



North Carolina I-95 Economic Assessment Study

Task 4: Traffic and Community Impact Study

prepared for

North Carolina Department of Transportation

prepared by

Cambridge Systematics, Inc.

with

Kimley-Horn and Associates, Inc.

June 2013



report

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Table of Contents

1.0 Purpose of Study	1-1
2.0 Data Source and Purpose	2-1
2.1 Traffic Count Data	2-1
2.2 County Interview Process and Results	2-1
2.3 Windshield Survey	2-3
3.0 Traffic and Community Impact Analysis Methodology	3-1
3.1 Development of Analysis Network.....	3-1
3.2 Traffic Analysis Methodology	3-3
3.3 Community Impact Analysis Methodology	3-5
4.0 Long-Term Impact Analysis Results	4-1
4.1 Overview.....	4-1
4.2 Counties North Along I-95	4-2
4.3 Counties South Along I-95	4-22
4.4 Counties Northeast of I-95.....	4-35
4.5 Counties Southeast of I-95	4-40
4.6 Counties Northwest of I-95	4-44
4.7 Counties Southwest of I-95.....	4-48
5.0 Construction-Year Impact Analysis Results	5-1
A. County Interview Names	A-1
B. Synchro Forms	B-1

List of Tables

Table 3-1	Level-of-Service Control Delay Thresholds	3-4
Table 4-1	Long-Term Impact Analysis Results for Edgecombe County	4-4
Table 4-2	Long-Term Impact Analysis Results for Halifax County	4-8
Table 4-3	Long-Term Impact Analysis Results for Johnston County	4-12
Table 4-4	Long-Term Impact Analysis Results for Nash County	4-16
Table 4-5	Long-Term Impact Analysis Results for Northampton County	4-18
Table 4-6	Long-Term Impact Analysis Results for Wilson County	4-21
Table 4-7	Long-Term Impact Analysis Results for Cumberland County	4-26
Table 4-8	Long-Term Impact Analysis Results for Harnett County	4-30
Table 4-9	Long-Term Impact Analysis Results for Robeson County	4-33
Table 4-10	Long-Term Impact Analysis Results for Beaufort, Martin, and Pitt Counties.....	4-37
Table 4-11	Long-Term Impact Analysis Results for Greene, Lenoir, and Wayne Counties	4-40
Table 4-12	Long-Term Impact Analysis Results for Duplin and Sampson Counties.....	4-44
Table 4-13	Long-Term Impact Analysis Results for Franklin, Vance, and Warren Counties	4-46
Table 4-14	Long-Term Impact Analysis Results for Wake County.....	4-47
Table 4-15	Long-Term Impact Analysis Results for Hoke, Richmond, and Scotland Counties	4-51

List of Figures

Figure 4-1	Legend for Long-Term Impact Analysis Figures	4-1
Figure 4-2	Long-Term Impact Analysis Map for Edgecombe County	4-3
Figure 4-3	Long-Term Impact Analysis Map for Halifax County	4-6
Figure 4-4	Long-Term Impact Analysis Map for Johnston County	4-10
Figure 4-5	Long-Term Impact Analysis Map for Nash County	4-15
Figure 4-6	Long-Term Impact Analysis Map for Northampton County	4-17
Figure 4-7	Long-Term Impact Analysis Map for Wilson County	4-20
Figure 4-8	Long-Term Impact Analysis Map for Cumberland County	4-23
Figure 4-9	Long-Term Impact Analysis Map for Harnett County	4-29
Figure 4-10	Long-Term Impact Analysis Map for Robeson County	4-31
Figure 4-11	Long-Term Impact Analysis Map for Beaufort, Martin and Pitt Counties	4-36
Figure 4-12	Long-Term Impact Analysis Map for Bertie and Hertford Counties	4-38
Figure 4-13	Long-Term Impact Analysis Map for Greene, Lenoir, and Wayne Counties	4-39
Figure 4-14	Long-Term Impact Analysis Map for Bladen County	4-41
Figure 4-15	Long-Term Impact Analysis Map for Columbus County	4-42
Figure 4-16	Long-Term Impact Analysis Map for Duplin and Sampson Counties	4-43
Figure 4-17	Long-Term Impact Analysis Map for Franklin, Vance, and Warren Counties	4-45
Figure 4-18	Long-Term Impact Analysis Map for Wake County	4-47
Figure 4-19	Long-Term Impact Analysis Map for Chatham and Lee Counties	4-49
Figure 4-20	Long-Term Impact Analysis Map for Hoke, Richmond, and Scotland Counties	4-50
Figure 4-21	Long-Term Impact Analysis Map for Moore County	4-52

1.0 Purpose of Study

The purpose of the traffic and community impact study is to determine the noneconomic impacts of the I-95 Improvements project on communities in eastern and central North Carolina. This study examines changes in traffic operations as a result of the I-95 Improvements project, as well as short-term and long-term community impacts caused by these traffic operation changes. Improving I-95 may attract traffic currently using other routes to I-95; however, adding tolls to fund those improvements may have the opposite effect, causing traffic currently using I-95 to divert to other routes.

This study identifies which other roads are most likely to be used as diversion routes. It also analyzes the changes in traffic on those roads and the effect on communities those roads traverse.

2.0 Data Source and Purpose

2.1 TRAFFIC COUNT DATA

This study used two primary sources of traffic count data: average annual daily traffic volumes (AADT) and historic turning movement counts. The NCDOT Traffic Survey Group provided both sets of data in electronic format, the former as an ArcMap shapefile and the latter in Excel.

AADT represents the total traffic volume in both directions on a roadway on an average day under typical traffic conditions. NCDOT collects 48-hour traffic count data using their more than 40,000 Portable Traffic Count (PTC) Stations for interstates, U.S. roads, NC roads, and State Roads. The traffic count data is then adjusted using seasonal factors to produce AADT estimates. NCDOT's AADT data are produced in several different forms including maps, tables, and ArcGIS shapefiles. The most recent AADT data available is from 2011.

Turning movement counts are typically conducted during two time periods for an intersection: the AM period from 6:00 AM to 2:00 PM and the PM period from 2:00 PM to 10:00 PM. Vehicles are counted by approach leg and movement. From the turning movement counts, peak-hour volumes and other intersection statistics, including peak-hour factor, are calculated. NCDOT provided available historic turning movement counts for approximately one-third of the total study intersections, ranging from 1990 to 2013.

2.2 COUNTY INTERVIEW PROCESS AND RESULTS

As part of the data collection process, Kimley-Horn interviewed staff from 30 counties in eastern and central North Carolina. The purpose of these interviews was to further understand the nature of the roads that may be used as diversion routes if tolls were added to I-95. Based on an initial assessment of likely diversion routes, Kimley-Horn interviewed representatives of all the counties traversed by one or more of these routes.

The subject counties included Beaufort, Bladen, Chatham, Columbus, Cumberland, Duplin, Edgecombe, Franklin, Greene, Halifax, Harnett, Hertford, Hoke, Johnston, Lee, Lenoir, Martin, Moore, Nash, Northampton, Pitt, Richmond, Robeson, Sampson, Scotland, Vance, Wake, Warren, Wayne, and Wilson. Some counties also asked local town managers to participate in the discussion. A full list of the county contacts is in the appendix.

The following questions were asked during each interview:

- We had previously identified several potential diversion routes through the county. Do you think this list is complete? Are there any routes listed you don't think are reasonable?
- Are the travelers using these routes primarily local or regional? Does truck traffic or slow moving farm equipment use these routes?
- Are businesses along these routes serving primarily local or regional traffic? Are there certain times these routes are utilized more than others?
- What do you think is the likelihood of drivers choosing one of these alternate routes if tolls were implemented on I-95?
- If more traffic uses these alternate routes, will communities feel the additional traffic is a benefit or a burden?
- Do you have any concerns about the roadways themselves to carry additional traffic? Do you feel there are any safety concerns that could be worsened by diverted traffic?

The answers to these questions were used in several ways during the study.

- The responses were used to modify the diversion route network. For example, if the county staff felt that a road not initially identified as a diversion route would be attractive for drivers currently using I-95, in several cases that road was added to the studied diversion route network.
- The responses were used to validate the results of the model output. The responses helped the team understand the nature of the roadways beyond the information included in the travel demand model. It resulted in several changes to the roadway network included in the travel demand model.
- The information provided by the counties was used during the community impact assessment. The areas noted by county staff as having congestion or safety concerns were looked at specifically.

Staff from several of the counties had similar questions or concerns:

- Will some of the money collected from tolls be used to improve and maintain roads other than I-95 that are experiencing an increase in traffic due to diversion traffic?
- Will more funds be available for local communities to use towards police and EMS?

Specific input from county staff related to the traffic and community analysis is discussed in the Analysis Results sections.

2.3 WINDSHIELD SURVEY

A windshield survey was performed on roadways that were anticipated to experience a change in traffic volumes as a result of the I-95 Improvements project. The purpose of this survey was to collect information on traffic signals and locations, and verify information provided by county staff. Through the surveys, we also gained an understanding of the communities that may be impacted and identified intersections or roadway segments with potential congestion or safety concerns.

3.0 Traffic and Community Impact Analysis Methodology

3.1 DEVELOPMENT OF ANALYSIS NETWORK

Identification of Diversion Routes

An iterative method was used to identify the diversion route network for this study. An origin-destination matrix was created to aid the initial identification of diversion routes. The matrix included 32 municipalities in eastern North Carolina (east of U.S. 1) with populations over 10,000, Richmond and Norfolk in Virginia, and Florence and Myrtle Beach in South Carolina. Diversion routes were identified for trips that likely use I-95 currently, based on local knowledge of traffic patterns and Google travel time estimates.

After the initial diversion route network was developed, it was validated based on input from county staff, findings from the windshield survey, and the results of the travel demand forecast for the 2040 No Build and 2040 Build (Tolls) scenarios.

Projects funded in the 2013-2023 draft State Transportation Improvement Program (STIP) are included in the travel demand model and were considered during development of the diversion route network.

Interstates, U.S. routes, and NC routes expected to experience a change in traffic as a result of drivers diverting from I-95 are included in the diversion route network. Diversion routes were limited to NC routes or above for the following reasons:

- Annual average daily traffic (AADT) volume data does not exist on all state roads, and is available on only a few local routes.
- The travel demand model includes primarily NC, U.S., and Interstate routes.
- After evaluating potential diversion routes, most diversions (especially of nonlocal traffic) are expected to occur on NC, U.S., and Interstate routes. Although intersections of diversion routes with state roads or local roads could still be impacted by diversions because of the change in through traffic on the mainline, those impacts are expected to be minimal.
- There are numerous intersections with state roads and local roads, requiring a large data gathering exercise. Although the information would be relevant, the value of the data would not be consistent with the level of effort required.

Development of Traffic Analysis Network

Study intersections in the diversion route network include all locations where the diversion routes cross NC roads, U.S. roads, or Interstate ramps. These intersections were modeled using Synchro 7. SIDRA was used to model roundabouts on the diversion route network.

The study team used aerial imagery from NC OneMap, Google, and Bing to obtain intersection geometry data, including laneage and storage lane lengths. Data specific to intersection operations (i.e., signalization and speed limits) were determined based on field visit observations and Google Street View.

The existing number and types of signal heads were input into Synchro, and reasonable assumptions about signal phasing were made based on the existing signal heads present. Cycle lengths and phase splits were optimized using Synchro 7's optimization function. Cycle lengths then were adjusted to meet NCDOT Congestion Management's recommended minimum cycle lengths based on number of phases.

Existing signal timing plans were not used since this effort is a planning-level study. Signal timing at existing intersections could be changed at any time, including in the future as needed to accommodate fluctuations in traffic volumes.

Identification of Primary and Secondary Networks

Once the diversion network was finalized and the Synchro network was created for all study intersections, the network was divided into "primary" and "secondary" routes. The purpose of this step was to focus the intersection analysis on the locations that are most likely to experience impacts. Roads in the primary network were identified based on an understanding of local traffic patterns and input from county staff.

Development of Existing Traffic Volumes

NCDOT has developed the Intersection Analysis Utility, a spreadsheet tool that converts forecasted AADTs to peak-hour volumes. This tool can similarly convert historic AADTs to estimate historic peak-hour volumes by assuming design hour factors and peak-hour directional splits. Every intersection in this study assumes 12 percent as its design hour factor and 55 percent as the PM peak-hour directional split.

The Intersection Analysis Utility also requires the input of turning AADTs, the average annual daily number of vehicles turning between two legs of an intersection. However, NCDOT does not collect turning AADT data, so they were estimated for this study. One method of estimating turning AADTs is to consult historic turning movement counts. For the intersections where turning movement counts were available, calculations of the daily turning percentages served as the basis for the turning AADTs. Where turning movement counts

were unavailable, the turning AADTs were estimated based on surrounding land uses, roadway connections, and intersection geometry.

The nondirectional turning movement method from the National Cooperative Highway Research Program (NCHRP) Report 255 was used to estimate turning AADTs for T-intersections where turning movement counts were not available. The method's equations are:

$$X = (A - B + c) / 2$$

$$Y = (C - A + b) / 2$$

Where: A, B, and C are link volumes and X and Y are the desired turning movements.

Based on the 2011 AADTs, estimated turning AADTs, design hour factors, and PM peak-hour directional splits, the Intersection Analysis Utility tool outputs AM and PM peak-hour volumes. The PM peak-hour volumes were then input into the Synchro network. Only the PM peak-hour volumes were analyzed for this project since they generally are heavier than AM peak-hour volumes and thus represent a "worst case" scenario.

Development of Future Traffic Volumes

The travel demand model outputs existing AADTs and future AADTs, which were used to determine growth factors by link. These growth factors were input into Synchro 7 for study intersections in the primary network for the 2040 No Build and 2040 Build (Tolls) scenarios to produce future traffic volumes.

3.2 TRAFFIC ANALYSIS METHODOLOGY

Intersection Analysis

Capacity analyses were performed for the PM peak hour for the 2040 No Build and 2040 Build (Tolls) scenarios using Synchro Version 7 software to determine the operating characteristics of the diversion route network. Traffic operations at the primary route study intersections were measured by level of service (LOS) and delay. Roundabouts were analyzed using SIDRA Intersection 5.1 software to determine the volume to capacity (v/c) ratio.

Capacity is defined as the maximum number of vehicles that can pass over a particular road segment or through a particular intersection within a set time duration. Capacity is combined with LOS to describe the operating characteristics of a road segment or intersection. LOS is a qualitative measure that describes operational conditions and motorist perceptions within a traffic stream. Synchro Version 7 defines six levels of service, LOS A through LOS F, with A representing the shortest average delays and F representing the longest average delays. 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. Accordingly, minor street approach delays are reported herein for unsignalized conditions. 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 3-1 below lists the LOS control delay thresholds published in the Highway Capacity Manual for signalized and unsignalized intersections.

Table 3-1 Level-of-Service Control Delay Thresholds

Level of Service	Control Delay Per Vehicle (Sec/Veh)	
	Signalized Intersections	Unsignalized Intersections
A	≤ 10	≤ 10
B	> 10 – 20	> 10 – 15
C	> 20 – 35	> 15 – 25
D	> 35 – 55	> 25 – 35
E	> 55 – 80	> 35 – 50
F	> 80	> 50

The anticipated LOS and delay for study intersections within the primary network are listed in the appendix. The Long-Term Impact Analysis Results section of this report describes in more detail the intersections with specific thresholds that identify them as “intersections of concern.” These include the following changes between the 2040 No Build and 2040 Build (Tolls) scenarios:

- LOS increases or decreases by a letter grade (between LOS D and LOS E, or between LOS E and LOS F), or
- If the intersection is at LOS F in both scenarios, delay increases or decreases by more than 25 seconds for signalized intersections or 15 seconds for unsignalized intersections, or
- If the intersection is at LOS F in both scenarios and the delay is reported as “Err” in both scenarios (Synchro does not report delays for unsignalized movements where the v/c ratio at the intersection is greater than 3.0.).

Queue lengths also were analyzed as another measure of traffic operations. The 95-percent queue lengths at study intersections along the primary routes (as reported by Synchro) were compared with measured turn bay lengths. Locations where queues exceeded turn bay lengths in the 2040 No Build or 2040 Build

(Tolls) scenario are documented in the Long-Term Impact Analysis Results section of this report.

Traffic simulation (such as SimTraffic or VISSIM) was not used to simulate the traffic on the network because it was determined that doing so would not provide additional information about traffic operations or be of additional value to the study.

Segment Analysis

The primary metric used to measure the performance of segments in this analysis is volume-to-capacity (v/c) ratio, which may be described as congestion. The volume-to-capacity ratio compares the number of vehicles using a roadway to the number of vehicles that the roadway can carry. The capacities account for the nature of the area (urban or rural) and are adjusted based on criteria such as roadway type, number of lanes, lane width, median type, and percent of trucks using the road.

For the purposes of this study, uncongested segments are characterized by v/c ratios less than 0.8, segments approaching congestion have v/c ratios between 0.8 and 1.0, and segments with v/c ratios above 1.0 are described as severely congested. Maps in the results section display whether segments are projected to be above or below v/c ratio of 0.8 in the 2040 Build (Tolls) scenario.

3.3 COMMUNITY IMPACT ANALYSIS METHODOLOGY

Identification of Potential Long-Term Impacts

After the traffic analysis was completed, the next step was to determine the long-term impacts of the diverted traffic on the communities in eastern and central North Carolina. This study accounted for information from many sources:

- **Comprehensive Transportation Plans (CTP).** If projects on the CTPs were funded on the draft 2013-2023 NCDOT STIP, they were included in the travel demand forecast or the traffic diversion analysis.
- **Corridor plans.** Plans or studies have been completed for several diversion routes. They describe the vision for those corridors that are relevant to understanding the community and potential impacts, even if the proposed projects are not funded.
- **Current traffic use.** The type of traffic currently using the roads was considered, including large trucks, slow-moving agricultural vehicles, and regional versus local traffic.
- **Type and quality of roadway.** The ability of the roadway to handle traffic was considered, and factors considered include lower speed limits through towns, 90-degree turns on the diversion route, and congestion issues caused

by driveway density and facilities such as schools and major employment generators.

- **Specific areas of concern.** Identified during the county interviews or the windshield survey, areas of concern include difficult or dangerous areas such as sharp or blind curves, sight distance issues, and frequent driveways.

Potential impacts were determined based on the change in traffic patterns between the 2040 No Build and 2040 Build (Tolls) scenarios. In the areas identified as having possible impacts, additional research was conducted to further understand the nature of the intersection or roadway segment. Impacts may result from increases/decreases in traffic volumes or anticipated safety consequences.

Development of Mitigation Strategies

Once long-term impacts were understood, mitigation opportunities were identified to reduce the impact of the I-95 improvements project on other roadways. Mitigation strategies may include physical mitigation such as spot improvements, intersection improvements, or signal improvements. They may also include discussion on the location of toll plazas or policy options that might reduce demand during peak periods. Potential mitigation measures are described in the Long-Term Impact Analysis Results section.

Identification of Potential Construction-Year Impacts

Impacts during construction will differ from long-term impacts. The traffic volumes on the roads will likely be lower in the construction year than in 2040. However, since the year of construction is unknown at this time, specific traffic volumes cannot be studied. Instead, construction-year impacts focus on impacts of diverted traffic potentially caused by potential lane closures, shoulder closures, speed reductions, lane narrowing, and time-of-day restrictions. Construction-year impacts are discussed for the eight counties along I-95.

4.0 Long-Term Impact Analysis Results

4.1 OVERVIEW

The long-term traffic and community impact analysis results are summarized in the following sections. Additional analysis detail is in the appendix. For the 30 counties in the Diversion Route Network, maps display whether the v/c ratio is greater than 0.8 for the 2040 No Build and/or the 2040 Build (Tolls) scenario, 2011 traffic volumes, and growth factors for the 2040 Build (Tolls) and No Build scenarios for all segments included in the travel demand model.

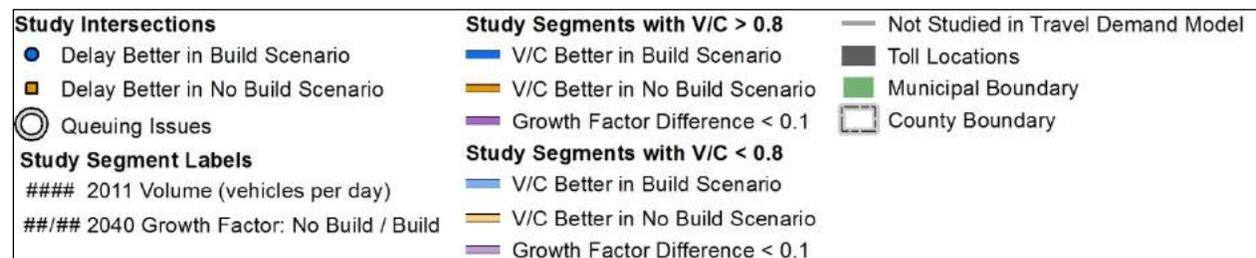
For the counties along the I-95 corridor, the county maps also identify specific intersections that were studied and found to have a notable change in level of service (see Section 3.2 for more detail on the intersection analysis methodology). Maps of individual intersections also are provided where needed to show the areas of concern in more detail.

The 30 counties are organized geographically in the following sections:

- Along I-95 on the north (Section 4.2) – Edgecombe, Halifax, Johnston, Nash, Northampton, Wilson;
- Along I-95 on the south (Section 4.3) – Cumberland, Harnett, Robeson;
- Northeast of I-95 (Section 4.4) – Beaufort, Bertie, Greene, Hertford, Lenoir, Martin, Pitt, Wayne;
- Southeast of I-95 (Section 4.5) – Bladen, Columbus, Duplin, Sampson;
- Northwest of I-95 (Section 4.6) – Franklin, Vance, Wake, Warren; and
- Southwest of I-95 (Section 4.7) – Chatham, Hoke, Lee, Moore, Richmond, Scotland.

The legend used for all the graphics is shown below in: Figure 4-1.

Figure 4-1 Legend for Long-Term Impact Analysis Figures



4.2 COUNTIES NORTH ALONG I-95

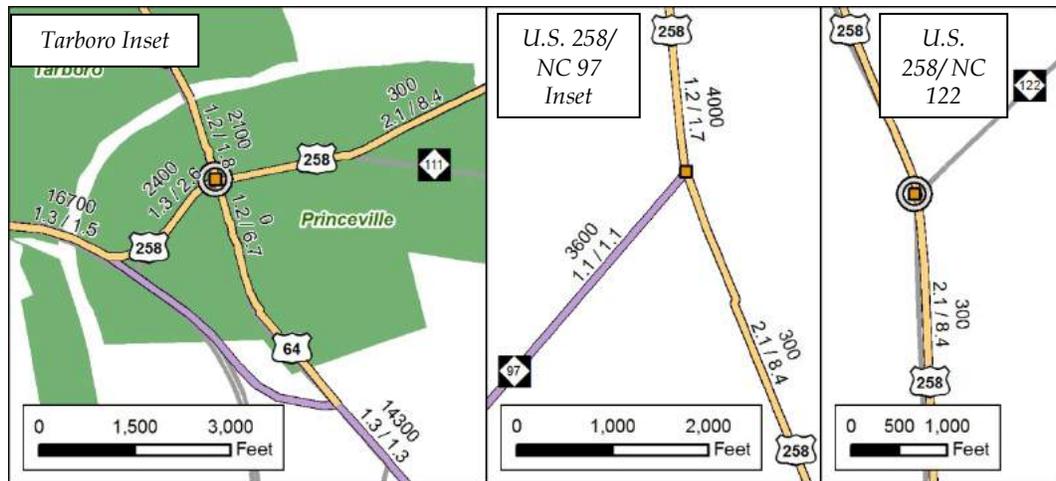
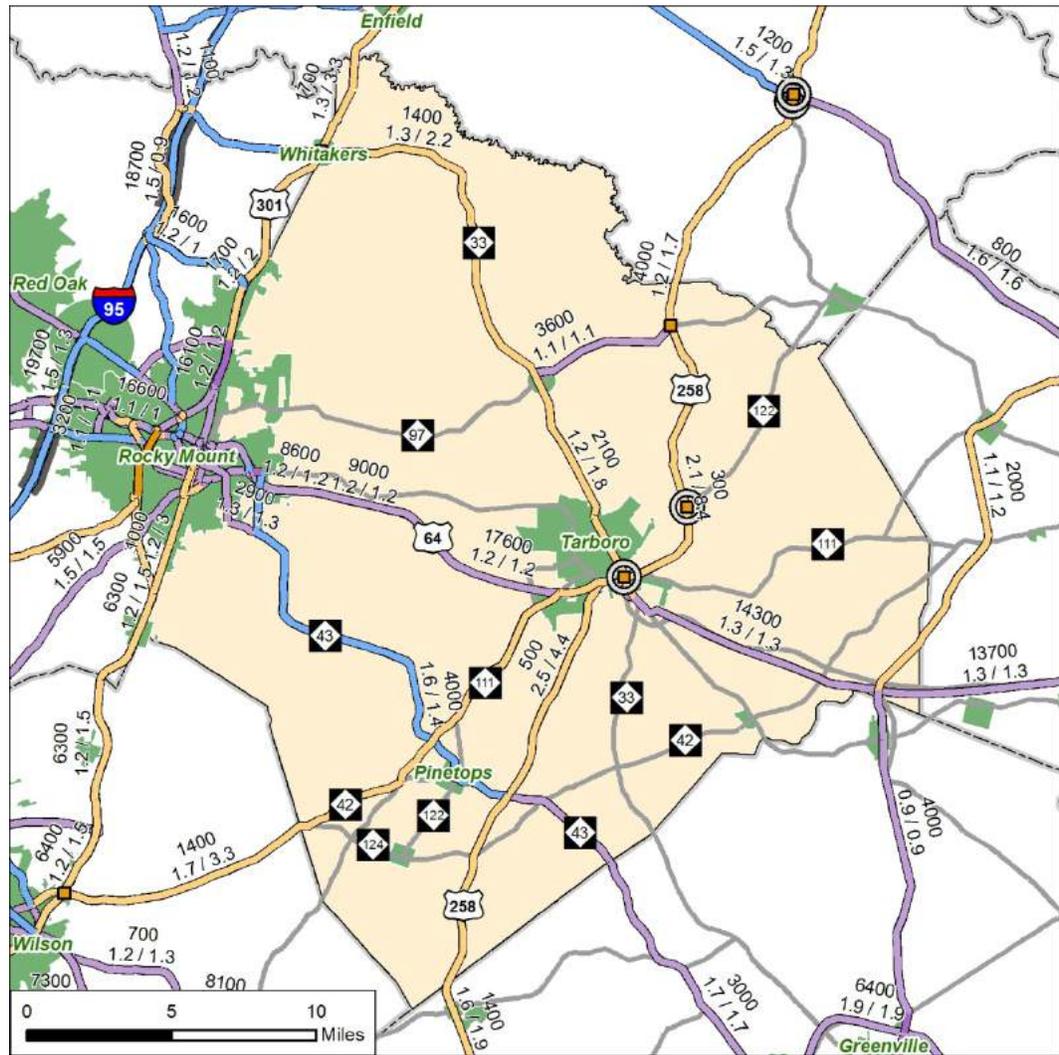
Edgecombe County

According to Edgecombe County staff, U.S. 258 and U.S. 301 are the routes most likely to be used as diversion routes for drivers who want to avoid tolls on I-95. This supposition is supported by the travel demand model projections, which show traffic on U.S. 258 growing by a factor of 8.4 north of Tarboro in the 2040 Build (Tolls) scenario compared with a growth factor of 2.1 in the 2040 No Build scenario. Growth factors on U.S. 258 south of Tarboro are 4.4 in the 2040 Build (Tolls) scenario and 2.5 in the 2040 No Build scenario. Additional traffic also is anticipated on NC 42/111, with Build (Tolls) scenario volumes double in the compared with the No Build scenario. All roads studied in Edgecombe County are predicted to be under capacity in both the 2040 Build (Tolls) and 2040 No Build scenarios.

Local staff was particularly concerned about the impacts of additional traffic on NC 42/111. Countywide water lines are available, so increased traffic may lead to more development. South of Tarboro, development is currently concentrated in the Town of Pinetops, and the town is not seeking to grow.

Drivers on U.S. 258 must make a 90-degree turn to stay on U.S. 258 in southeast Tarboro/Princeville. That signal-controlled movement is projected to operate at an acceptable level of service in both future scenarios. U.S. 258 also is a primary truck route through the county, providing access for the Sara Lee plant on U.S. 258 south of Tarboro.

Figure 4-2 Long-Term Impact Analysis Map for Edgecombe County



Three intersections in Edgecombe County meet the thresholds for intersections of concern. Two of the three also are expected to have queuing issues. Analysis results for the intersections of concern in Edgecombe County are summarized in Table 4-1.

Table 4-1 Long-Term Impact Analysis Results for Edgecombe County

Intersection (Inset Name, if Applicable)	Traffic Signal	2040 No Build	2040 Build (Tolls)	Queue Exceeds Available Storage	Potential Mitigation Strategies
		LOS (Delay in Seconds)	LOS (Delay in Seconds)		
U.S. 258-NC 111-122/U.S. 64 Alt (Tarboro Inset)	Yes	B (15.6)	F (809.1)	Yes	Turn lanes
U.S. 258/NC 97 (U.S. 258/NC 97 Inset)	No	WB – B (12.6)	E (49.1)	No	
U.S. 258/NC 122 (U.S. 258/NC 122 Inset)	No	EB – B (14.1) WB – C (20.9)	EB – F (Err) ^a WB – F (Err) ^a	Yes	Signalize, turn lanes

^a Synchro does not report delays for unsignalized movements where the v/c ratio at the intersection is greater than 3.0. The v/c for intersections is calculated using different parameters than the v/c for roadway segments.

When traffic volumes meet warrants, it is recommended that the U.S. 258/NC 122 intersection be studied for signalization. In addition, adding or extending turn lanes would improve the operation of the intersections where queues are predicted to exceed available storage bays.

In addition to the intersections expected to operate at a poor level of service, the intersection of U.S. 258/NC 111 is a concern. The traffic volumes through this intersection are expected to increase by a factor of 8.4 in the 2040 Build (Tolls) scenario compared with 2.1 in the 2040 No Build scenario. The turning radius from westbound NC 111 to northbound U.S. 258 and from southbound U.S. 258 to eastbound NC 111 is sharp, and may create additional delays as traffic volumes increase.

The intersection of NC 42/NC 124 also is of potential concern due to its geometry. The turning radius in the west quadrant is sharp, and a dirt path indicates that drivers frequently use the shoulder as a right-turn lane. The turning radius in the east quadrant also is tight; dirt tire tracks on the road indicate that some vehicles cut the corner to make this turn.

The movement from northbound NC 42 to NC 111 is anticipated to be a route used by drivers to avoid toll plazas on I-95. This intersection requires a stop for the southbound movement, but is a free-flow movement for northbound traffic. The intersection is shaped like an “X”, with tight turning radii in the northeast and southwest quadrants. As traffic increases, a striped stop bar and flashers may be appropriate to increase the visibility of oncoming vehicles at this location.

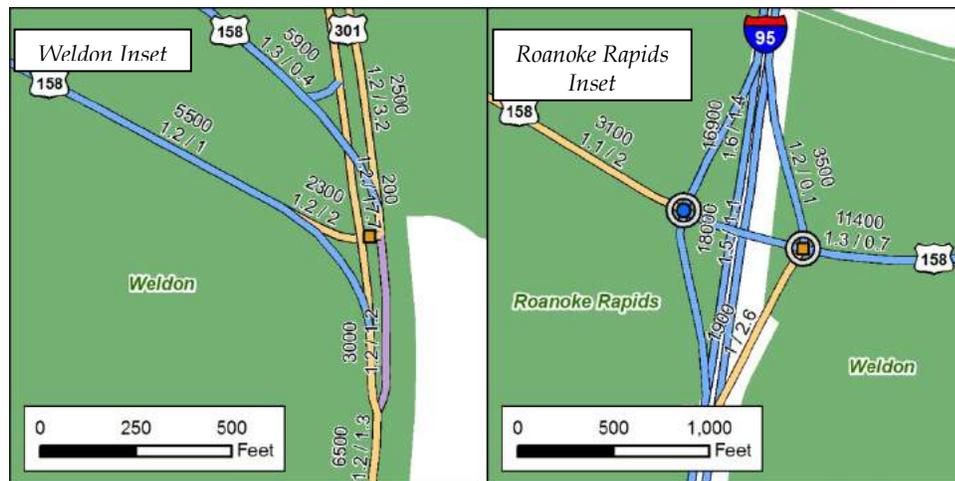
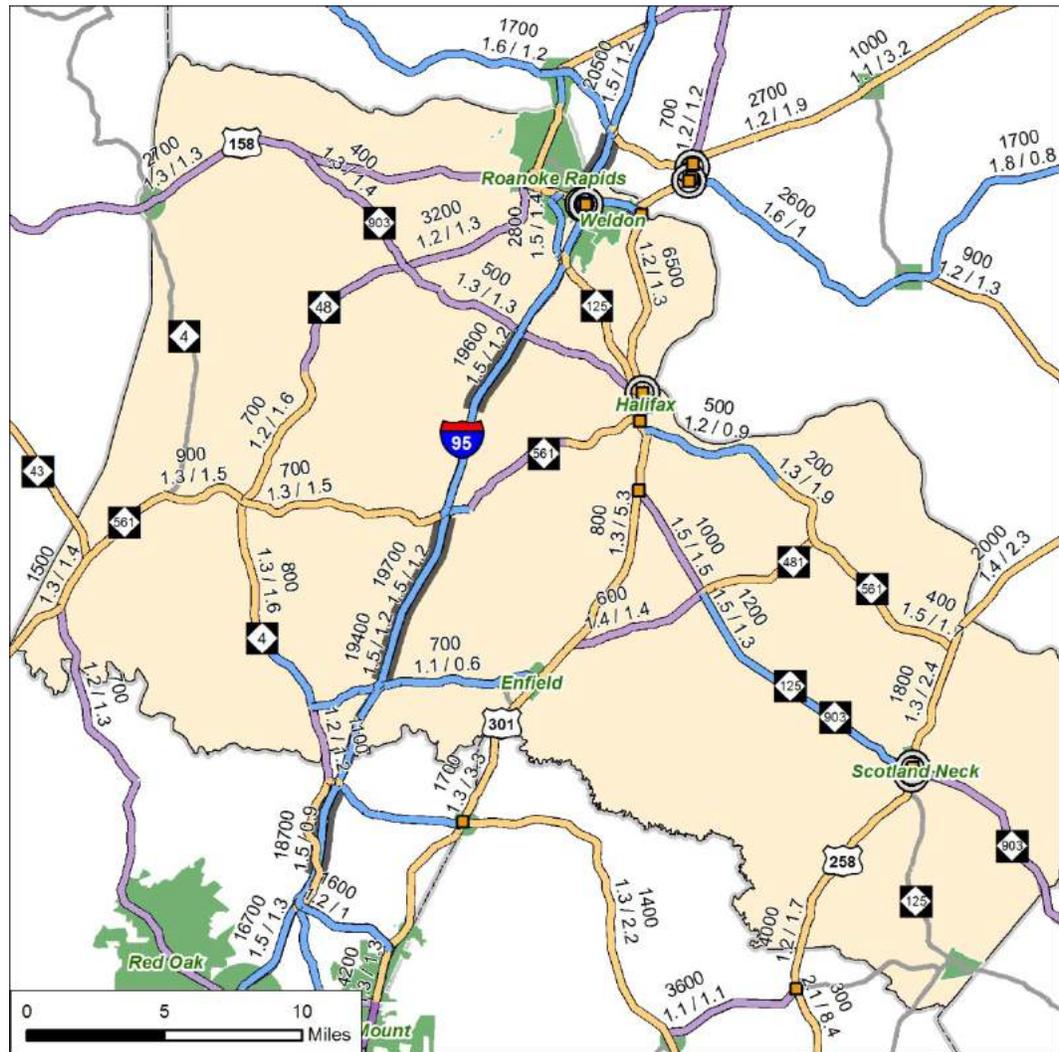
Halifax County

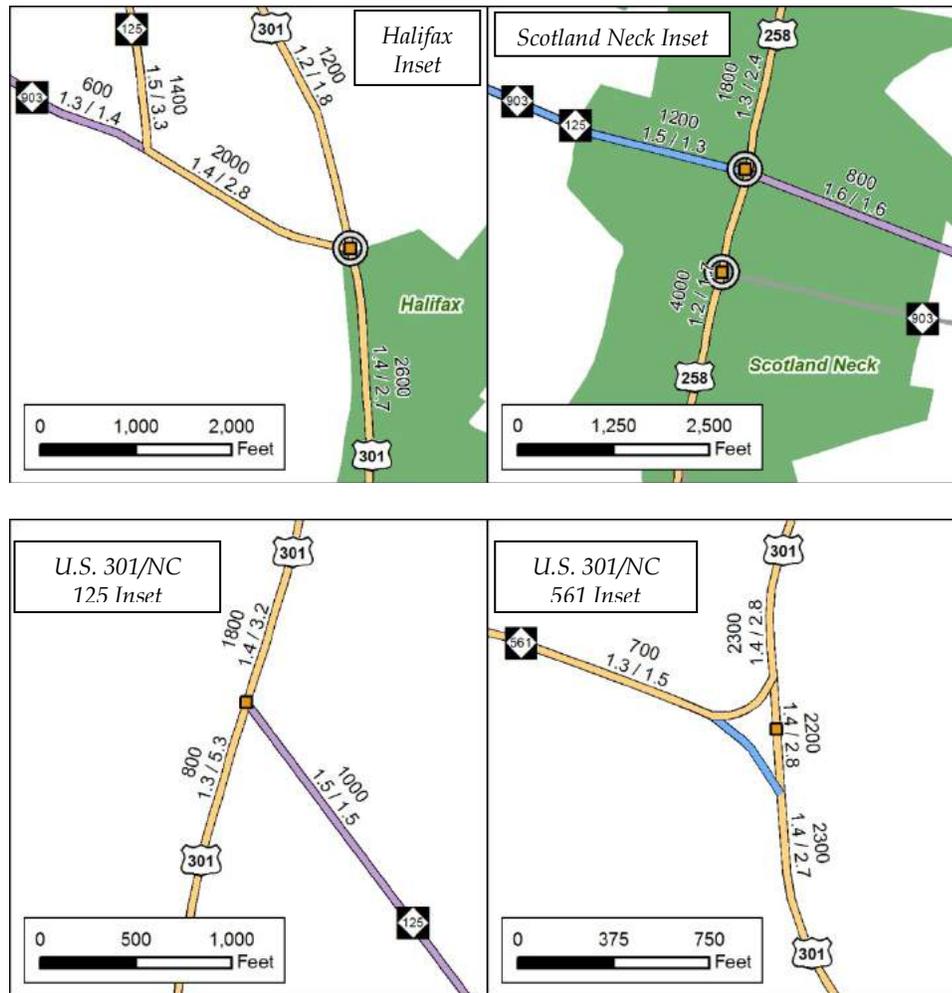
The primary routes through Halifax County expected to be affected by this project are I-95, U.S. 301, and U.S. 258. In the 2040 Build (Tolls) scenario, I-95 would be widened, but would have slightly lower volumes in the 2040 Build (Tolls) scenario compared with the 2040 No Build scenario (growth rates of approximately 1.2 in the Build (Tolls) scenario versus 1.5 in the No Build scenario). All roads studied in Halifax County are predicted to be under capacity in both the 2040 Build (Tolls) and 2040 No Build scenarios.

The travel demand model is consistent with county staff expectations. It shows an increase in traffic primarily on U.S. 301 in the Build (Tolls) scenario compared with the No Build scenario, with a smaller increase in traffic on U.S. 258. County staff noted that many businesses on U.S. 301 closed when I-95 was built, and that an increase of traffic on U.S. 301 would generally be welcomed by the local communities.

There is a potential concern about safety on U.S. 301 due to the density of driveways and the relatively high number of elderly drivers that live in the county and prefer to drive on U.S. 301 rather than I-95. Although crashes have not been a notable problem lately, the crash rate had been higher when U.S. 301 was more congested before I-95 was built, because drivers would be more aggressive when passing and turning onto U.S. 301. Trucks use U.S. 301 to access businesses along the route, the Lowe's Distribution Center in Garysburg (Northampton County, northeast of Roanoke Rapids), and tree harvesting farms.

Figure 4-3 Long-Term Impact Analysis Map for Halifax County





Eight intersections in Halifax County meet the thresholds for intersections of concern, one of which is expected to improve under the 2040 Build (Tolls) scenario compared with the 2040 No Build scenario. Five of these intersections also are expected to have queuing issues. Analysis results for the intersections of concern in Halifax County are summarized in Table 4-2.

When traffic volumes meet warrants, it is recommended that several of the intersections be studied for signalization. In addition, adding or extending turn lanes would improve the operation of the intersections where queues are predicted to exceed available storage bays. Adding or extending turn lanes also is recommended for consideration in locations where levels of service are worse in the 2040 Build (Tolls) scenario than the 2040 No Build scenario.

Table 4-2 Long-Term Impact Analysis Results for Halifax County

Intersection (Inset Name, if Applicable)	Traffic Signal	2040 No Build	2040 Build (Tolls)	Queue Exceeds Available Storage	Potential Mitigation Strategies
		LOS (Delay in Seconds)	LOS (Delay in Seconds)		
U.S. 301/U.S. 158 EB (Weldon Inset)	No	EB – B (11.0)	EB – F (56.7)	No	Signalize
I-95 SB/U.S. 158 (Roanoke Rapids Inset)	Yes	E (65.7)	D (40.5)	Yes	
I-95 NB/U.S. 158 (Roanoke Rapids Inset)	Yes	E (55.3)	F (101.8)	Yes	Turn lanes
U.S. 301/NC 125-903 (Halifax Inset)	Yes	B (18.9)	F (92.0)	Yes	Turn lanes
U.S. 258/NC 903 (Scotland Neck Inset)	No	EB – F (73.5) WB – F (432.3)	EB – F (1,802.4) WB – F (Err) ^a	EB – No WB – Yes	Signalize, turn lanes, realign
U.S. 258/NC 125-903 (Scotland Neck Inset)	No	EB – C (22.6) WB – F (226.3)	EB – F (223.9) WB – F (Err) ^a	EB – No WB – Yes	Signalize, turn lanes, realign
U.S. 301/NC 125-903 (U.S. 301/NC 125 Inset)	No	WB – B (11.5)	WB – F (67.7)	No	Signalize
U.S. 301-NC 125-903/NC 561 (U.S. 301/NC 561 Inset)	No	EB – C (20.5)	EB – F (245.1)	No	Signalize

^a Synchro does not report delays for unsignalized movements where the v/c ratio at the intersection is greater than 3.0. The v/c for intersections is calculated using different parameters than the v/c for roadway segments.

The intersections of U.S. 258 with NC 903 and 125 in Scotland Neck operate as a series of three off-set unsignalized intersections. To stay on NC 903 or NC 125, you must turn right onto U.S. 258 and then left onto NC 903 or NC 125. This creates a heavy traffic movement along this short segment of U.S. 258, especially at the intersections of U.S. 258/NC 903 and U.S. 258/NC 903-125. These intersections are projected to operate at a poor level of service in both future scenarios, but are likely to be worse in the Build (Tolls) scenario than the No Build scenario. The proximity of the adjacent buildings on the northwest corner of the U.S. 258/NC 903 intersection and on the northeast corner of the U.S. 258/NC 903-125 intersection limits sight distance and creates sharp turning radii, which may limit widening those intersections.

Consideration may be given to studying the realignment of NC 903 on the east side of NC 258 to enter Scotland Neck along E. 12th Street rather than its current location on E. 9th Street. This shift would connect the two legs of the U.S. 258/NC 903 movement, potentially improving traffic operations through downtown Scotland Neck.

Although the intersection of U.S. 258/NC 125 is not projected to operate at an unacceptable level of service in the future, the geometry at that location is a potential concern. The turning radius in the south quadrant is sharp, and may create additional delays as traffic volumes increase.

NC 561/NC 43 is a five-legged, stop-controlled intersection that is confusing for many drivers to navigate. Traffic volumes are anticipated to increase slightly in the 2040 Build (Tolls) scenario compared with the 2040 No Build scenario. As traffic volumes increase, a study may be needed to improve this intersection.

An additional mitigation measure to consider for Halifax County communities is to move the toll plaza currently shown north of Roanoke Rapids to south of the I-95/U.S. 158 interchange. This measure is likely to encourage more traffic to divert onto U.S. 158 and U.S. 301 than the current toll plaza location, which would be viewed as a benefit to the towns along U.S. 301. U.S. 158 east of I-95 is a five-lane section with sufficient capacity for additional traffic.

Johnston County

About one third of the roads through Johnston County are expected to experience an increase in traffic volumes in the 2040 Build (Tolls) scenario compared with the 2040 No Build scenario; about a third are expected to experience a decrease in traffic (including I-95); and about a third will not have a noticeable difference in traffic volumes between the two scenarios.

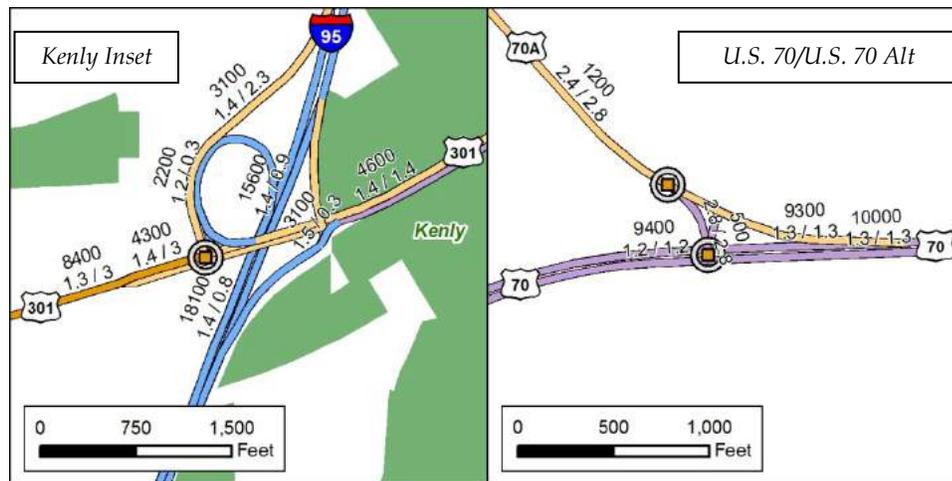
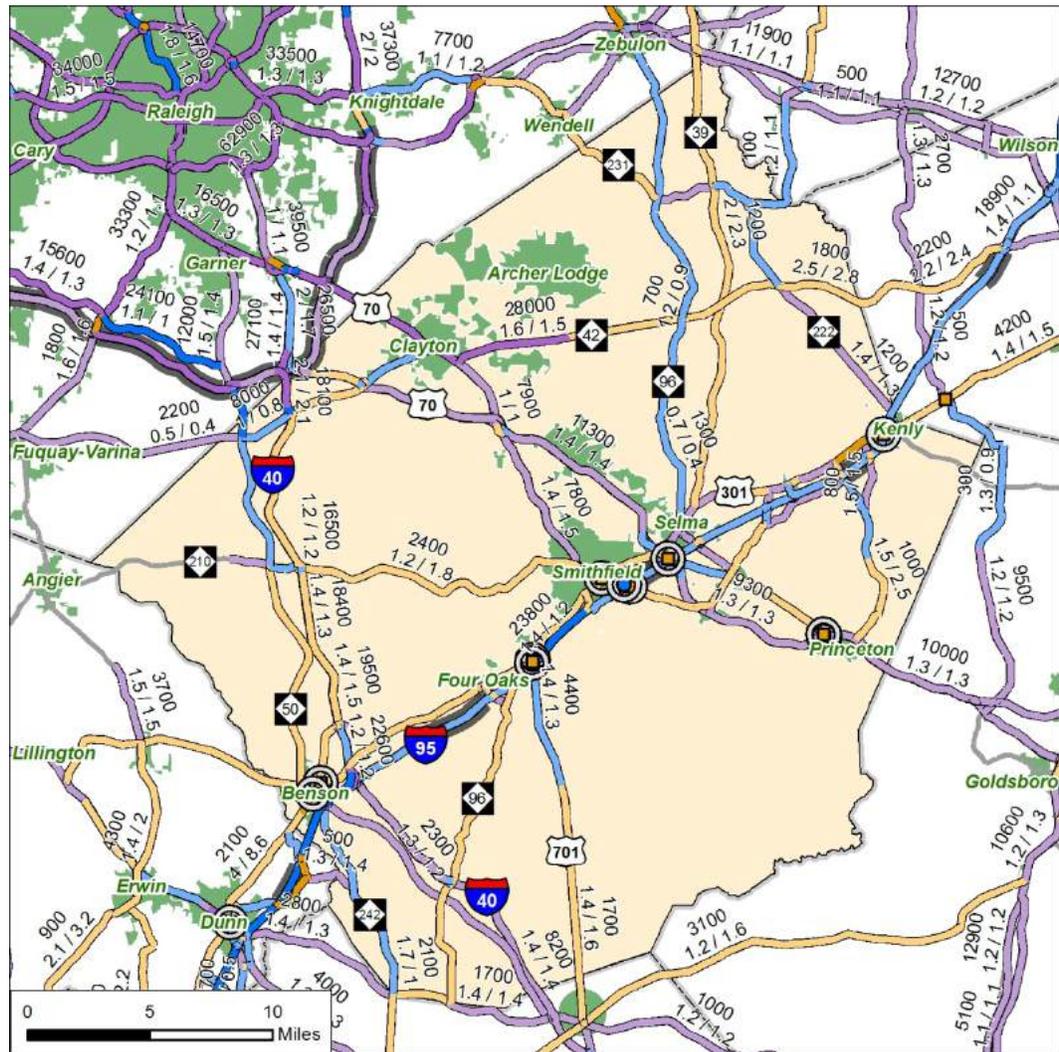
NC 42 east of Clayton and U.S. 70 west of Clayton are projected to have a v/c ratio of 0.9 in both future scenarios. Portions of I-95 through Benson and south of Smithfield are projected to have a v/c ratio of 0.8 in the 2040 No Build scenario, but a v/c ratio of 0.3 to 0.5 in the 2040 Build (Tolls) scenario.

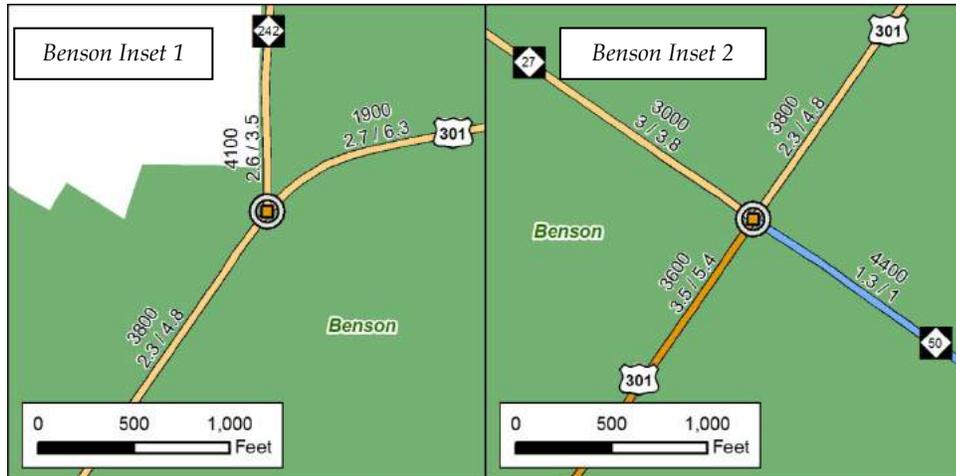
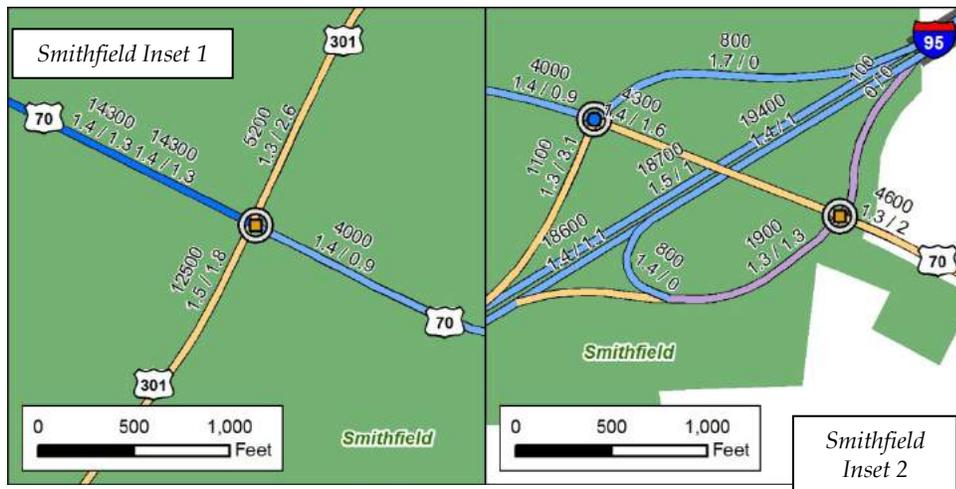
Traffic volumes are most likely to increase due to diverted traffic on U.S. 301 and NC 39. County staff noted that local travelers were more likely to divert to U.S. 301 through this area than regional travelers because of the slower speed limits and delays through the many small towns along the corridor.

Increased traffic on U.S. 301 is generally viewed as a negative impact in Johnston County. Some sections of U.S. 301 would likely need improvement when volumes increase. The businesses along U.S. 301 are located in the towns rather than at the interchanges and primarily serve the local population. County staff felt that tolls on I-95 would give the county a disadvantage for attracting industries. Since county residents are also frequent users of I-95, many residents also are concerned about paying the tolls.

Thirteen intersections in Johnston County meet the thresholds for intersections of concern. Of this total, one is expected to improve under the 2040 Build (Tolls) scenario compared with the 2040 No Build scenario. Eleven of these intersections also are expected to have queuing issues. Analysis results for the intersections of concern in Johnston County are summarized in Table 4-3.

Figure 4-4 Long-Term Impact Analysis Map for Johnston County





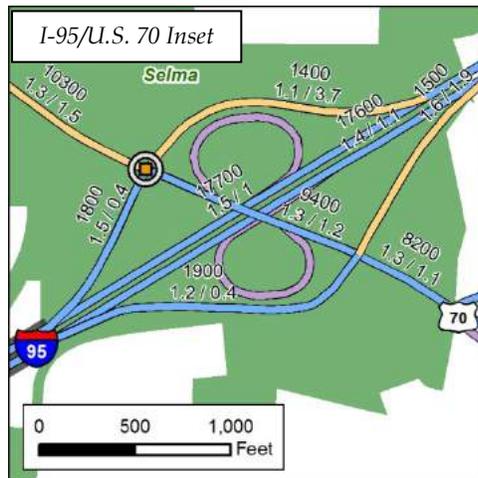


Table 4-3 Long-Term Impact Analysis Results for Johnston County

Intersection (Inset Name, if Applicable)	Traffic Signal	2040 No Build LOS (Delay in Seconds)	2040 Build (Tolls) LOS (Delay in Seconds)	Queue Exceeds Available Storage	Potential Mitigation Strategies
I-95 SB/U.S. 301 (Kenly Inset)	No	SB – C (18.1)	SB – F (Err) ^a	Yes	Signalize, turn lanes
U.S. 70/U.S. 70 Alt slip ramp (U.S. 70/U.S. 70 Alt Inset)	No	NB – F (Err) ^a SB – F (Err) ^a	NB – F (Err) ^a SB – F (Err) ^a	Yes	Signalize, turn lanes, realign
U.S. 70 Alt/U.S. 70 Alt slip ramp (U.S. 70/U.S. 70 Alt Inset)	No	NB – F (157.0)	NB – F (282.8)	Yes	Signalize, turn lanes, realign
U.S. 301/NC 96 (Four Oaks Inset 1)	No	EB – F (Err) ^a	EB – F (Err) ^a	Yes	Signalize, turn lanes, realign
I-95 SB/U.S. 301 (Four Oaks Inset 1)	No	EB – F (479.5)	F (558.5)	Yes	Signalize, turn lanes, realign
I-95 SB/U.S. 701-NC 96 (Four Oaks Inset 1)	No	WB – F (50.9)	WB – F (Err) ^a	No	Signalize, realign
U.S. 701/NC 96 (Four Oaks Inset 2)	No	EB – F (89.6)	EB – E (38.3)	No	
U.S. 70/U.S. 301-NC 96 (Smithfield Inset 1)	Yes	F (130.4)	F (199.7)	Yes	Turn lanes
I-95 NB/U.S. 70 Bus-NC 210 (Smithfield Inset 2)	No	NB – F (558.2)	NB – F (Err) ^a	Yes	Signalize, turn lanes
I-95 SB/U.S. 70 Bus-NC 210 (Smithfield Inset 2)	No	SB – F (Err) ^a	SB – F (Err) ^a	Yes	Signalize, turn lanes
U.S. 301/NC 242 (Benson Inset 1)	No	NB – F (Err) ^a SB – F (841.3)	NB – F (Err) ^a SB – F (Err) ^a	Yes	Signalize, turn lanes, widen radii

Intersection (Inset Name, if Applicable)	Traffic Signal	2040 No Build	2040 Build (Tolls)	Queue Exceeds Available Storage	Potential Mitigation Strategies
		LOS (Delay in Seconds)	LOS (Delay in Seconds)		
U.S. 301/NC 50-27 (Benson Inset 2)	Yes	F (385.5)	F (791.8)	Yes	Turn lanes
I-95 SB/U.S. 70 Byp (I-95/U.S. 70 Inset)	Yes	C (21.9)	F (288.8)	Yes	Signalize, turn Lanes

^a Synchro does not report delays for unsignalized movements where the v/c ratio at the intersection is greater than 3.0. The v/c for intersections is calculated using different parameters than the v/c for roadway segments.

When traffic volumes meet warrants, it is recommended that several of the intersections be studied for signalization. In addition, adding or extending turn lanes would improve the operation of the intersections where queues are predicted to exceed available storage bays.

The large I-95/U.S. 301 intersection includes multiple left-turn and right-turn lanes. While it may not be reasonable or feasible to construct additional turn lanes at these locations, it may be beneficial to lengthen the existing turn lanes. The intersections of I-95 SB/U.S. 701-NC 96 and U.S. 70/U.S. 301-NC 96 have existing turn lanes, but could likely accommodate either extension of those turn lanes or the addition of new turn lanes.

The northern half of the I-95/U.S. 701-U.S. 301-NC 96 interchange is a complex system of free-flowing ramps and stop-controlled movements. The stop-controlled movements are projected to operate at an unacceptable level of service in both future scenarios. The turning radii for the off-ramps are both tight with limited turn bay lengths. Traffic volumes on U.S. 301 are expected to be higher in the Build (Tolls) scenario, but volumes on I-95 are expected to be lower in the Build (Tolls) scenario. Rather than signalizing specific movements as warranted, it may be more appropriate to study reconfiguration of all of the southbound ramp connections to create a more effective interchange for future traffic volumes.

The intersection of U.S. 70/U.S. 70 Alt also includes a combination of free-flow and stop-controlled movements. The stop-controlled movements are projected to operate at an unacceptable level of service in both future scenarios, with traffic volumes on U.S. 70 Alt slightly higher in the Build (Tolls) scenario compared with the No Build scenario, and volumes on U.S. 70 about the same in both scenarios. When traffic volumes warrant signalization, a study is recommended that would consider realigning this intersection to provide adequate queuing potential.

In addition to having an unacceptable level of service in 2040, the intersection of U.S. 301/NC 242 has poor geometry, with a tight turning radius in the northeast quadrant. A median on NC 242 has been installed recently.

The v/c ratio of U.S. 301 south of the U.S. 301/NC 50-27 intersection is expected to be over 0.8, indicating that the roadway will be nearing or above capacity. The travel demand model projects that traffic volumes on U.S. 301 will be approximately 1.5 times greater in the Build (Tolls) scenario than in the No Build scenario, and the signalized intersection is expected to operate at LOS F in both scenarios. Turn lanes have been proposed as potential mitigation, but sidewalks and buildings are located near the street in most corners, potentially making the impacts of widening unacceptable.

An additional mitigation measure to consider for Johnston County communities is to move the toll plaza currently shown southwest of Kenley to northeast of the I-95/U.S. 301 interchange. This measure is less likely to encourage traffic from diverting onto U.S. 301 than the current toll plaza location. Drivers diverting from I-95 will either stay on I-95 or distribute themselves onto several diversion routes between Kenly and Selma.

Nash County

U.S. 301 through Nash County is expected to be used as a diversion route for drivers avoiding tolls on I-95, but the travel demand model projects that those drivers will primarily be trips through the county rather than beginning or ending in Nash County. Since there are no easy “cut-around” paths to avoid toll plazas on I-95, traffic on I-95 is less likely to divert to an alternate route in this location. This data is consistent with input from county staff, who indicate that most locals currently use U.S. 301 and, therefore, would not be diverted from I-95 to U.S. 301.

In the 2040 Build (Tolls) scenario, I-95 would be widened, but would have slightly lower volumes in the 2040 Build (Tolls) scenario compared with the 2040 No Build scenario (growth rates of between 0.9 and 1.3 in the Build (Tolls) scenario versus 1.3 to 1.5 in the No Build scenario).

Portions of U.S. 301 north of Rocky Mount are projected to have a v/c ratio of 0.7 to 0.8 in the 2040 No Build scenario and 0.8 to 0.9 in the 2040 Build (Tolls) scenario.

One intersection in Nash County meets the thresholds for intersections of concern, which is in Table 4-4.

Table 4-4 Long-Term Impact Analysis Results for Nash County

Intersection <i>(Inset Name, if Applicable)</i>	Traffic Signal	2040 No Build	2040 Build (Tolls)	Queue Exceeds Available Storage	Potential Mitigation Strategies
		LOS (Delay in Seconds)	LOS (Delay in Seconds)		
U.S. 301/NC 33 (Whitakers Inset)	No	WB – C (19.2)	WB – F (356.9)	No	Signalize, wider radii

When traffic volumes meet warrants, it is recommended that the U.S. 301/NC 33 intersection be studied for signalization. This intersection has sharp 90 degree corners, and trucks likely have to swing into the intersection when turning. If this intersection is signalized, consideration may be given to increasing the turning radii of the corners.

Northampton County

The overall impact of the Build (Tolls) scenario to Northampton County is expected to be positive. Traffic volumes likely will increase on NC 186, U.S. 258, and U.S. 301. Volumes on those roads are currently low except, on the segments of U.S. 301 adjacent to Roanoke Rapids. Additional traffic is generally perceived as a benefit to local businesses in the small towns throughout the county. The primary concern expressed by county staff is that additional traffic may increase the risk of crashes on the rural roads because of the many driveways that intersect with the main routes. All roads studied in Northampton County are predicted to be under capacity in both the 2040 Build (Tolls) and 2040 No Build scenarios.

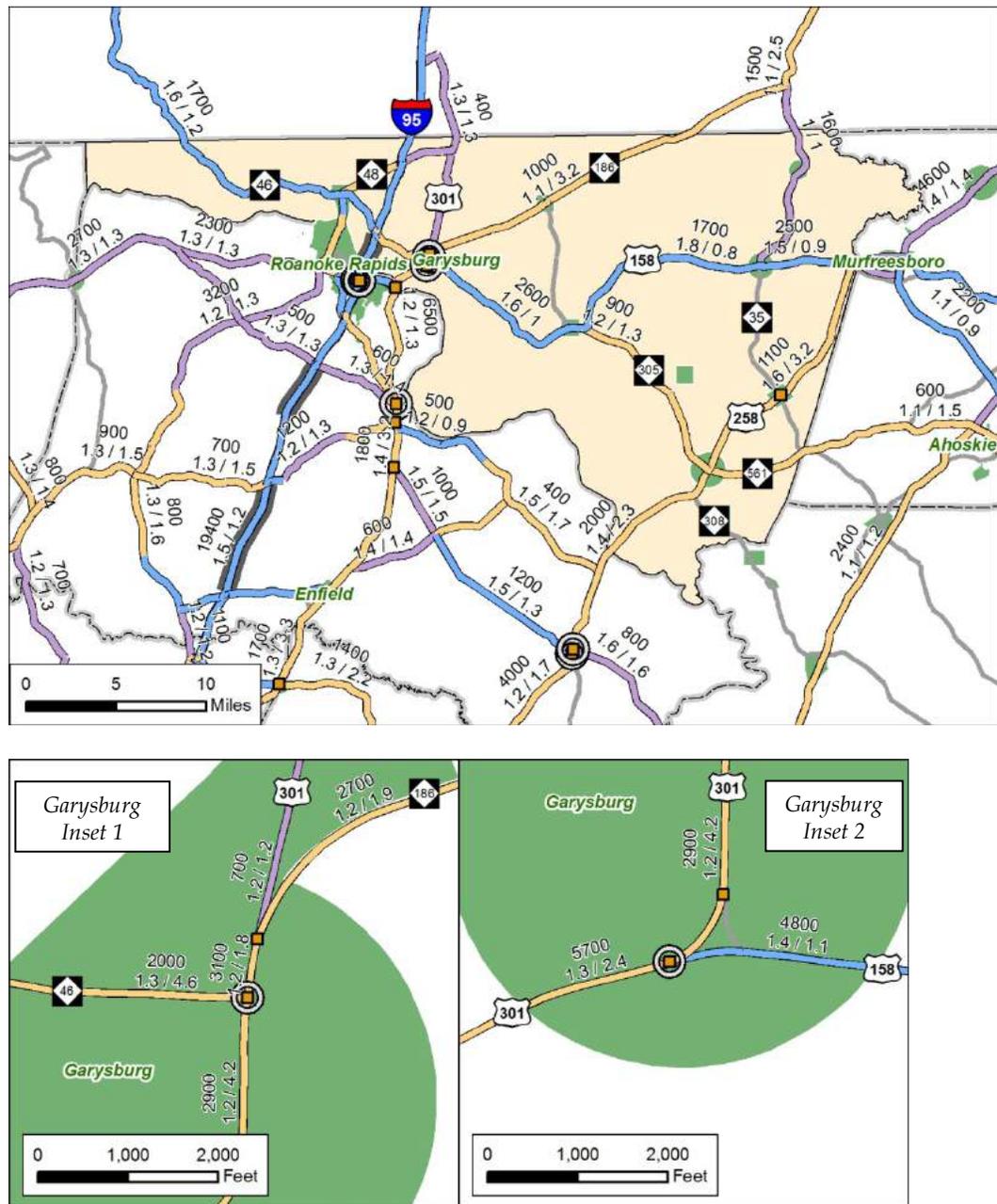
In the 2040 Build (Tolls) scenario, I-95 would be widened, but would have lower volumes in the 2040 Build (Tolls) scenario than in the 2040 No Build scenario.

County staff anticipates that traffic currently using I-95 would divert to U.S. 258 and U.S. 301 if tolls were built on I-95, but is less likely to divert to NC 186 or U.S. 158. The travel demand model is consistent with this expectation except on NC 186, where traffic volumes are predicted to increase approximately three times more in the 2040 Build (Tolls) scenario compared with the 2040 No Build scenario. This is because of the location of the northernmost toll plaza on I-95, which is north of Roanoke Rapids. The specific locations of toll plazas were not known at the time of the county interviews.

The increase in traffic volumes for the 2040 Build (Tolls) scenario at the U.S. 301/NC 46 and U.S. 301/U.S. 158 intersections is primarily due to drivers using NC 46 and U.S. 301/U.S. 158 to bypass the toll plaza north of Roanoke Rapids. This detour would add approximately 5.5 miles to a through trip. Drivers also may choose to stay on U.S. 301, but since U.S. 301 diverges away from I-95

between Roanoke Rapids and Rocky Mount that detour is less likely for short trips.

Figure 4-6 Long-Term Impact Analysis Map for Northampton County



Four intersections in Northampton County meet the thresholds for intersections of concern. Two of these five also are expected to have queuing issues. Analysis results for the intersections of concern in Northampton County are summarized in Table 4-5.

Table 4-5 Long-Term Impact Analysis Results for Northampton County

Intersection (Inset Name, if Applicable)	Traffic Signal	2040 No Build LOS (Delay in Seconds)	2040 Build (Tolls) LOS (Delay in Seconds)	Queue Exceeds Available Storage	Potential Mitigation Strategies
U.S. 258/NC 35	No	NB – C (16.0) SB – C (19.5)	NB – E (47.9) SB – F (238.9)	No	Signalize
U.S. 301/NC 46 (Garysburg Inset 1)	No	EB – F (172.9) WB – D (30.8)	EB – F (Err) ^a WB – F (Err) ^a	EB – Yes WB – Yes	Signalize, Turn lanes
U.S. 301/NC 186 (Garysburg Inset 1)	No	WB – C (17.7)	WB – F (68.0)	No	Signalize, widen radii
U.S. 301/U.S. 158 (Garysburg Inset 2)	No	NB – B (12.9) WB – F (214.3)	NB – F (566.1) WB – F (Err) ^a	NB – No WB – Yes	Signalize, turn lanes reconfigure

^a Synchro does not report delays for unsignalized movements where the v/c ratio at the intersection is greater than 3.0. The v/c for intersections is calculated using different parameters than the v/c for roadway segments.

When traffic volumes meet warrants, it is recommended that the intersections be studied for signalization. In addition, adding or extending turn lanes would improve the operation of the U.S. 301/NC 46 and U.S. 301/U.S. 158 intersections.

The U.S. 301/U.S. 158 intersection is currently triangle shaped. Although this configuration allows for a continuous flow for several movements, it limits queuing for the other, stop-controlled movements. When considering signalization and turn lanes at this location, it may be beneficial to reconfigure the intersection.

The turning radius for the U.S. 301/NC 186 intersection is tight in the northeast quadrant. This intersection is approximately 800 feet from the U.S. 301/NC 46 intersection. NC 46 to NC 186 is a likely diversion route for drivers going to or from the Norfolk area, and traffic volumes making this movement, which requires two 90-degree turns southbound or one 90-degree turn northbound, are expected to increase. Potential mitigation measures include signalizing one or both intersections and adding turn lanes to the U.S. 301/NC 46 intersection. It is recommended that planning for these two intersections be done together due to their proximity.

The U.S. 258/NC 35 intersection is anticipated to operate at an unacceptable level of service in the 2040 Build (Tolls) scenario, with traffic volumes growing at twice the rate of the 2040 No Build scenario. If capacity of the road or intersection becomes a problem in the future, widening will be difficult because of physical constraints such as buildings and parking in proximity to the road. At this time, the only mitigation measure proposed is signalization when warranted by traffic volumes.

An additional mitigation measure to consider for Northampton County communities is to move the toll plaza currently shown northeast of Roanoke Rapids to southwest of the I-95/U.S. 158 interchange. This measure is less likely

to encourage traffic from diverting onto NC 186 than the current toll plaza location.

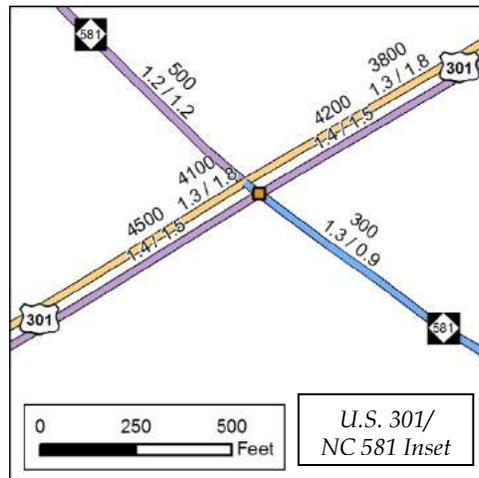
Wilson County

On most roads in Wilson County, traffic volumes are expected to be similar under the 2040 Build (Tolls) and 2040 No Build scenarios. The travel demand model is consistent with expectations of county staff, who predict that NC 42 will see the greatest increase in traffic from diversions, and that the other roads will experience little change. All roads studied in Wilson County are predicted to be under capacity in both the 2040 Build (Tolls) and 2040 No Build scenarios except for a small segment of I-95 which is projected to have a v/c ratio of 0.8 in the 2040 No Build scenario and a v/c ratio of 0.4 in the 2040 Build (Tolls) scenario.

U.S. 301 is parallel to I-95, and the local communities generally view additional traffic as a benefit to their businesses. However, since U.S. 301 through Wilson is over 5 miles from I-95 and there are already some congestion issues on the segments of U.S. 301 through the small towns, it is less likely to be used as a diversion route for travelers who would otherwise use I-95.

The travel demand model projects that the growth rate on NC 42 through Wilson will be higher in the Build (Tolls) scenario compared with the 2040 No Build scenario (a projected growth factor of 3.3 in the Build (Tolls) scenario compared with 1.7 in the No Build scenario east of Wilson). Although the volumes will still be below the roadways through capacity, the county is concerned that additional traffic on NC 42 will be problematic. NC 42 is currently congested with a high number of slow moving and frequently stopping vehicles, narrow lanes, and slower speed limits through the small communities. Several sections of the road between U.S. 301 and the eastern county border are of particular concern, including areas with sharp horizontal and vertical curves, and sections with broken pavement from farm equipment.

In the 2040 Build (Tolls) scenario, I-95 would be widened, but would have slightly lower volumes in the 2040 Build (Tolls) scenario compared with the 2040 No Build scenario (growth rate of approximately 1.1 in the Build (Tolls) scenario versus 1.4 in the No Build scenario).



Three intersections in Wilson County meet the thresholds for intersections of concern, which are summarized in Table 4-6.

Table 4-6 Long-Term Impact Analysis Results for Wilson County

Intersection (Inset Name, if Applicable)	Traffic Signal	2040 No Build LOS (Delay in Seconds)	2040 Build (Tolls) LOS (Delay in Seconds)	Queue Exceeds Available Storage	Potential Mitigation Strategies
I-795 SB/U.S. 301 (I-795/U.S. 301 Inset)	No	SB - E (44.0)	SB - F (78.9)	No	Signalize, turn lanes
U.S. 301 NB/NC 42 (Wilson Inset)	No	NB - D (28.9)	NB - F (94.7)	No	Signalize
U.S. 301/NC 581 (U.S. 301/NC 581 Inset)	No	EB - C (24.9)	EB - E (44.4)	No	

When traffic volumes meet warrants, it is recommended that the I-795 SB/U.S. 301 and U.S. 301 NB/NC 42 intersections be studied for signalization. In addition, adding or extending turn lanes would improve the operation of the I-795 SB/U.S. 301 intersection.

4.3 COUNTIES SOUTH ALONG I-95

Cumberland County

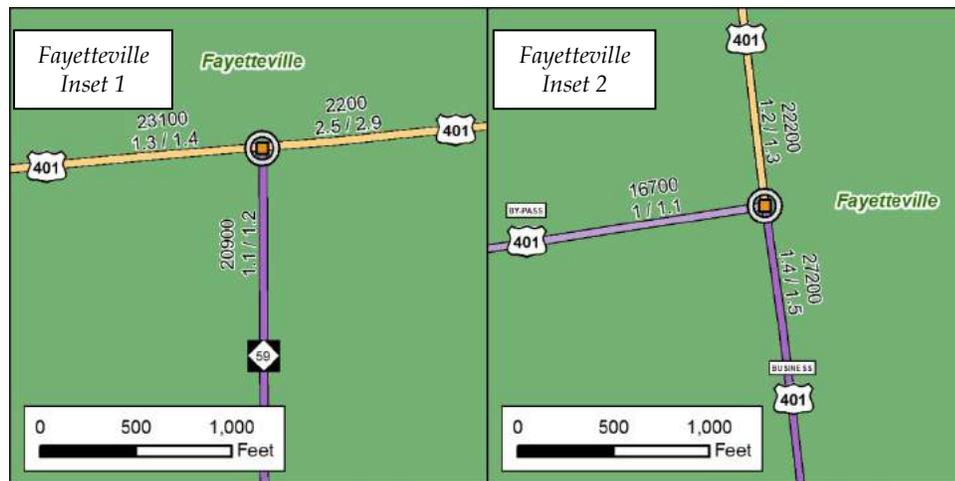
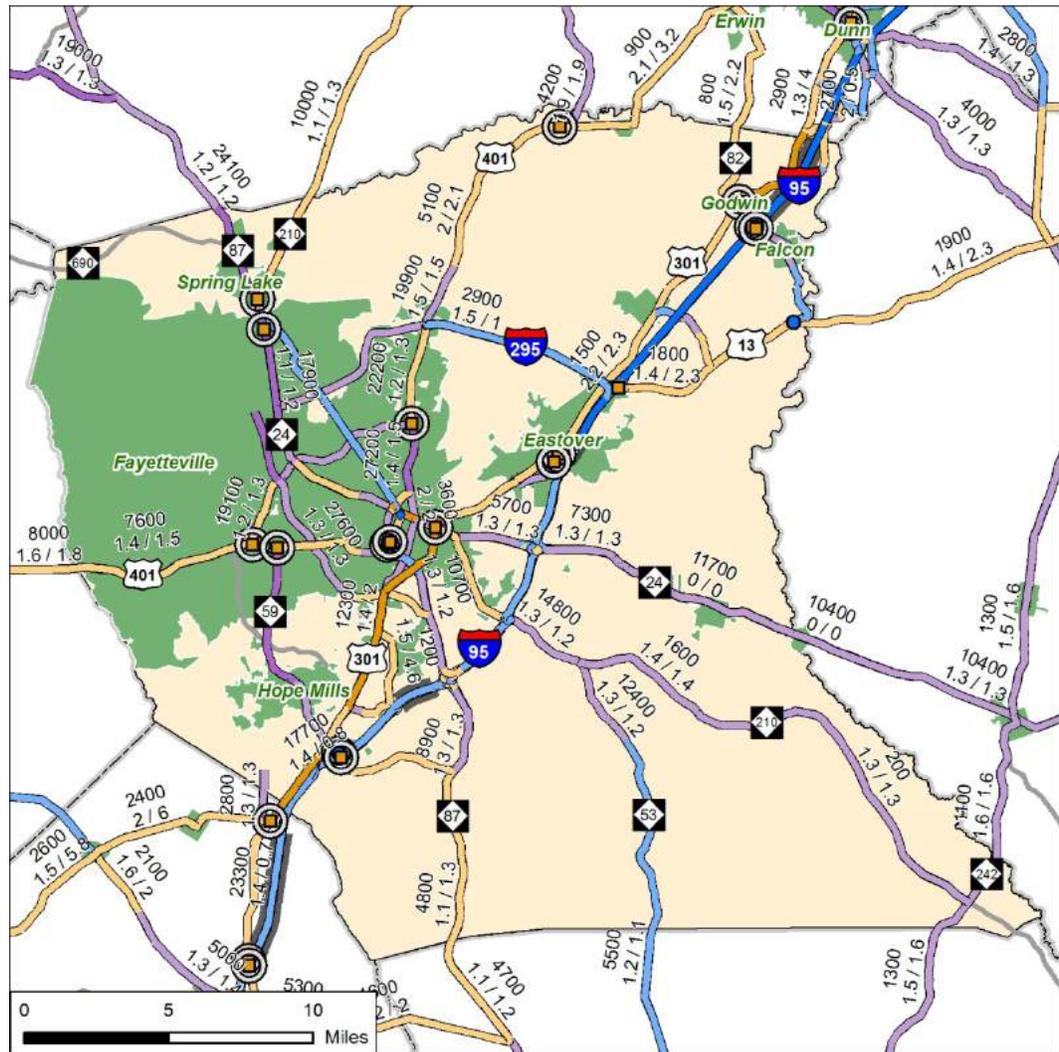
County staff anticipates that U.S. 301 will experience a higher percentage increase in traffic than other routes through Cumberland County if tolls are installed on I-95, which is consistent with the travel demand model. Traffic volumes are expected to be slightly higher on U.S. 301 in the 2040 Build (Tolls) scenario compared with the 2040 No Build scenario (growth factor of 2.0 versus 1.4). County staff noted that communities between Eastover and NC 59 may feel that additional traffic on U.S. 301 is a positive impact, at least until the road becomes too congested. Traffic volumes are also expected to increase slightly on U.S. 401, NC 210, and several short routes connecting U.S. 301 with I-95.

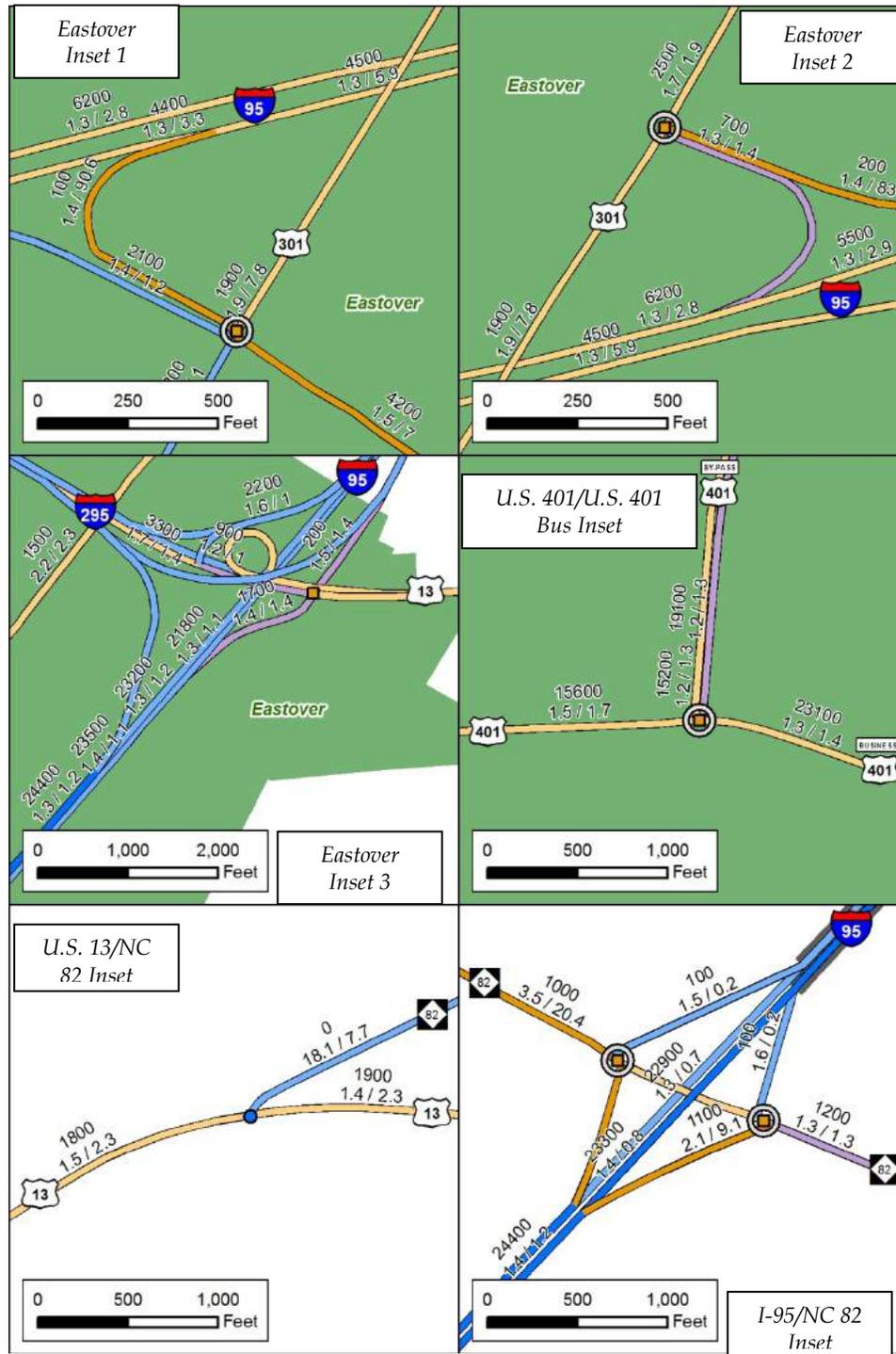
Several road segments within Cumberland County are nearing or over capacity, but volumes are expected to stay approximately the same in the Build (Tolls) scenario as in the No Build scenario. These include NC 24 south of Spring Lake (v/c ratio of 0.9), NC 87 north of Spring Lake (v/c ratio of 1.2), and NC 59 north of Hope Mills (v/c ratio of 1.0). I-95 north of Eastover is projected to have a v/c ratio of 0.8 to 0.9 in the 2040 No Build scenario, dropping to a v/c ratio of 0.2 to 0.4 in the 2040 Build (Tolls) scenario.

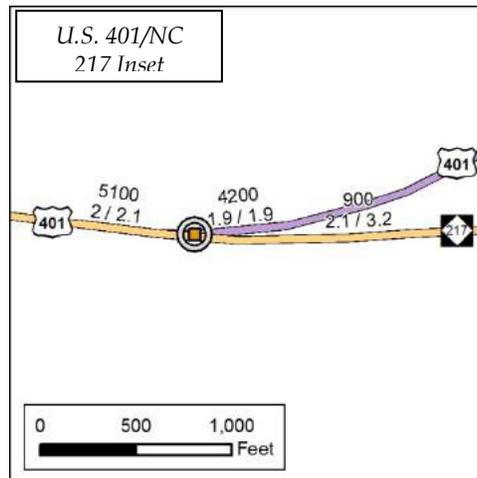
The v/c on U.S. 301 near Godwin is projected to increase from 0.2 in the 2040 No Build scenario to 0.9 in the 2040 Build (Tolls) scenario. The v/c ratio of U.S. 301 south of Fayetteville is expected to increase from between 0.2 and 0.8 in the 2040 No Build scenario to between 0.9 and 1.1 in the 2040 Build (Tolls) scenario.

County staff expressed concern about the ability of U.S. 401 to handle additional traffic. It is used heavily by trucks and agricultural vehicles and already feels congested. According to the travel demand model, adding tolls to I-95 will result only in a slight increase in traffic volumes on U.S. 401, and the road will have a v/c ratio of 0.6 in the 2040 Build (Tolls) scenario.

Figure 4-8 Long-Term Impact Analysis Map for Cumberland County







Eighteen intersections in Cumberland County meet the thresholds for intersections of concern. One of these intersections is expected to improve under the 2040 Build (Tolls) scenario compared with the 2040 No Build scenario. Sixteen also are expected to have queuing issues. Analysis results for the intersections of concern in Cumberland County are summarized in Table 4-7.

Table 4-7 Long-Term Impact Analysis Results for Cumberland County

Intersection (Inset Name, if Applicable)	Traffic Signal	2040 No Build	2040 Build (Tolls)	Queue Exceeds Available Storage	Potential Mitigation Strategies
		LOS (Delay in Seconds)	LOS (Delay in Seconds)		
U.S. 401 Bus/NC 59 (Fayetteville Inset 1)	Yes	F (325.2)	F (450.3)	Yes	Turn lanes
U.S. 401/U.S. 401 Bus (Fayetteville Inset 2)	Yes	F (278.8)	F (316.6)	Yes	Turn lanes
NC 87/U.S. 401 SB (Fayetteville Inset 3)	Yes	F (244.9)	F (318.2)	Yes	Turn lanes
NC 87/U.S. 401 NB (Fayetteville Inset 3)	Yes	F (218.5)	F (330.4)	Yes	Turn lanes
NC 210/NC 24-87 (Fayetteville Inset 4)	Yes	F (238.0)	F (270.0)	Yes	Turn lanes
NC 210-24-87/Butner Road (Fayetteville Inset 5)	Yes	F (277.8)	F (317.8)	Yes	
U.S. 301/I-95 Bus/NC 24-210 (Fayetteville Inset 6)	Yes	F (163.1)	F (287.1)	Yes	
I-95 SB/NC 59 (Fayetteville Inset 7)	No	WB – F (Err) ^a	WB – F (Err) ^a	Yes	Signalize, turn lanes
I-95 NB/NC 59 (Fayetteville Inset 7)	No	EB – F (Err) ^a	EB – F (Err) ^a	Yes	Signalize, turn lanes

Intersection (Inset Name, if Applicable)	Traffic Signal	2040 No Build LOS (Delay in Seconds)	2040 Build (Tolls) LOS (Delay in Seconds)	Queue Exceeds Available Storage	Potential Mitigation Strategies
U.S. 301/NC 82 (Godwin Inset)	No	EB – B (14.4) WB – C (18.8)	EB – F (Err) ^a WB – F (Err) ^a	Yes	Signalize, turn lanes
U.S. 301/I-95 Bus WB (Eastover Inset 1)	No	WB – C (19.2)	WB – F (Err) ^a	Yes	Signalize, turn lanes
U.S. 301/I-95 Bus EB (Eastover Inset 2)	Yes	B (18.9)	E (71.9)	Yes	Turn lanes
I-95 NB/I-295/U.S. 13 (Eastover Inset 3)	No	NB – F (73.3)	NB – F (96.9)	No	Signalize
U.S. 13/NC 82 (U.S. 13/NC 82 Inset)	No	SB – F (53.5)	SB – C (21.6)	No	
I-95 SB/NC 82 (I-95/NC 82 Inset)	No	SB – B (13.6)	SB – F (Err) ^a	Yes	Signalize, turn lanes
I-95 NB/NC 82 (I-95/NC 82 Inset)	No	NB – B (11.3)	NB – F (522.8)	Yes	Signalize, turn lanes
U.S. 401/NC 217 (U.S. 401/NC 217 Inset)	No	NB – F (64.1)	NB – F (293.4)	Yes	Signalize, turn lanes
U.S. 401/U.S. 401 Bus (U.S. 401/U.S. 401 Bus Inset)	Yes	F (275.0)	F (345.8)	Yes	Turn lanes

^a Synchro does not report delays for unsignalized movements where the v/c ratio at the intersection is greater than 3.0. The v/c for intersections is calculated using different parameters than the v/c for roadway segments.

When traffic volumes meet warrants, it is recommended that several of the intersections be studied for signalization. In addition, adding or extending turn lanes would improve the operation of the intersections where queues are predicted to exceed available storage bays.

The intersections of U.S. 401 Bus/NC 59 and U.S. 401/U.S. 401 Bus are large with multiple left-turn and right-turn lanes. While it may not be reasonable or feasible to construct additional turn lanes at these locations, it may be beneficial to lengthen the existing turn lanes. The intersections of U.S. 401/U.S. 401 Bus and NC 210/NC 24-87 have existing turn lanes, but could likely accommodate either extension of those turn lanes or the addition of new turn lanes.

The U.S. 401/NC 59 intersection is anticipated to operate at LOS F in both future scenarios. It is signalized, and turn lanes are proposed as a potential mitigation measure. However, buildings are immediately adjacent to the road on several corners, and widening may not be feasible without relocating businesses.

The large intersection of NC 210-24-87/Butner Road is projected to operate at LOS F in both future scenarios. It currently has multiple left-turn and right-turn lanes. No additional mitigation is proposed at this location because of the size of the existing intersection. Also, county staff noted that the City of Fayetteville plans to close Bragg Boulevard (NC 24-87) south of this intersection. It is

expected that most traffic will shift to NC 210, a parallel route through Fayetteville. A traffic study of the Bragg Boulevard closing will be needed to determine what other improvements will be required as a result of that action.

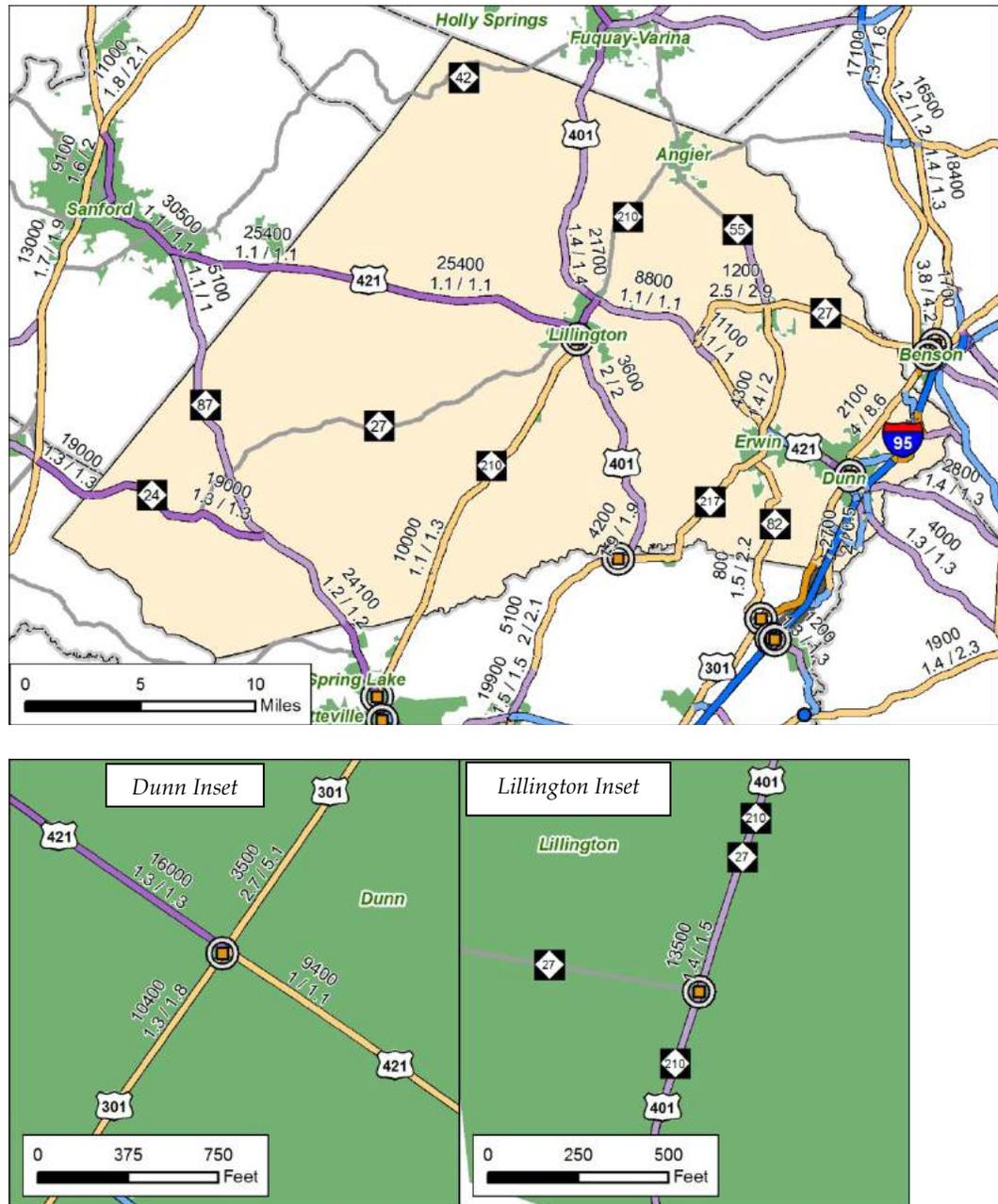
Harnett County

County staff noted that there is a large commuting population from Harnett County north to Wake County and from Harnett County south to the Ft. Bragg/Fayetteville area.

In the 2040 Build (Tolls) scenario, I-95 would be widened, but would have lower volumes in the 2040 Build (Tolls) scenario than in the 2040 No Build scenario. Portions of U.S. 421 (v/c ratio of 1.2), NC 24 (v/c ratio of 1.0) are projected to be over capacity, although traffic volumes will be approximately the same in both future scenarios. The v/c on I-95 through Harnett County is projected to be 0.8 in the 2040 No Build scenario and 0.3 in the 2040 Build (Tolls) scenario.

Several likely diversion routes traverse Harnett County. Based on the travel demand model, U.S. 301 is expected to have double the growth in the 2040 Build (Tolls) scenario as in the 2040 No Build scenario (8.6 growth rate versus 4.0). U.S. 301 is used by trucks, including those accessing a distribution center south of Dunn. Agricultural vehicles also use U.S. 301, especially between Dunn and Fayetteville. County staff said that some areas through Dunn are difficult for trucks to maneuver, but there are no opportunities to expand because of the buildings adjacent to the road at most intersections. Many local drivers avoid U.S. 301 because of current delay, and they are even more likely to do so with additional traffic volumes.

Figure 4-9 Long-Term Impact Analysis Map for Harnett County



Two intersections in Harnett County meet the thresholds for intersections of concern. Both also are expected to have queuing issues. Analysis results for the intersections of concern in Harnett County are summarized in Table 4-8.

Table 4-8 Long-Term Impact Analysis Results for Harnett County

Intersection (Inset Name, if Applicable)	Traffic Signal	2040 No Build	2040 Build (Tolls)	Queue Exceeds Available Storage	Potential Mitigation Strategies
		LOS (Delay in Seconds)	LOS (Delay in Seconds)		
U.S. 301/U.S. 421-NC 55 (Dunn Inset)	Yes	F (240.4)	F (348.7)	Yes	Turn lanes
U.S. 401/NC 210 (Lillington Inset)	No	EB – F (Err) ^a	F (Err) ^a	Yes	Signalize, turn lanes

^a Synchro does not report delays for unsignalized movements where the v/c ratio at the intersection is greater than 3.0. The v/c for intersections is calculated using different parameters than the v/c for roadway segments.

When traffic volumes meet warrants, it is recommended that the U.S. 401/ NC 210 intersection be studied for signalization. In addition, adding or extending turn lanes at both locations would improve the operation of the intersections where queues are predicted to exceed available storage bays.

Traffic volumes on U.S. 301 near U.S. 421 are anticipated to grow twice as fast in the 2040 Build (Tolls) scenario as in the 2040 No Build scenario. To stay on U.S. 301 through Dunn, drivers must make two 90-degree turns. The intersection of U.S. 301/W. Granville Street/N. Ellis Avenue is narrow, and trucks need to use the entire intersection to maneuver. County staff noted that this problem will worsen with additional traffic. The intersection of U.S. 321/U.S. 421 (shown in the *Dunn Inset* above) is in downtown Dunn, with buildings adjacent to the road in three corners.

Robeson County

The travel demand model predicts a high level of diverted traffic through Robeson County. Due to the curve of I-95 in this area, several routes are available that provide a parallel route and avoid three toll plazas. During the interviews, county staff did not expect NC 71 or NC 710 to be heavily used as diversion routes. However, now that toll locations are known, a notable increase in traffic volumes are projected in the 2040 Build (Tolls) scenario compared with the 2040 No Build scenario. Because of the relatively low existing volumes on these roads, they are still anticipated to operate below capacity, although the community will likely notice a difference in the level of traffic on these roads.

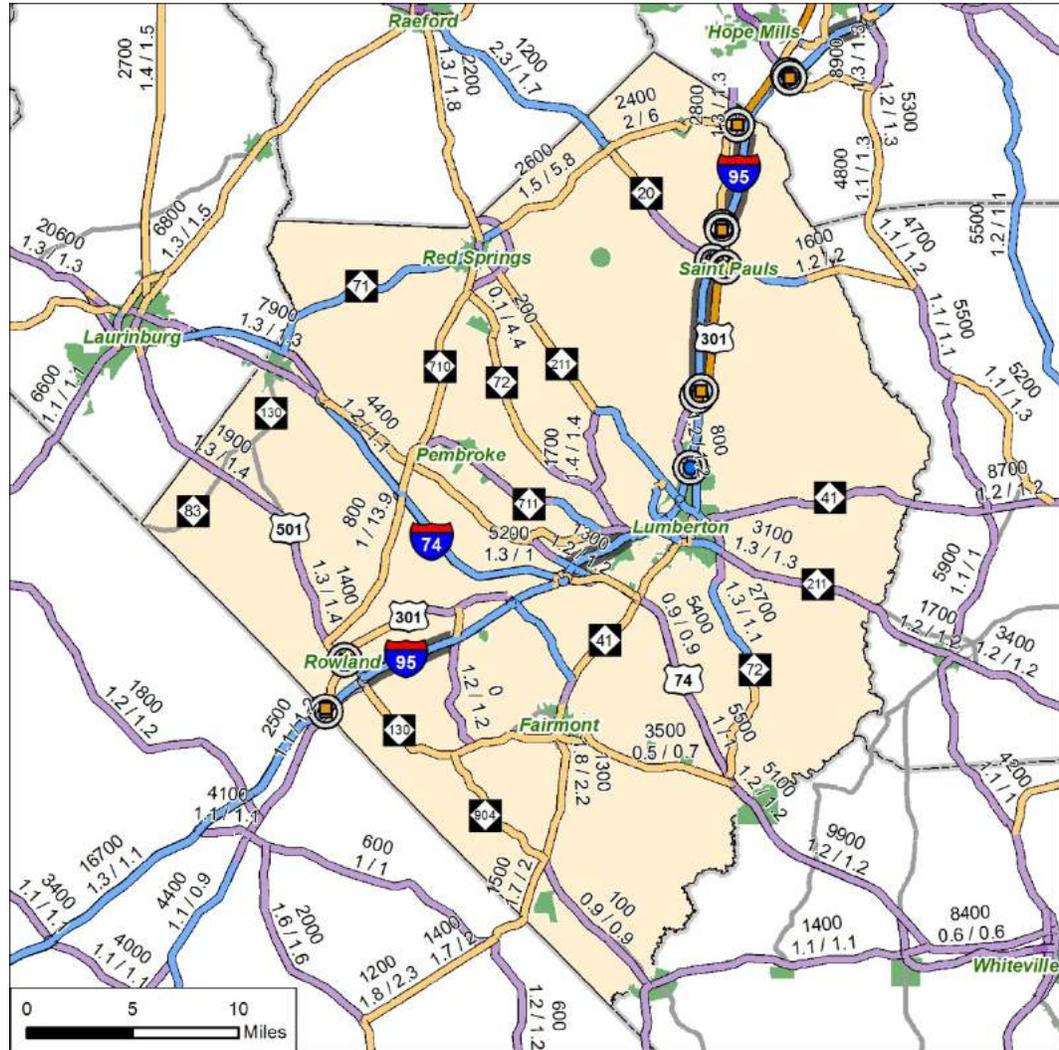
Between Saint Pauls and Lumberton, U.S. 301 is projected to be used as a diversion route, operating with a projected v/c ratio of 0.1 in the 2040 No Build scenario and 0.8 in the 2040 Build (Tolls) scenario. County staff noted that many trucks already use U.S. 301 to avoid weigh stations on I-95; agricultural vehicles also use that route.

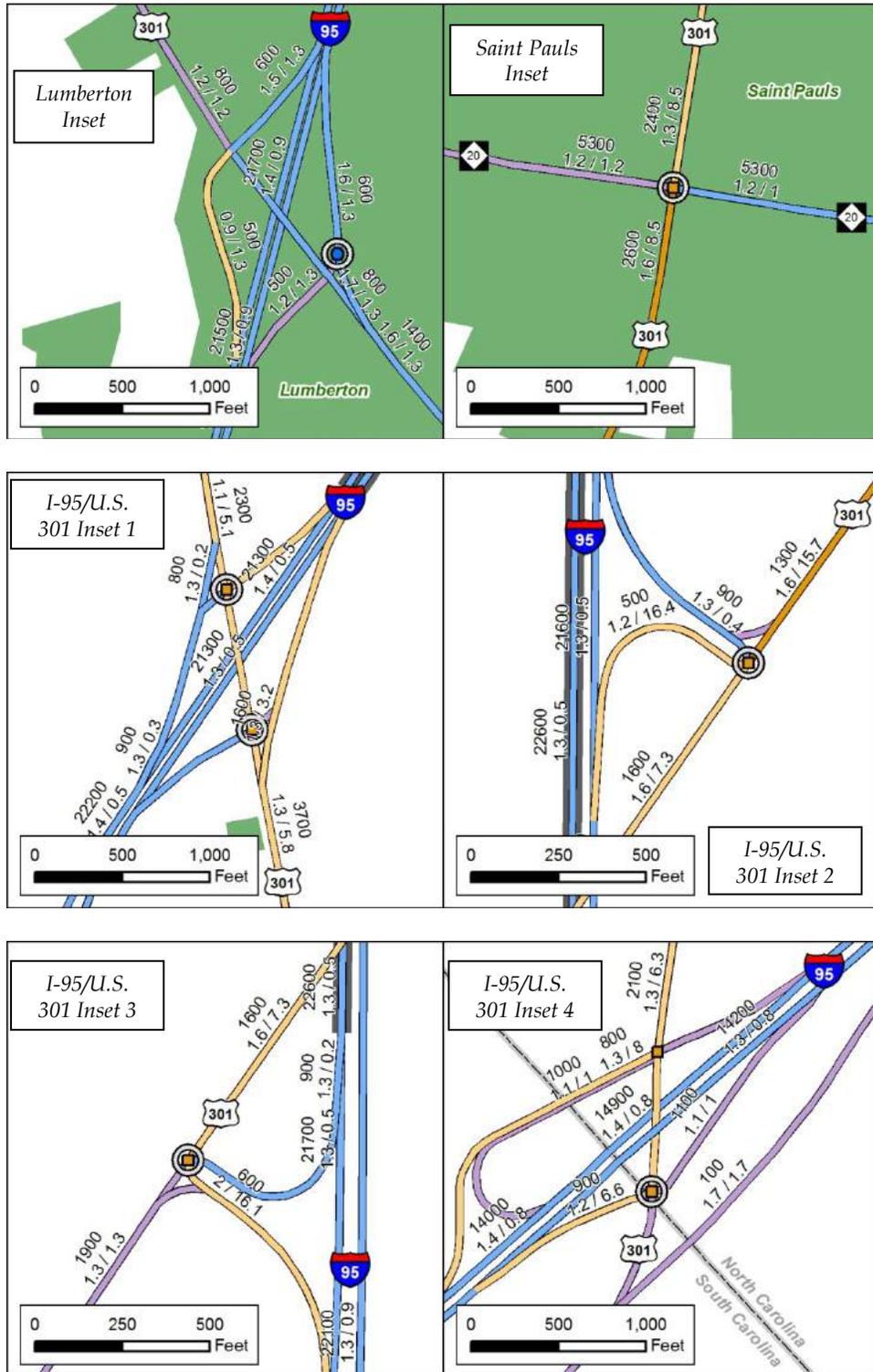
In the 2040 Build (Tolls) scenario, I-95 would be widened, but would have slightly lower volumes in the 2040 Build (Tolls) scenario compared with the 2040

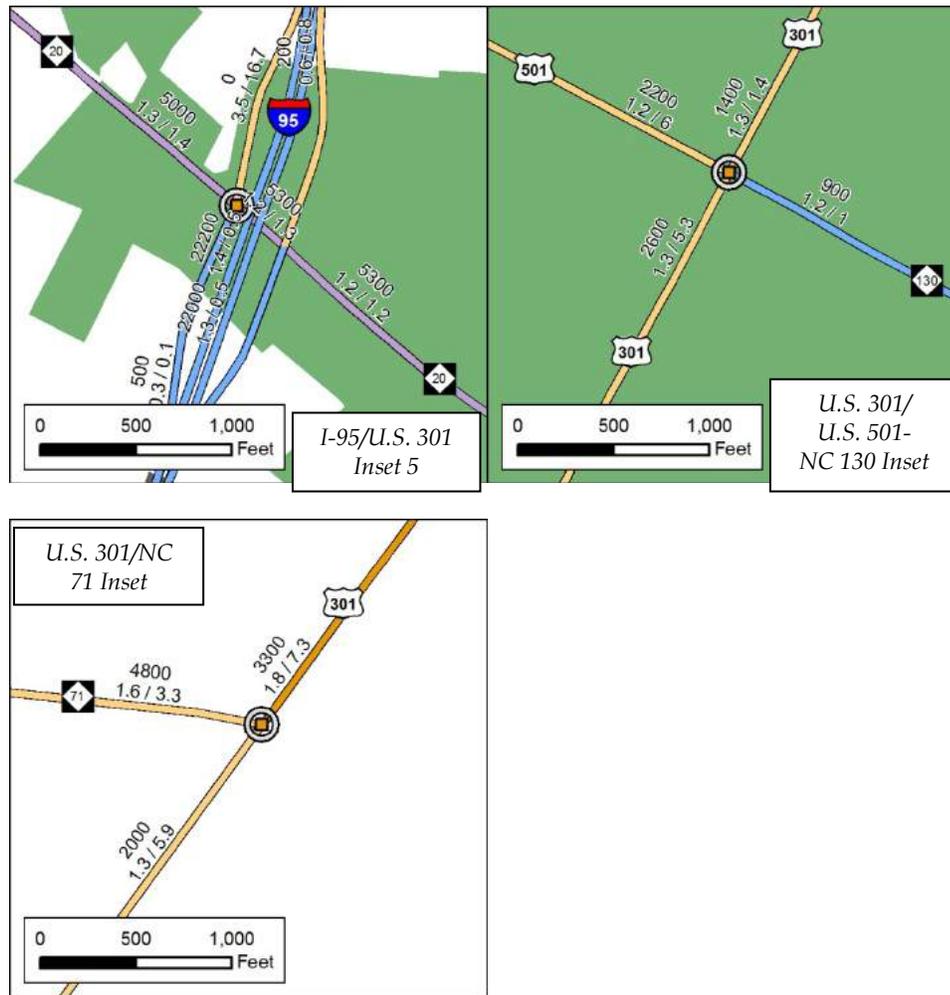
No Build scenario (growth rates of between 0.9 and 1.3 in the Build (Tolls) scenario versus 1.3 to 1.5 in the No Build scenario).

The Town of Saint Pauls has previously opposed tolls, but county staff anticipates that when more information is provided about the potential benefits of the project, the local community may perceive some benefit to local businesses resulting from additional traffic.

Figure 4-10 Long-Term Impact Analysis Map for Robeson County







Eleven intersections in Robeson County meet the thresholds for intersections of concern. Ten also are expected to have queuing issues. Analysis results for the intersections of concern in Robeson County are summarized in Table 4-9.

Table 4-9 Long-Term Impact Analysis Results for Robeson County

Intersection (Inset Name, if Applicable)	Traffic Signal	2040 No Build LOS (Delay in Seconds)	2040 Build (Tolls) LOS (Delay in Seconds)	Queue Exceeds Available Storage	Potential Mitigation Strategies
U.S. 301/NC 20 (Saint Pauls Inset)	Yes	B (18.1)	F (1,249.3)	Yes	Turn lanes
I-95 SB (Saint Pauls)/U.S. 301 (I-95/U.S. 301 Inset 1)	No	WB – C (17.6)	WB – F (Err) ^a	Yes	Signalize, turn lanes
I-95 NB (Saint Pauls)/U.S. 301 (I-95/U.S. 301 Inset 1)	No	EB – C (18.0)	EB – F (Err) ^a	Yes	Signalize, turn lanes

Intersection (Inset Name, if Applicable)	Traffic Signal	2040 No Build LOS (Delay in Seconds)	2040 Build (Tolls) LOS (Delay in Seconds)	Queue Exceeds Available Storage	Potential Mitigation Strategies
I-95 SB/NC 20 (I-95/U.S. 301 Inset 5)	No	SB – F (Err) ^a	SB – F (Err) ^a	Yes	Signalize, turn lanes
I-95 SB (Howellsville)/U.S. 301 (I-95/U.S. 301 Inset 3)	No	NB – B (14.6) SB – B (14.1)	NB – F (204.2) SB – F (205.8)	Yes	Signalize, turn lanes, realign
I-95 NB (Howellsville)/U.S. 301 (I-95/U.S. 301 Inset 2)	No	NB – B (14.1) SB – C (15.0)	NB – F (Err) ^a SB – F (Err) ^a	Yes	Signalize, turn lanes, realign
I-95 SB/U.S. 301-501 (I-95/U.S. 301 Inset 4)	No	EB – B (13.6)	EB – F (Err) ^a	Yes	Signalize, turn lanes
I-95 NB/U.S. 301-501 (I-95/U.S. 301 Inset 4)	No	EB – B (10.2) WB – B (11.8)	EB – E (37.9) WB – F (80.6)	No	Signalize, turn lanes
I-95/ (RCC) NB/U.S. 301 (I-95/U.S. 301 Inset 5)	Yes	F (89.5)	D (46.4)	Yes	Turn lanes
U.S. 301/U.S. 501-NC 130 (U.S. 301/U.S. 501-NC 130 Inset)	Yes	A (9.6)	F (386.2)	Yes	Turn lanes
U.S. 301/NC 71 (U.S. 301/NC 71 Inset)	No	EB – F (328.5) WB – C (16.6)	EB – F (Err) ^a WB – F (Err) ^a	Yes	Signalize, turn lanes

^a Synchro does not report delays for unsignalized movements where the v/c ratio at the intersection is greater than 3.0. The v/c for intersections is calculated using different parameters than the v/c for roadway segments.

When traffic volumes meet warrants, it is recommended that several intersections be studied for signalization. In addition, adding or extending turn lanes would improve the operation of the intersections where queues are predicted to exceed available storage bays.

The off-ramps at the I-95 (Howellsville) interchange with U.S. 301 have tight radii and short deceleration lanes. As traffic volumes increase, this condition may result in queuing onto I-95. A traffic responsive traffic signal at the intersections of U.S. 301 and the I-95 ramps may alleviate this issue. Otherwise, a study is recommended to reconfigure the interchange to provide additional storage for queuing.

In Red Springs, NC 710-72 intersects with NC 71 to the west, NC 211 to the east, and NC 71 to the east, all within a few blocks of each other. For traffic using NC 71 and NC 710 to avoid I-95, a 90-degree turn is required. The roads through Red Springs are densely residential with closely spaced driveways, traffic signals, and a 20-mph speed limit. NC 71 is anticipated to grow by a factor of 5.8 in the 2040 Build (Tolls) scenario compared with a growth factor of 1.5 in the 2040 No Build scenario. NC 710 is anticipated to grow by a factor of 13.9 in the 2040 Build (Tolls) scenario compared with a growth factor of 1.0 in the 2040 No Build scenario. Additional traffic will worsen congestion on these roads, especially in the densely populated areas.

4.4 COUNTIES NORTHEAST OF I-95

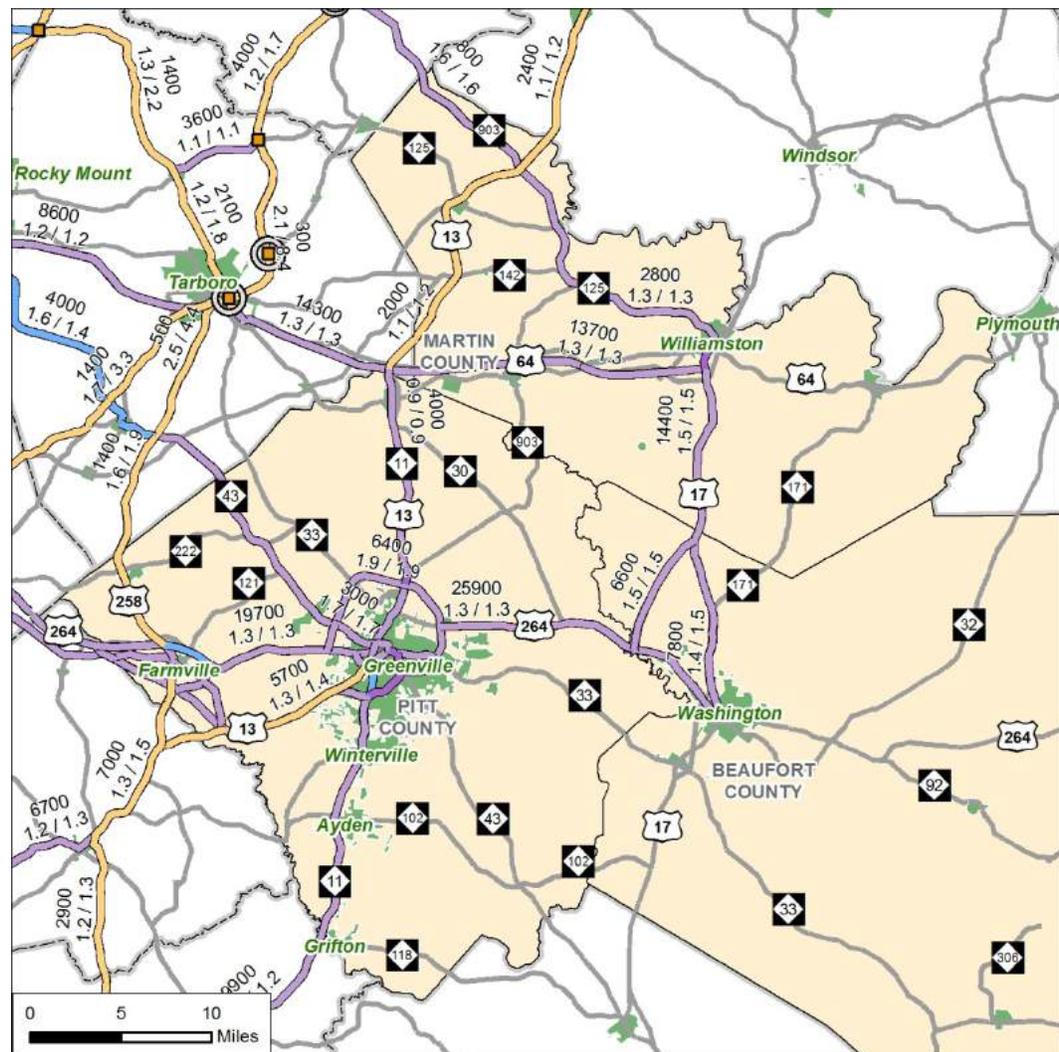
Beaufort, Martin, and Pitt Counties

Beaufort County staff noted that traffic volumes have increased on U.S. 17 as it has been improved. It is used heavily by trucks and agricultural vehicles, and provides access to the ports. Several widening projects are underway on U.S. 17, and a local association of public and private agencies is spearheading an effort to widen U.S. 17 to four lanes across the state. Overall, an increase in traffic as a result of tolls on I-95 is generally viewed as a positive impact for businesses on U.S. 17.

A slight increase in traffic volumes is expected on U.S. 13 through Martin and Pitt Counties in the 2040 Build (Tolls) scenario compared with the 2040 No Build scenario. County staff indicated that this route is used heavily by commuters, trucks, and agricultural vehicles. The proposed SW Bypass around Greenville will connect U.S. 264 with U.S. 13 and will improve the route for travelers diverted from I-95.

All roads studied in Beaufort County are predicted to be under capacity in both the 2040 Build (Tolls) and 2040 No Build scenarios. The U.S. 264 Bypass through southeast Greenville and a short segment of U.S. 17 in Martin County are projected to have a v/c ratio of 0.8 to 0.9 in both future scenarios.

Figure 4-11 Long-Term Impact Analysis Map for Beaufort, Martin and Pitt Counties



Two intersections in Pitt County meet the thresholds for intersections of concern, one of which also is expected to have queuing issues. There are no intersections that meet the thresholds for concern in Beaufort or Martin Counties. Analysis results for the intersections of concern in Pitt County are summarized in Table 4-10.

When traffic volumes meet warrants, it is recommended that the U.S. 13/U.S. 264 Alt intersection be studied for signalization. In addition, adding or extending turn lanes would improve the operation of the U.S. 13/U.S. 13-264 Alt intersection where queues are predicted to exceed available storage bays.

The U.S. 13/U.S. 13-264 Alt intersection is large with multiple left-turn and right-turn lanes. While it may not be reasonable or feasible to construct additional turn lanes at these locations, it may be beneficial to lengthen the existing turn lanes.

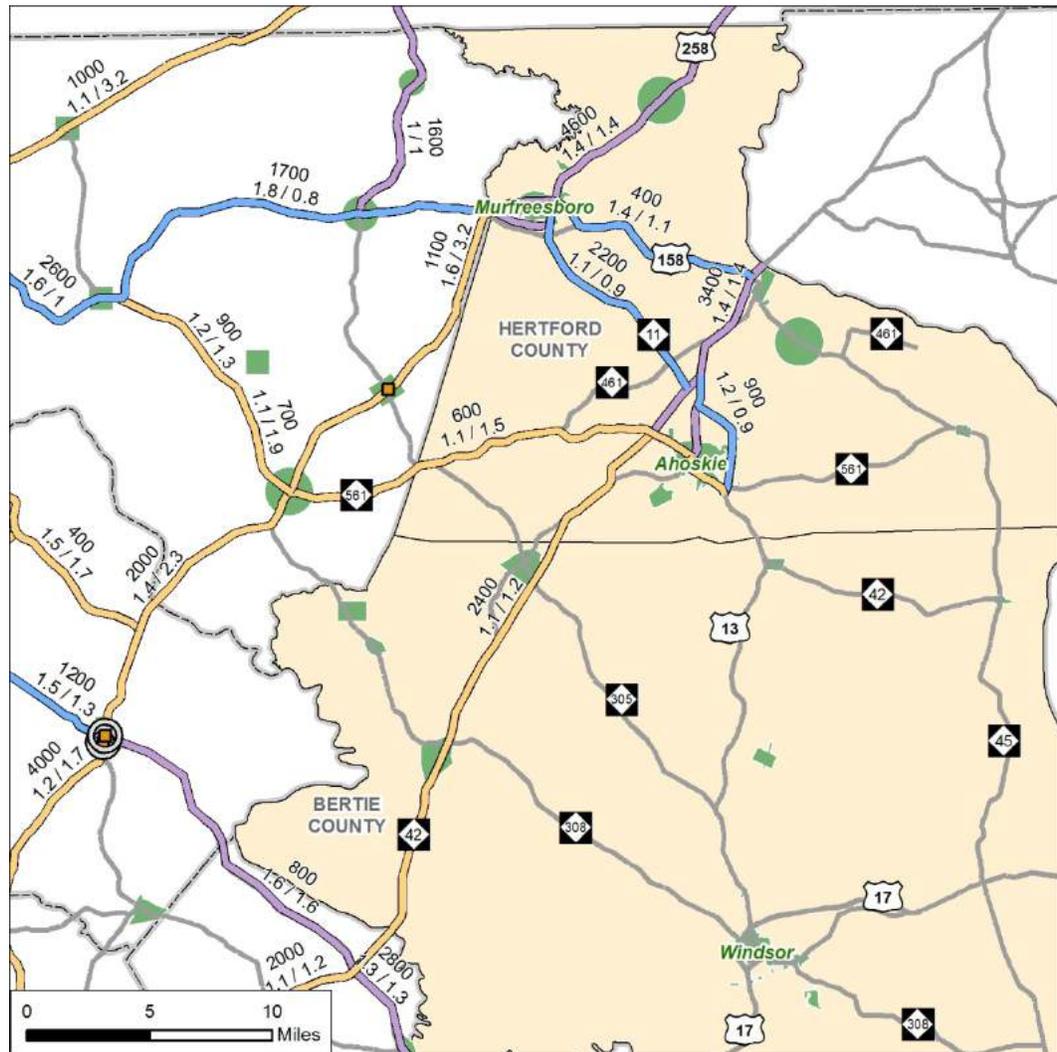
Table 4-10 Long-Term Impact Analysis Results for Beaufort, Martin, and Pitt Counties

Intersection	Traffic Signal	2040 No Build	2040 Build (Tolls)	Queue Exceeds Available Storage	Potential Mitigation Strategies
		LOS (Delay in Seconds)	LOS (Delay in Seconds)		
Pitt County					
U.S. 13/U.S. 264 Alt	No	EB – E (37.5)	EB – F (56.6)	No	Signalize
U.S. 13/U.S. 13-264 Alt	Yes	F (130.7)	F (157.8)	Yes	Turn lanes

Bertie and Hertford Counties

Through Bertie and Hertford Counties, a slight increase in traffic volumes is expected along NC 42 in the 2040 Build (Tolls) scenario compared with the 2040 No Build scenario. Traffic volumes on U.S. 158 and NC 11 are anticipated to decrease slightly in the 2040 Build (Tolls) scenario compared with the 2040 No Build scenario. All roads studied in Bertie and Hertford Counties are predicted to be under capacity in both the 2040 Build (Tolls) and 2040 No Build scenarios. However, Hertford County staff noted that, from a local employer’s perspective, the primary roads in the county are at capacity and additional traffic caused by the I-95 project could cause a strain.

Figure 4-12 Long-Term Impact Analysis Map for Bertie and Hertford Counties



There are no intersections that meet the thresholds for concern in Bertie or Hertford Counties. No mitigation measures are proposed.

Greene, Lenoir and Wayne Counties

Through Greene and Lenoir Counties, a slight increase in traffic volumes is expected along U.S. 258 in the 2040 Build (Tolls) scenario compared with the 2040 No Build scenario. All roads studied in Greene and Lenoir Counties are predicted to be under capacity in both the 2040 Build (Tolls) and 2040 No Build scenarios. Several freeway-to-freeway ramps in Wayne County are projected to have a v/c ratio of 0.8 to 1.2, but the volumes will be similar in both future scenarios.

Greene County staff felt that additional traffic would be beneficial for businesses and local sales tax revenue, but may worsen delays. Several sections of U.S. 258

Table 4-11 Long-Term Impact Analysis Results for Greene, Lenoir, and Wayne Counties

Intersection	Traffic Signal	2040 No Build LOS (Delay in Seconds)	2040 Build (Tolls) LOS (Delay in Seconds)	Queue Exceeds Available Storage	Potential Mitigation Strategies
Greene County					
U.S. 13/NC 58	No	SB – F (523.3)	SB – F (667.1)	Yes	Signalize, turn lanes
U.S. 13/U.S. 258 (northern intersection)	No	WB – F (306.4)	WB – F (564.5)	Yes	Signalize, turn lanes
U.S. 13-U.S. 258/NC 903	No	WB – F (648.7)	WB – F (945.9)	Yes	Signalize, turn lanes
U.S. 13-U.S. 258/NC 123	No	EB – F (442.0) WB – F (89.6)	EB – F (847.4) WB – F (210.5)	No	Signalize
Wayne County					
U.S. 117/NC 581	Yes	F (302.2)	F (362.0)	Yes	Turn lanes
U.S. 117/U.S. 117 Alt	No	EB – F (Err) ^a WB – F (Err) ^a	EB – F (Err) ^a WB – F (Err) ^a	Yes	Signalize, turn lanes
U.S. 117/U.S. 13	Yes	F (464.2)	F (505.8)	Yes	Turn lanes
U.S. 70/NC 111 EB	Yes	F (252.6)	F (616.0)	Yes	Turn lanes
U.S. 70/NC 111 WB	Yes	F (232.6)	F (365.4)	Yes	Turn lanes

^a Synchro does not report delays for unsignalized movements where the v/c ratio at the intersection is greater than 3.0. The v/c for intersections is calculated using different parameters than the v/c for roadway segments.

When traffic volumes meet warrants, it is recommended that several intersections be studied for signalization. In addition, adding or extending turn lanes would improve the operation of the intersections where queues are predicted to exceed available storage bays.

The U.S. 117/NC 581 intersection is large with multiple left-turn and right-turn lanes. While it may not be reasonable or feasible to construct additional turn lanes at these locations, it may be beneficial to lengthen the existing turn lanes. The intersections of U.S. 13/U.S. 258 and U.S. 70/NC 111 have existing turn lanes, but could likely accommodate either extension of those turn lanes or the addition of new turn lanes.

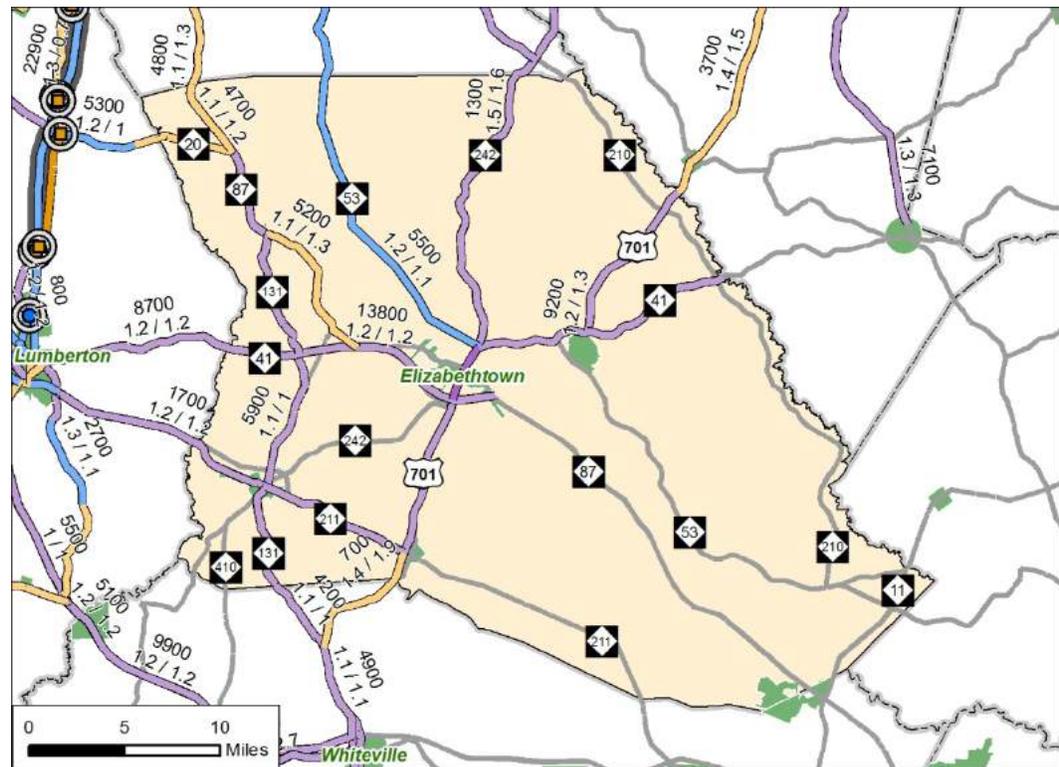
4.5 COUNTIES SOUTHEAST OF I-95

Bladen County

A slight increase in traffic volumes is expected along NC 87 in the 2040 Build (Tolls) scenario compared with the 2040 No Build scenario. A slight decrease in traffic volumes are expected on NC 53 in the 2040 Build (Tolls) scenario

compared with the 2040 No Build scenario. A short segment of U.S. 701 through Elizabethtown is projected to have a v/c ratio of 1.1 in both future scenarios.

Figure 4-14 Long-Term Impact Analysis Map for Bladen County

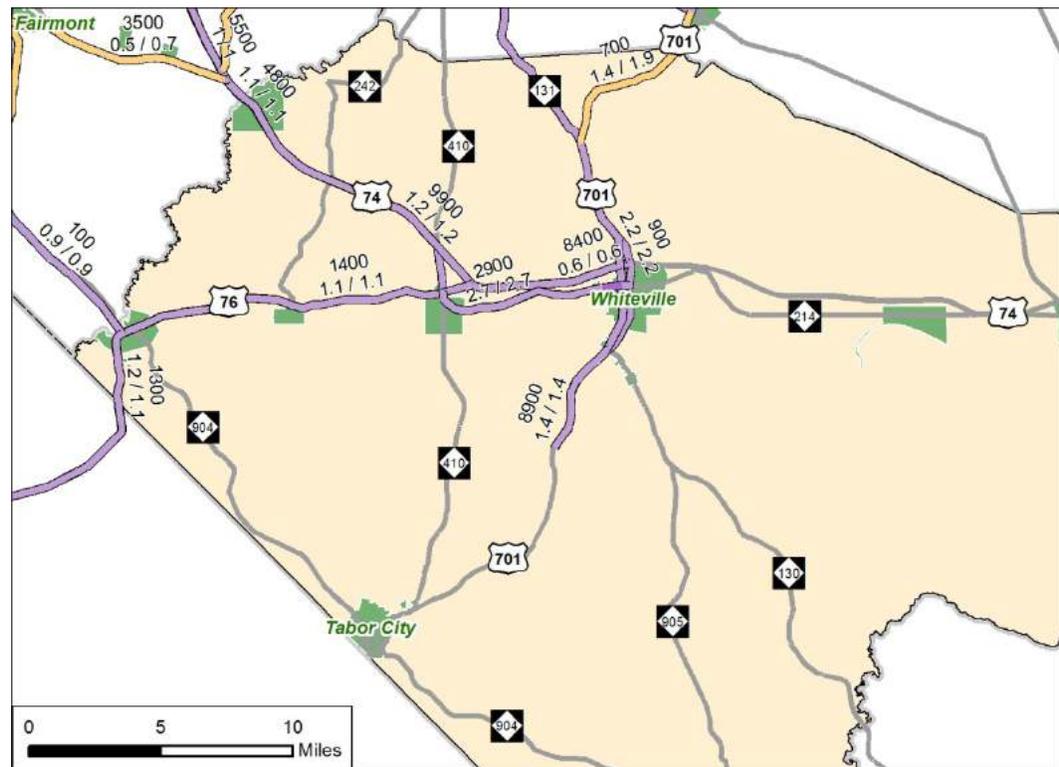


There are no intersections that meet the thresholds of concern in Bladen County. However, county staff noted that the intersection of NC 131/NC 87 backs up occasionally and may need to be improved as traffic volumes increase. Also, the northern intersection of NC 131/NC 410 has a tight turning radius in the north quadrant.

Columbus County

An increase in traffic volumes is expected along NC 87 in the 2040 Build (Tolls) scenario compared with the 2040 No Build scenario. County staff noted that some businesses would benefit from additional traffic volumes, but others in the county are concerned about congestion and environmental impacts. A short segment of U.S. 74 through Whiteville is projected to have a v/c ratio of 1.0 in both future scenarios.

Figure 4-15 Long-Term Impact Analysis Map for Columbus County



There are no intersections that meet the thresholds of concern in Columbus County, and no mitigation measures are proposed.

Duplin and Sampson Counties

The most notable change in traffic volumes through Sampson County is on U.S. 13 west of I-40, which has a projected growth factor 2.1 in the 2040 Build (Tolls) scenario compared with a growth factor of 1.2 in the 2040 No Build scenario. Slight increases also are predicted on U.S. 701 and NC 403. Generally, more traffic is welcome through Duplin and Sampson Counties, especially on U.S. 13 and U.S. 701. County staff mentioned that U.S. 701 needs improvements in a few sections.

All roads studied in Duplin County are predicted to be under capacity in both the 2040 Build (Tolls) and 2040 No Build scenarios. A short segment of NC 24 through Clinton is projected to have a v/c ratio of 0.9 in both future scenarios.

Table 4-12 Long-Term Impact Analysis Results for Duplin and Sampson Counties

Intersection	Traffic Signal	2040 No Build LOS (Delay in Seconds)	2040 Build (Tolls) LOS (Delay in Seconds)	Queue Exceeds Available Storage	Potential Mitigation Strategies
Duplin County					
U.S. 117/U.S. 117Alt	No	WB – F (672.8)	WB – F (862.7)	Yes	Signalize, turn lanes
Sampson County					
NC 403/NC 403 (Faison Highway)	No	WB – F (113.8)	WB – F (159.2)	No	Signalize
U.S. 701/U.S. 701 Bus	No	EB – F (210.9)	EB – F (227.0)	No	Signalize
NC 403/U.S. 701 Bus	Yes	F (655.0)	F (1,388.1)	Yes	Turn lanes
U.S. 701/NC 411	No	EB – E (48.3) WB – F (79.7)	EB – F (65.2) WB – F (112.5)	No	Turn lanes
U.S. 701/U.S. 13-NC 50-55	Round-about	v/c = 0.70 ^a	v/c = 2.00 ^a	No	Realign

^a Roundabouts were analyzed with Sidra software, which provides a v/c ratio rather than a LOS.

When traffic volumes meet warrants, it is recommended that several intersections be studied for signalization. In addition, adding or extending turn lanes would improve the operation of the intersections where queues are predicted to exceed available storage bays.

The intersection of U.S. 701/U.S. 13-NC 50-55 is a six-legged roundabout. County staff expressed concerns about this intersection, and the traffic analysis indicates that it will operate at an unacceptable level of service in the 2040 Build (Tolls) scenario. As traffic volumes increase, a reconfiguration may be necessary for this intersection to operate safely and efficiently.

County staff said that the intersection of U.S. 13/U.S. 421 has historically had crashes and suggested that it be evaluated if traffic volumes increase.

4.6 COUNTIES NORTHWEST OF I-95

Franklin, Vance, and Warren Counties

In Franklin and Vance Counties, County staff agreed that U.S. 1 is likely to be used by traffic avoiding tolls on I-95. Diverted trips will probably be at least 150 miles long (between Richmond and Wake County), since most diversion trips through this area would use I-85 to/from Virginia. Additional traffic on U.S. 1 is expected to be beneficial to businesses, have little impact on communities, but create additional congestion for commuters.

The travel demand model did not project a notable change in traffic volumes on roads in Warren County, which is consistent with input from county staff. All roads studied in Vance, and Warren Counties are predicted to be under capacity in both the 2040 Build (Tolls) and 2040 No Build scenarios. A small segment of U.S. 401 in Louisburg is projected to have a v/c ratio of 0.8 in both future scenarios.

Figure 4-17 Long-Term Impact Analysis Map for Franklin, Vance, and Warren Counties



Two intersections in Franklin County and three intersections in Vance County meet the thresholds for intersections of concern. Four of these intersections also are expected to have queuing issues. There are no intersections that meet the thresholds for concern in Warren County. Analysis results for the intersections of concern in Franklin and Vance Counties are summarized in Table 4-13.

Table 4-13 Long-Term Impact Analysis Results for Franklin, Vance, and Warren Counties

Intersection (Inset Name, if Applicable)	Traffic Signal	2040 No Build LOS (Delay in Seconds)	2040 Build (Tolls) LOS (Delay in Seconds)	Queue Exceeds Available Storage	Potential Mitigation Strategies
Franklin County					
U.S. 1 SB/NC 56	No	SB – F (128.7)	SB – F (Err) ^a	Yes	Signalize, turn lanes
U.S. 1 NB/NC 56	No	NB – F (581.8)	NB – F (Err) ^a	Yes	Signalize, turn lanes
Vance County					
U.S. 1 NB/NC 39	No	NB – F (Err) ^a	NB – F (Err) ^a	Yes	Signalize, turn lanes
U.S. 1 SB/NC 39	No	SB – F (Err) ^a	SB – F (Err) ^a	Yes	Signalize, turn lanes
U.S. 1/U.S. 1 Bus	No	WB – C (24.8)	WB – F (54.0)	No	Signalize

^a Synchro does not report delays for unsignalized movements where the v/c ratio at the intersection is greater than 3.0. The v/c for intersections is calculated using different parameters than the v/c for roadway segments.

When traffic volumes meet warrants, it is recommended that several intersections be studied for signalization. In addition, adding or extending turn lanes would improve the operation of the intersections where queues are predicted to exceed available storage bays.

The intersection of U.S. 1/NC 96 was noted by county staff as having safety concerns. As traffic volumes increase through that intersection, additional review is recommended. County staff also noted several other locations along U.S. 1 that have safety concerns or need improvement.

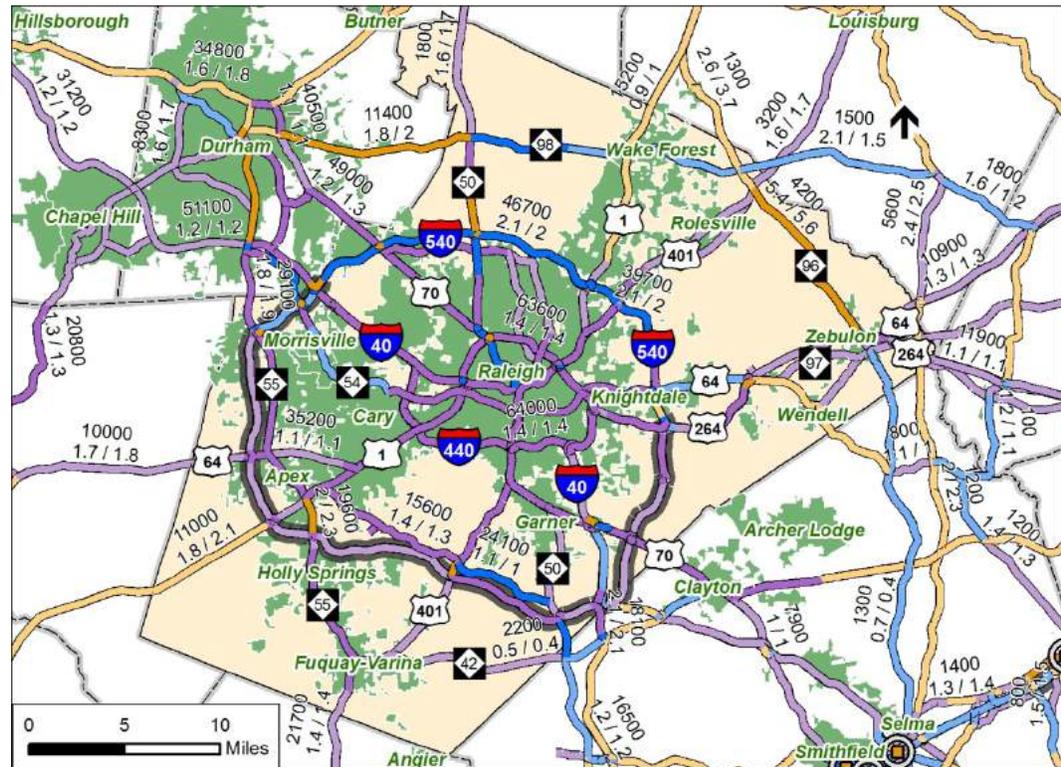
Wake County

Most of the roads studied in Wake County are projected to have a v/c ratio of 0.8 to 1.0. Some of these—such as I-540, U.S. 70 in downtown Raleigh, and I-98 east of NC 50—are expected to have less traffic in the 2040 Build (Tolls) scenario than in the 2040 No Build scenario. Others, such as NC 98 west of NC 50 and NC 96, are expected to have more traffic in the 2040 Build (Tolls) scenario than in the 2040 No Build scenario. Most roads in Wake County, however, are projected to have similar traffic volumes in the two future scenarios.

U.S. 1 south of Raleigh is projected to have a v/c ratio of 1.3 to 1.4 in both future scenarios. I-440 around southeast Raleigh is projected to have a v/c ratio of 1.4 in both future scenarios.

Wake County staff anticipates a neutral effect in Wake County. Most of the roads are at or past capacity and feature many businesses tailored to through traffic (such as gas stations and fast food restaurants).

Figure 4-18 Long-Term Impact Analysis Map for Wake County



Three intersections in Wake County meet the thresholds for intersections of concern. All three also are expected to have queuing issues. Analysis results for the intersections of concern in Wake County are summarized in Table 4-14.

Table 4-14 Long-Term Impact Analysis Results for Wake County

Intersection (Inset Name, if Applicable)	Traffic Signal	2040 No Build LOS (Delay in Seconds)	2040 Build (Tolls) LOS (Delay in Seconds)	Queue Exceeds Available Storage	Potential Mitigation Strategies
U.S. 1/U.S. 1 Alt	Yes	F (238.8)	F (289.2)	Yes	Turn lanes
U.S. 1/I-540 EB	Yes	F (516.9)	F (770.2)	Yes	Turn lanes
U.S. 401/NC 42-55	No	WB – F (Err) ^a	WB – F (Err) ^a	Yes	Signalize, turn lanes

^a Synchro does not report delays for unsignalized movements where the v/c ratio at the intersection is greater than 3.0. The v/c for intersections is calculated using different parameters than the v/c for roadway segments.

When traffic volumes meet warrants, it is recommended that the U.S. 401/ NC 42-55 intersection be studied for signalization. In addition, adding or extending turn lanes would improve the operation of the intersections where queues are predicted to exceed available storage bays.

The large U.S. 1/U.S. 1 Alt intersection includes multiple left-turn and right-turn lanes. While it may be beneficial to lengthen the existing turn lanes, it may not be reasonable or feasible to construct additional turn lanes at this location. The intersections of U.S. 1/I-540 EB and U.S. 401/NC 42-55 have existing turn lanes, but could likely accommodate either extension of those turn lanes or the addition of new turn lanes.

4.7 COUNTIES SOUTHWEST OF I-95

Chatham and Lee Counties

In Chatham and Lee Counties, U.S. 1 is the only road expected to have a notable change in traffic volumes between the 2040 Build (Tolls) scenario and the 2040 No Build scenario (growth factor of 2.1 versus 1.8). U.S. 1 provides truck access to several heavily industrial plants and a quarry. Through this area, U.S. 1 is four lanes controlled access; therefore, an increase in traffic volumes will not affect adjacent small towns. County staff did not have any concerns about the impact of additional traffic on U.S. 1.

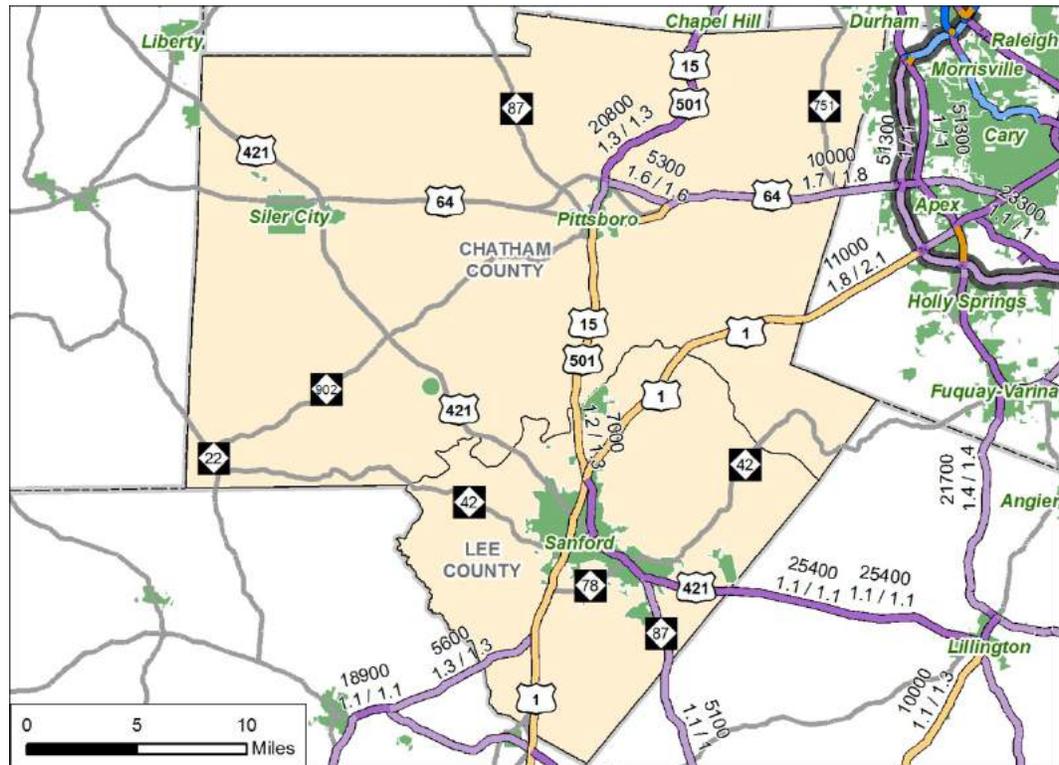
U.S. 15-501 north of Pittsboro is projected to have a v/c ratio of 1.1 in both future scenarios. U.S. 421 east of Sanford is projected to have a v/c ratio of 0.8 to 1.4 in both future scenarios; however, the travel demand model does not reflect the new U.S. 421 bypass northeast around Sanford, and so traffic volumes on U.S. 421 through the town are likely to be lower than shown.

There are no intersections that meet the thresholds of concern in Chatham and Lee Counties.

The intersection of U.S. 15-501/U.S. 64 in Pittsboro is a roundabout, which may become a concern if traffic volumes increase through that location.

U.S. 1/NC 78 is currently a four-legged signalized intersection. A developer is building a property called “Tramway” that will include roadway improvements along U.S. 401. NCDOT is considering a superstreet section that would replace the existing eight-phase traffic signal with three two-phase signals along the property’s frontage.

Figure 4-19 Long-Term Impact Analysis Map for Chatham and Lee Counties



Hoke, Richmond, and Scotland Counties

In Hoke County, the travel demand model predicted a slight increase in traffic volumes along U.S. 401 and NC 211 in the 2040 Build (Tolls) scenario compared with the 2040 No Build scenario. This finding is consistent with input from county staff, who identified U.S. 401 as the primary route commuters and military vehicles use to access Ft. Bragg. Population and retail growth along U.S. 401 between Raeford and Ft. Bragg is anticipated to be high. Travel on the corridor is frequently delayed now because of driveways and slow moving vehicles, and additional congestion in the future will likely discourage diversion traffic.

U.S. 1 north of Rockingham through Richmond County is expected to have a growth factor of up to 2.7 in the 2040 Build (Tolls) scenario and a growth factor of 1.6 in the 2040 No Build scenario. U.S. 1 is used heavily by trucks, many of which take NC 177 through Hamlet to avoid a difficult turn in Rockingham. The NC Motor Speedway and Dragstrip is a major sports complex at the U.S. 1/ NC 117 interchange. County staff is concerned about additional traffic on U.S. 1 and noted two constraints - U.S. 1 north of Rockingham is controlled by a police officer in peak periods because the City has chosen not to install traffic signals, and a 3-mile segment between Rockingham and Raleigh is posted at 45 mph (as requested by local officials).

Table 4-15 Long-Term Impact Analysis Results for Hoke, Richmond, and Scotland Counties

Intersection	Traffic Signal	2040 No Build LOS (delay in sec)	2040 Build (Tolls) LOS (delay in sec)	Queue Exceeds Available Storage	Potential Mitigation Strategies
Hoke County					
U.S. 401/U.S. 401 Bus	No	NB – F (Err) ^a	NB – F (Err) ^a	Yes	Signalize, turn lanes

^a Synchro does not report delays for unsignalized movements where the v/c ratio at the intersection is greater than 3.0. The v/c for intersections is calculated using different parameters than the v/c for roadway segments.

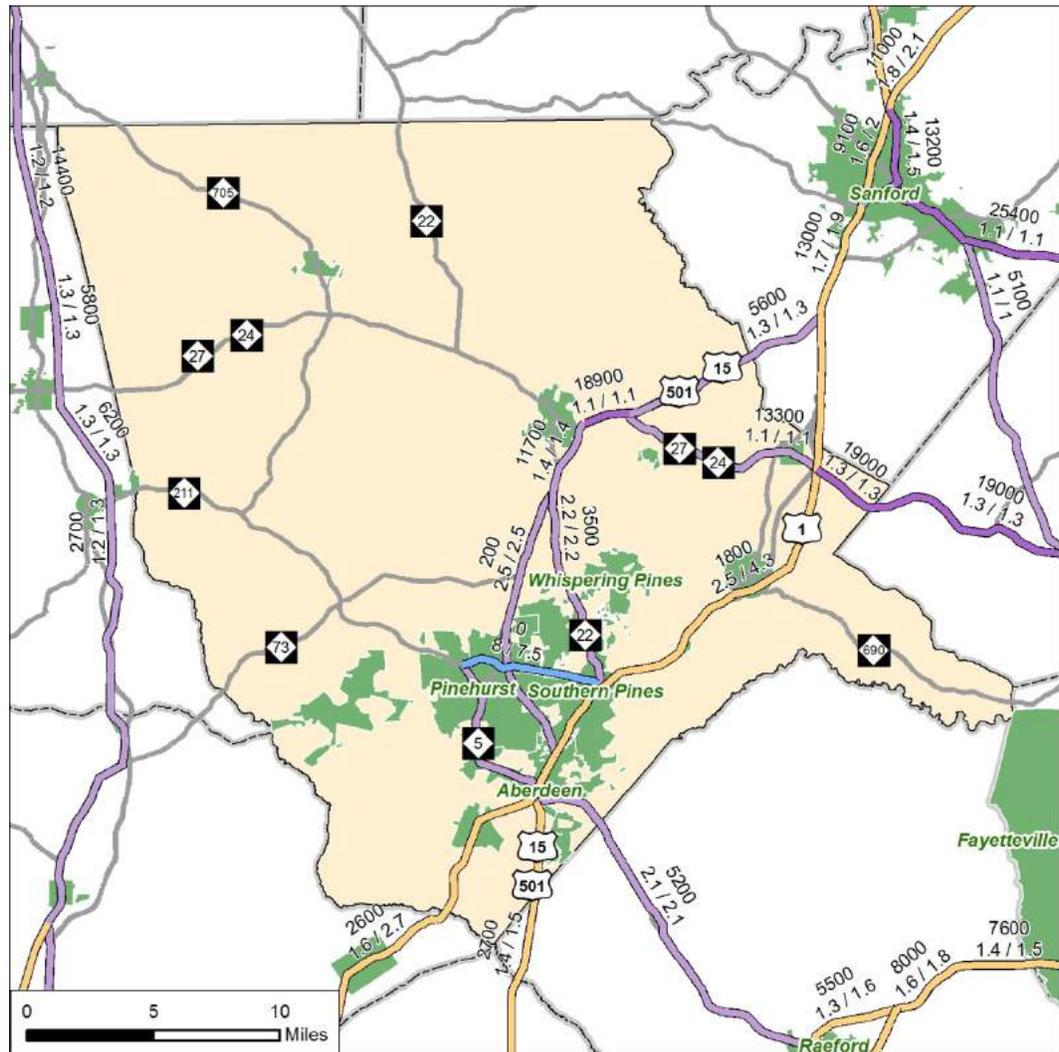
When traffic volumes meet warrants, it is recommended that the U.S. 401/U.S. 401 Business intersection around Raeford be studied for signalization. In addition, adding or extending turn lanes would improve the operation of the intersection where queues are predicted to exceed available storage bays.

Moore County

U.S. 1 through Moore County is projected to carry more traffic in the 2040 Build (Tolls) scenario than in the 2040 No Build scenario. While it was identified as a potential detour, county staff thought the likelihood of diversion to U.S. 1 was low because of the additional length of the route. U.S. 1 goes through several small towns and narrows to two lanes south of Moore County. Businesses along the corridor are likely to see the additional traffic as a benefit, although it might result in U.S. 1 needing to be widened sooner than expected. County staff identified several sections of U.S. 1 that need improvement, and NCDOT is currently studying widening U.S. 1 through this area.

NC 27-24 east of U.S. 1 is projected to have a v/c ratio of 1.0 in both future scenarios. A short segment of U.S. 15-501 west of NC 27-24 is projected to have a v/c ratio of 0.9 in both future scenarios.

Figure 4-21 Long-Term Impact Analysis Map for Moore County



There are no intersections that meet the thresholds of concern in Moore County, and no mitigation measures are proposed.

5.0 Construction-Year Impact Analysis Results

Cumberland County

U.S. 301 serves as I-95 Business through central Cumberland County, and is expected to have a v/c ratio nearing or over capacity in 2040. Traffic on I-95 is likely to divert to U.S. 301 because there are several interchanges of the two roads through the county. To reduce traffic volumes during construction, a potential mitigation is to educate regional drivers of other potential diversion routes, such as U.S. 401 or NC 210 between Raleigh and Fayetteville.

Halifax County

In Halifax County, traffic is likely to use U.S. 301 as a detour while I-95 is under construction. U.S. 301 is a parallel route that is accessible 2.5 miles from I-95 in Weldon and five miles from I-95 south of Enfield. A large increase in traffic on U.S. 301 through this area is a concern because of the density of driveways and the relatively high number of elderly drivers that live in Halifax County.

One potential mitigation measure is to direct drivers to NC 48 and NC 4 during construction, which is a parallel route to the west that is the same distance between Weldon and Enfield as U.S. 301. Both routes are two lane undivided, and U.S. 301 currently carries more traffic than NC 48/NC 4. Local traffic is likely to continue to use U.S. 301 because it provides access to the more populated areas of the county. South of Enfield in Nash County, U.S. 301 widens to four lane divided, and can more easily carry diverted traffic during construction.

Harnett County

U.S. 301 is parallel to I-95 through Harnett County. It traverses several small towns, and is expected to have a v/c ratio nearing or above capacity in 2040. Of particular concerns is congestion in Dunn, which has some areas that are difficult for trucks to maneuver. Additional traffic on U.S. 301 during construction would impact local drivers and residents of these small towns.

U.S. 401, NC 55, and NC 210 also parallel I-95, although they are not easy to access directly from I-95 in Harnett County. During construction, a potential mitigation is to use signage on I-95 further to the north, directing through drivers to these alternate routes in order to disperse the traffic onto multiple routes.

Johnston County

U.S. 301 is the only route likely to be used as a detour during construction through Johnston County. In this area, U.S. 301 traverses several small towns with lower speed limits, frequent driveways, and traffic signals. Diverting traffic to U.S. 301 during construction would have a negative effect on local drivers and would provide a slow route for through drivers.

Additional signage informing drivers of potential diversion routes to their destination would be beneficial in this area. For example, drivers going through Johnston County could also use U.S. 701 or NC 96 to south I-40; NC 210 or U.S. 70 to north I-40; and NC 222 to Raleigh. Providing information to drivers notifying them of the many potential detour routes through this area will decrease the level of traffic using U.S. 301 during construction.

Nash County

U.S. 301 through most of Nash County is four lanes with a grassy median and few driveways. Although there are sections that are projected to have a v/c ratio nearing or at capacity in 2040, the road is expected to be able to accommodate additional traffic during construction.

Northampton County

Two routes parallel I-95 in Northampton County. U.S. 301 to the east traverses Garysburg and is adjacent to Roanoke Rapids. NC 48 to the west is a two-lane undivided street that traverses residential neighborhoods through much of Roanoke Rapids, and is not appropriate for diversion traffic. Drivers on I-95 should be directed to use U.S. 301 through Northampton County.

Robeson County

The travel demand model predicts that a high level of traffic will divert from I-95 in the 2040 Build (Tolls) scenario because of the availability of “short-cut” routes to the west. Some of these routes also may be used during construction. Although all of these routes—including NC 710, NC 72, and NC 211—are projected to operate under capacity, a large change in traffic volumes may feel like an impact to the local communities. A potential mitigation during construction is to use signage to divert traffic from I-95 to NC 71 on the north and U.S. 501 on the south, and then provide information about multiple routes back to I-95 or other destinations. This will disperse the traffic onto multiple routes to reduce impacts on any particular road.

Wilson County

County staff has expressed a desire for additional traffic on U.S. 301 through Wilson County. During construction, it is recommended that I-95 traffic be diverted onto U.S. 301 from Whitakers or Rocky Mount in Nash County to the interchange of I-95/U.S. 301 south of Wilson in Wilson County.

A. County Interview Names

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	Patsy Carson	Town of Erwin Mayor		
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North Carolina I-95 Economic Assessment Study
 Task 4: Traffic and Community Impact Study

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B. Synchro Forms