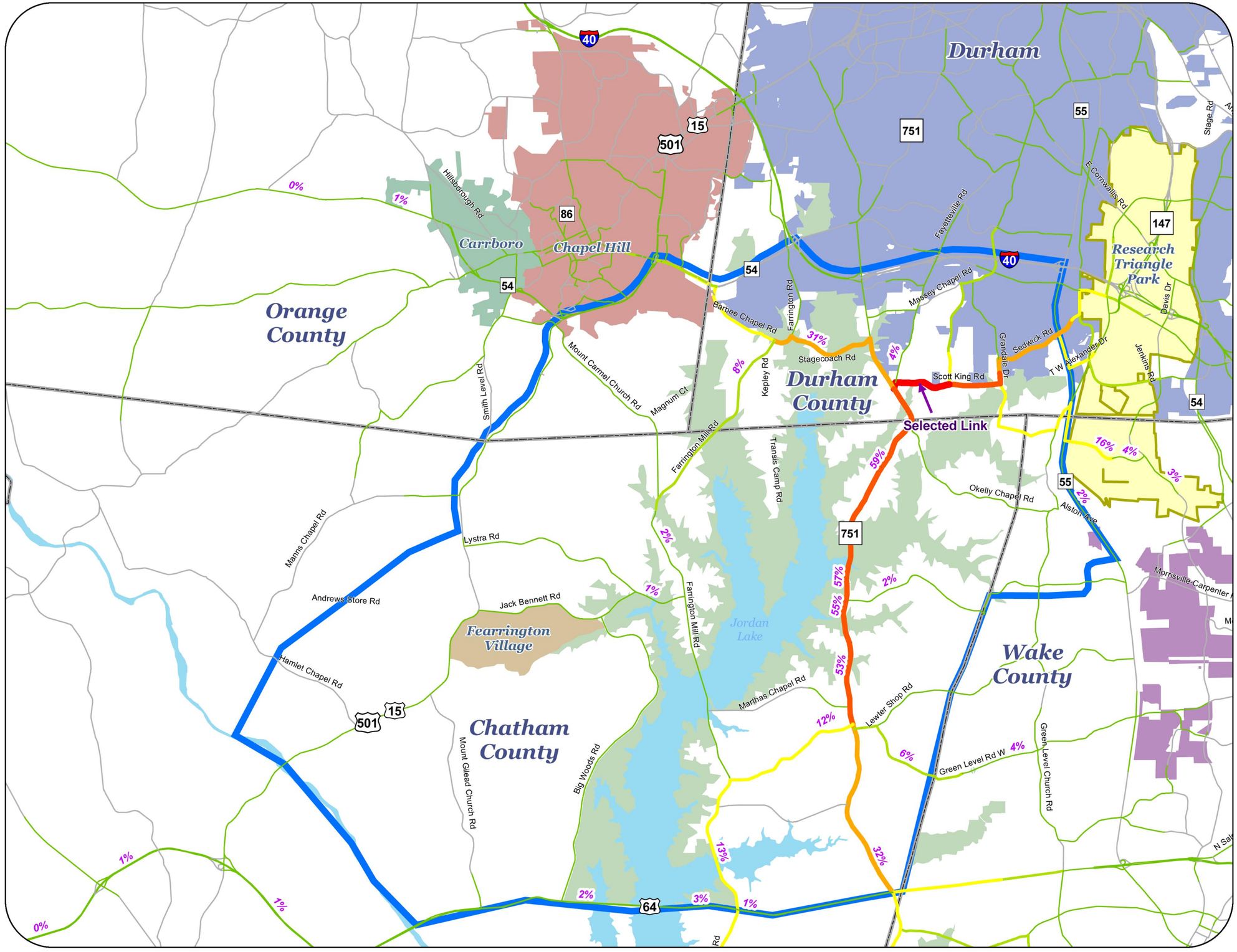
Farrington Road Corridor Study

Figure 16

Select Link Analysis
Scott King Road



Select Link Volumes
Percent of Trips

- 0.0
- 0.1 - 5
- 5 - 10
- 10 - 25
- 25 - 50
- 50 - 75
- 75 - 100
- Counties
- Study Area
- Research Triangle Park
- Lakes
- Durham
- Chapel Hill
- Fearrington Village
- Cary
- Carrboro
- Corps of Engineers Land

November 25, 2008

N W E S

0 0.5 1 2 3 Miles

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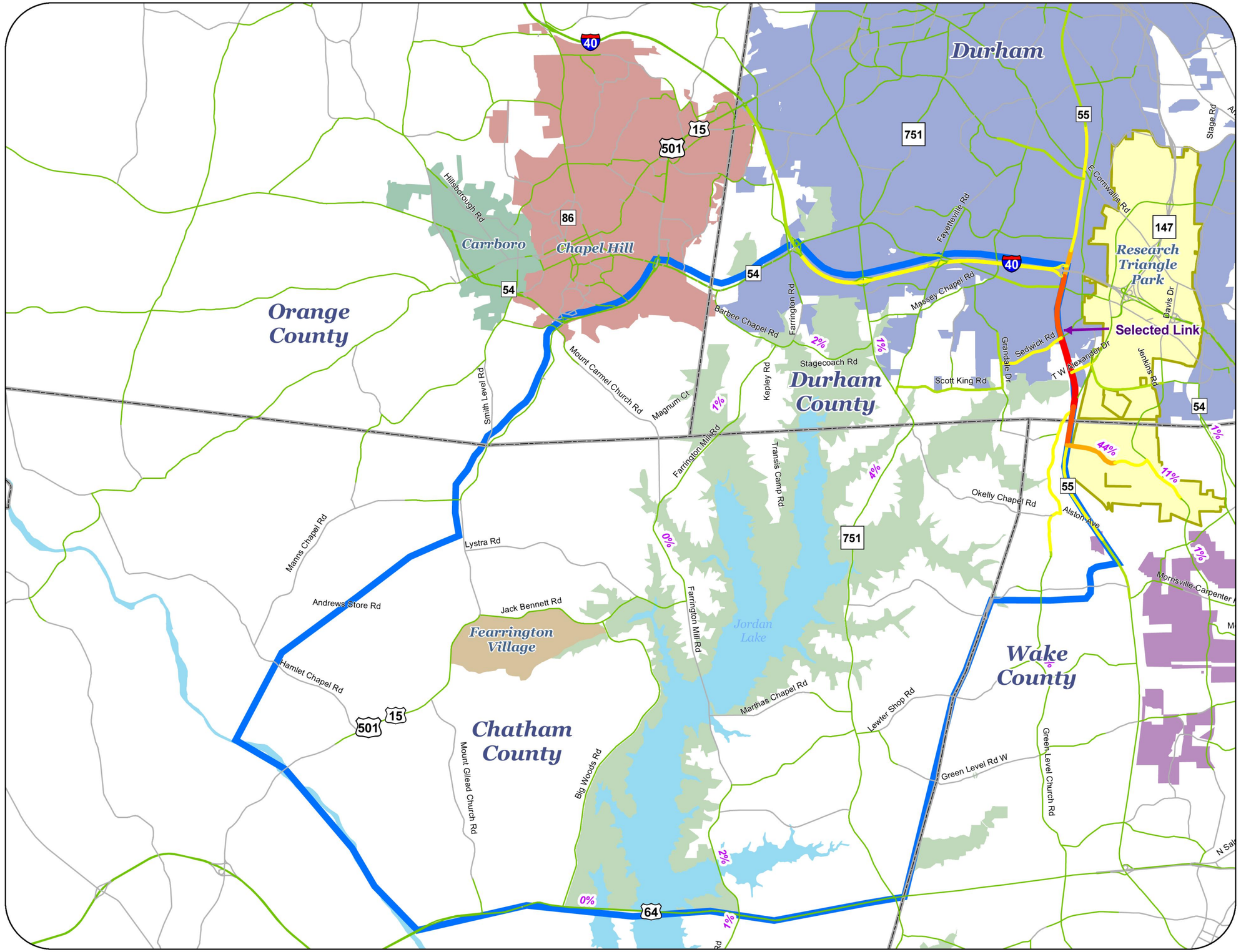
Farrington Road Corridor Study

Figure 17

Select Link Analysis
NC 55



Select Link Volumes
Percent of Trips

- 0.0
- 0.1 - 5
- 5 - 10
- 10 - 25
- 25 - 50
- 50 - 75
- 75 - 100
- Counties
- Study Area
- Research Triangle Park
- Lakes
- Durham
- Chapel Hill
- Fearrington Village
- Cary
- Carrboro
- Corps of Engineers Land

November 25, 2008

N
W E
S

0 0.5 1 2 3
Miles

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District Flow Analysis

DCHC MPO provided daily and peak period origin-destination (O-D) matrices at the district level from the Triangle Regional Model (TRM). For the TRM, the region is divided into 21 districts representing different parts of the area. For example, the portion of Chatham County in the regional model is considered one district, while the western and southern portions of Wake County are divided into two districts. Durham County is divided into six districts which are labeled Northern, Eastern, Central, Downtown, Southwest, and Research Triangle Park. Orange County is divided into four districts which are labeled Northern, Southeast, Southwest, and Chapel Hill-Carrboro.

For the Farrington Road analysis, these 21 TRM districts were grouped into 14 super-districts. For example, Southeast Orange County was combined with Chapel-Hill-Carrboro. O-D data from the Triangle Regional Model were aggregated to these super-districts and are presented in **Table 7**. This table shows that the majority of trips to and from Chatham County are internal (63%). Trips to the Chapel Hill/Carrboro area are also prominent (14%), and are expected to use the US 15-501 corridor. Trips to Western Wake (Cary/Apex) comprise 8% of trips, and are expected to use the US 64 corridor. Southwest Durham County and RTP make up 5% and 2% of the trips, respectively (approximately 7% or 12,400 trips combined). These trips are the most likely to use the Farrington Road Corridor to avoid future congestion on US 15-501, US 64, and I-40.

Table 7. Triangle Regional Model District Flows to and from Chatham County

Super-District	Trips to/From Chatham County	% of Total
Chatham County	110,574	63%
Chapel Hill/Carrboro Area	24,403	14%
West Wake (Cary/Apex)	13,576	8%
Southwest Durham County	8,731	5%
South Wake (Holly Springs/Fuquay Varina)	4,972	3%
Research Triangle Park	3,721	2%
Central Durham	2,532	1%
Raleigh (Inside the Beltine)	2,040	1%
Northern Durham /Durham County	1,267	1%
North/Eastern Wake County	1,229	1%
Southwest Orange County	1,114	1%
Northern Orange County	635	0%
Johnston/Harnett County	462	0%
Granville/Franklin County	116	0%
Total	**175,372**	**100%**

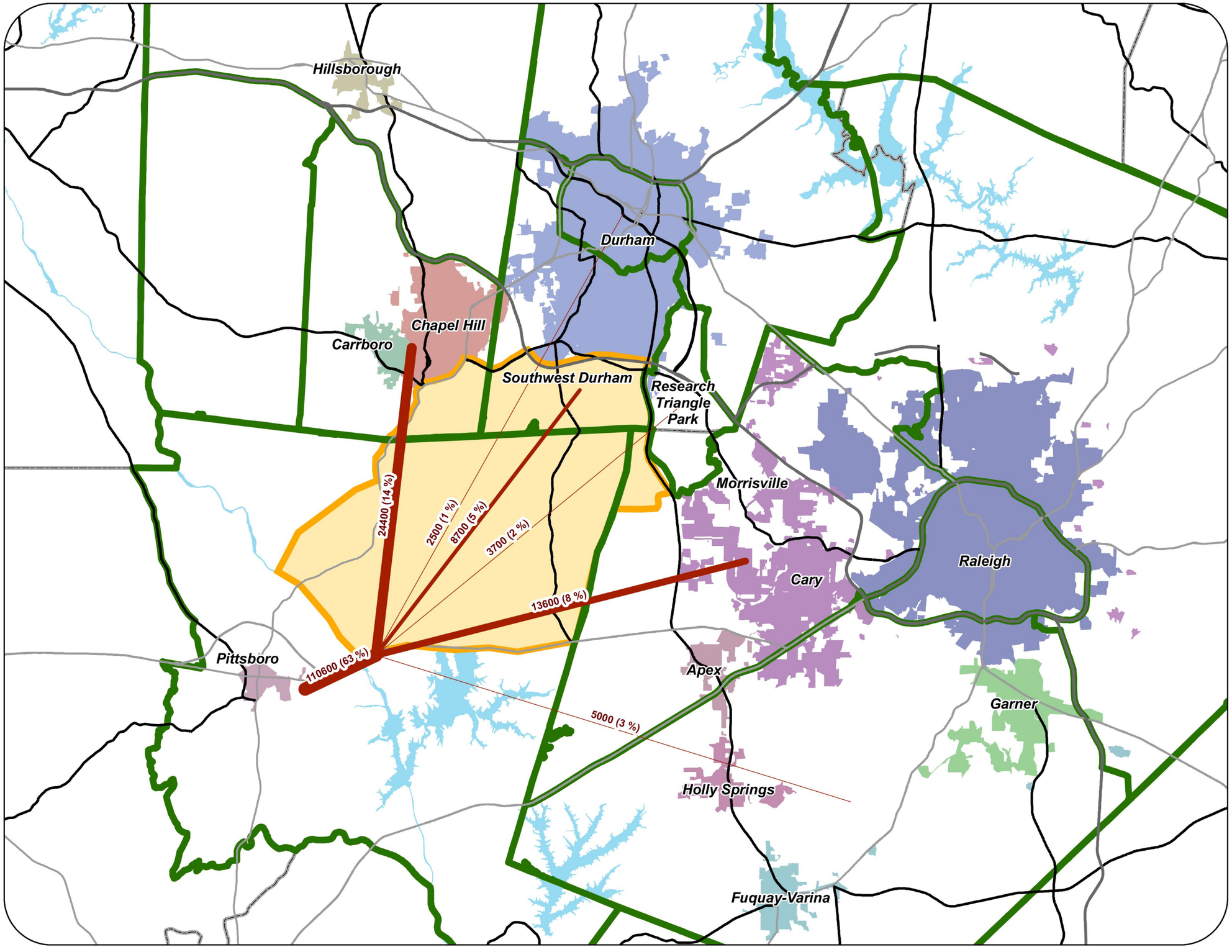
These district flows were added to the Triangle Regional Model to create a graphic showing “travel desire lines”. These desire lines show the district flows in a graphical manner. These graphical district flows can be seen in **Figure 18**.

Farrington Road Corridor Study

Figure 18

District Flows into Chatham County

Triangle Regional Model Origin-Destination Data



District Flows
Total Trips (and % of Trips)

- 2500 - 5000
- 5000 - 10000
- 10000 - 20000
- 20000 - 30000
- > 30000
- TRM Super-Districts
- Interstates
- US Highways
- State Highways
- Counties
- Study Area
- Lakes

November 25, 2008

N W E S

0 1 2 4 6 8 Miles

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The Built Environment

To demonstrate and understand growth in the Farrington Road corridor, it is necessary to examine the existing land use profile, development patterns, and the effects of these trends on the transportation system. A CommunityViz model that contains land use data (by parcel and TAZ) was developed. This land use model provides existing conditions and the existing land use profile along with future conditions in both a "business as usual" and "compact development" scenario. Each of these scenarios impacts the transportation system in a different way.

Land Use Profile

The Farrington Road Corridor study area is largely rural and undeveloped and includes a significant portion of environmentally sensitive lands. Over 41% of the land in the study area is classified as permanent conservation. These lands are predominantly comprised of Jordan Lake and its tributaries and game lands owned by the US Army Corps of Engineers but also include preserves and natural areas.

Slightly less than 40% of land in the study area is classified as residential. The majority of residential land is developed at extremely low densities. Roughly a fifth of residential land is classified as rural residential, with an additional 13.56% classified as low density residential. These lands are predominantly located adjacent to Jordan Lake. Less than 2% of land in the study area is comprised of medium or high density residential land uses.

Less than 2% of land in the study area is classified as commercial, industrial, or institutional. The majority of these areas are found in the extreme northern and southern portions of the study area, along Interstate 40 and Highway 64.

Lastly, slightly less than 9% of land in the study area is classified as vacant/unprotected. This category includes all undeveloped lands that are not classified as permanent conservation, farmland, or parks and recreation. These lands are usually adjacent to residential developments and in areas west of Jordan Lake.

Table 8 summarizes the existing land use profile for the study area and **Figure 19** shows Existing Land Use by parcel.

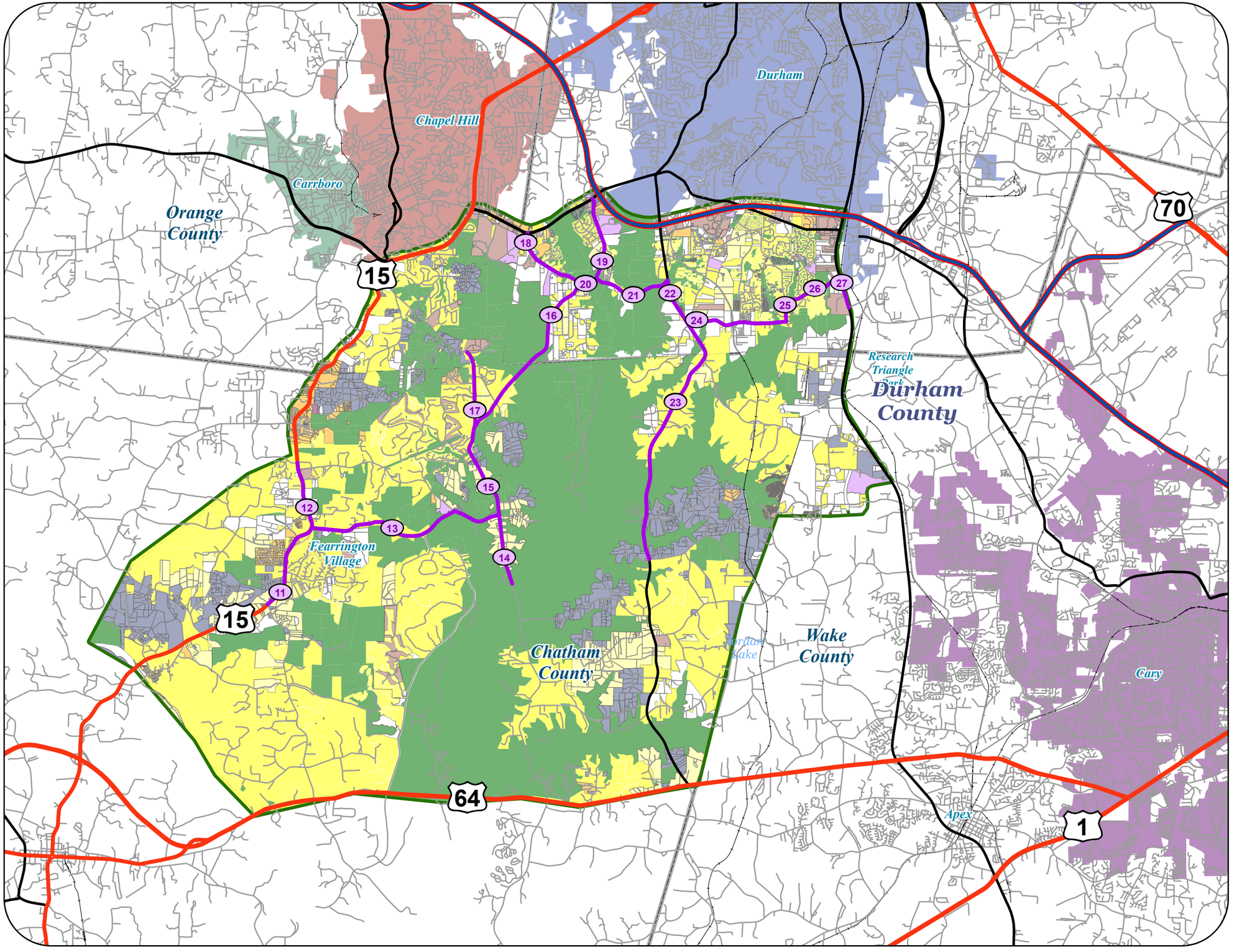
Table 8. Existing Land Use

Land Use	Acres	Percentage
Agriculture	4101.12	5.07%
Civic/Institutional	486.13	0.60%
Commercial/Retail	1735.3	2.14%
General Office	31.06	0.04%
High Density Residential	1.17	0.00%
Low Density Residential	26756.11	33.05%
Light Industrial	20.28	0.03%
Medium Density Residential	1433.98	1.77%
Conservation	33471.3	41.35%
Rural Residential	6123.41	7.56%
Vacant/Unprotected	6785.36	8.38%
Total	80945.22	100.00%

Farrington Road Corridor Study

Figure 19

Existing Land Use



Legend

elum study area

- Agriculture
- Civic/Institutional
- Commercial Retail
- Conservation
- General Office
- High Density Residential
- Low Density Residential
- Light Industrial
- Medium Density Residential
- Rural/Residential
- Vacant Unprotected
- Study Area
- Counties

Surrounding Communities

- Durham
- Chapel Hill
- Fearrington Village
- Cary
- Carrboro

November 25, 2008

N W E S

0 0.5 1 2 3 Miles

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The travel distance between origin and destination is one primary factor (along with travel mode choice) for influencing travel behavior. The physical distance between complimentary land uses in more rural or suburban settings tends to promote automobile travel, particularly since safe, convenient facilities are not usually available for pedestrians and bicyclists. Mixed-use, dense community development centers decrease the travel distance between complimentary land uses, and support transit, bicycle, and walking as viable alternatives to the automobile for meeting daily travel needs.

Existing Development Patterns

As indicated by the Land Use profile, the majority of the study area is characterized by very low density development. Residential development of this nature is comprised of large lot residential subdivisions designed with limited access points and cul-de-sacs. Large tracts of rural and farmland areas are interspersed throughout the study area, which have little transportation infrastructure other than two-lane farm-to-market roads which are ill-equipped to accommodate encroaching urbanization.

The examination of existing transportation infrastructure revealed that Jordan Lake significantly influences regional transportation and development patterns. Because east-west corridors that cross the lake are limited to Interstate 40 and NC 54 to the north and US 64 to the south, traffic is forced onto these existing routes or other existing smaller routes that travel around the lake entirely.

Proximity to the lake and location within its watershed can make infrastructure investment and development in those areas undesirable. Not all sites within the study area are unacceptable, but the transportation system must be low impact, especially in the interior core of the study area. Avoidance of environmental constraints creates additional gaps in the roadway network.

Natural Environment

As part of the corridor and land use evaluation, this section identifies and summarizes features of the natural environment that affect development patterns and build-out in the study area. The mapping in this section should be used for planning purposes only. Detailed assessments and

formal delineations of natural features should be conducted for any projects within the study area, prior to design and development.

Wetlands

Wetlands are areas that are inundated or saturated by surface or ground water at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions. Wetlands provide a variety of environmental benefits, including erosion and flood control, ground water recharge and discharge, and wildlife habitat.

Wetlands and streams are under the jurisdiction of the U.S. Army Corps of Engineers (USACE) as defined in Section 404 of the Clean Water Act. The Division of Water Quality (DWQ) also regulates streams and wetlands under Section 401 of the Clean Water Act. Additionally, the state regulates isolated wetlands under a separate state law. The USACE must approve any jurisdictional determinations as part of the permitting process. It is required that wetland and stream delineations be obtained prior to design. Permits (404/401) are required prior to impacting streams and wetlands within the study area.

Wetlands are prevalent in the study area throughout Jordan Lake and its tributaries. Several roads in the study area have wetlands on both sides of the right-of-way. Widenings or relocations of the road in these areas to smooth or straighten curves would require considerable study for and scrutiny by DWQ and USACE.

Federally Threatened and Endangered Species

According to information provided by the U.S. Fish and Wildlife Service and National Heritage Program, threatened and endangered species and their habitats are present in the study area. These species are found in Chatham, Orange, and Durham Counties and include the following:

- bald eagle (*Haliaetus leucocephalus*)
- Cape Fear Shiner (*Notropis mekistocholas*)
- red-cockaded woodpecker (*Picoides borealis*)
- harperella (*Ptilimnium nodosum*)
- Michaux's sumac *(Rhus michauxii*)
- smooth coneflower (*Echinacea laevigata*).

Any projects conducted in the study area should avoid impacting federally threatened and endangered species and their habitats.

Nutrient Sensitive Waters

Jordan Reservoir was constructed as a flood control project, and also functions as a water supply reservoir for surrounding communities. All waters in the Haw River watershed including Jordan Reservoir were classified as nutrient sensitive waters (NSW) due to the high nitrogen levels found in the lake in 1983.

This classification remains in place today, and according to DWQ, the Jordan Reservoir (and its tributaries) is one of the most eutrophic reservoirs in the state.

As a result, a NSW strategy was created and implemented to protect the reservoir from water quality problems associated with nutrient enrichment. As part of the management strategy, the entire Jordan watershed was designated a critical water supply watershed and given additional, more stringent requirements than the state minimum water supply watershed management requirements. These additional requirements include rules for protection and maintenance of riparian areas, urban storm water management, and discharge.

Water Supply Watersheds

All water supply watersheds in the study area are classified as WS-IV NSW. Class WS-IV watersheds have the following maximum allowable development requirements:

- Low density development at 2 dwelling units an acre or 24% built-upon area, and
- High density development at 24-50% built-upon area.

In addition, Class WS-IV watersheds do not allow the 10/70 provision. Typically this provision allows local governments to use 10% of the non-critical area of the watershed for development up to, but not exceeding, a total of 70% built upon area. In the study area, this provision is not allowed.

Agriculture, forest, and transportation best management practices (BMPs) are also required. Specifically the transportation BMP's are those described in DOT's document "Best Management Practices for Protection of Surface Waters."

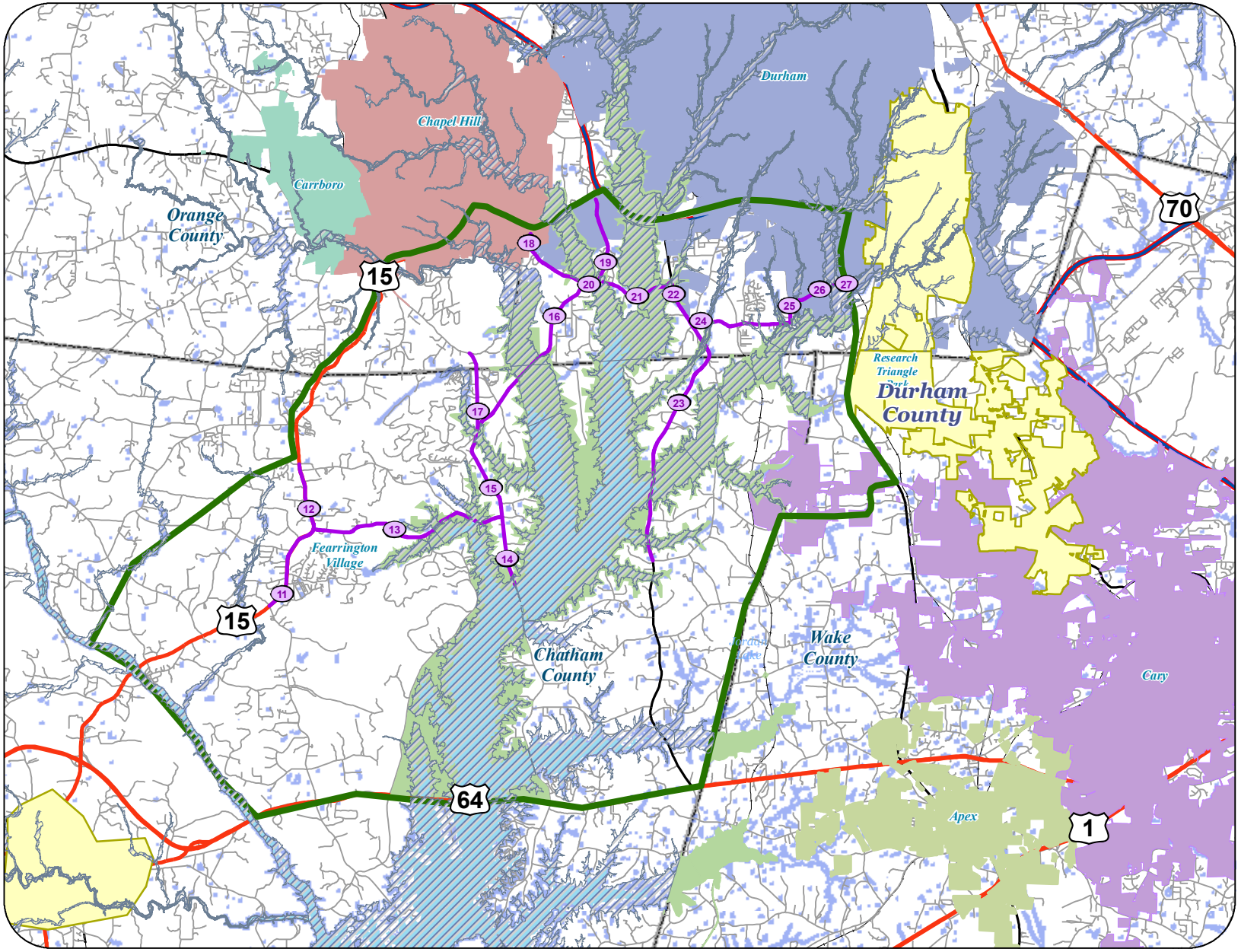
Required stream buffers in WS-IV watersheds are 30 ft for low density development and 100 feet for high density development. However, because the Neuse River Basin Riparian Buffer Protection Rules are applicable to the study area, 50 foot buffers are required, and these buffers are measured differently than buffers required by other classifications.

Floodplain/Floodway Zones

Many areas within the project corridor contain regulated floodplains or floodways. Jordan Reservoir and adjacent areas are within the 100-year flood zone. These areas are designated as Special Flood Hazard Areas and AE zones. Special Flood Hazard areas are defined as areas subject to inundation by the 1% chance annual flood. Zones designated as AE are also present within the Special Flood Hazard Areas. Zone AE is defined as the channel of a stream and the adjacent floodway that must be kept free of encroachment.

Development in these areas will require coordination with the county's floodplain administrator. Any proposed fill in the floodplain will need to be evaluated to show a "no rise" in flood elevation. If this is not possible, detailed hydrologic analysis will be required and a map revision will need to be approved by the administrator and the Federal Emergency Management Agency (FEMA). Floodplain fill permits may be required by county regulators prior to construction. Counties may have delegated programs for disturbance activities within these areas. It is recommended that the floodplain administrators be contacted for specific information regarding floodway regulations within each of the counties.

Figure 20 shows the natural features present in the study area**.**



Farrington Road Corridor Study

Figure 20

Natural Features Map

Legend

- Study Area
- Counties
- Corridor Roads
- 100-Year Floodplain
- UFWS National Wetland Inventory
- Corps of Engineers Land
- Lakes
- RESEARCH TRIANGLE PARK
- APEX NC
- CARRBORO NC
- CARY NC
- CHAPEL HILL NC
- DURHAM NC

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Existing Plans, Policies, & Regulatory Tools

The Corridor Study was coordinated closely with other state, regional, county, and local plans and/or policies that guide planning efforts in the area. All plans and policies in jurisdictions pertinent to the study area were reviewed. These jurisdictions include Orange County, Durham County, Chatham County, Wake County, the City of Durham, the Town of Chapel Hill, and the Town of Cary. Plans and policies were divided into three main categories: visioning documents, land development controls, and environmental rules and regulations. This section summarizes the consultant's review of the materials and highlights, issues, policies, or directives that may influence reasonable implementation of the Farrington Road Corridor Study.

Visioning Documents

Visioning documents create a framework for decision-making in communities. They serve to guide growth and development and can address a multitude of issues from housing to transportation to economic development. Visioning documents set goals and objectives for the community and should be referenced by officials when making policy decisions to ensure a coordinated approach for future growth. With a clear vision for the future and an established course of action to get there, a community is much more likely to realize desired outcomes. The following visioning documents are believed to have an impact on the Farrington Road Corridor Study:

Joint Land Use Plan-Chatham County and Town of Cary

A resolution to draft a joint land use plan between Jordan Lake and the Chatham/Wake County line was adopted by Chatham County and the Town of Cary in December 2005. Two community meetings were held in 2006 and two joint meetings and a public hearing were held in 2007. Development of the plan is currently underway, with a draft land use map available online for public comment.

The draft plan emphasizes very low density development (1 du/10 acres) within a ½ mile of the lake because of sensitive environmental resources including natural heritage sites and game lands. A resource conservation overlay, a 150 yard hunting buffer, and ½ mile buffers

around burn-blocks are also recommended to protect natural resources. The plan is recommending placement of no major roads through designated environmentally-sensitive areas. Residential development should occur in "zoning extremes," where some areas allow very high density development and some allow very low density development to prevent fragmentation of the landscape. Conservation subdivision design should be used whenever possible within the study area.

Chatham County Land Conservation and Development Plan

Chatham County's vision developed for this plan is as follows: "Chatham County will be a place that cooperatively controls its own destiny to assure the state of well-being desired by all of our people, while proudly preserving diverse cultural heritages and the County's rural character." Two fundamental policies identified throughout the plan are achieving "balanced growth" and engaging in "an open, pro-active and cooperative approach to land development and conservation." The plan emphasizes preservation of form and function of rural character, development of compact communities with a mix of activities including economic development centers in order to promote a diversified, sustainable business community, and development of an integrated approach to protecting and promoting high-quality open space, recreation, historic and tourism locations. However, the "community plan map" was never adopted.

Chatham County Land Use Strategic Plan

The Land Use Strategic Plan complements the Land Conservation and Development Plan described above. Achieving "balanced growth" and conserving and protecting natural resources are of particular relevance to this Plan. In support of these policies, goals were established. These goals include: implementation of community-supported growth management strategies, conservation of prime farmland, concentration of high intensity uses, increased proportion of land preserved as open space in areas under development, and provision of a transportation system that effectively and efficiently fulfills the needs of all county interests.

Draft Orange County Comprehensive Plan

The Orange County Comprehensive Plan serves as a guide to the county's growth and development through 2030. On May 19, 2008 a draft of the Comprehensive Plan was made available for public review. Adoption of the comprehensive plan document is pending.

Becoming a sustainable community is the underpinning of the plan. Key objectives to achieve sustainability initiatives in the county include environmental conservation, energy efficiency, affordable housing, social equity, a thriving economy, regional agricultural production, and the availability of transit-oriented, walkable, mixed-use communities. Key implementation strategies include:

- Establish Economic Development Districts to stimulate and accommodate development in strategic locations that can be served by transportation systems and public infrastructure, and be convenient to housing opportunities.
- Identify and encourage mixed-use districts that provide live-work-shop opportunities and minimize travel needs.
- Explore a Strategic Growth and Resource Conservation program that will help focus new development in areas that can best accommodate it. Simultaneously, this program should preserve / conserve rural and agricultural land with compensation mechanisms for rural property owners.
- Develop an interconnected system of pedestrian and bicycle trails to provide both recreation opportunities and increased mobility choices to residents.
- Identify growth opportunity areas near transit corridors and along major thoroughfares to encourage more public transportation use by County residents.
- Encourage residents to use alternative modes of transportation and ride-sharing including interconnected pedestrian and bicycle trails, transit lanes along major

thoroughfares; and development of park-and-ride lots that would encourage use of public transportation to travel to and from work.

Durham City/County Comprehensive Plan

The Durham City/County Comprehensive Plan serves as a guide for future growth and development through 2020. The document was adopted in February 2005 and amended in August 2007.

The transportation element of the Comprehensive Plan emphasizes public transit and pedestrian and bicycle movement, as well as automobile travel. It stresses regional solutions and the importance of integration between land use and transportation planning processes. The land use element concentrates on balancing predicted demand with the need to protect natural resources and to move towards a more efficient development pattern.

Wake County Land Use Plan

The Wake County Land Use Plan was adopted in 1996 and updated in 2003. Goals and strategies of particular significance to this plan include seeking regional solutions to transportation issues, ensuring that the land use plan and transportation plan mutually support each other, identifying and preserving areas that make a significant contribution to environmental quality, and planning transportation facilities in relation to planned growth.

Wake County Transportation Plan

The Wake County Transportation Plan was adopted by the County in April 2003. The goal of the plan is to identify a diversified multimodal transportation investment program to provide safe, efficient, and effective mobility for all citizens and visitors. The plan encompasses collector streets, thoroughfares, public transit, bicycle and pedestrian needs of the County through 2025.

Chapel Hill Southern Area Small Area Plan

The Chapel Hill Southern Area Small Area Plan was adopted June 23, 1992. The area of town, although undeveloped, was designated to

develop at urban densities and the plan was created to determine how best to develop the land. The primary objective of the plan was preservation, with a focus on preserving the natural beauty and character of the area, protecting environmentally sensitive areas and water quality, and enhancing existing neighborhoods. The Plan proposes low density residential development for most of the land, with higher density residential development concentrated in a walkable village setting.

Land Development Controls

Land Development Controls, including zoning ordinances, subdivision ordinances, and unified development ordinances establish regulations, procedures, and standards local governments can enforce or implement to ensure land is developed in a manner that is consistent with the goals, policies, and strategies set forth in the various visioning documents described above.

The land development controls of particular influence to this corridor study include the Chatham County zoning ordinance and the Durham City/County Unified Development Ordinance (UDO).

Chatham County amended their zoning ordinance to include a Compact Community District in April 2004. This district allowed for compact residential development with a mixed-use commercial village center with a conditional use permit. It was created to help implement the Chatham County Land Conservation and Development Plan described above. The desirable location for these villages is in northeastern Chatham County, within the study area. The purpose of this district is to promote new communities that support mixed-use development, allow for compact village-style development surrounded by protected green space, and promote connectivity and walkability. This type of development was considered when reviewing future year development scenarios (see Scenario Planning section).

The Durham City/County UDO establishes development tiers to ensure that development reflects the character of the area within which it occurs. The southern portions of Durham City and County are in the study area. These areas are predominately located in rural and suburban tiers. The majority of Rural tiers are located within watershed critical areas Development in this tier should focus on protecting water

resources and is characterized by large lots and limited commercial areas. Suburban tiers are where the majority of population growth in Durham is expected and are characterized by traditional suburban densities and patterns.

Environmental Rules and Regulations

Federal, state, and local governments have established environmental regulations to protect water quality of streams and surface waters and other environmentally sensitive areas, to minimize losses due to flooding, and to encourage the wise and productive use of natural resources.

The following environmental rules and regulations were considered in the development of recommendations for the study area:

Neuse River Nutrient Sensitive Waters (NSW) Management Strategy

The study area is subject to the Neuse River Nutrient Sensitive Waters (NSW) Management Strategy. This strategy is state mandated by the North Carolina Division of Water Quality (DWQ) and uses nutrient removal as the water quality criteria. The strategy resulted in the development of Neuse Rules, or permanent rules designed to support implementation of the strategy. These rules established a nutrient reduction goal and included rules for wastewater discharges, urban storm water management, agricultural nitrogen reduction, and nutrient management.

Another set of rules of particular interest to this study, also established under the NSW management strategy, is the Neuse Riparian Buffer Protection Rules. Neuse River buffer rules apply to vegetated areas within 50 feet of the top of the bank along surface water features, including streams, rivers, lakes, ponds, etc. These rules apply where features are shown on either the most recent version of the soil survey map prepared by the Natural Resources Conservation Service of the United States Department of Agriculture or the most recent version of the 1:24,000 scale (7.5 minute) quadrangle topographic maps prepared by the United States Geologic Survey (USGS). In addition to the 50-foot buffer requirements, storm water that runs into the buffer must be continually diffused. New buffer rules were implemented for the study area as part of the newly adopted Jordan Lake Rules in 2007.

Jordan Lake Rules

The Division of Water Quality (DWQ) published a proposed set of rules for Jordan Lake in June 2007 that affects all jurisdictions in the study area. These rules are the strictest implemented watershed rules to date in North Carolina and include measures that will require retrofitting of existing development. These rules were revised in 2008, and a new set of rules is still under review. Like the Neuse Rules, the Jordan Lake Rules establish nutrient reduction goals and require nutrient management, agriculture, storm water management (both for new and existing development), and protection of riparian buffers.

These buffer rules apply to all streams and areas along the edge of Jordan Lake. In addition, these rules govern activities that impact any areas within 50 feet of surface waters in the Jordan watershed, including intermittent streams, perennial streams, lakes, reservoirs, and ponds.

In addition, the N.C. Division of Water Quality (DWQ) requires that a Hazardous Spill Catch Basin be constructed at stream crossings that are within the Lake Jordan watershed, excluding roadway projects.

Local Buffer Regulations

The following county-wide buffer regulations were considered in the development of the corridor study:

Chatham County has 100-foot buffer requirements on most streams, rivers, and lakes within the Jordan Lake watershed. In some instances the buffer requirements are lessened to 50 feet. The county is also considering institution of additional restrictions, such as limiting development on steep slopes and along stream buffers.

The buffer regulations in Orange County vary from approximately 65-80 feet dependent upon the degree of slope within the area. If the feature occurs within a floodplain, a licensed engineer or surveyor must calculate the extent of the floodplain and slopes. There are general 50-foot buffers for those areas not within a protected watershed. The protected and unprotected watersheds

are designated by the County, and protected areas are defined by the county as those features that feed into a water supply watershed.

Durham County buffer regulations include 50-foot buffers on all perennial or intermittent streams. Streams occurring within water supply watersheds can have increased buffer requirements of 50-100 feet for intermittent streams and 100-150 feet for perennial streams.

Watershed Regulations/Ordinances

A watershed ordinance protects the water quality of the streams and surface water in the water supply watersheds. Watershed regulations/ordinances in this study area comply with the management strategies and rules described above.

Flood Damage Prevention Ordinance

A flood damage prevention ordinance promotes the health, safety, morals, and general welfare of a community by minimizing public and private losses due to flood conditions within flood prone areas. These ordinances restrict or prohibit certain uses which are dangerous to health, safety, and property due to water or erosion hazards, or those uses which result in damaging increases in erosion, flood heights, or velocities.

Environmental Impact Ordinance

Orange County has an environmental impact ordinance that encourages the wise and productive use of natural resources, promotes public and governmental awareness of the environment, educates the public on the environmental consequences of development, requires full disclosure of the anticipated effects of proposed development on the resources of the county, and permits and facilitates full enforcement of all ordinances and regulations concerning the environment in an efficient, coordinated and comprehensive manner.

Specifically, the ordinance requires the preparation and evaluation of environmental impact documents for projects that either require certain state permits or require a local land use permit for development within environmentally sensitive areas.

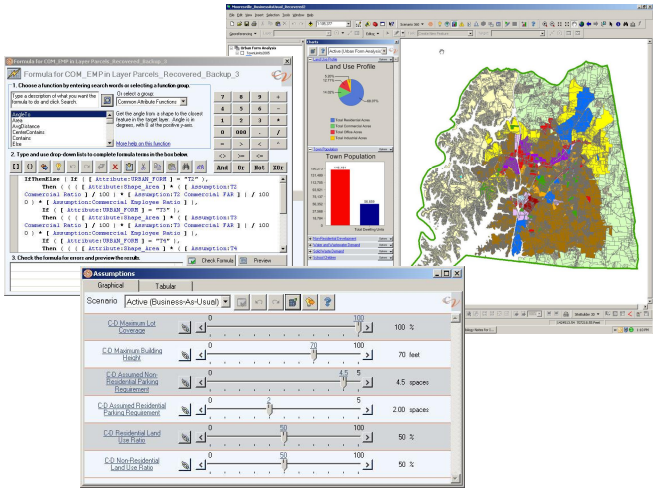
Section 404 Wetland Regulations

Communities within the study area recognize the importance of protecting environmentally sensitive areas, which include those lands designated as wetlands by the US Army Corps of Engineers. It is generally the policy of the local governments that all development within these areas conforms to federal, state, and local regulations and relevant development ordinances.

4 scenario planning

Scenario planning represents the next generation of analytical processes created to evaluate the influence of physical characteristics, environmental features, land use patterns, development intensities, and urban design on the efficiency of the surrounding transportation system. Visualization of the interaction between land use and transportation decisions, as well as causational factors that explain the push-pull relationship between them, provides community leaders with information they need to evaluate the consequences of potential actions. Building on this momentum, the Federal Highway Administration, Environmental Protection Agency, and other federal agencies are actively promoting the use of scenario planning models by state agencies, metropolitan planning organizations, and local governments to better integrate land use, urban design, and transportation decision-making processes.

CommunityViz Software



The two-dimensional map and data analysis component of CommunityViz® software, Scenario 360®, was used to evaluate impacts on the transportation system generated by competing future year development scenarios considered for the study area. It adds the functionality of a spatial spreadsheet to ArcGIS Map®, similar to how a spreadsheet program like Microsoft Excel® handles numerical data. Dynamic calculations embedded in the spatial spreadsheet were controlled by user-written formulas that change value as referenced inputs change. Formulas were written to supply the result of mathematical relationships with other spatial data included in the analysis, and with assumptions programmed in the planning model that reflect certain public policies, development controls, or market conditions unique to the study area.

Study Area

The study area for the scenario planning analysis is slightly smaller than the study area described in Chapter 1. Specifically, it omits parcels in the Town of Cary and Wake County to better match the traffic analysis zone boundaries used in the Triangle Regional Model (TRM).

Growth Projections (2035)

The MPO planning process for developing growth projections in the region (commonly referred to as socioeconomic data) relies on static data sets generated from independent studies commissioned during major updates to the Triangle Area Regional Travel Demand Model. Collectively, this information represents the assumed development potential for eight counties (some full and some in part) and multiple cities (major cities include Raleigh, Durham, Chapel-Hill, Apex, Cary, and Wake Forest) included in the Triangle Region. Demand on the transportation system (i.e., trip generation) is calculated directly from the TRM socioeconomic data.

The last major update to regional control totals for socioeconomic data used in the Triangle Regional Travel Demand Model was completed in 2008. Population, housing, and employment estimates included in the socioeconomic dataset available for the study area were used as direct inputs to the CommunityViz® growth allocation model. The planning horizon for the land use allocation model is 2035.

Growth Allocation Model: Three Step Process

There are three main steps in the CommunityViz® growth allocation model: supply, desirability, and demand. Each of these is briefly described below:

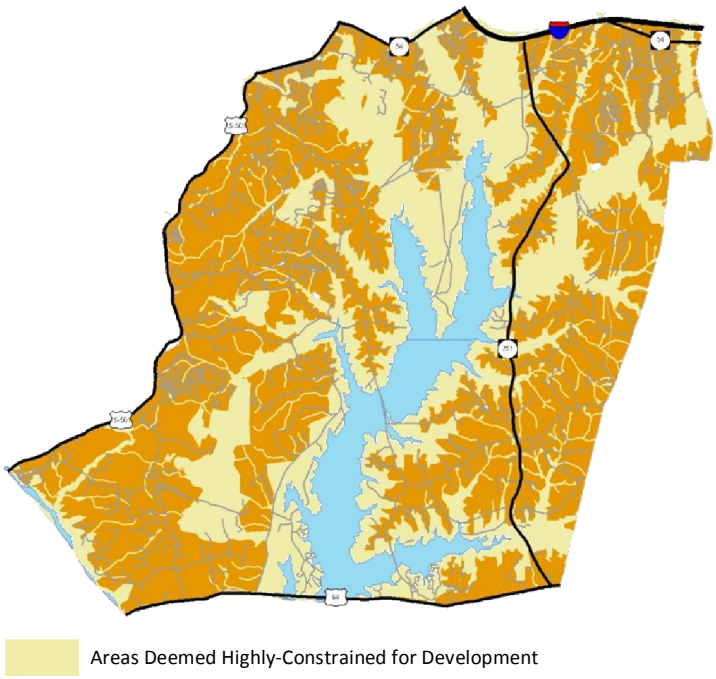
Supply

The "supply" of development potential remaining in the study area was estimated using two general factors: land availability and local land development controls. Land availability was determined based

on the presence of physical, political, or policy conditions that would prohibit or limit future growth (i.e., areas highly-constrained for development). Data used to identify highly-constrained areas for development in the study area include major water bodies, 100-year floodplain, 50-foot riparian buffers from perennial streams, dedicated and registered conservation easements, NWI wetlands, formalized agriculture districts, and significant natural heritage areas.

A site efficiency factor (10%-30%) for each generalized land use category was also applied to the parcels greater than twenty acres in size to account for land typically dedicated to certain on-site improvements (e.g., internal streets, storm water management, open space, etc.) necessitated by new development. The remaining portion(s) of a parcel after removal of highly-constrained areas for development and application of the site efficiency factor was used to estimate build-out potential in the model.

Highly-Constrained Areas Map



Areas Deemed Highly-Constrained for Development

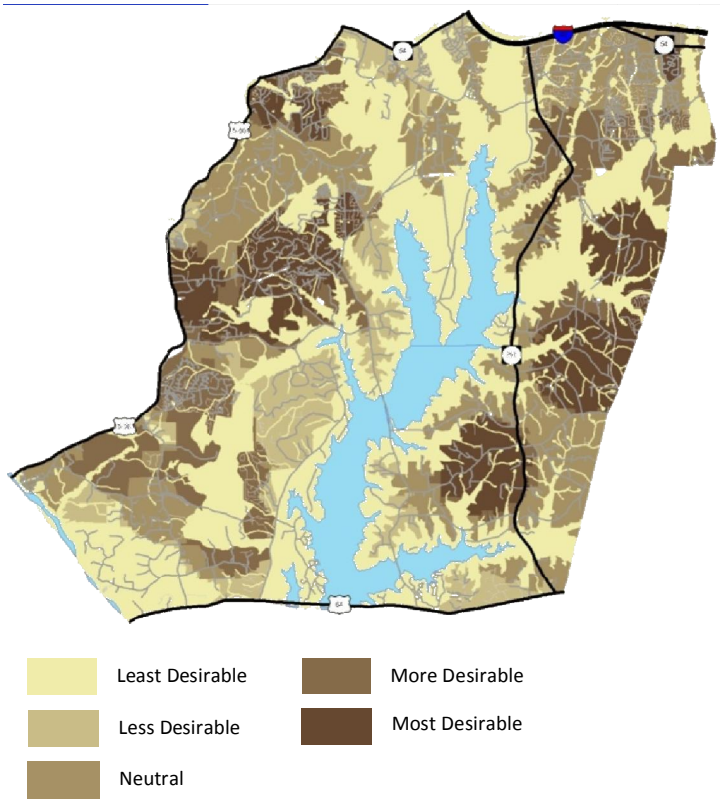
Build-out potential for residential and non-residential uses was estimated using land development controls set forth in adopted plans and ordinances administered by cities and counties in the study area. Height, bulk, and density controls observed for the study area were inventoried and applied to general land use categories assigned in the model (See appendix for development controls by generalized land use). Build-out potential for each parcel in the model was reported by number of dwelling units, commercial square footage, commercial employees, general office square footage, general office employees, institutional square footage, institutional employees, industrial square footage, and industrial employees.

Desirability

The "desirability" of one parcel to develop relative to another was based on its spatial relationship to factors deemed either positive or negative for attracting growth. Factors represented in the study area included proximity to existing urban areas, proximity to permanent conservation areas, access to water and sewer service, proximity to major intersections, proximity to the regional activity center in the study area (i.e., Streets at South Point Mall), and proximity to compact development nodes identified for Chatham County.

The physical presence of factors prevalent in the study area, as well as those that extend across the region, were layered on a parcel map, and calculations were performed to determine either percent overlap or physical proximity (as appropriate) for each of the physical features in relation to individual parcels. CommunityViz® software calculated a numeric score for desirability based on the presence of each individual feature relevant to individual parcels. A normalized score (between 0 and 100) was used to rank the parcels from least to most desirable for development.

Development Desirability Map



Raw scores reported for individual features were weighted to prioritize the desirability factors for attracting new development (See appendix for weighting values). For example, access to water and sewer service areas was assigned a higher importance in determining desirability for development than proximity to the regional activity center in the study area. After each of the individual features was weighted, the scores were combined into one final desirability score representing the overall desirability of that parcel for attracting new

development. These scores were normalized to ensure that the lowest score was rescaled to 0, the highest score rescaled to 100, and the scores in between rescaled to fall within the new spectrum. Normalizing the scores is a critical process for ensuring that parcels are ranked relative to each other, that suitability maps are easily presentable to viewers, and that allocation of new growth occurs according to relative desirability.

Demand

The amount of growth anticipated in 2035 (i.e., "demand") was forecasted to the parcel level for the study area. The "allocation tool wizard" in CommunityViz® used supply, desirability, and demand statistics calculated in the model to allocate projected new dwelling units and employees by type amongst the parcels. For this process, the allocation wizard uses build-out potential as the "supply", population and employment forecasts as the "demand", and the results of the land suitability analysis as the "desirability score." (Note: Parcels noted with existing development were removed from the list of eligible parcels for new development in the "supply" step of the process). Results generated at the parcel level were aggregated to the traffic analysis zone level for use in the regional travel demand model.

Future Year Development Scenarios

Three extreme future year development scenarios (i.e., business-as-usual, compact development centers, and constrained growth projections) were created for the study area to measure the impact that competing development alternatives may have on demand factors (i.e., trip generation, trip length, and travel mode choice) commonly thought to influence the efficiency of the transportation system. All three development scenarios represent the same study area and long-term planning horizon (2035). A brief summary of each development scenario follows.

Business-as-Usual

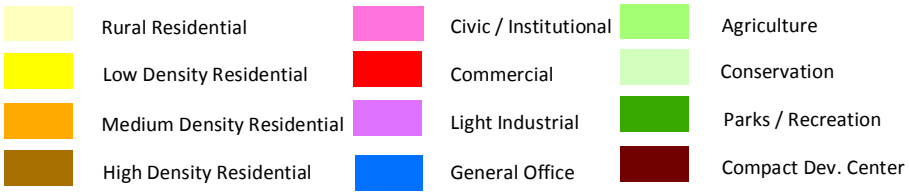
The business-as-usual scenario represents continuation of an emerging suburban development pattern prevalent in the study area

(see image on following page). New construction is characterized by isolated, single-use developments surrounded by low-density rural residential home sites. The regional activity center surrounding the Streets at South Point Mall continues to be the social and economic center of the study area. Low-density development patterns and the physical distance between complementary land uses tends to promote automobile travel, particularly since safe, convenient facilities are not easily available for pedestrians, bicyclists, and transit riders. Increased traffic congestion on the rural road network means less mobility for residents and visitors to the study area as well as others traveling through the community.

Compact Development Centers

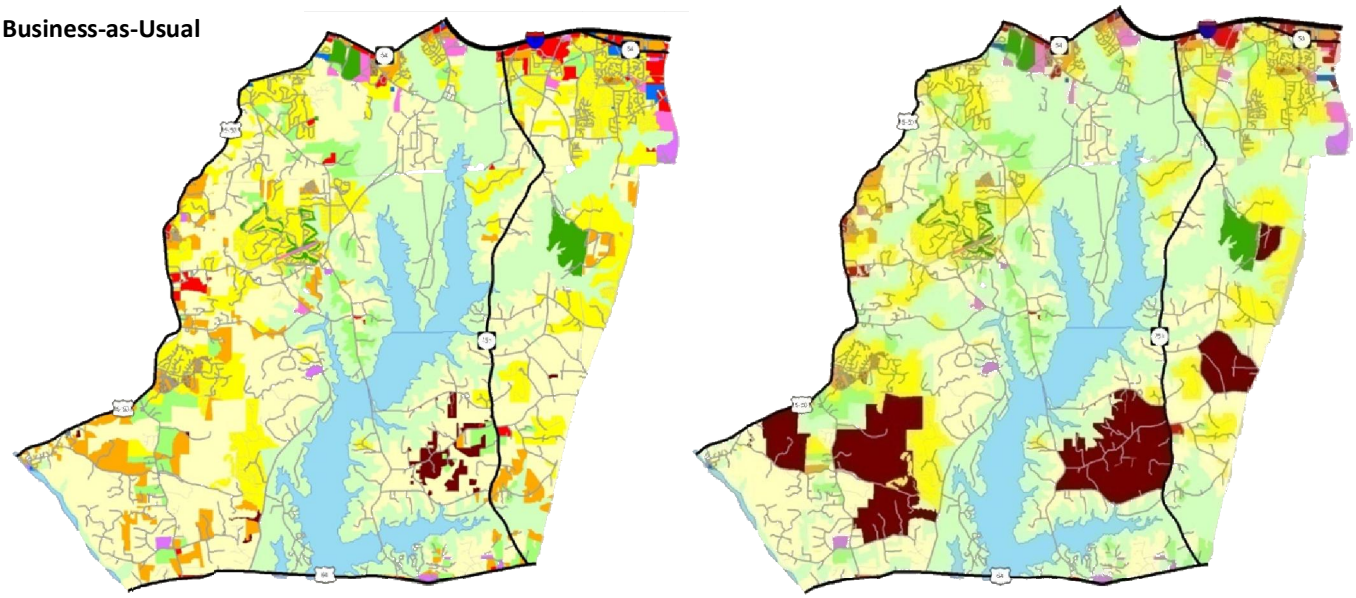
The compact development scenario represents fulfillment of the vision for many communities in the study area to promote a more sustainable development pattern – measured by environmental stewardship and equitable distribution of community resources – that also reflects the community's unique character and local values. In this planning scenario, future year growth is largely directed to one of six compact development centers identified for the study area. Each compact development center would be designed following the principles of new urbanism (i.e., containing town center, walkable streets, higher densities, etc.) and may include multiple neighborhoods within it.

The diversity of close-by, complementary land uses and local travel options within the designated compact development centers encourages better distribution of trips and shorter trip lengths, thereby reducing the number of vehicles traveling similar routes on a daily basis. This scenario also assumes provision of safe and convenient facilities for pedestrians, bicyclists, and transit riders traveling between complementary land uses. Permanent preservation of natural areas in between the designated centers respects the vulnerability of this environmentally-sensitive area while accommodating new growth.



Compact Development Centers

Business-as-Usual



Development Scenario Maps

Constrained Growth Projection

The constrained growth projection scenario assumes the same land use patterns and development densities/intensities represented in the business-as-usual development scenario. However, this scenario assumes a 15% overall reduction in the number of new dwelling units and employees anticipated for the area. This phenomenon could occur for several reasons, including reduced market demand for development in the study area, adoption of an adequate public facilities ordinance for the study area, increased development impact fees, or some other policy-driven initiative by local governments in the study area to reduce overall growth.

Scenario Planning Results

Summary statistics for evaluating the impacts generated by the three development scenarios were reported using CommunityViz software®

and the 2035 TRM. Measures of Effectiveness (MOEs) generated by the two software programs articulate the significance of reorganizing land use patterns and development densities/intensities, or implementing policies and ordinances to manage the type and timing of development, to improve efficiency of the regional transportation system (i.e., business-as-usual scenario vs. compact development centers scenario or business-as-usual scenario vs. constrained growth projections scenario).

MOEs from the TRM indicated a 4.76% decrease in vehicle miles traveled per person (system-wide) for the compact development center scenario and 6.90% decrease in vehicle miles traveled per person for the constrained growth projection scenario compared to business-as-usual. **Table 9** summarizes all MOEs from the 2035 TRM for all three development scenarios.

Table 9. Measures of Effectiveness from the Triangle Research Model (TRM)

	Scenario			Percent Difference	
	Business-As-Usual (BAU)	Compact Development Centers (CDC)	Constrained Growth Projection (CGP)	BAU-CDC	BAU-CGP
Study Area Population	22,789.00	22,789.00	21,687.00	NA	NA
Vehicle Trips	95,116.00	76,330.00	71,895.00	-19.75%	-24.41%
Vehicle Trips/Person	4.17	3.35	3.32	-19.75%	-20.57%
VMT	526,106.00	501,041.00	466,130.00	-4.76%	-11.40%
VMT/Person	23.09	21.99	21.49	-4.76%	-6.90%
VHT	795,316.00	752,541.00	694,950.00	-5.38%	-12.62%
VHT/Person (hours)	0.58	0.55	0.53	-5.38%	-8.18%
VHT/Person (minutes)	34.90	33.02	32.04	-5.38%	-8.18%
Average AM Speed	41.11	41.36	41.03	0.61%	-0.80%
Percent VMT over Capacity	5.32%	4.66%	4.41%	NA	NA

VMT= Vehicle miles traveled. VHT= Vehicle hours traveled.

Both the compact development centers scenario and constrained growth projection scenario reduce the spatial footprint of suburban development on the surrounding landscape. Compact, mixed-use centers identified in the hypothetical development scenario would limit sprawling, low-density development patterns and reduce accompanying public infrastructure costs. Output data from CommunityViz® indicates that up to 47.02% of the total land area included in the study area could be conserved compared to 34.63% in the business-as-usual scenario. Beyond environmental stewardship, the compact development scenario supports prudent fiscal responsibility for capital improvements planning and accommodates purposeful growth beyond the twenty year planning horizon.

Land consumption in the constrained growth projection development scenario would also limit the footprint of suburban-scale development through 2035. However, continued reliance on the same land use patterns and development densities/intensities represented in the business-as-usual development scenario only delays the effects of sprawl in the study area.

Table 10 summarizes the land use profile, by general land use category, for all three development scenarios.

Table 10. Land Use Profile by Scenario

General Land Use Category	Business As Usual		Compact Development Centers		Constrained Growth Projection	
	Acreage	Percent	Acreage	Percent	Acreage	Percent
Agriculture	2,989.95	4.20%	2,614.06	3.67%	2,989.95	4.20%
Civic / Institutional	519.48	0.73%	519.48	0.73%	519.48	0.73%
Commercial	1,046.66	1.47%	599.62	0.84%	1,046.66	1.47%
General Office	227.81	0.32%	123.87	0.17%	227.81	0.32%
High Density Residential	166.63	0.23%	166.63	0.23%	166.63	0.23%
Low Density Residential	10,656.32	14.96%	9,604.48	13.48%	10,656.32	14.96%
Light Industrial	335.03	0.47%	335.03	0.47%	335.03	0.47%
Medium Density Residential	3,846.39	5.40%	916.33	1.29%	3,846.39	5.40%
Permanent Conservation	24,669.52	34.63%	33,494.36	47.02%	24,669.52	34.63%
Parks & Recreation	923.14	1.30%	917.71	1.29%	923.14	1.30%
Rural Residential	25,209.14	35.39%	15,416.21	21.64%	25,209.14	35.39%
Compact Development Center	650.07	0.91%	6,532.37	9.17%	650.07	0.91%
Total	**71,240.15**	**100.00%**	**71,240.15**	**100.00%**	**71,240.15**	**100.00%**

5 future year transportation analysis

This chapter of the report summarizes a comprehensive assessment of traffic conditions anticipated for the study area in 2035. Future year conditions reported for corridors and key intersections were used to identify isolated deficiencies in the transportation network, as well as indications of larger, system-wide deficiencies expected from continued "business-as-usual" development patterns. Results from the analysis were compared to existing conditions (2005) using performance measures included in the Triangle Regional Model (TRM). Output from the analysis was used to justify short- and long-term improvements highlighted in Chapter 5 of this report.

Triangle Regional Model

The Triangle Regional Model (Air Quality Conformance Version) was developed in 2004 to serve as a planning tool for analyzing and forecasting traffic in the Triangle area. The model was developed using the TranPlan software package and follows a traditional four-step modeling process — trip generation, trip distribution, mode split, and traffic assignment. The base year for the approved travel demand model is 2005. Forecast years include 2015, 2025, and 2035. Future year traffic forecasts for this study (2035) were estimated from the fiscally-constrained existing + committed network assumed for the DCHC MPO Long Range Transportation Plan.

Growth Scenario

The future year transportation assessment assumed the business-as-usual development scenario described in Chapter 4 of this report.

Future Travel Pattern Analysis

Travel patterns in the study area were reviewed to identify prevalent traffic movements that will affect the roads in the study area in 2035. This analysis drew from the 2035 TRM to determine regional traffic patterns from western Chatham County and the Jordan Lake area to Research Triangle Park (RTP). Specific data included in the review are:

- TRM Future Year (2035) model traffic flows from Chatham County
- TRM Future Year (2035) model select link analysis

As in the 2005 base year, the presence and shape of Jordan Lake has an effect on local and regional travel patterns, limiting the number of east-west corridors that cross it. Interstate 40 and NC 54 are the predominant routes north of the watershed, while U.S. Highway 64 crosses Jordan Lake at the southern edge of the study area. In addition, future growth and changes in the larger transportation system (such as the addition of I-540 in Western Wake County) are likely to have significant effects on travel throughout the study area.

Select Link Analysis

DCHC MPO and Kimley-Horn prepared a number of Select Link Analysis model runs using the Triangle Research Model for roadway segments in the study area. Segments that corresponded to corridors in this study included:

- Farrington Road
- Farrington Mill Road
- US 15-501
- Jack Bennett Road
- Scott King Road
- NC 55.

Select link analysis is a means to demonstrate how traffic that crosses a particular section of roadway distribute (comes from and goes to) throughout the network. It does not present the total volume for model links, only those which pass through a particular section. This type of analysis is helpful when contemplating the likely impacts of proposed improvements.

Figures 21-24 on the following pages show the results of the select link analysis for each corridor. These figures show the location of each of the select link analysis locations, along with the distribution of trips (by percentage of total trips on the subject link). For example, in **Figure 21**, the select link analysis location is Farrington Road between Stagecoach Road and Barbee Chapel Road. By definition, 100% of the select link volume goes through this section. East of this link, 74% of this traffic is either coming from or going to Stagecoach Road. The other 26% is heading North on Farrington Road. Of the 74% using Stagecoach Road, 24% heads south on NC 55.

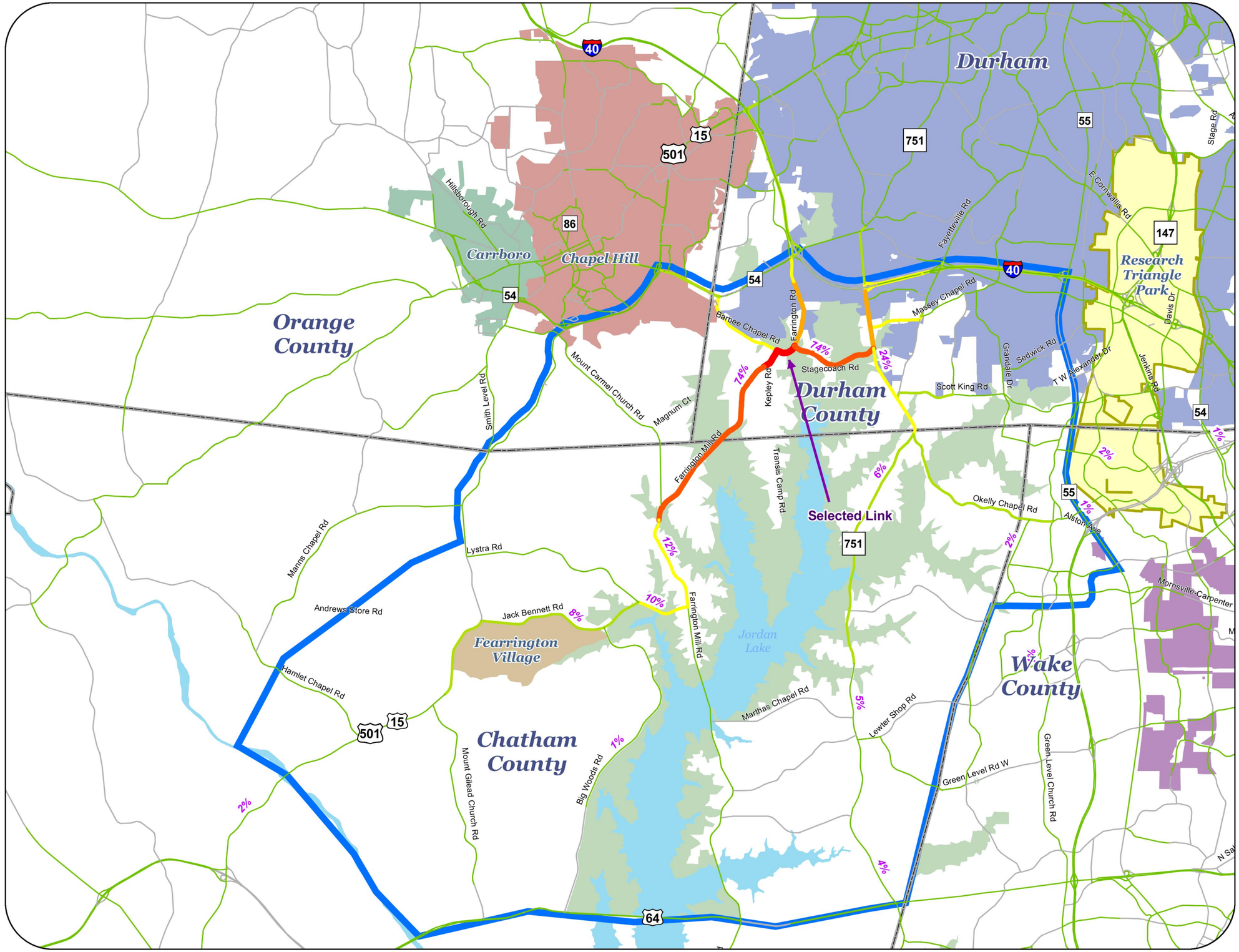
Figure 21 shows the select link analysis for Farrington Road between Stagecoach Road and Barbee Chapel Road. This select link reveals that the majority of traffic on this facility could be characterized as local, even more than the 2005 select link analysis showed in **Figure 13**. Increases in demand (percentage, not total volume) from the Fearrington Village area were noted, along with traffic from NC 751.

Decreases in the percent of the total demand from Farrington Mill Road south of Jack Bennett Road were observed, indicating that over time, a majority of traffic growth on this facility will be from inside the study area.

Farrington Road Corridor Study

Figure 21

Select Link Analysis Farrington Rd.



Select Link Volumes
Percent of Trips

- 0.0
- 0.1 - 5
- 5 - 10
- 10 - 25
- 25 - 50
- 50 - 75
- 75 - 100
- Counties
- Study Area
- Research Triangle Park
- Lakes
- Durham
- Chapel Hill
- Fearrington Village
- Cary
- Carrboro
- Corps of Engineers Land

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N W E S

0 0.5 1 2 3 Miles

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Figure 22 shows the select link analysis for Farrington Mill Road south of Mt. Carmel Church Road. Like the select link analysis for Farrington Road, a shift in demand is observed when compared to the 2005 select link analysis shown in **Figure 14**, but to a lesser extent. As a percent of link volume, reduction in traffic demand from the south occurs, while traffic increases from developing areas near Fearrington Village and east of Jordan Lake. The most significant shifts in traffic are increases in demand from US 64 from the east and US 15-501 to the south.

Figure 23 shows the select link analysis for US 15-501 south of Jack Bennett Road. When compared to **Figure 15**, no major shifts in traffic demand are noted, except for a minor shift of traffic demand from Mount Gilead Church Road to southwest of the study area (Pittsboro).

Figure 24 shows the select link analysis for Jack Bennett Road west of Farrington Mill Road. When compared to **Figure 16**, no major shifts in traffic demand are noted, except for a shift of traffic demand from Big Woods Road to Farrington Mill Road to the south, and increasing traffic from developing areas east of Jordan Lake, including Western Wake County.

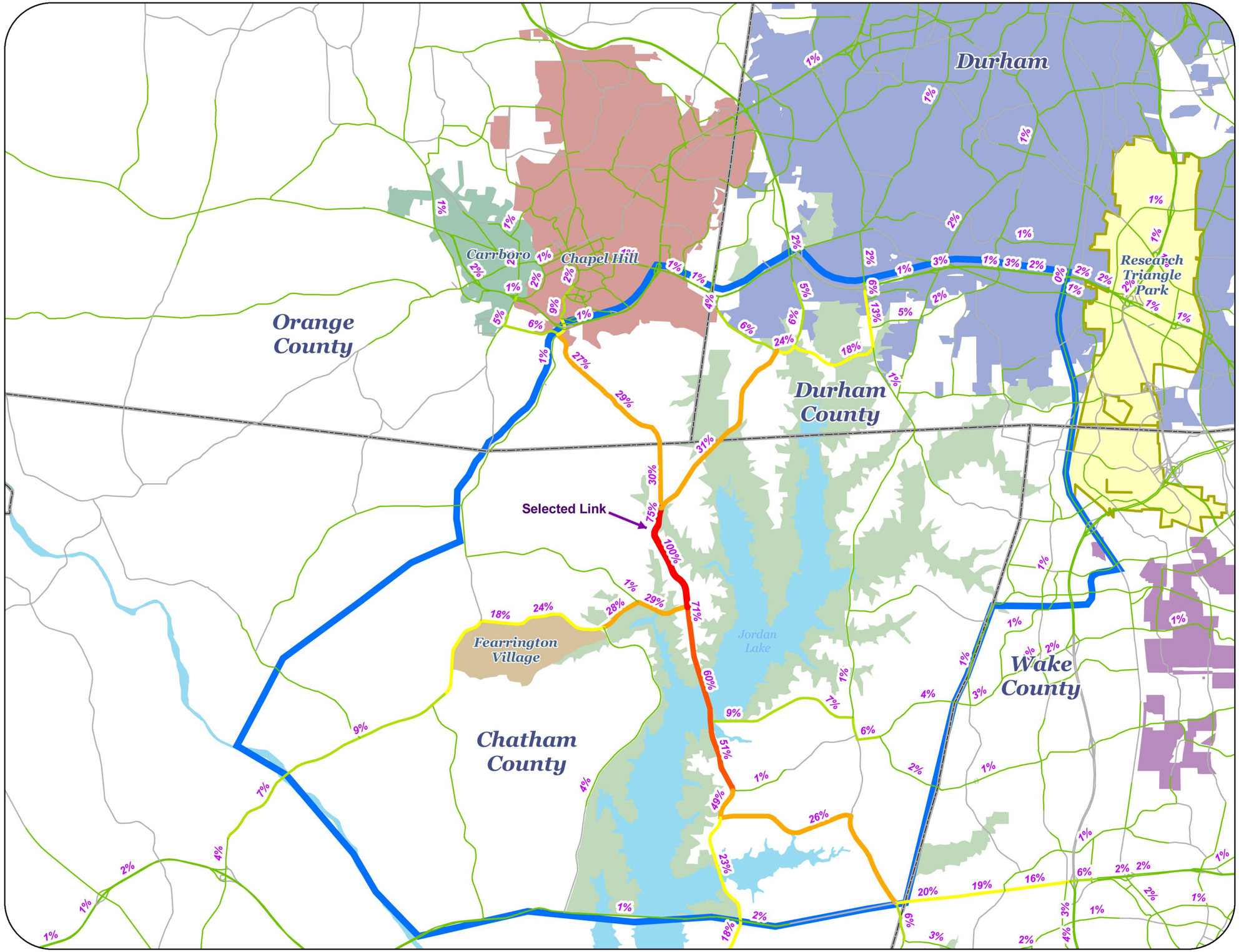
Figure 25 shows the select link analysis for Scott King Road east of Fayetteville Road. This analysis shows the most dramatic shift in traffic from 2005 (**Figure 17**). In 2005, a majority of the traffic was coming from NC 751 to the south (59%). In 2035, only 9% of traffic is predicted to come from this area. Traffic demand increases are noted on Farrington Mill Road, Stagecoach Road, NC 751 north of Stagecoach, and Fayetteville Road. The analysis further indicates that this facility will experience traffic pressure in the future due to heavy congestion on I-40, and will serve as an alternative route to Research Triangle Park and I-540.

Figure 26 shows the select link analysis for NC 55 north of Sedwick Road. When compared to **Figure 18**, little change in travel demand patterns are noted, other than the expected shift of traffic onto the new section of I-540 south of NC 55 towards Apex. No other significant changes are noted in the study area.

Farrington Road Corridor Study

Figure 22

Select Link Analysis
Farrington Mill Rd



Select Link Volumes
Percent of Trips

- 0.0
- 0.1 - 5
- 5 - 10
- 10 - 25
- 25 - 50
- 50 - 75
- 75 - 100
- Counties
- Study Area
- Research Triangle Park
- Lakes
- Durham
- Chapel Hill
- Fearrington Village
- Cary
- Carrboro
- Corps of Engineers Land

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N W E S

0 0.5 1 2 3 Miles

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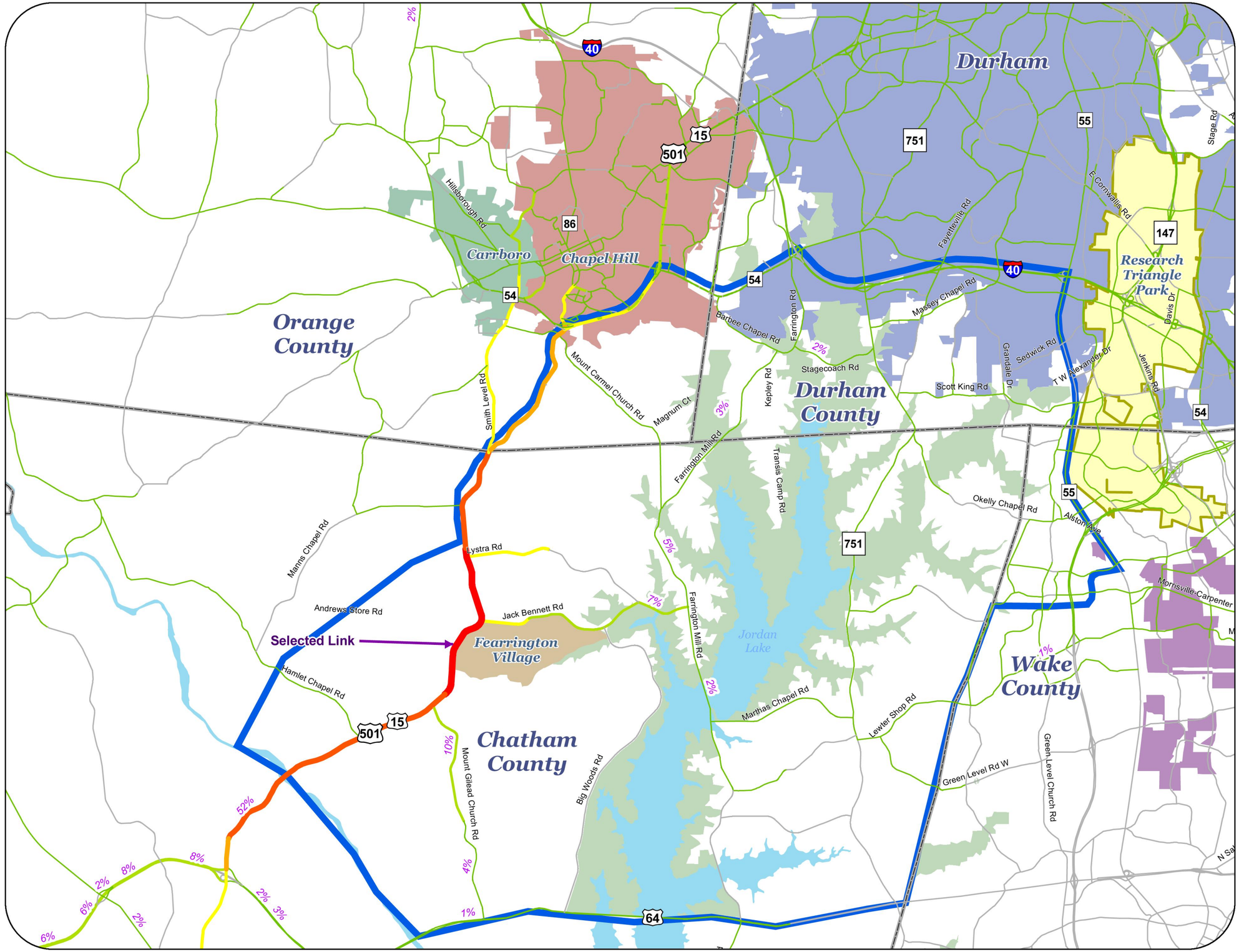
Farrington Road Corridor Study

Figure 23

Select Link Analysis
US 15/501



Select Link Volumes
Percent of Trips

- 0.0
- 0.1 - 5
- 5 - 10
- 10 - 25
- 25 - 50
- 50 - 75
- 75 - 100
- Counties
- Study Area
- Research Triangle Park
- Lakes
- Durham
- Chapel Hill
- Fearrington Village
- Cary
- Carrboro
- Corps of Engineers Land

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N W E S

0 0.5 1 2 3 Miles

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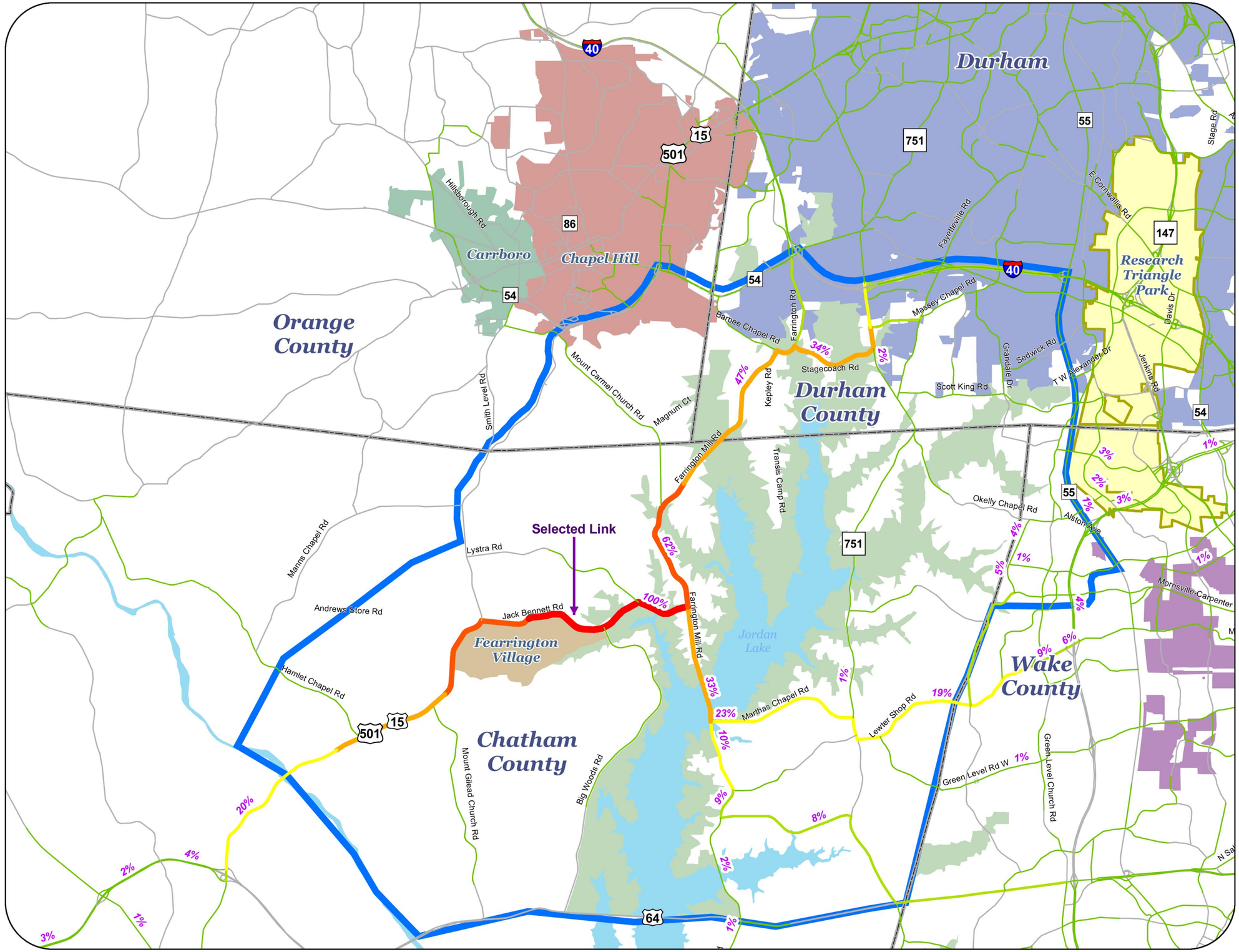
Farrington Road Corridor Study

Figure 24

Select Link Analysis
Jack Bennett Rd



Select Link Volumes
Percent of Trips

- 0.0
- 0.1 - 5
- 5 - 10
- 10 - 25
- 25 - 50
- 50 - 75
- 75 - 100
- Counties
- Study Area
- Research Triangle Park
- Lakes
- Durham
- Chapel Hill
- Fearrington Village
- Cary
- Carrboro
- Corps of Engineers Land

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N W E S

0 0.5 1 2 3 Miles

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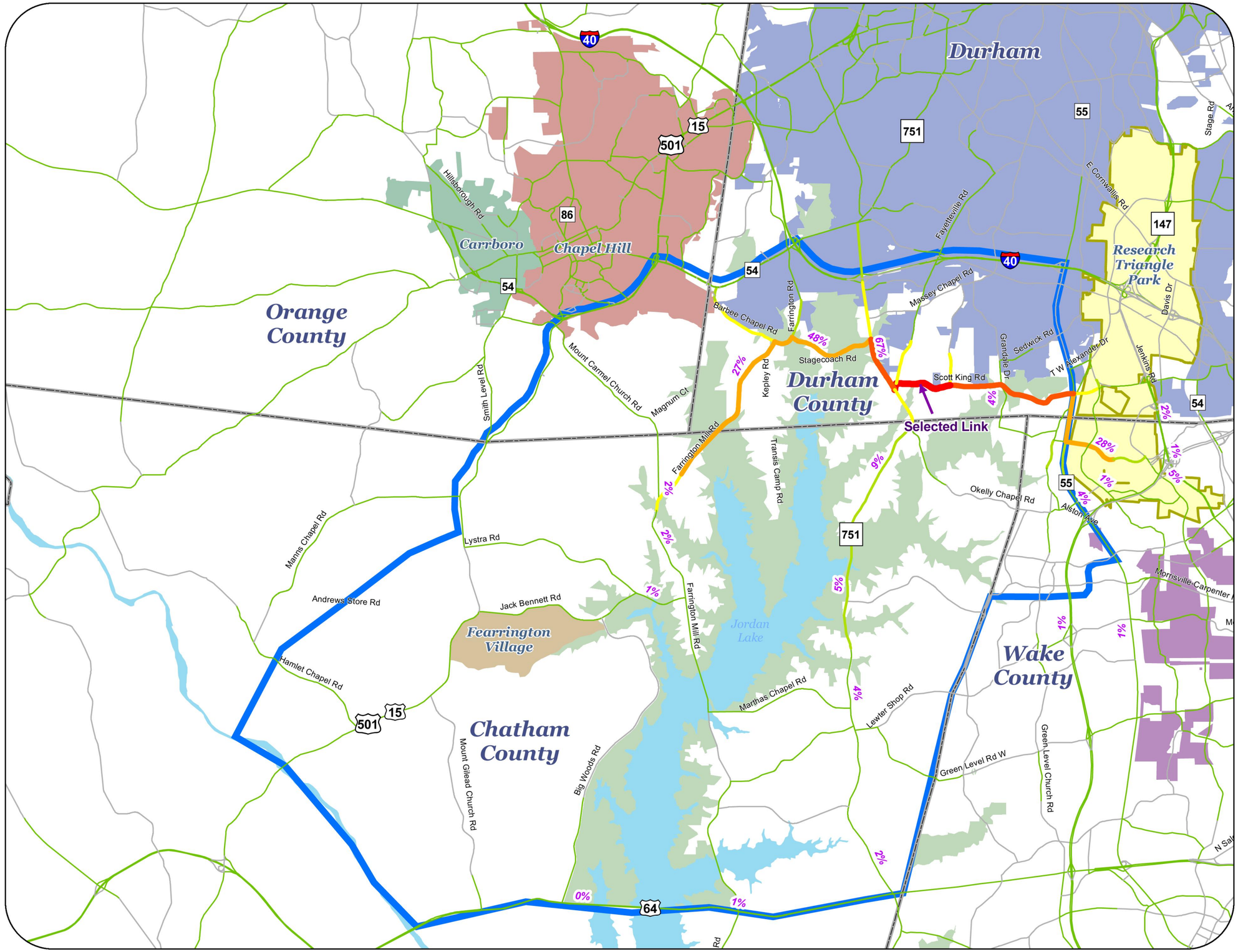
Farrington Road Corridor Study

Figure 25

Select Link Analysis
Scott King Road



Select Link Volumes
Percent of Trips

- 0.0
- 0.1 - 5
- 5 - 10
- 10 - 25
- 25 - 50
- 50 - 75
- 75 - 100
- Counties
- Study Area
- Research Triangle Park
- Lakes
- Durham
- Chapel Hill
- Fearrington Village
- Cary
- Carrboro
- Corps of Engineers Land

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N W E S

0 0.5 1 2 3 Miles

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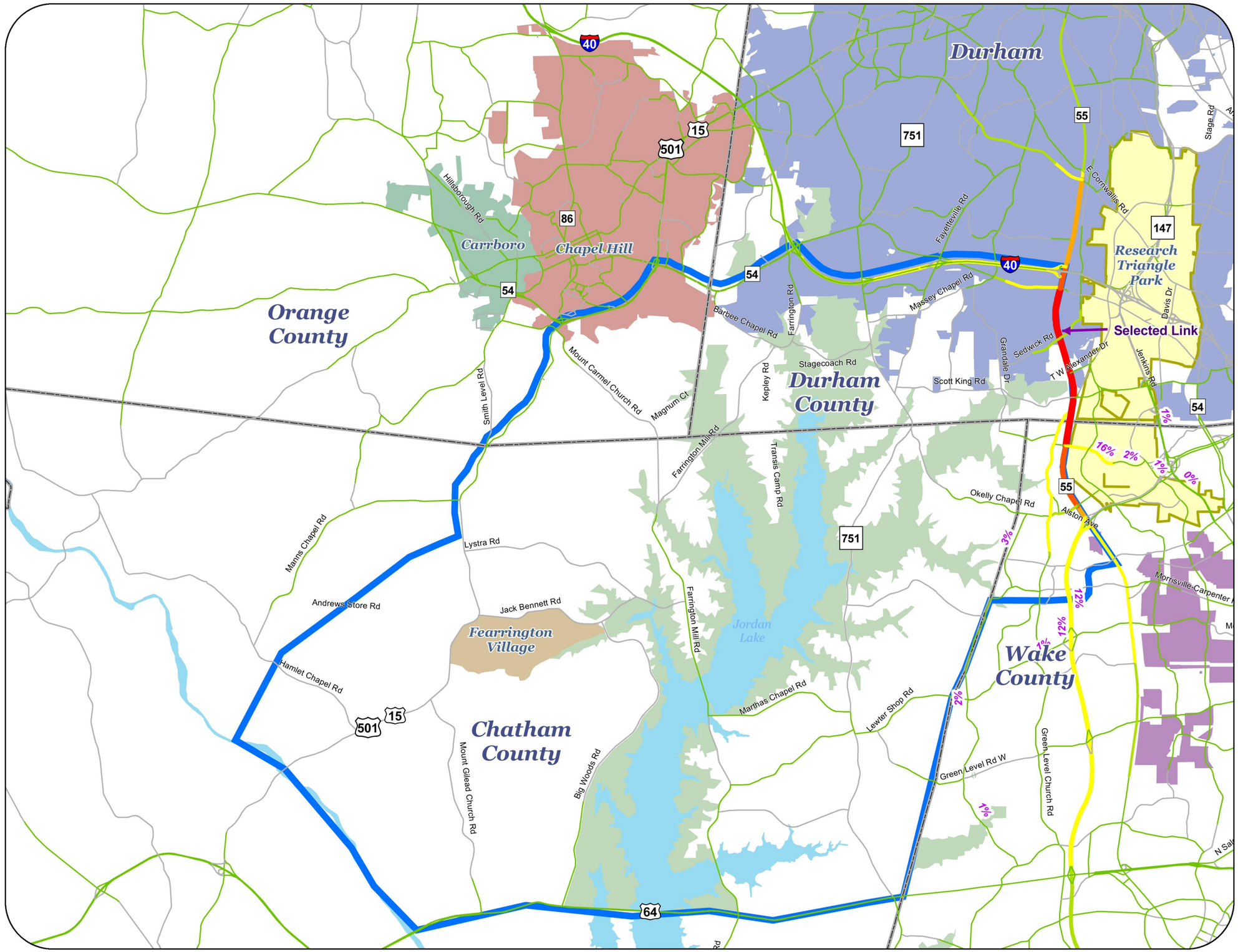
Farrington Road Corridor Study

Figure 26

Select Link Analysis
NC 55



Select Link Volumes
Percent of Trips

- 0.0
- 0.1 - 5
- 5 - 10
- 10 - 25
- 25 - 50
- 50 - 75
- 75 - 100
- Counties
- Study Area
- Research Triangle Park
- Lakes
- Durham
- Chapel Hill
- Fearrington Village
- Cary
- Carrboro
- Corps of Engineers Land

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N W E S

0 0.5 1 2 3 Miles

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Based on the results of the 2035 select link analysis, it can be concluded that the majority of the traffic demand in the study area will remain local. However, there will be impacts associated with increased congestion on I-40 and shifts in regional traffic demand resulting from the extension of I-540.

District Flow Analysis

DCHC MPO provided daily and peak period origin-destination (O-D) matrices at the district level from the Triangle Regional Model (TRM). For the Triangle Model, the region is divided into 21 districts representing different parts of the area. For the Farrington Road analysis, these 21 TRM districts were grouped into 14 super-districts. O-D data from the Triangle Regional Model were aggregated to these super-districts, and are presented in **Table 11**.

Table 11 shows that the majority of trips to and from Chatham County are internal (63%). Trips to the Chapel Hill/Carrboro area are also prominent (14%), and are predicted to use the US 15-501 corridor. Trips to Western Wake (Cary/Apex) represent 8% of trips, and are expected to use the US 64 corridor for access into those areas. Southwest Durham County and RTP make up 5% and 2% of the trips, respectively (approximately 7% or 12,400 trips combined). These trips are the most likely to use the Farrington Road Corridor to avoid future congestion on US 15-501, US 64, and I-40.

Table 11. Triangle Model District Flows to and from Chatham County

Super-District	Trips to/From Chatham County (2035)	% of Total (2035)	% of Total (2005)
Chatham County	389,545	72%	63%
Chapel Hill/Carrboro Area	32,185	6%	14%
West Wake (Cary/Apex)	50,009	9%	8%
Southwest Durham County	19,208	4%	5%
South Wake (Holly Springs/Fuquay Varina)	18,283	3%	3%
Research Triangle Park	10,697	2%	2%
Central Durham	5,235	1%	1%
Raleigh (Inside the Beltine)	3,030	1%	1%
Northern Durham /Durham County	3,461	1%	1%
North/Eastern Wake County	2,268	0%	1%
Southwest Orange County	2,606	0%	1%
Northern Orange County	2,121	0%	0%
Johnston/Harnett County	3,092	1%	0%
Granville/Franklin County	144	0%	0%
Total	**541,884**	**100%**	**100%**

These district flows were added to the Triangle Model to create a thematic map representing "travel desire lines". These graphical district flows can be seen in **Figure 27**.

Future Traffic and Travel Conditions

Future Year (2035) traffic conditions were analyzed based on the results of the Triangle Regional Model and other available data developed during this study. The 2035 TRM was run using updated socio-economic data (residential and employment) based on future land use scenarios (described in the Scenario Planning chapter of this document). The resulting traffic volumes were used to identify future deficiencies (corridor and intersection level) based on volume-to-capacity (V/C) ratios for the study area corridors. Corridor and intersection traffic forecasts were prepared based on the output of the model, and were refined based on review of 2007 traffic count data and the results of the 2005 model.

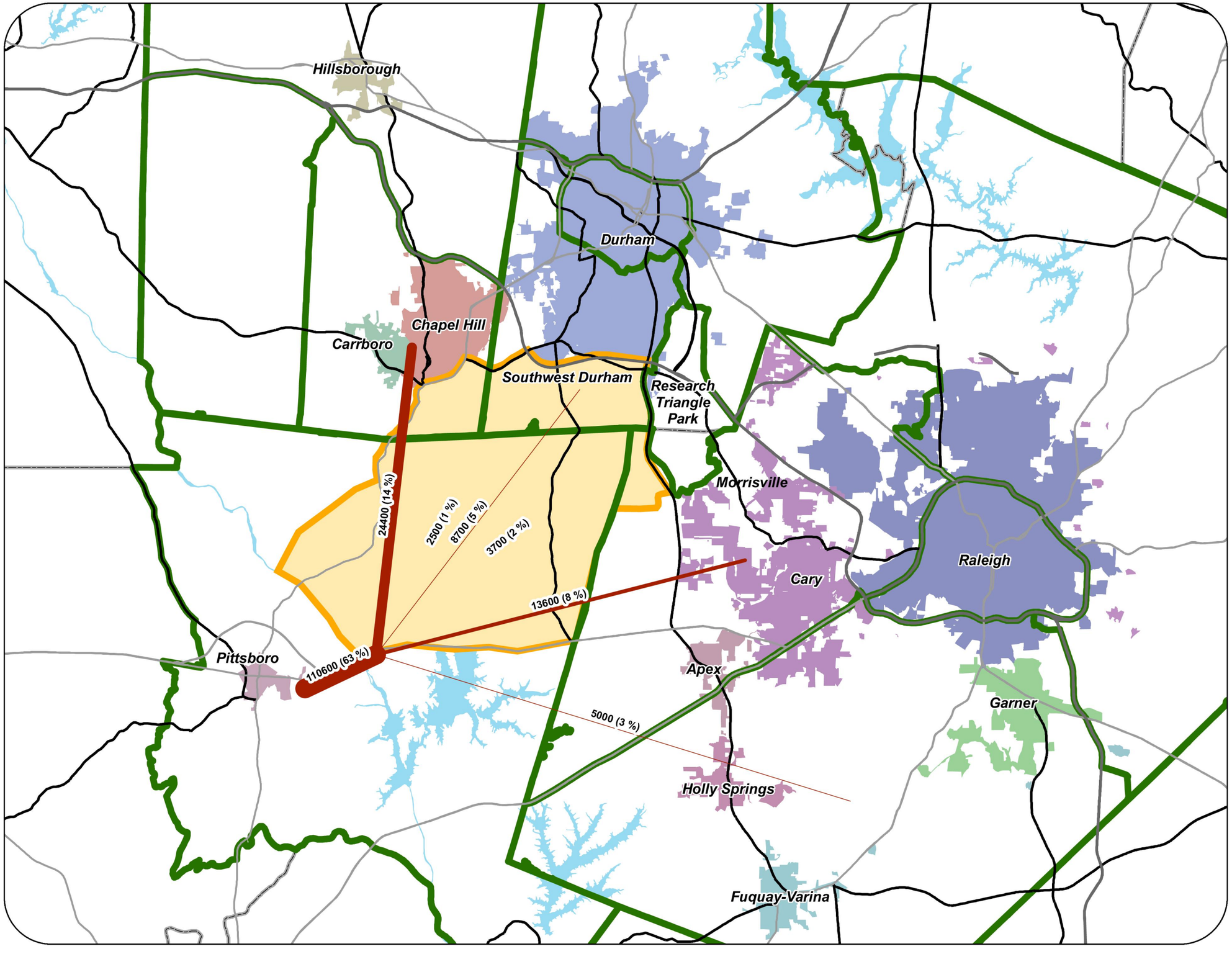
Figures 28 and 29 show the 2005 and 2035 Model Volumes, respectively. These figures show that many facilities within the study area experience significant traffic increases, including NC 751, Farrington Mill Road, Farrington Road, Stagecoach Road, NC 55, and US 15-501. Many of these roads are two-lane facilities with no current plans or funding for improvements.

Farrington Road Corridor Study

Figure 27

2035 District Flows into Chatham County

Triangle Regional Model Origin-Destination Data



District Flows
Total Trips (and % of Trips)

- 5000 - 10000
- 10000 - 15000
- 15000 - 20000
- 20000 - 30000
- 30000 - 40000
- 40000 - 50000
- > 50000
- Interstates
- US Highways
- State Highways
- TRM Super-Districts
- Counties
- Study Area
- Lakes

November 25, 2008

N W E S

0 1 2 4 6 8 Miles

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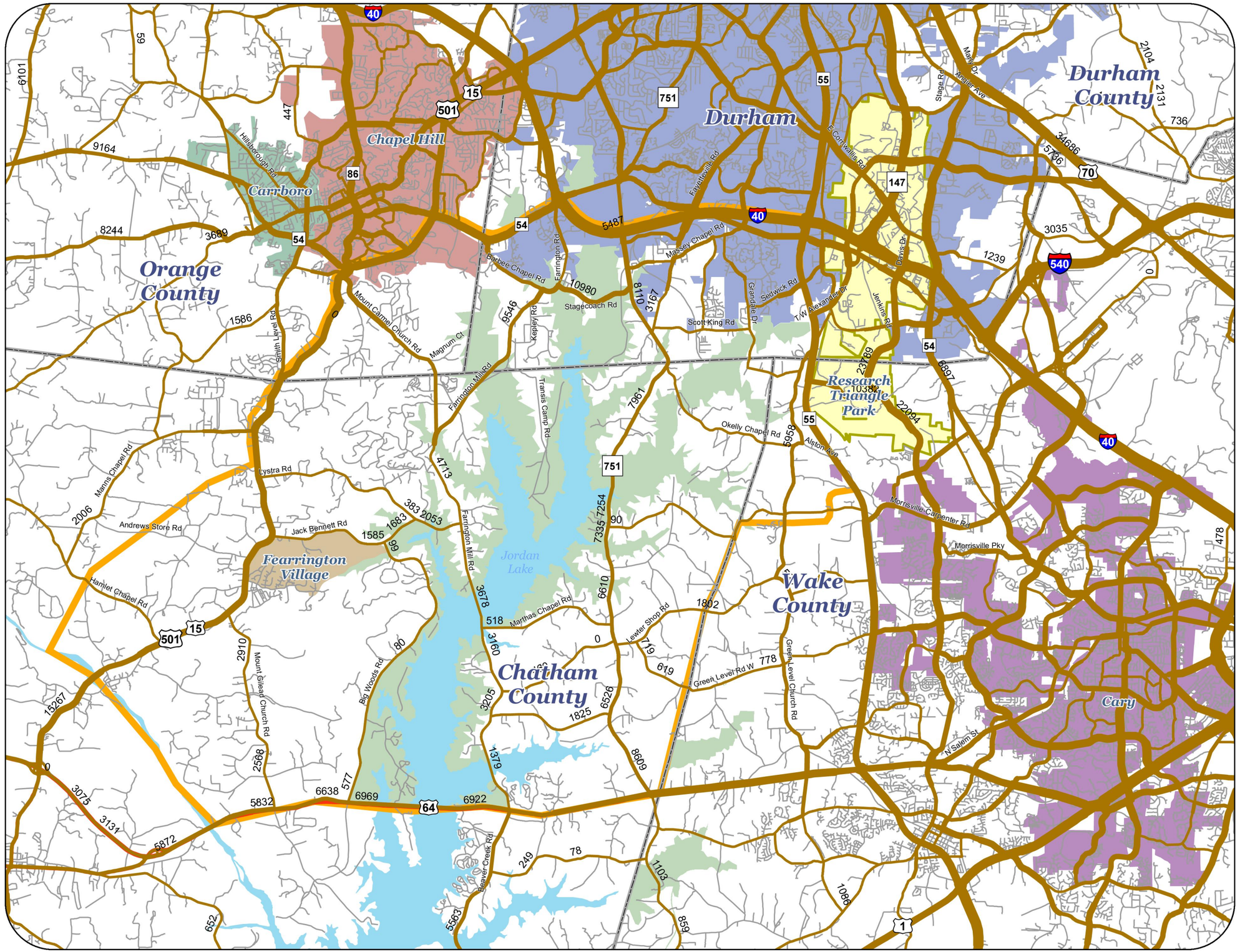
Farrington Road Corridor Study

Figure 28

2005 Volumes



2005 Volumes

- < 5000
- 5001 - 10000
- 10001 - 15000
- 15001 - 20000
- 20001 - 30000
- 30001 - 40000
- > 40000
- Interstates
- US Highways
- State Highways
- State Roads
- Counties
- Study Area
- Research Triangle Park
- Lakes
- Durham
- Chapel Hill
- Fearrington Village
- Cary
- Carrboro
- Corps of Engineers Land

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N W E S

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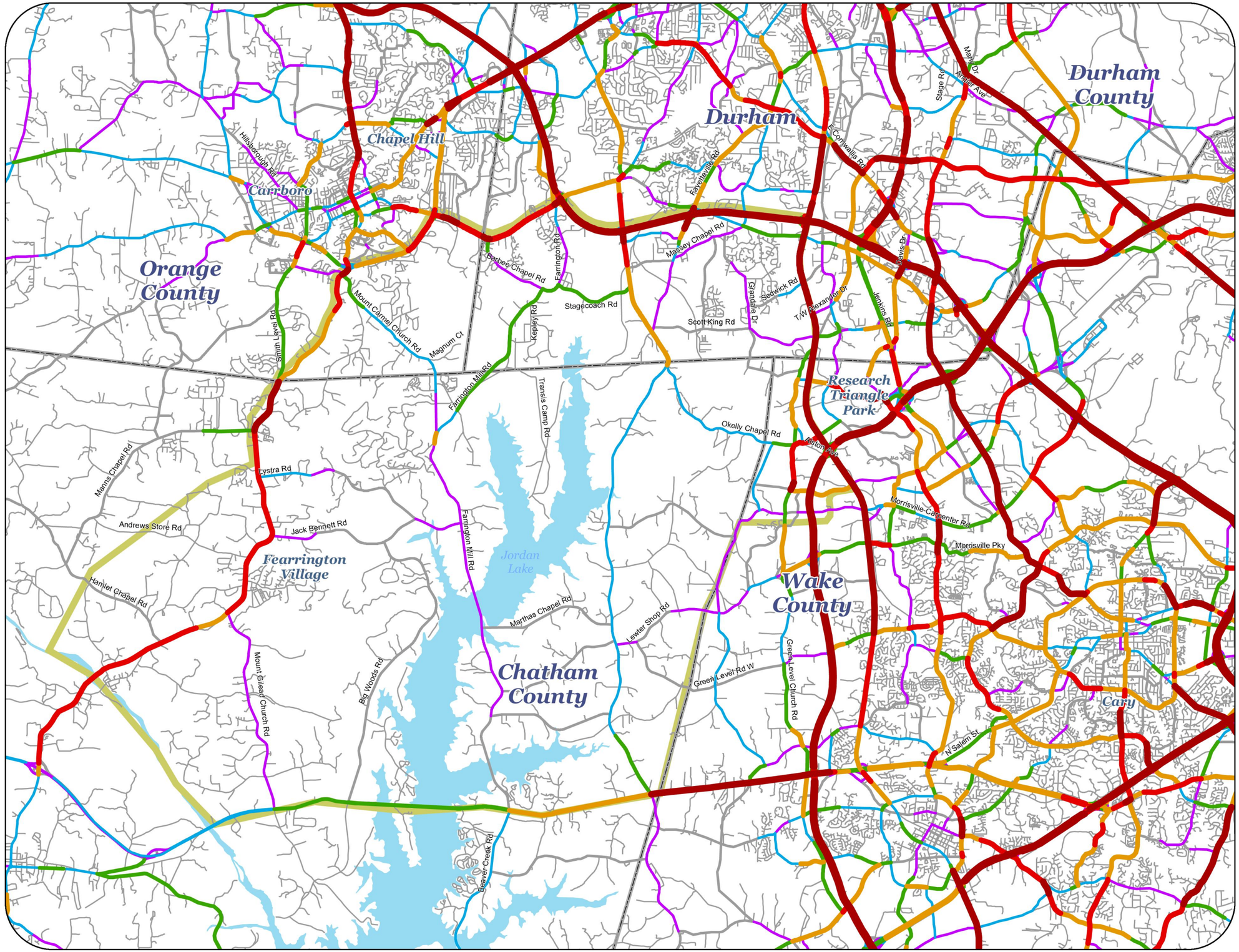
Farrington Road Corridor Study

Figure 29

2035 Volumes



2035 Daily Traffic Volumes

- < 5000
- 5000 - 10000
- 10000 - 15000
- 15000 - 20000
- 20000 - 30000
- 30000 - 40000
- > 40000
- State Roads
- Counties
- Study Area
- Lakes

November 25, 2008

N W E S

0 0.5 1 2 3 Miles

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Figure 30 shows growth between 2005 and 2035 in the study area as an average annual growth rate. The more established areas such as Durham, Chapel Hill, and Cary experience low to moderate growth, between 1% and 3% per year. Annual growth rates are much higher in the rural parts of the study area, particularly in areas where new development is forecast. However, percent growth can be deceiving. The absolute growth in traffic is actually higher in the established urbanized locations and, these locations have a much higher observed and predicted future traffic volume. Nonetheless, this figure does demonstrate that development in the area, paired with external factors such as travel along the I-40 and I-540 corridors, will likely have measurable impacts on the transportation system within the study area.

Trendline Scenario - Future Corridor Level-of-Service

As in the existing conditions analysis, seventeen roadway sections were identified for corridor level-of-service (LOS) traffic analysis for projected future conditions. **Figure 1** shows the corridors that were studied as part of this analysis, as well a reference Section ID that are used throughout the report.

Corridor Level-of-Service Analysis shows that traffic growth between 2005 and 2035 in the study area will significantly impacts the transportation system. In 2005, only one of the 27 roadway sections studied performed at a LOS D, and no sections were failing (LOS E or worse). In 2035, two sections are predicted to perform at LOS D, and six sections are LOS E or worse. Two of the six failing sections are NC Routes – NC 55 and NC 751, but four of the most congested sections are two-lane rural roads: Farrington Road, Old Farrington Point Road, Barbee Chapel Road, and Stagecoach Road. Without improvements (or a change in future development patterns), these sections of road may experience heavy traffic delays on a daily basis. They are not designed to carry the forecasted traffic.

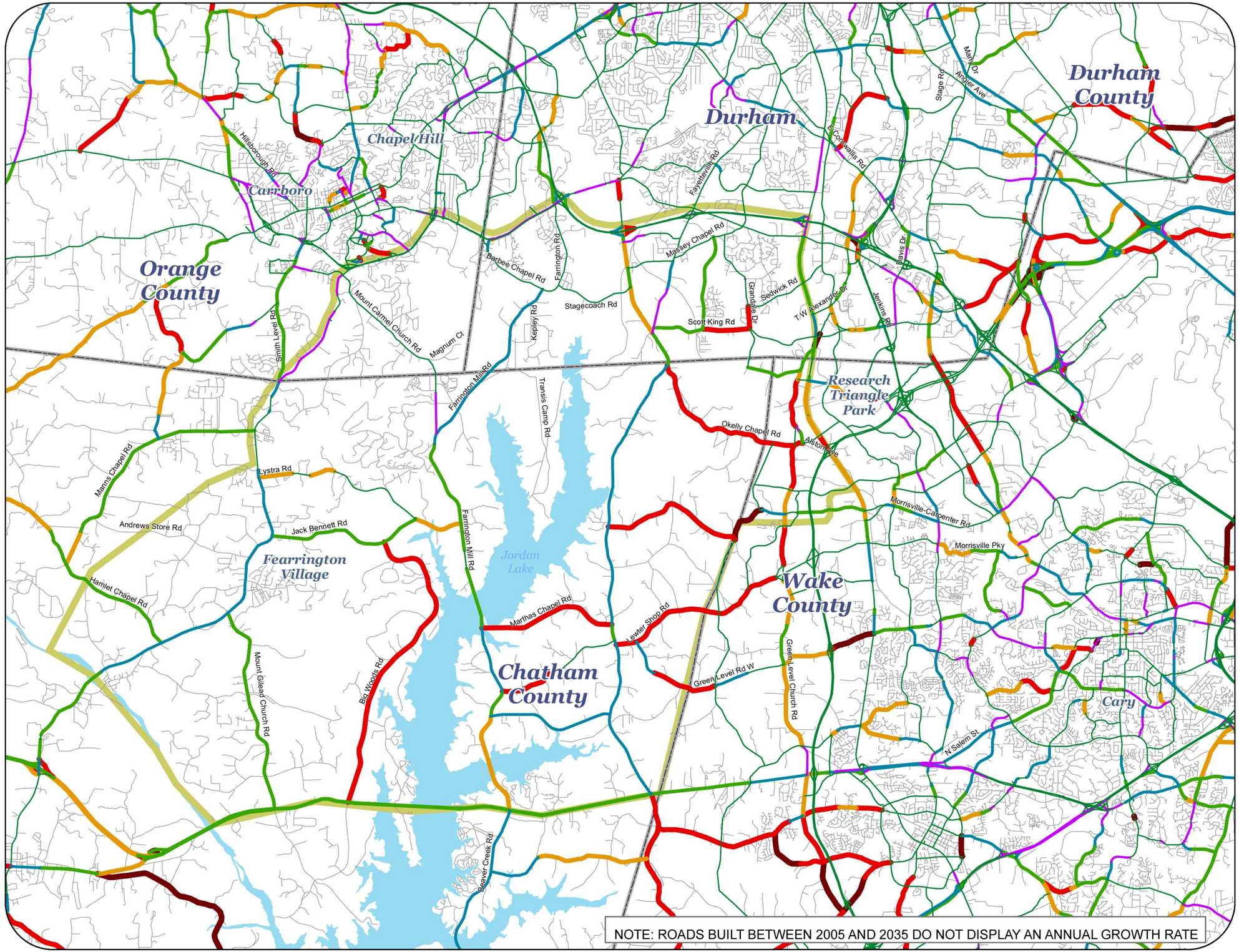
Table 12 communicates existing as well as predicted 2035 Level of Service.

Farrington Road Corridor Study

Figure 30

Annual Growth Rate, 2005 - 2035 (%)

Triangle Regional Model



2035_Model_Growth
Annual Growth Rate

- < 1%
- 1 - 2%
- 2 - 3%
- 3 - 4%
- 4 - 5%
- 5 - 7.5%
- > 7.5%
- State Roads
- Counties
- Study Area
- Lakes

November 25, 2008

N W E S

0 0.5 1 2 3 Miles

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Table 12 - Trendline 2035 Level of Service

Section	Road	From	To	LOS D Traffic Capacity	2035 Traffic (ADT)	2035 V/C	2035 LOS	2005 LOS
11	US 15-501	Southern PAB	Jack Bennett Road	62,600	36,100	0.58	B	A
12	US 15-501	Jack Bennett Road	Northern PAB	62,600	35,600	0.57	B	A
13	Jack Bennett Rd	US 15-501	Farrington Point Road	11,900	4,900	0.41	B	A
14	Farrington Rd	Southern PAB	Lystra Road	11,800	8,800	0.75	C	B
15	Farrington Point Rd	Lystra Road	Mt. Carmel Church Rd.	10,500	9,700	**0.92**	**D**	B
16	Old Farrington Pt Rd	Mt. Carmel Church Rd.	Barbee Chapel Road	9,400	16,600	**1.77**	**F**	B
17	Mt Carmel Rd	Farrington Mill Road	Downing Creek Pkwy	12,400	10,900	**0.88**	**D**	B
18	Barbee Chapel Rd	Farrington Mill Road	NC 54	9,500	11,300	**1.19**	**F**	B
19	Farrington Rd	Stagecoach Road	Ridgefield Drive	15,300	8,200	0.54	B	B
20	Farrington Rd	Barbee Chapel Road	Stagecoach Road	15,300	19,800	**1.29**	**F**	B
21	Stagecoach Rd	Farrington Road	NC 751	9,500	15,600	**1.64**	**F**	C
22	NC 751 (Hope Valley Rd)	Stagecoach Road	Scott King Road	62600	22,800	0.36	B	C
23	NC 751 (Hope Valley Rd)	Scott King Road	Southern PAB	11,800	17,400	**1.48**	**F**	**D**
24	Scott King Road	NC 751	Grandale Drive	9,500	4,000	0.42	B	A
25	Grandale Dr	Scott King Road	Sedwick Road	9,500	5,500	0.58	B	B
26	Sedwick Rd	Grandale Drive	NC 55	12,500	5,800	0.46	B	B
27	NC 55	Sedwick Road	Alexander Drive	39,700	44,800	**1.13**	**E**	B

TWLTL = Two-Way Left Turn Lane

Future Intersection Level-of-Service (LOS) Analysis

For the future year intersection LOS analysis, the same nine intersections that were analyzed in the existing conditions section were used. For each of these intersections, a set of 2035 turning-movement projections was prepared using existing volumes and trend growth rates. These forecasted traffic volumes were then analyzed using existing intersection geometry, as shown in **Figure 9**. Capacity analyses were performed for the AM and PM peak hours for projected trendline (2035) traffic conditions using *SYNCHRO* (Version 7) and SIDRA (for roundabouts) software to determine the operating characteristics of the adjacent road network.

Capacity analyses were performed for the existing (2007) traffic condition for the following intersections:

- US 15-501 at Jack Bennett Road
- Farrington Point Road at Lystra Road
- Farrington Road and Stagecoach Road at Mt. Carmel Road

- Farrington Mill Road/Farrington Road at Barbee Chapel Road
- Hope Valley Road (NC 751) at Fayetteville Road
- Stagecoach Road at Hope Valley Road (NC 751)
- Farrington Road at Stagecoach Road
- NC 55 at T.W. Alexander Drive
- NC 55 at Sedwick Road.

For intersection analysis, capacity is combined with Level-of-Service (LOS) in a relationship table to describe the operating characteristics of a road segment or intersection. LOS D is the typically accepted standard for signalized intersections in urbanized areas. For signalized intersections, LOS is defined for the overall intersection operation. For unsignalized intersections, only the movements that must yield right-of-way experience control delay. Therefore, LOS criteria for the overall intersection is not reported by *SYNCHRO* Version 7 or computable using methodology published in the *Highway Capacity Manual.*

The recommended improvements evaluated in **Table 13** are listed following the table. These improvements are further delineated into short-term and long-term improvements in **Section 4**. **Table 13** summarizes the LOS and delay (seconds per vehicle) for all of the study intersections for the existing traffic conditions.

Table 13. Level of Service Summary

Condition	AM Peak-Hour LOS (Delay)	PM Peak-Hour LOS (Delay)
US 15-501 and Jack Bennet Road - (Signalized)		
Existing (2007) Traffic	A (9.0)	B (10.1)
Projected (2035) Traffic	B (13.5)	B (16.1)
Projected (2035) Traffic with Improvements	B (13.5)	B (16.1)
Farrington Point Road and Lystra Road - (Signalized)		
Existing (2007) Traffic	C (20.6)	B (14.3)
Projected (2035) Traffic	E (78.7)	E (58.7)
Projected (2035) Traffic with Improvements	D (40.1)	C (33.4)
Projected (2035) Traffic with Improvements -*Roundabout*	B (19.0)	B (12.5)
Farrington Point Road/Old Farrington Point Road and Mt. Carmel Road -(Unsignalized)		
Existing (2007) Traffic	Short delays for minor street approach	Moderate delays for minor street approach
Projected (2035) Traffic	Long delays for minor street approach	Long delays for minor street approach
Projected (2035) Traffic with Improvements -*Signalized*	B (15.6)	C (21.8)
Projected (2035) Traffic with Improvements -*Roundabout*	B (12.1)	B (11.9)
Farrington Mill Road/Farrington Road and Barbee-Chapel Road - (Unsignalized)		
Existing (2007) Traffic	Moderate delays for minor street approach	Long delays for minor street approach
Projected (2035) Traffic	Long delays for minor street approach	Long delays for minor street approach
Projected (2035) Traffic with Improvements - *Signalized*	B (17.0)	D (37.8)
Projected (2035) Traffic with Improvements - *Roundabout*	A (8.1)	A (9.9)
Farrington Road and Stagecoach Road - (Unsignalized)		
Existing (2007) Traffic	Long delays for minor street approach	Long delays for minor street approach
Projected (2035) Traffic	Long delays for minor street approach	Long delays for minor street approach
Projected (2035) Traffic with Improvements – *Signalized*	C (20.4)	B (17.4)
Projected (2035) Traffic with Improvements - *Roundabout*	A (9.4)	A (9.1)
Stagecoach Road and Hope Valley Road (NC 751) - (Signalized)		
Existing (2007) Traffic	D (43.0)	B (19.8)
Projected (2035) Traffic	F (370.0)	F (287.5)
Projected (2035) Traffic with Improvements	C (21.8)	C (23.8)
Hope Valley Road (NC 751) and Fayetteville Road - (Signalized)		
Existing (2007) Traffic	B (10.7)	C (21.4)
Projected (2035) Traffic	E (71.8)	F (136.1)
Projected (2035) Traffic with Improvements	B (18.7)	C (21.8)
NC 55 and Sedwick Road - (Signalized)		
Existing (2007) Traffic	B (19.6)	C (29.8)
Projected (2035) Traffic	C (25.2)	D (39.4)
Projected (2035) Traffic with Improvements	C (25.2)	D (39.4)
NC 55 and T.W. Alexander Drive – (Signalized)		
Existing (2007) Traffic	C (24.3)	C (24.5)
Projected (2035) Traffic	D (47.0)	D (26.1)
Projected (2035) Traffic with Improvements	B (16.1)	C (26.1)

6 recommendations

The following transportation recommendations were developed based on the established vision and guiding principles, results from the Triangle Regional Model, thorough consideration of existing and future land uses, and basic transportation planning principles. The structure of the recommendations does not require that all improvements be completed in unison. This structure allows flexibility to encourage cooperation and partnership with the development community to implement the vision of the plan in several phases as development occurs and funding sources become available.

The recommendations are broken down into roadway recommendations and intersection improvement recommendations. **Figure 31** illustrates the proposed recommendations.

Roadway Recommendations

US 15-501 and Jack Bennett Road

- Lengthen the existing westbound left-turn lane on Jack Bennett Road to provide 250 feet of full-width storage.

Old Farrington Point Road and Lystra Road

- Construct an additional eastbound left-turn lane on Lystra Road with 425 feet of full-width storage.
- Construct an exclusive southbound right-turn lane on Old Farrington Point Road with 300 feet of full-width storage.
- Consider conversion of traffic signal to a roundabout configuration.

Farrington Point Road/Old Farrington Point Road and Mt. Carmel Road

- Construct an exclusive westbound right-turn turn lane on Farrington Point Road with 100 feet of full-width storage.
- Construct an exclusive northbound right-turn lane on Old Farrington Point Road with 225 feet of full-width storage.
- Construct an exclusive southbound left-turn turn lane on Mt. Carmel Road with 125 feet of full-width storage.
- Install a roundabout or traffic signal when warranted.

Farrington Mill Road/Farrington Point Road and Barbee-Chapel Road

- Construct an exclusive eastbound right-turn turn lane on Barbee-Chapel Road with 125 feet of full-width storage.
- Construct an exclusive westbound left-turn lane on Farrington Point Road with 700 feet of full-width storage.
- Construct an exclusive northbound left-turn lane on Farrington Point Road to provide 225 feet of full-width storage.
- Install a roundabout or traffic signal when warranted.

Farrington Road and Stagecoach Road

- Construct an exclusive northbound right-turn turn lane on Farrington Road with 200 feet of full-width storage.
- Construct an exclusive southbound left-turn lane on Farrington Road with 100 feet of full-width storage.
- Construct an exclusive westbound left-turn lane on Stagecoach Road with 100 feet of full-width storage.
- Install a roundabout or traffic signal when warranted.

Stagecoach Road and Hope Valley Road (751)

- Construct an additional northbound and southbound through lane on Hope Valley Road.
- Construct an additional eastbound left-turn lane on Stagecoach Road with 250 feet of full-width storage.
- Construct an exclusive northbound left-turn lane on Hope Valley Road with 400 feet of full-width storage.
- Construct an exclusive southbound right-turn lane on Hope Valley Road with 200 feet of full-width storage.

Hope Valley Road (751) and Fayetteville Road

- Construct an additional northbound and southbound through lane on Hope Valley Road.
- Lengthen the existing northbound right-turn lane on Hope Valley Road to provide 350 feet of full-width storage.
- Construct an additional westbound left-turn lane Fayetteville Road with 100 feet of full-width storage

- Lengthen the existing westbound right-turn lane on Fayetteville Road to provide 175 feet of full-width storage.

NC 55 and T.W. Alexander Drive

- Provide a free flow northbound right-turn lane.
- Lengthen the existing westbound right-turn lane on T.W. Alexander Drive to provide 400 feet of full-width storage.

Intersection Improvement Recommendations

The following improvements are recommended for the study intersections to accommodate projected traffic volumes in 2035. They are broken down into short and long term lists in order to provide guidance on implementation phasing:

Short-Term Improvements

US 15/501 and Jack Bennett Road

- Lengthen the existing westbound left-turn lane on Jack Bennett Road to provide 250 feet of full-width storage.

Old Farrington Point Road and Lystra Road

- Construct an additional eastbound left-turn lane on Lystra Road with 425 feet of full-width storage.

Farrington Road and Stagecoach Road

- Construct an exclusive northbound right-turn turn lane on Farrington Road with 200 feet of full-width storage.

NC 751 Hope Valley Road and Stagecoach Road

- Construct an additional eastbound left-turn lane on Stagecoach Road with 250 feet of full-width storage.

NC 55 and T.W. Alexander Drive

- Lengthen the existing westbound right-turn lane on T.W. Alexander Drive to provide 400 feet of full-width storage.

Long-Term Improvements

Old Farrington Point Road and Lystra Road

- Construct an exclusive southbound right-turn lane on Old Farrington Point Road with 300 feet of full-width storage.
- Consider conversion of traffic signal to a roundabout configuration.

Farrington Point Road/Old Farrington Point Road and Mt. Carmel Road

- Construct an exclusive westbound right-turn turn lane on Farrington Point Road with 100 feet of full-width storage.
- Construct an exclusive northbound right-turn lane on Old Farrington Point Road with 225 feet of full-width storage.
- Construct an exclusive southbound left-turn turn lane on Mt. Carmel Road with 125 feet of full-width storage.
- Install a roundabout or traffic signal when warranted.

Farrington Mill Road/Farrington Point Road and Barbee-Chapel Road

- Construct an exclusive eastbound right-turn turn lane on Barbee-Chapel Road with 125 feet of full-width storage.
- Construct an exclusive westbound left-turn lane on Farrington Point Road with 700 feet of full-width storage.
- Construct an exclusive northbound left-turn lane on Farrington Point Road to provide 225 feet of full-width storage.
- Install a roundabout or traffic signal when warranted.

Farrington Road and Stagecoach Road

- Construct an exclusive southbound left-turn lane on Farrington Road with 100 feet of full-width storage.
- Construct an exclusive westbound left-turn lane on Stagecoach Road with 100 feet of full-width storage.
- Install a roundabout or traffic signal when warranted.

NC 751 Hope Valley Road and Stagecoach Road

- Construct an additional northbound and southbound through lane on Hope Valley Road.

- Construct an exclusive northbound left-turn lane on Hope Valley Road with 400 feet of full-width storage.
- Construct an exclusive southbound right-turn lane on Hope Valley Road with 200 feet of full-width storage.

NC 55 and T.W. Alexander Drive

- Provide a free flow northbound right-turn lane.

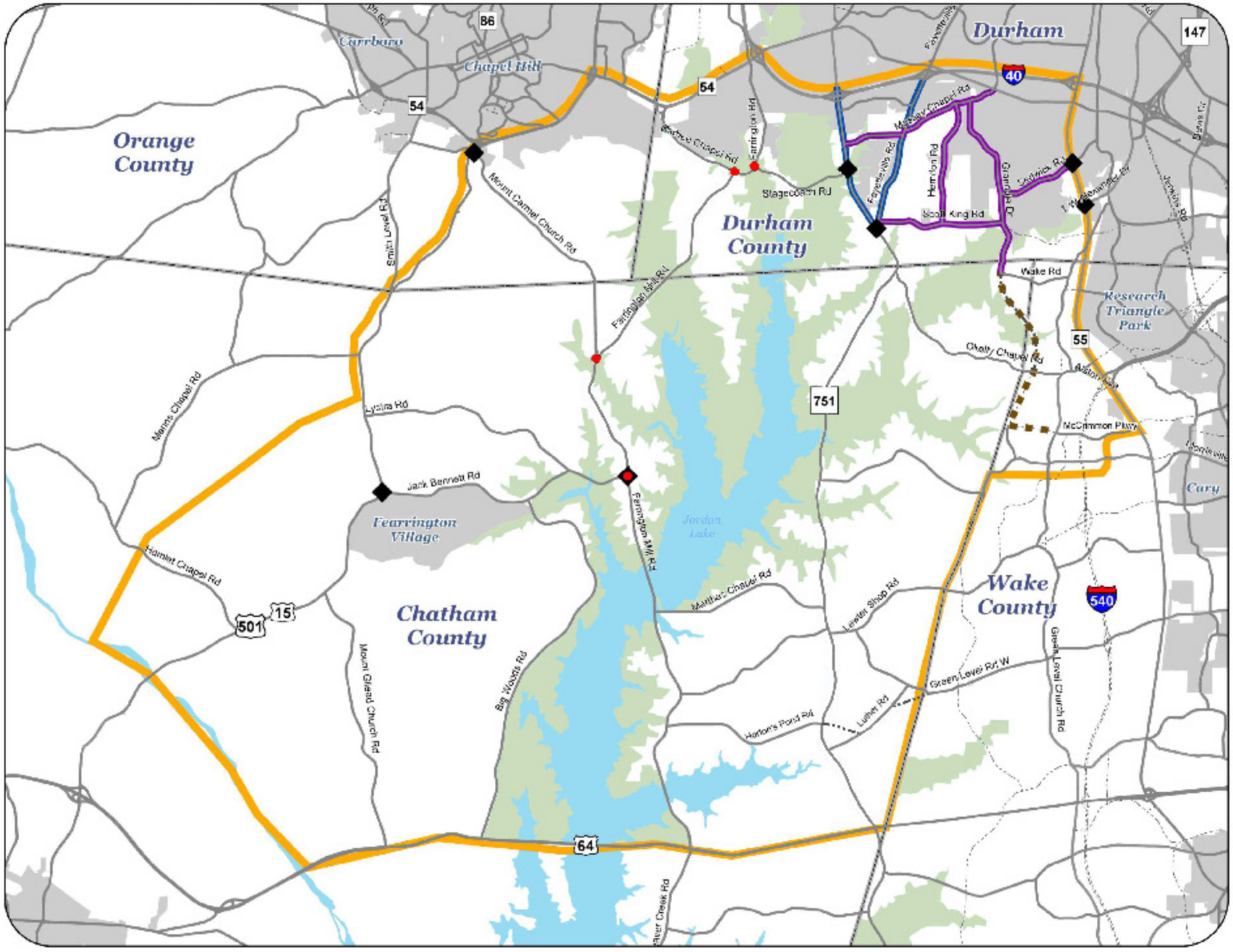
NC 751 Hope Valley Road and Fayetteville Road

- Construct an additional northbound and southbound through lane on Hope Valley Road.
- Lengthen the existing northbound right-turn lane on Hope Valley Road to provide 350 feet of full-width storage.
- Construct an additional westbound left-turn lane Fayetteville Road with 100 feet of full-width storage
- Lengthen the existing westbound right-turn lane on Fayetteville Road to provide 175 feet of full-width storage.

Land Use Recommendations

The scenario planning analysis confirms that reorganization of land use patterns and/or development densities or intensities throughout the study area into a more compact, nodal development pattern significantly improves the efficiency of the transportation system, while preserving unspoiled natural areas immediately surrounding new town centers. Successful implementation of a compact, nodal development pattern will require the strengthening of some development policies and/or land development controls administered in the study area. Purposeful coordination among private landowners, officials for the various local governments, the DCHC MPO, and the North Carolina Department of Transportation to combine land use and transportation planning processes traditionally completed in isolation will ensure a more efficient and fiscally responsible regional transportation system.

Cities and counties in the study area should consider strengthening rules, policies, and incentives for promoting compact development patterns in locally-adopted plans and ordinances to implement a more livable transportation system.



Farrington Road Corridor Study

Figure 31

Recommended Transportation Improvements

Recommendations

- Roundabout Conversion
- Intersection Improvement
- Access Management
- Operational Management
- New Roadway
- New Roads
- Counties
- Study Area
- Municipalities
- Lakes
- Corps of Engineers Land

November 25, 2008

0 0.5 1 2 Miles

Kimley-Horn and Associates, Inc.

Farrington Road Corridor Study
Land Use Scenario Planning Analysis
Generalized Development Characteristics Table

Generalized Land Use Category	Site Efficiency Factor	Average Res. Density	Floor Area Ratio	Employee Space Ratio
Agriculture	-	-	-	-
Civic / Institutional	85%	-	0.45	5.0 / 1,000 s.f.
Commercial	80%	-	0.25	4.5 / 1,000 s.f
General Office	80%	-	0.35	4.0 / 1,000 s.f.
High-Density Residential	70%	12 du / ac	-	-
Low-Density Residential	70%	3 du / ac	-	-
Light Industrial	80%	-	0.15	2.5 / 1,000 s.f.
Medium-Density Residential	70%	5 du / ac	-	-
Conservation	-	-	-	-
Parks & Recreation	-	-	-	-
Rural Residential	90%	0.2 du / ac	-	-
Compact Dev. Center	70%	8 du / ac	0.50	4.5 / 1,000 s.f. (com) 4.0 / 1,000 s.f. (off)

Note: land use categories and associated development controls were normalized among the various political jurisdictions represented in the study area.

Farrington Road Corridor Study
Land Use Scenario Planning Analysis
Desirability Factor Weightings Table

Desirability Factor	Relationship to a Parcel	Weighting Factor (0 - 10)
Proximity to Open Space	Positive	2
Proximity to Existing Urban Areas	Positive	8
Proximity to Major Intersections	Positive	6
Proximity to Regional Activity Center	Positive	6
Proximity to Community Development Nodes	Positive	8
Access to Water / Sewer Service	Positive	10