

**ADMINISTRATIVE ACTION**

**WILMINGTON BYPASS  
US 17 TO US 421  
BRUNSWICK & NEW HANOVER COUNTIES, NORTH CAROLINA**

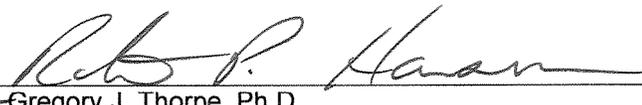
**FEDERAL AID PROJECT NO: STPNHF-17 (1)  
STATE PROJECT NO: 34491.1.2  
TIP NO: R-2633A/B**

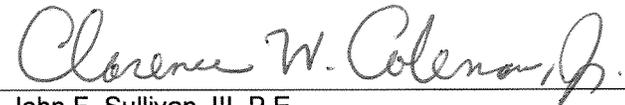
**FINAL ENVIRONMENTAL IMPACT STATEMENT  
VOLUME 1 OF 2**

**U.S. Department of Transportation  
Federal Highway Administration  
And  
North Carolina Department of Transportation**

Submitted Pursuant to the National Environmental Policy Act 42 U.S.C. 4332(2)(c)

Cooperating Agencies:  
U.S. Coast Guard  
U.S. Army Corps of Engineers

*4/5/07*  
Date of Approval *for*   
Gregory J. Thorpe, Ph.D.  
Manager  
Project Development and Environmental Analysis Branch  
North Carolina Department of Transportation

*4/17/07*  
Date of Approval *for*   
John F. Sullivan, III, P.E.  
Division Administrator  
Federal Highway Administration

The following persons may be contacted for additional information concerning this document:

John F. Sullivan, III, P.E.  
Federal Highway Administration  
310 New Bern Avenue, Suite 410  
Raleigh, NC 27601-1418  
(919) 856-4346 ext. 122

Gregory J. Thorpe, Ph.D.  
North Carolina Department of Transportation  
1548 Mail Service Center  
Raleigh, NC 27699-1548  
(919) 733-3141

The documented needs for the transportation project in Brunswick and New Hanover counties are presented in the report. The existing conditions of the study area are described and the alternatives are assessed in terms of environmental impacts, compatibility with local planning goals, relative cost-effectiveness and public opinion.



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**VOLUME 1 OF 2**

**April 2007**

Prepared by:  
**URS Corporation – North Carolina**

4/5/07  
Date \_\_\_\_\_  
Jeffrey C. Weisner, AICP  
Project Manager

4/5/07  
Date \_\_\_\_\_  
Peter N. Trencansky, P.E.  
Project Engineer



For the:  
**North Carolina Department of Transportation**

4/5/07  
Date \_\_\_\_\_  
Derrick Weaver, P.E.  
Consultant Engineering Unit Head

4/5/07  
Date \_\_\_\_\_  
Vincent J. Rhea, P.E.  
Project Manager

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# Project Environmental Commitments

## WILMINGTON BYPASS

FROM US 17 IN BRUNSWICK COUNTY, NC TO US 421 IN NEW HANOVER COUNTY, NC

FEDERAL AID PROJECT No: STP-17 (1)

STATE PROJECT No: 8.U250901

TIP No. R-2633A/B

In addition to the Section 404 Conditions, Regional Conditions, State Consistency, North Carolina Department of Transportation's (NCDOT) Guidance for Best Management Practices for the Protection of Surface Waters, General Certification Conditions, and Section 401 Conditions of Certification, State Stormwater Permit, NCDOT has agreed to the following special commitments:

### ***PROJECT DEVELOPMENT AND ENVIRONMENTAL ANALYSIS BRANCH***

**Study proposed noise barrier at the southwest quadrant of the interchange at SR 1430 (Cedar Hill Road).** This issue shall be presented for review and comment at the Design Public Hearing to receive input from the residents affected. A decision on whether or not to construct a noise barrier or to implement other noise abatement measures, if any, will be made after the public comment period expires.

### ***ROADWAY DESIGN UNIT / STRUCTURE DESIGN UNIT / GEOTECHNICAL ENGINEERING UNIT / ROADSIDE ENVIRONMENTAL UNIT***

**1) Wetlands on the periphery of the Cape Fear River will be bridged to minimize impacts.** USCOE gave concurrence that Alternative 9 represented the Preferred Alternative in March of 1998 on the condition that the Cape Fear River floodplain wetlands be bridged. NCDOT intends to bridge the wetland zones on both banks of the river. Fill slopes will not encroach into the jurisdictional wetland boundaries. The bridge(s) will be constructed such that wetland impacts are minimized and construction practices that minimize impacts to populations of shortnose sturgeon known to utilize the river during spawning season (February to June) will be implemented. In order to protect shortnose sturgeon and other anadromous fish, there shall be no in-water work in the Cape Fear River and Toomers Creek between February 1 and June 15 of any year. For the purposes of this moratorium, in-water is defined as the main channel where the vegetation line meets open water and extending 35 meters (115 feet) into adjacent wetlands on both sides of the channel'.

This condition was developed specifically for this project in coordination with the National Marine Fisheries Service (NMFS), the North Carolina Division of Marine Fishes (NCDMF), and the North Carolina Wildlife Resources Commission (NCWRC). The 35-meter (115-foot) buffer from where the vegetation line meets the open water includes wetlands only and not upland areas. Construction equipment will be allowed to traverse the temporary work bridges during the moratorium period.

**2) Fill slopes within the Natural Heritage Program (NHP) US 421 Sand Ridge Significant Natural Heritage Area (SNHA) located east of the Cape Fear River will be minimized to the greatest extent possible so that impacts to populations of**

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**Pickering's dawnflower (*Stylisma pickeringii* var. *pickeringii*) will be avoided and minimized.** Construction easements within the US 421 Sand Ridge SNHA will be limited to greatest extent practicable. Several populations of this floral species, which is listed as a Federal Species of Concern and is state-listed as endangered, are present within and along the right of way. Minimizing slope and construction easement footprints and temporary protective fencing will be installed during construction on the south side of the project construction limits from station 208+40 to station 211+00 and from station 212+00 to station 213+00 to ensure that no inadvertent impacts occur outside the limits of the construction easement. Coordination with NHP shall continue well in advance of project construction regarding protection of this species, as NHP may want to relocate populations of this species that would be impacted by the project.

**3) Provide temporary protective fencing between project construction area and archaeological site 31NH39\*\*.** As currently designed, the proposed highway plans do not directly impact sites 31NH39\*\* and 31BW604. However, because the sites are close to the edge of the proposed highway corridor, temporary protective fencing will be installed during construction on the south side of the project construction limits from station 208+40 to station 211+00 and on the west side of the project construction limits from station 13+75 to station 15+50 to ensure that no inadvertent impacts occur. If the final highway design changes such that avoidance is not possible and if the effect of this alternative on these sites is adverse, pursuant to 36CFR800.5, then appropriate measures to address these adverse effects will be developed.

**4) Wildlife passages will be provided at locations agreed to by federal and state resource agencies and the dimensions of each passage shall be constructed as specified on the preliminary design plans. Wildlife passages will be provided at three locations on the mainline: one (a box culvert designed for small animal passage) will be located within a wetland between US 74/76 and SR 1426 and two bridge structures will located between SR 1414 and US 74/76. Additional wildlife passage will be accommodated by lengthening bridge structures over stream and wetland areas as indicated on the preliminary design plans.** Bridge structures and fill slopes will be placed outside jurisdictional wetland boundaries such that sufficient ground-to-structure clearance and dry passage is provided for large-bodied wildlife. The crossing areas under the bridge structures will provide a minimum of eight feet of vertical clearance. The horizontal width is specific to each crossing and is identified on the preliminary design plans. The box culvert crossing will have a vertical clearance of 6 feet and a horizontal clearance of 12 feet. Fencing will be installed for a distance of approximately 2,500 feet on either side of any of the proposed crossings and will be of sufficient height to guide wildlife into the passageways. The final distance and height of the fence shall be determined during final design through coordination between NCDOT, US Fish and Wildlife Service, and the NC Division of Wildlife Resource Conservation. Locations of wildlife crossings and bridge lengths (toe of slope limits at abutments) were determined using a global positioning system (GPS) and through agency coordination.

**4) Revise Phase I Environmental Site Assessment.** For all sites identified within the corridor ranked low for severity of potential impact, the data accumulated for the initial Phase I Assessment will be revisited prior to project right-of-way acquisition and construction and an updated review of agency files and public records will be conducted to determine if there has been any substantial change in the status since the report was prepared. For those sites ranked with a moderate to high expected severity of impact, a further review of records will be conducted to determine the status of any contamination

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assessments or remedial actions taking place at those sites. Phase II Site Assessments, including, at a minimum, soil and water sampling, will be conducted as necessary.

**6) Provide evergreen vegetation along National Register-eligible boundary of the Goodman House and Doctor's Office.** Native evergreen vegetation will be planted at the edge of the project right-of-way from station 34 + 50 to station 36 + 00 on the preliminary design plans between the roadway and the Goodman House and Doctor's Office. Best planning practices will be used for tree removal to reduce impacts to the woods adjacent to the Goodman House and Doctor's Office.

### ***DIVISION 3***

**1) Implement moratorium on construction of the Bridge over the Cape Fear and Toomers Creek from February 1 to June 15.** A construction moratorium shall be imposed as follows:

In order to protect shortnose sturgeon and other anadromous fish, there shall be no in-water work in the Cape Fear River and Toomer's Creek between February 1 and June 15 of any year. For the purposes of this moratorium, in-water is defined as the main channel where the vegetation line meets open water and extending 35 meters (115 feet) into adjacent wetlands on both sides of the channel. This condition was developed specifically for this project in coordination with the National Marine Fisheries Service, NC Division of Marine Fisheries and the NC Wildlife Resources Commission and applies to either vibratory or impact pile driving.

The 35-meter (115-foot) buffer from where the vegetation line meets the open water includes wetlands only and not upland areas.

**2) Procedures for construction of bridges over wetlands will utilize temporary work bridges to minimize impacts to wetlands.** Temporary work bridges will be required to construct the project's bridges over wetland areas at tributaries to Morgan's Branch, Cartwheel Branch, and Cape Fear River/ Toomers Creek). It is anticipated that both single and dual work bridges will be constructed. Finger bridges will be constructed at bent locations. Preliminary work bridge plans, including pile construction information, will be prepared before Concurrence Points 4B and 4C can be achieved. Construction within the main channel of the Cape Fear River may be accomplished using a barge. NCDOT has identified a wetland fill area on the west bank of the Cape Fear River adjacent to the proposed bridge location. This area appears to be an old roadbed leading to the remains of a pier on the river, south of the proposed alignment. NCDOT will consider using this as a temporary work bridge/construction easement for construction of the proposed bridge and the post construction removal of this fill area as a potential mitigation measure.

**3) Fill slopes within the Natural Heritage Program (NHP) US 421 Sand Ridge Significant Natural Heritage Area (SNHA) located east of the Cape Fear River will be minimized to the greatest extent possible so that impacts to populations of**

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**Pickering's dawnflower (*Stylisma pickeringii* var. *pickeringii*) will be avoided and minimized.** See Number 2) under Roadway Design Unit

**4) Provide temporary protective fencing between project construction area and archaeological site 31NH39\*\*.** See Number 3) under Roadway Design Unit.

**5) The Project Engineer or contractor will inform all personnel associated with the project construction that manatees may be present in the project area during the months of June through October.** The Project Engineer will ensure that the Contractor has a copy of the US Fish and Wildlife Service *Guidelines for Avoiding Impacts to the West Indian Manatee - Precautionary Measures for Construction Activities in North Carolina Waters* on-site during construction. A copy of the Guidelines can be found in the Appendix of the Final EIS or at the following website address (<http://nc-es.fws.gov/es/publications.html>). The contractor is responsible for complying with the *Guidelines* and reviewing them with all personnel associated with the project construction.

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## **SUMMARY**



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## SUMMARY

### S.1 FEDERAL HIGHWAY ADMINISTRATION

Administrative Action: Final Environmental Impact Statement

Since the Draft Environment Impacts Statement (DEIS) for R-2633A/B (proposed action) was released on December 24, 1996, the North Carolina Department of Transportation in cooperation with the Federal Highway Administration has conducted a Reevaluation of the DEIS, February 2007, in accordance 23 CFR Part 771 Section 771.129. The regulation states:

(a) A written evaluation of the draft EIS shall be prepared by the applicant in cooperation with the Administration if an acceptable final EIS is not submitted to the Administration within 3 years from the date of the draft EIS circulation. The purpose of this evaluation is to determine whether a supplement to the draft EIS or a new draft EIS is needed.

(b) A written evaluation of the final EIS will be required before further approvals may be granted if major steps to advance the action (e.g., authority to undertake final design, authority to acquire a significant portion of the right-of-way, or approval of the plans, specifications and estimates) have not occurred within three years after the approval of the final EIS, final EIS supplement, or the last major Administration approval or grant.

(c) After approval of the EIS, FONSI, or CE designation, the applicant shall consult with the Administration prior to requesting any major approvals or grants to establish whether or not the approved environmental document or CE designation remains valid for the requested Administration action. These consultations will be documented when determined necessary by the Administration.

[52 FR 32660, Aug. 28, 1987; 53 FR 11066, Apr. 5, 1988]

According to the regulations implementing the National Environmental Policy Act in 40 CFR Part 1502.9(c)(1). Agencies shall prepare supplements to either draft or final environmental impact statements if:

(i) The agency make substantial changes in the proposed action that are relevant to environmental concerns; or

(ii) There are significant new circumstances or information relevant to environmental concerns and bearing on the proposed action or impacts.

The reevaluation of the DEIS concluded that no substantial changes in the proposed action or significant new circumstances relevant to environmental concerns and bearing on the proposed action have occurred since approval of the DEIS, and that a supplemental draft environmental impacts statement is not required. The Reevaluation was approved February 2007 and is on file with the Federal Highway Administration.

### S.2 CONTACTS

The following individuals may be contacted for additional information regarding the Final Environmental Impact Statement:

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Federal Highway Administration

Mr. John F. Sullivan, III, PE  
Division Administrator  
Federal Highway Administration  
310 New Bern Avenue, Suite 410  
Raleigh, North Carolina 27601  
Telephone: (919) 856-4346

North Carolina Department of Transportation

Mr. Gregory J. Thorpe, PhD  
Environmental Management Director  
Project Development and Environmental Analysis Branch  
North Carolina Department of Transportation  
1548 Mail Service Center  
Raleigh, North Carolina 27699-1548  
Telephone: (919) 733-3141

### **S.3 PROPOSED ACTION**

The proposed action is the construction of a fully controlled access freeway on new alignment from US 17 in Brunswick County, north of the NC 87 intersection, to US 421 in New Hanover County (Figure S-2). The proposed action is designated as project number R-2633A/B in the North Carolina Department of Transportation (NCDOT) 2006-2012 Transportation Improvement Program (TIP) and is referred to as the 'the project' throughout this FEIS.

#### **S.3.1 DESCRIPTION OF THE PROPOSED ACTION**

The project is the continuation of an urban loop around Wilmington, North Carolina. Construction of the initial section of the urban loop, which extends from US 421 to Interstate 40 (I-40) (referred to as R-2633C in the TIP and in this FEIS) in New Hanover County, will be completed in 2006. The project and R-2633C together are referred to as the Wilmington Bypass. When completed, the Wilmington Bypass, coupled with a third project extending from I-40 to US 17 in New Hanover County (referred to as R-2405 in the TIP and this FEIS) will be designated as Interstate 140 (I-140).

The project would be a fully controlled access freeway with a design speed of 70 miles per hour (mph). Interchanges are proposed at US 17, US 74/76, SR 1426, SR 1430, and US 421. The US 17/NC 87 intersection would be relocated farther south on US 17 to provide safe spacing between the intersection and the US 17/Future I-140 interchange. The project includes bridges over stream crossings and a bridge over the Cape Fear River. Additionally, two bridges and a box culvert are provided for wildlife passage.

#### **S.3.2 NEED FOR THE PROPOSED ACTION**

The need for the proposed action is summarized as follows:

- **Improve traffic capacity deficiencies**

The project is needed to alleviate project capacity deficiencies in the design year. Traffic studies show the base year (2000) level of service (LOS) on the roadway segments studied range from free-flow conditions (LOS A) to full capacity (LOS E). Roadway segments on US 17

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that are at or approaching capacity include US 17 between NC 133 and US 421, which operates at LOS E with an average daily traffic (ADT) volume of 69,000 and US 17 between US 421 and the bridge over the Cape Fear River, which operates at LOS D with an ADT volume of 54,600. In the 2025 design year over half the roadway segments studied would operate at LOS D or worse. The segment of US 17 from NC 133 to the Cape Fear Memorial Bridge would operate at an unacceptable level of service (LOS F) with ADT volumes ranging from 86,200 to 131,100. The project will remove through traffic, reducing the number of vehicles on this section of US 17.

- **Increase mobility within the region**

The project is needed to improve the existing regional transportation system by providing a continuous freeway route for through traffic to bypass downtown Wilmington. The US 17 corridor is the state's major north-south route east of Interstate 95 (I-95) and serves the major coastal cities of Myrtle Beach and Charleston, South Carolina; and Wilmington, Jacksonville, New Bern, Washington, Williamston, and Elizabeth City in North Carolina. The current US 17 route passes through downtown Wilmington with no control of access. This section of US 17 is heavily used by local traffic as well as by through traffic traveling to destinations north and south of Wilmington on US 17 and I-40. Through-traffic must travel across one of two bridges over the Cape Fear River. The northern bridge is part of NC 133 and the southern bridge is part of US 17/74/76. Both bridges are movable span bridges and the raising of the spans to accommodate river-going vessels stops traffic, causes queues to form in both directions, and adds to congestion and delays, especially during peak-hour periods and summer beach travel.

The project is a vital link in the interstate and intrastate systems. The Wilmington Bypass (I-140) is identified as a NCDOT Strategic Highway Corridor.<sup>1</sup> The project is part of the planned urban loop around Wilmington. The project, combined with the adjacent R-2633C and R-2405 projects will provide a controlled access facility around Wilmington.

- **Hurricane Evacuation**

A controlled access freeway with a new, fixed-bridge crossing the Cape Fear River north of Wilmington is needed to provide connectivity between existing evacuation routes and facilitate access to I-40 and I-95. As expected growth and development continues within Brunswick County, the need for additional evacuation routes leading away from coastal areas will also increase. State designated hurricane evacuation routes in the vicinity of the project include US 17, US 74/76, and US 421. NC 87, US 17 and US 74/76 are identified as Brunswick County evacuation routes. It is anticipated that, once completed, Future I-140 will be designated as a hurricane evacuation route. None of the other identified routes are fully controlled access facilities.

### **S.3.3 PURPOSE OF THE PROPOSED ACTION**

The purpose of the proposed action and the needs that will be fulfilled by the action are presented below:

- **Increase traffic capacity and reduce traffic volumes on congested roadway segments.**

The project will provide a controlled access freeway bypassing the Wilmington Urban Area and will provide additional traffic capacity. Through traffic will be separated from local traffic thereby reducing the number of vehicles on congested segments of US 17 and US 421.

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- **Complete a critical link in the National Highway System and the Intrastate transportation system that will increase mobility, support economic growth and improve military transportation routes within the region.**

The project will increase mobility within the region by facilitating connectivity of Brunswick County to the Intrastate and Interstate systems. The project is identified as a NCDOT Strategic Highway Corridor and is included in the NCDOT 2006-2012 TIP. It is also identified as a future component of the NHS. The Wilmington Bypass will provide an important connection between US 17 and US 74/76 (both of which are included in the NHS and identified as Strategic Highway Corridors) and I-40 and will improve transportation access for existing industries along US 421 and US 74/76 and will enhance the opportunity for future economic development within Brunswick County. The project in conjunction with US 17, US 74/76, and NC 87 link important military installations and ports, and as such, are part of the US Department of Defense Strategic Highway Network (STRAHNET).

- **Facilitate Hurricane Evacuation**

The Wilmington Bypass will facilitate evacuation of growing coastal areas in Brunswick County by providing a controlled access freeway evacuation route and by providing connectivity between the existing hurricane routes of US 17, US 74/76, US 421 and I-40.

### **S.3.4 PROJECT HISTORY AND BACKGROUND**

The 1972 Wilmington Transportation Study was the first study to identify the need for a circumferential route around the City of Wilmington.<sup>ii</sup> The northern half of this recommended loop extended from US 17 in Brunswick County, west of Wilmington, to US 17 in New Hanover County, east of Wilmington, and was proposed as a four-lane divided freeway.

In the 1985 update of the Wilmington Transportation Study, a number of changes were made to the recommended northern outer loop. Notably, the corridor was shifted northward to take into account the extension of I-40.<sup>iii</sup> In addition, the recommended size of the outer loop was downgraded from a four-lane freeway to a four-lane expressway and a separate thoroughfare plan was established for Brunswick County.<sup>iv</sup>

Following adoption of the 1985 Wilmington Transportation Study, the Wilmington Urban Area Metropolitan Planning Organization (WMPO) requested that the northern outer loop be added to the NCDOT's TIP. In November 1989, the northern outer loop was added to NCDOT's 1990-1996 TIP as a four-lane freeway and was renamed the Wilmington Bypass. The project was designated as R-2633 and extended from US 17 in Brunswick County to I-40 in New Hanover County. Funding was included in fiscal year 1990 for the start of the planning and environmental studies. The studies began in August 1990. In December 1991, documentation focusing on protected species and cultural resources was converted to federal NEPA standards. Other studies, including land use analyses, were also being conducted. In 1994, Governor James Hunt's *Transportation 2001 Plan* recognized the immediate need to relieve traffic congestion in downtown Wilmington and accelerated the schedule for the improvements to R-2633C.<sup>v</sup> In order to accomplish the accelerated schedule, the NCDOT, in consultation with the FHWA, determined that two environmental impact statements (EISs) should be prepared; one for R-2633C and one for R-2633A/B.<sup>vi</sup> The Draft EIS (DEIS) for R-2633C was approved on January 31, 1995. During the DEIS review period, citizens, and state and federal environmental resource and regulatory agencies expressed concern about R-2633A/B. The agencies requested that further studies be conducted for R-2633A/B before commenting on the R-2633C DEIS.

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The NCDOT postponed preparation of the FEIS for R-2633C until a Supplemental DEIS for R-2633C and a Draft EIS for R-2633A/B were prepared. This allowed for simultaneous review of both documents. The Supplemental DEIS for R-2633C was released on December 5, 1996, and the DEIS for R-2633A/B was released on December 24, 1996 and a Reevaluation of the DEIS was approved in February 2007. The FEIS for R-2633C was released on November 7, 1997 and the Record of Decision (ROD) was signed on January 29, 1998. Construction of R-2633C is expected to be completed in June 2006.

In 1998 Alternative 9 was selected as the Preferred Alternative. Since selection of the Preferred Alternative, preliminary engineering has proceeded and efforts to further avoid and minimize impacts to the social, physical, and natural environment have been studied and are documented throughout this FEIS. These efforts include, but are not limited to, shifting the alignment, bridging streams and wetlands, inclusion of wildlife crossings, and adjusting interchange configurations.

The project is included in the NCDOT 2006-2012 as project number R-2633A/B. Right-of-way acquisition is scheduled to begin in NCDOT fiscal years 2007 and 2008 and construction is scheduled to begin in NCDOT fiscal years 2009 and 2010.

In a letter dated January 24, 2002, NCDOT requested FHWA to add the Wilmington Bypass to the Interstate System under 23 USC 103(c) (4) (b). NCDOT also submitted an application for consideration by the American Association of State Highway and Transportation Officials (AASHTO) Route Numbering Committee for the Wilmington Bypass to be designated as I-140. FHWA approved NCDOT's request in a letter dated September 11, 2002, noting that it will not be added to the Interstate System until completion of construction of the project. In a letter dated June 30, 2003, AASHTO approved the application for establishment of I-140 noting that until it is added to the Interstate System by FHWA, it should be referred to only as "Future I-140."

## **S.4 DETAILED STUDY ALTERNATIVES**

Alternatives studied through detailed environmental analysis in the DEIS included the No-Build Alternative and four construction, or build alternatives. The build alternatives studied were all on new location connecting US 17 and US 421 at R-2633C (Figure S-1).

### **S.4.1 NO-BUILD ALTERNATIVE**

In accordance with NEPA and FHWA guidelines, the environmental consequences of taking no action to meet future travel demand, or the consequences of the No-Build Alternative, are given full consideration. As a necessary component of alternatives analysis, the No-Build Alternative provides a baseline condition with which to compare the improvements and consequences associated with each build alternative. The No-Build Alternative does not include construction of R-2633A/B, but does assume that other road improvements planned and funded in the TIP would be in place, including R-4002 (Village Road in Leland), U-0092 (Smith Creek Parkway), and R-2633C. There are no funded TIP projects currently in the Brunswick County Thoroughfare Plan in the vicinity that would directly impact the Wilmington Bypass.

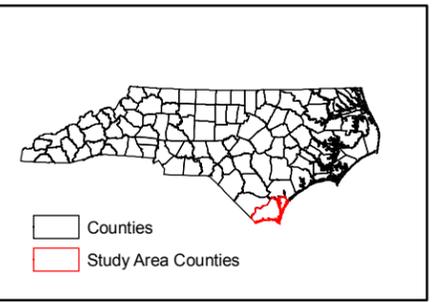
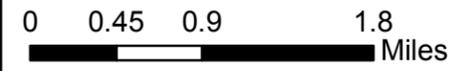
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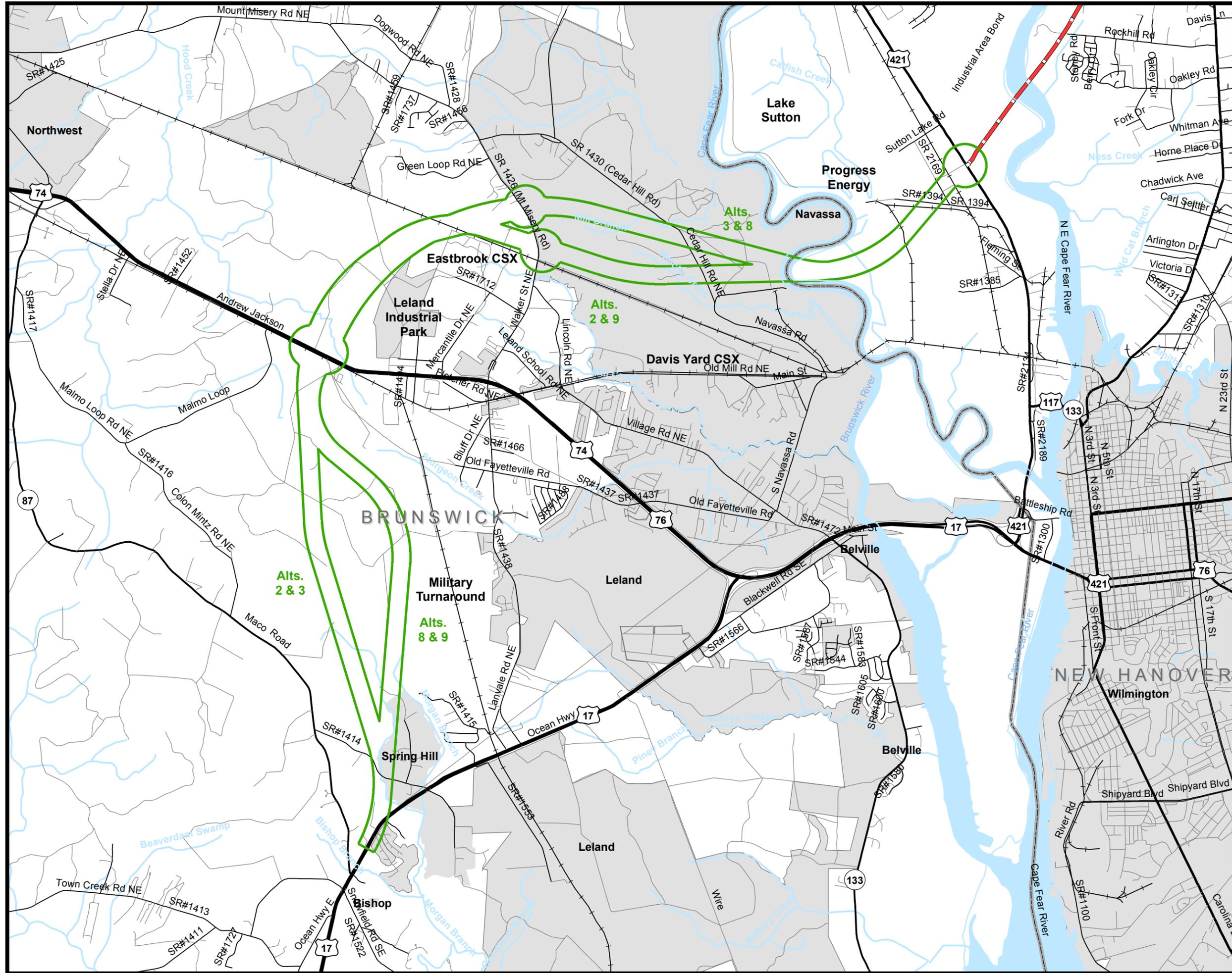
TIP R-2633 A/B  
Wilmington Bypass

Figure S-1  
Build Alternatives  
Evaluated in the DEIS

- Legend**
-  Build Alternatives
  -  R-2633 C
  -  Interstate Highways
  -  US Highways
  -  State Highways
  -  State Routes
  -  Local Roads
  -  Railroads
  -  Municipal Boundaries
  -  County Boundaries
  -  Water
  -  Streams (Non-delineated)



April 2007  
This map is for reference only.  
Sources: ESRI, CGIA, Brunswick County,  
New Hanover County, USDOT, NCDOT, URS.





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## **S.4.2 BUILD ALTERNATIVES**

### **Alternative 2**

Alternative 2 is a corridor extending northward from Bishop, just east of NC 87 (Maco Road) and west of Spring Hill. This corridor intersects with US 74/76 at the west end of the Leland Industrial Park, curving eastward through the Leland Industrial Park to cross the railroad tracks west of Davis Yard. This corridor parallels the north side of the railroad tracks through Eastbrook, turning northeastward at Davis Yard. The terminus of this corridor is at US 421, south of Lake Sutton and the Progress Energy Plant.

### **Alternative 3**

Alternative 3 is the same as Alternative 2, as it travels northward from Bishop, crossing US 74/76 at the west end of Leland Industrial Park, curving northeastward to the railroad tracks. At this point, the corridors diverge, as Alternative 3 takes a more northerly curve (approximately 1/4 mile north at the widest separation), traveling south of Cedar Hill to rejoin Alternative 2 and cross SR 1430, to terminate at US 421.

### **Alternative 8**

Alternative 8 begins similarly to Alternatives 2 and 3 at a point along US 17, between Bishop and Spring Hill, traveling north toward the military railroad "turn-around" yard to parallel the western fence line of the yard. The corridor then turns northwesterly and crosses US 74/76 at the west end of the Leland Industrial Park. This alternative then rejoins the corridor used for Alternative 3 to terminate at US 421.

### **Alternative 9**

Alternative 9 is the same as Alternative 8 as it travels northward from Bishop to parallel the military railroad "turn-around" yard. This corridor diverges from Alternative 8 near the railroad tracks west of Eastbrook. Here, Alternative 9 follows the corridor used for Alternative 2 to terminate at US 421.

## **S.5 PREFERRED ALTERNATIVE**

### **S.5.1 ACTIONS TAKEN SINCE SELECTION OF THE PREFERRED ALTERNATIVE**

After the selection of Alternative 9 as the Preferred Alternative it was decided that additional traffic and environmental analyses were necessary before beginning preliminary design and preparation of the FEIS. In early 1999, preliminary design and preparation of the FEIS was initiated. At this time the project entered into the Section 404/NEPA Merger Process, the environmental streamlining process newly implemented by NCDOT, USACE and the North Carolina Department of Environment and Natural Resources (NCDENR).

The Section 404/NEPA Merger Process requires agency concurrence at major decision points in the NEPA and Section 404 processes. The major decision points reached during the FEIS phase of the project include Concurrence Point 2A, decisions on bridge lengths; and Concurrence Point 4A, avoidance and minimization of impacts.

During preliminary design, discoveries were made in the course of additional environmental analysis which resulted in a widening of the Preferred Alternative study corridor. Expansion of

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the study corridor allowed for changes in the preliminary alignment to avoid and minimize impacts to environmental resources. The expanded study corridor and several alignments studied for avoidance and minimization purposes are presented on Figure S-2. Several opportunities were provided for the public to provide input on the expanded study corridor (see Chapter 8 of the FEIS for a record of public involvement activities).

Several changes and additions were made to the alignment during the preliminary design process to avoid and minimize impacts to the human and natural environment. These changes included shifts in the alignment, changes in interchange design, inclusion of bridges over streams, and inclusion of wildlife crossings. Section 2.3.1 of the FEIS describes specific alignment changes made to avoid and minimize impacts. Many of the changes were a direct result of agency and public input.

### **S.5.2 DESCRIPTION OF THE RECOMMENDED ALIGNMENT**

The recommended alignment (shown in Figure S-3) of the Preferred Alternative begins at a point along US 17, between Bishop and Spring Hill, traveling north toward the military railroad "turn-around" yard to parallel the western fence line of the yard. The alignment then turns northwesterly and intersects with US 74/76 at the west end of the Leland Industrial Park. It then curves eastward through the Leland Industrial Park to cross the railroad tracks west of Davis Yard. The recommended alignment parallels the north side of the railroad tracks through Eastbrook, turning northeastward at Davis Yard toward the Cape Fear River. The alignment crosses the Cape Fear River and associated wetlands on a high-level, fixed-span bridge. The project terminus aligns with R-2633C at US 421, south of Lake Sutton and the Progress Energy Plant. The recommended proposed centerline, the slope stake limits, and proposed right of way were established upon completion of the preliminary design of the recommended alignment.

Three wildlife crossings, two of which are bridges and one of which is a culvert, are provided at various locations along the alignment. In addition to the bridge over the Cape Fear River and Toomers Creek, four bridges are provided at stream crossing locations along the mainline alignment. Additionally, two bridges are provided at stream crossings on NC 87 and SR 1430. Grade separation is provided at each of the project's five interchanges (US 17, US 74/76, SR 1426, SR 1430 and US 421) as well as at three locations where the alignment crosses a railroad. The project also provides grade separation at two roads near US 421. Each interchange location and configuration is described below:

**US 17:** The interchange at US 17 is a trumpet configuration and would provide free-flow traffic movements between the project and US 17. NC 87 and SR 1522 (Snowfield Road) would be realigned to tie into US 17 so that a desirable control of access distance from the interchange can be provided as part of US 17 Strategic Highway Corridor. SR 1522 (Snowfield Road) would be realigned to provide a four-legged intersection with SR 1701 (Zion Church Road). Three service roads would be required to maintain access to properties in this area and cul-de-sacs would be provided on SR 1414 (Goodman Road) in lieu of a grade separation. Existing access to SR 1414 (Goodman Road) would be maintained at US 17 and at NC 87.

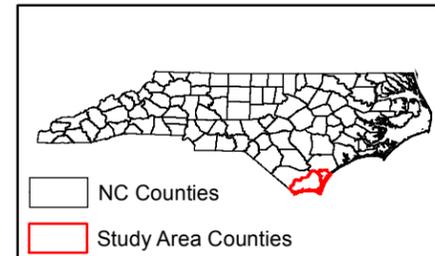
**US 74/76:** The interchange at US 74/76 is a modified diamond with all ramps and loops placed in the northern quadrants of the interchange due to the railroad tracks that parallel US 74/76 to the south. The ramps and loops would have stop conditions at their termini on US 74/76. The mainline of the project will be grade separated over US 74/76 and the CSX railroad.

TIP R-2633A/B  
Wilmington Bypass

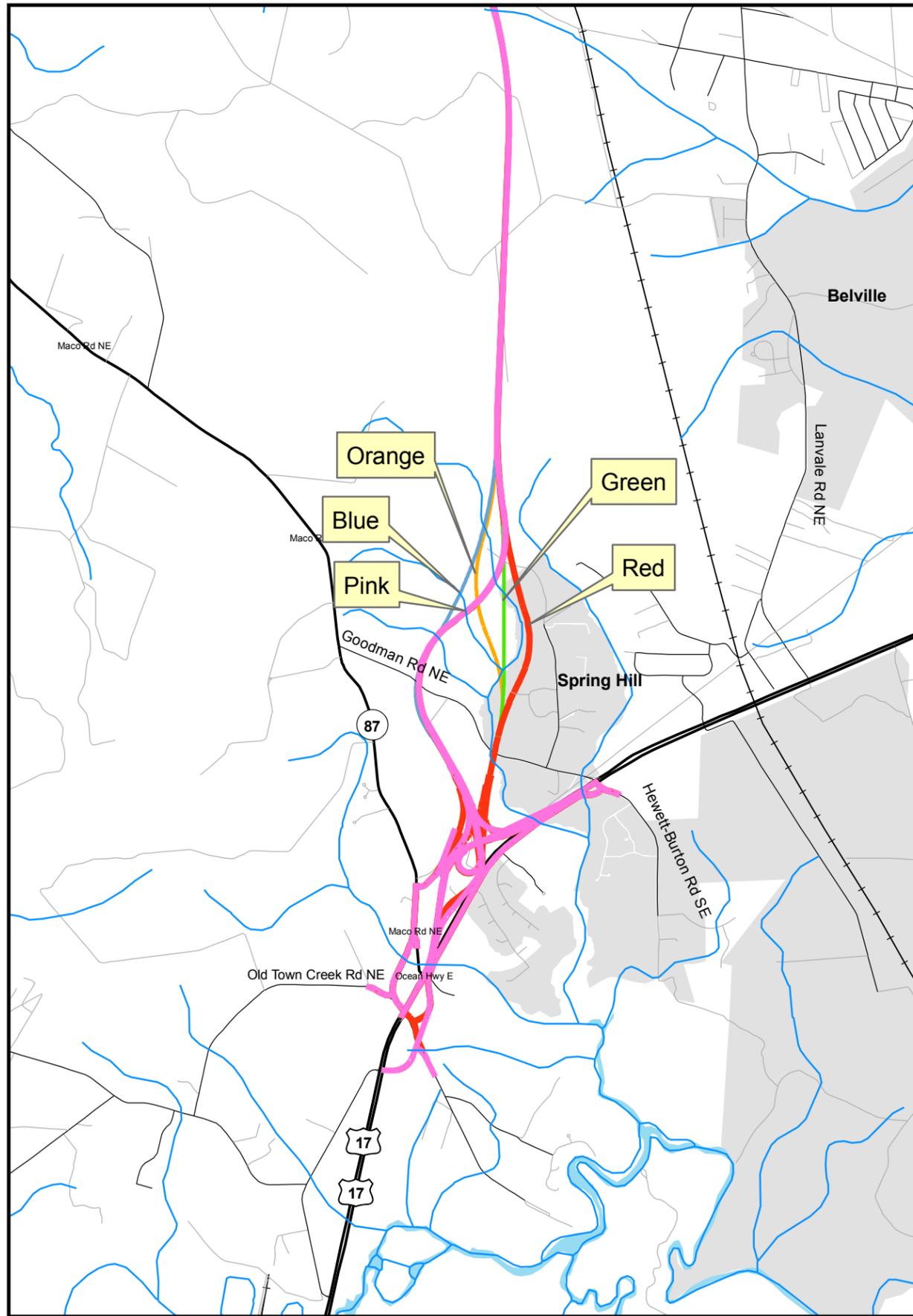
Figure S-2  
Expanded Study Corridor and  
Alternative Alignments

Legend

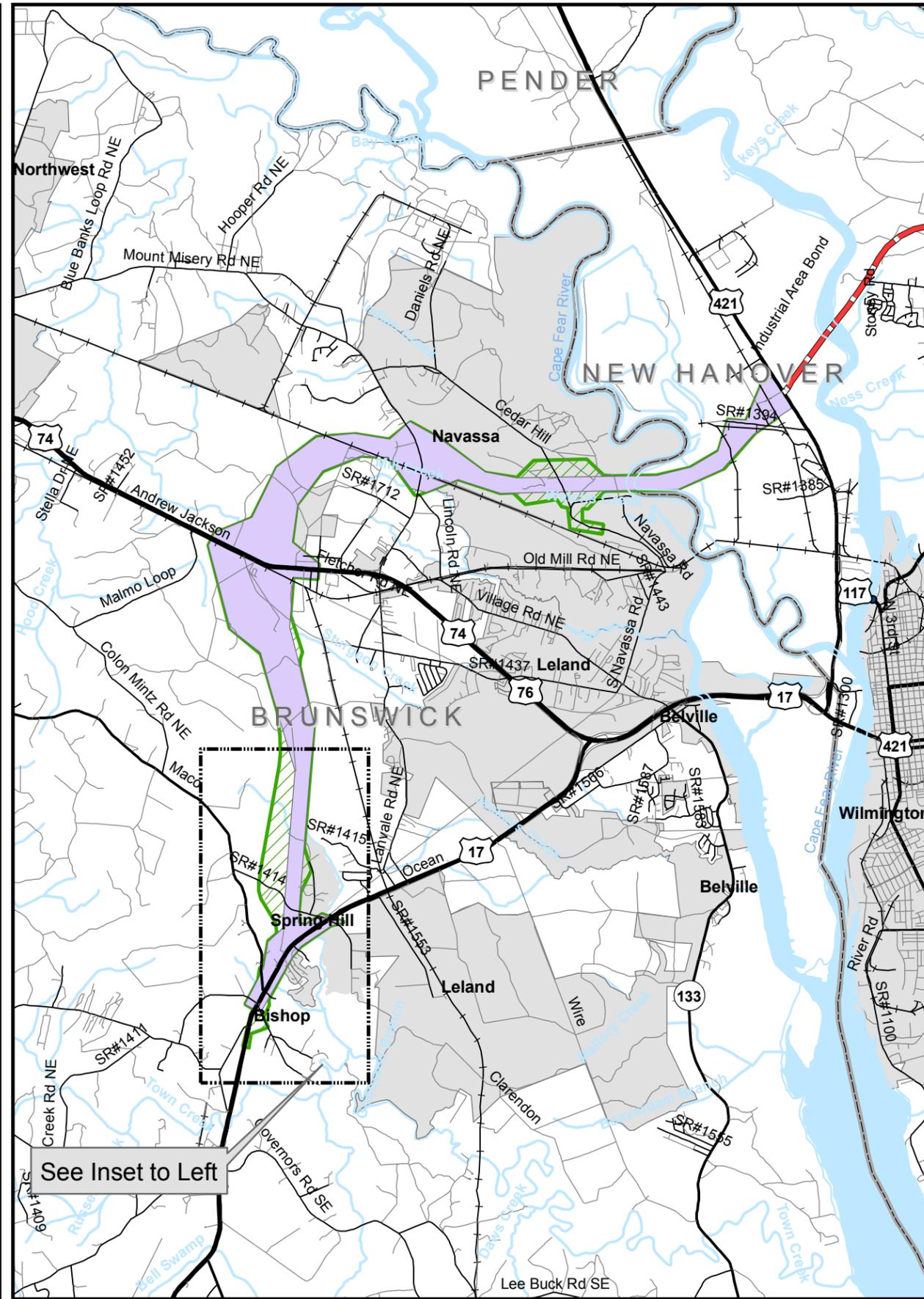
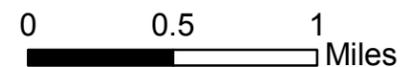
-  R-2633 A/B Initial Study Corridor
-  Expanded Study Corridor
-  R-2633 AB Final Alignment
-  R-2633 C
-  Interstate Highways
-  US Highways
-  State Highways
-  State Routes
-  Local Roads
-  Railroads
-  Municipal Boundaries
-  County Boundaries
-  Water
-  Streams (Non-delineated)



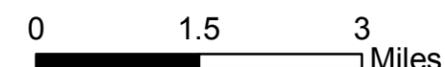
April 2007  
This map is for reference only.  
Sources: ESRI, URS, CGIA, NC DOT,  
Brunswick County, and New Hanover County.



Alternative Alignments



Corridor Study Area



See Inset to Left

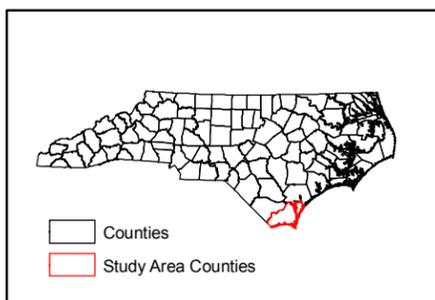


TIP R-2633 A/B  
Wilmington Bypass

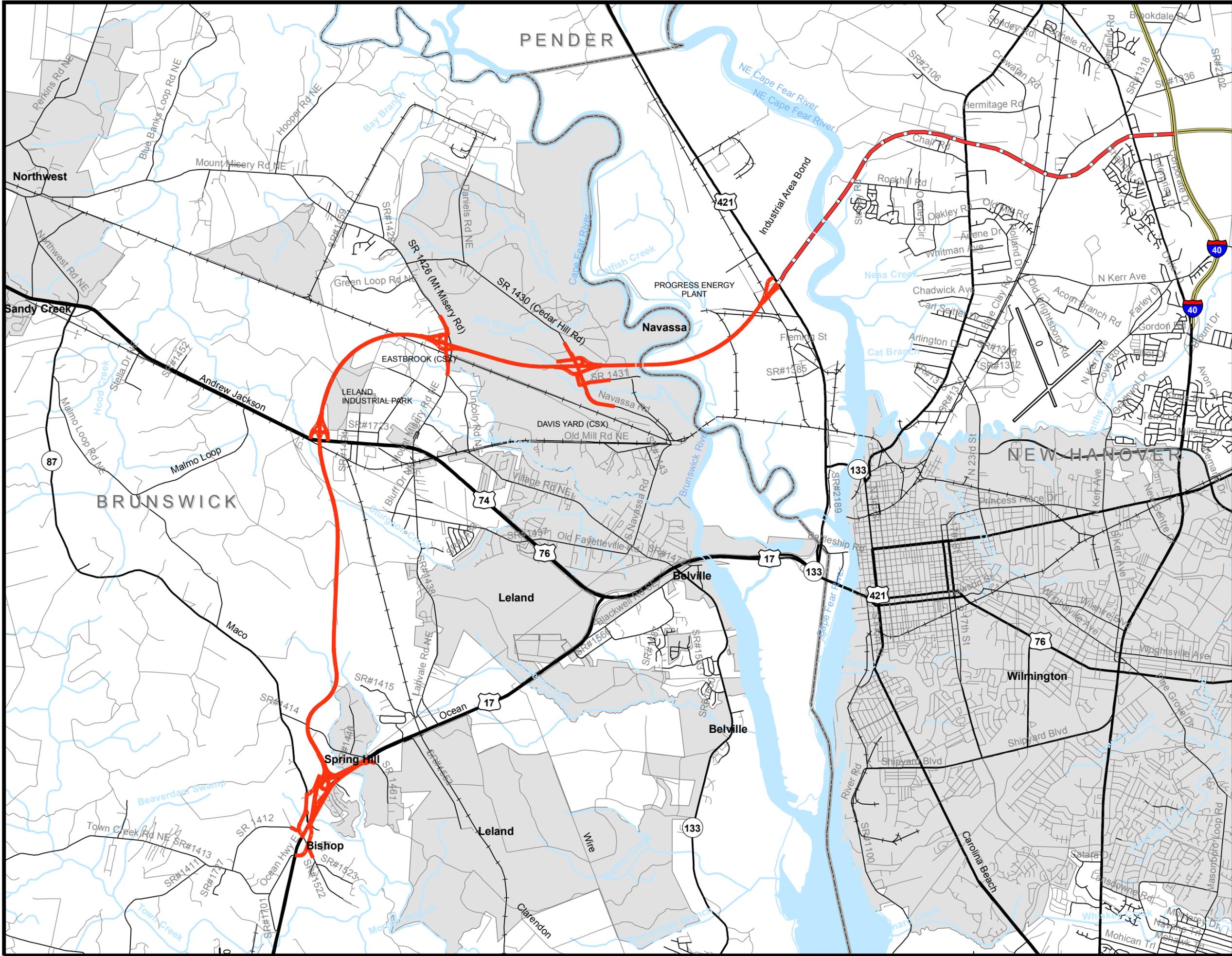
Figure S-3  
Recommended Alignment

Legend

-  R-2633 A/B Recommended Alignment
-  R-2633 C
-  Interstate Highways
-  US Highways
-  State Highways
-  State Routes
-  Local Roads
-  Railroads
-  Municipal Boundaries
-  County Boundaries
-  Water
-  Streams (Non-delineated)



April 2007  
This map is for reference only.  
Sources: ESRI, CGIA, Brunswick County,  
New Hanover County, USDOT, NCDOT, URS.





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**SR 1426:** A modified diamond interchange is provided at SR 1426 and all ramps have stop conditions at their termini on SR 1426. SR 1426 will be realigned to the west to have grade separated crossings over the CSX railroad and the project.

**SR 1430:** A modified diamond interchange is provided at SR 1430 and all ramps have stop conditions at their termini on SR 1430. Restriction of access through the interchange on SR 1430 requires that access roads be provided to residences on the north and south sides of the interchange. South of the interchange, SR 1431 will be realigned to a perpendicular intersection with SR 1430. South of the interchange, SR 1430 currently has a reverse curve with a substandard design speed and is prone to flooding. This section of SR 1430 will be improved to mitigate the safety problems from flooding and future traffic generated by the project. A bridge will be provided over a stream and wetland system and the reverse curve will be eliminated and the curve radius will be increased to improve the design speed of the road.

**US 421:** The interchange at US 421 would provide a modified diamond interchange. The ramps would have stop conditions at their termini on US 421, while the loop would have both free-flow and stop condition at its termini on US 421. A portion of this interchange will be constructed under R-2633C. To the southwest of the interchange, a grade separation would be provided for SR 1394. SR 2169 would be realigned to tie into SR 1394 to the north and a cul-de-sac would be provided on SR 2169 to the south of the project.

## **S.6 SUMMARY OF ENVIRONMENTAL CONSEQUENCES**

The following summary of environmental consequence focuses on the environmental effects of the recommended alignment of the Preferred Alternative (Alternative 9). The preliminary design process began for the Preferred Alternative after completion of the DEIS and the alignment was refined over long period time. The evaluation of impacts was also refined during this time and avoidance and minimization measures were incorporated in the preliminary design of the recommend alignment through the NEPA/Section 404 Merger Process. Alternatives that were not selected (Alternatives 2, 3, and 8) were not advanced through to the preliminary design phase. Thus a side-by-side comparison of environmental effects among alternatives is not feasible. The FEIS does, however, include the evaluation of environmental consequences presented in the DEIS.

### **S.6.1 DIRECT IMPACTS**

Estimated environmental impacts associated with the recommended alignment are summarized in Table S-1. Some of the projected effects of the project can only be presented qualitatively and therefore could not be quantified for inclusion in Table S-1. These issues include: community cohesion, economic effects, regional planning consistency, visual impacts, water quality, soils, and mineral resources. These impacts are briefly summarized below.

#### **S.6.1.1 COMMUNITY COHESION (SECTION 4.1.1.1)**

The presence of a new, limited-access freeway can have both positive and negative effects to the cohesion of a community or neighborhood; however, these effects are difficult to quantify. In general, positive effects can include shorter travel times and more convenient access between homes, stores, and businesses. Alternatively, a new roadway can also create a wall or barrier between individual homes previously connected by a local street system or residential areas and their shopping centers, recreation, and schools. Because of the rural, sparsely developed nature of the study area, displaced households along the project are not anticipated to cause substantial disruptions in developed communities. Most displacements would occur in the

**Table S-1. Summary of Environmental Impacts**

FACTORS	RECOMMENDED ALIGNMENT
<b>Project Features</b>	
Length (miles)	14.2
Number of Interchanges	5
Number of railroad crossings	6
Construction Costs	\$273,700,000
Right of way Costs	\$6,989,000
Total Costs	\$280,689,000
<b>Socioeconomic Features</b>	
Residential Relocations	16
Business Relocations	9
Schools Impacted	0
Parks Impacted	0
Churches Impacted	0
Cemeteries Impacted	0
<b>Physical Factors</b>	
Electric Power Lines Crossed	7
Gas Lines Crossed	2
Water Lines Crossed	3
Receptors Impacted by Noise	54
Moderate and High Ranked Haz. Mat. Sites	2 High, 2 Low-Moderate
Prime and Unique Farmland (AD-1006 rating)	66
Number of Exceedances of Carbon Monoxide Ambient Standards	0
<b>Cultural Resources</b>	
Previously Recorded Archaeological Sites Impacted	0
Previously Recorded Archaeological Sites	1
Recorded Historical Sites	0
National Register Historic Districts Impacted	0
<b>Natural Resources</b>	
Stream Crossings	20
Navigable Waterway Crossings	1
Stream Crossings Bridged	6
Stream Impacts (linear feet)	1,003
Red Cockaded Woodpecker Colony Sites Impacted	0
Red Cockaded Woodpecker Foraging Habitat (acres)	0.07
NCHP Identified Priority Areas (IPAs) (total acres)	18
Primary (acres)	7
Secondary (acres)	11
Floodplains (linear feet)	7,335
Floodplains (acres)	31.1

FACTORS	RECOMMENDED ALIGNMENT
Natural Communities (total acres)	377
Mesic Pine Flatwoods (acres)	124
Pine/Scrub Oak Sandhills (acres)	77
Mesic Mixed hardwood Forests (acres)	52
Wet Pine Flatwoods (acres)	67
Tidal Freshwater Marsh	0
Tidal Cypress Gum Swamp/Gum Swamp (acres)	0
Coastal Plain Bottomland Hardwoods (acres)	11
Coastal Plain Semi-permanent Impoundments (acres)	<1
Small Stream Swamp (acres)	4
Pocosin/Streamhead Pocosin (acres)	42
Open Water (acres)	0
Altered Communities (total acres)	120
Urban/Disturbed (acres)	75
Agricultural Land (acres)	36
Maintained Utility Right of Way (acres)	9
<b>Wetlands</b>	
Palustrine (total acres)	78.8
Palustrine Emergent (PEM) (acres)	0.7
Palustrine Forested (PFO) (acres)	78.1
Riverine (total acres)	0

vicinity of the proposed interchanges at SR 1426, SR 1430, and US 17. The project includes service roads that maintain access residences so no residences would be isolated by the project.

### **S.6.1.2 ECONOMIC EFFECTS (SECTION 4.1.1.5)**

It is likely that the project would have an overall beneficial economic impact on the region by providing facilitated access to major industries and trade centers in both Brunswick and New Hanover counties. Project-induced growth in the form of highway-oriented retail and industrial businesses in the vicinity of interchanges would also contribute to the positive economic effects of the project. In addition, there would be an increase in construction employment during the construction phase of the project, as well as increased government revenues from transportation-related taxes. However, there would also be a loss of land from property tax roles. Loss of property tax revenues is expected to be temporary as other development in the project vicinity is likely to offset any losses.

Local economic impacts to property near the project could be positive or negative. Properties near the roadway and throughout the study area could become more accessible making them more attractive for development; however, noise and visual impacts could also be associated with the roadway which could make residential property adjacent to the project less desirable.

Positive economic effects can also have negative environmental effects as natural or undeveloped areas become developed. Potential negative environmental effects could include

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loss of wetlands and recharge areas, degradation of water quality from increased impervious surface, and habitat loss. Considering the past development trends and the continued favorable growth environment, impacts to these resources could also occur with the no-build scenario, though to a lesser degree. Indirect and cumulative effects on the natural environment are addressed in Section 4.2.5 of the FEIS.

## **S.6.2 REGIONAL PLANNING (SECTION 4.1.2)**

The project is consistent with the Wilmington Urban Area LRTP, the Brunswick County Thoroughfare Plan and the region's land use plan.

### **S.6.2.1 VISUAL EFFECTS (SECTION 4.1.3.5)**

The project will introduce a new visual element into the context of the landscape thereby adversely impacting views of natural areas that will be converted to transportation uses. However, the terrain in the project area is generally flat and expansive and scenic vistas are uncommon. The project corridor will generally be screened from view by existing vegetation, except in the vicinity of interchanges and grade separations.

Construction of the project would have a visual impact on adjacent areas. The project would be designed and constructed as a four-lane, divided, controlled-access freeway, which would be similar in appearance to I-40 through New Hanover County. One of the problems inherent in designing a controlled-access freeway involves providing sufficient right of way to comply with design criteria while minimizing disruption to the surrounding area.

Although the project corridor shows some relief in the terrain towards the southern terminus at US 17, the project area is generally flat. Because of the flat terrain and near sea level elevations, the design of the project's mainline, interchanges, and crossings of roadways, railways, and waterways, precludes depressed or below grade construction. As a result of elevated grade separations, the project would be seen as a subtle undulation of road surface rising and falling across the relatively flat landscape. Each of the interchanges would require grade separation for overpasses. Grade separation would also be required at the railroad crossings west of SR 1426. A high-level fixed-span bridge would be constructed over the Cape Fear River. At grade separations and bridges, the roadway would be highly visible to people in areas off of the roadway, which would be an adverse impact. Conversely, numerous opportunities for views across agricultural fields, forested areas and study area waterways from the tops of overpasses and bridges would exist for motorists using the new roadway, which would be a positive effect. The highest point along the roadway would be the bridge crossing over the Cape Fear River. This bridge would be highly visible from vessels traveling along the river.

### **S.6.2.2 WATER QUALITY (SECTION 4.1.5.5)**

Stormwater runoff rates would increase slightly due to the increase in impervious roadway surface area. This is an unavoidable, long-term impact resulting from construction of the project. The proposed build alternative also has the potential to temporarily degrade the quality of water in the surrounding streams as a result of soil erosion during construction. Best management practices will be employed during construction to minimize water quality degradation.

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### **S.6.2.3 SOILS AND GEOLOGY (SECTION 4.1.5.1)**

The properties of the soils within the expanded study corridor could affect the engineering design of the project. Soil limitations for the build alternative include erosion hazard, shrink/swell potential, differential settlement, low strength, corrosivity, and flood hazard.

Due to the proximity of the project to existing construction material sites, more efficient transport of these construction materials may result. New development in the county may increase the demand for local sand and crushed stone. Construction of the roadway may also temporarily increase demand for local mineral resources.

### **S.6.3 INDIRECT AND CUMULATIVE EFFECTS**

#### **S.6.3.1 INDIRECT EFFECTS**

Due to the growth trends already apparent in the study area without the project and since the project does not provide direct access to major employment centers; the project is not anticipated to substantially affect the urban spatial structure of greater Wilmington. The main effects of the project are expected within interchange catchment areas. These effects include influencing location decisions for future development, accelerating the pace of industrial expansion, and inducing commercial growth. To a lesser extent, the project may induce some residential development by providing new access to low cost, undeveloped, rural land.

The project is generally expected to intensify and concentrate development trends already apparent in the study area. For example, study area land use shifts from rural to suburban will occur under both the build and no-build scenarios but are expected to be concentrated and intensified around project interchanges under the build scenario. The overall economic outlook in the study area is positive with or without the project; however, but the project is expected to facilitate industrial expansion, associated employment opportunities, and the distribution of goods and services; thus potentially improving an already positive trend.

Effects related to encroachment and alterations are particular to the build scenario. These include an expected positive effect on traveler proclivity and an expected negative effect on study area aesthetics.

Effects related to induced development are likely to impact wetlands and threatened and endangered species and degradation to water quality. Considering the past development trends and the continued favorable growth environment, impacts to these resources are also expected with the no-build scenario, though to a lesser degree.

#### **S.6.3.2 CUMULATIVE EFFECTS**

The project, combined with other transportation projects, will cumulatively benefit transportation in the Wilmington region and southeastern North Carolina by reducing congestion on local roadways and enhancing the intrastate transportation system. Considered cumulatively with other infrastructure projects, such as water and sewer expansion and projects to increase the capacity of the port, the project is expected to positively affect an already favorable economic outlook in the area.

Cumulative environmental effects will occur from the proposed project and other past, present and reasonably foreseeable development activities. These effects are most notable for natural resources such as biotic communities and wildlife as development replaces natural areas.

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Cumulative effects to natural resources are difficult to quantify from readily available data. However, cumulative effects to wetlands were quantified from obtaining impact data from other NCDOT projects. Approximately 280 acres of wetlands would be impacted from the combine TIP projects R-2633A/B, R-2633C, R-2405A (I-40 Connector), and TIP U-0092 (Smith Creek Parkway). Mitigation for wetland impacts has been or will be provide and coordinated through the Section 404 permitting process.

Degradation of water quality is also a possible cumulative effect that may result from development project. Impervious surfaces can block or redirect recharge and affect the amount of surface runoff in rivers and streams. Considered with the removal of vegetative cover adjacent to stream channels and at road crossings, effects may include sediment and nutrient loading and increased water temperature. In the long term, as the stream channels go through a re-shaping process to accommodate the increased flow, stream banks are likely to become eroded and incised, leading to further sediment loading downstream. Numerous policies are applicable in the study area that will help protect the quality of surface waters.

## **S.7 REQUIRED PERMITS AND ACTIONS**

Construction of the project would result in several activities requiring environmental regulatory permits from state and federal agencies. A list of these permits, organized by issuing agency, is provided below. The NCDOT will obtain all necessary permits prior to construction.

Many of the environmental issues and mitigation measures discussed in this FEIS will be further quantified and evaluated as final roadway designs are completed. The actions that would occur after completion of the FEIS are described below. Specific sections of Chapter 4 of the FIES provide more detailed discussions of environmental commitments and recommendations.

### **S.7.1 PERMITS**

#### **S.7.1.1 NORTH CAROLINA DIVISION OF COASTAL MANAGEMENT**

Coastal Area Management Act (CAMA) Major Development Permit. CAMA requires permits for major land disturbing activities within designated areas of environmental concern, which include: marshlands, tidelands, estuaries, and fragile natural and cultural resource areas.

Authority. North Carolina General Statute 113A, Article 7, Subsection 118. Regulations promulgated in 15A NCAC 7.

State Dredge and Fill Permit. A permit is required for any project involving excavation and/or filling activities in estuarine waters, tidelands, or marshlands. A joint application may be filed if the project also requires a CAMA Major Development Permit, US Army Corps of Engineers Section 10 and 404 Permits, or a Section 401 Water Quality Certification.

Authority. North Carolina General Statute 113-229. Regulations promulgated in 15A NCAC 7J permit procedures.

#### **S.7.1.2 NORTH CAROLINA DIVISION OF WATER QUALITY**

Section 401 Certification. Any activity which may result in discharge to navigable waters and which requires a federal permit must obtain a certification that such discharge will be in compliance with applicable state water quality standards.

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Authority. North Carolina General Statute 143, Article 21, Part 1. Regulations promulgated in 15A NCAC 2H and 2B.

National Pollutant Discharge Elimination System (NPDES) Permit. A permit is required for projects involving sewer systems, treatment works, disposal systems, and certain stormwater runoff that would result in a discharge to surface waters. The State has the authority to administer the national NPDES program for projects in North Carolina.

Authority. North Carolina General Statute 143, Article 21, Part 1. Regulations promulgated in 15A NCAC 2H.0100.

Stormwater Certification. Development in a coastal county that requires a CAMA major permit or a sedimentation and erosion control plan requires stormwater certification. Requirements vary and are affected by the classifications of the water to which the project would drain. The DWQ Regional Office provides site-specific requirements.

Authority. North Carolina General Statute 143, Article 21, Part 1. Regulations promulgated in 15A NCAC 2H.1000 and 2B.0200.

### **S.7.1.3 NORTH CAROLINA DIVISION OF FOREST RESOURCES**

Burning Permit. A permit is required to start a fire in woodlands or within 500 feet of woodlands under the protection of the Division of Forest Resources. Thirty-day permits can be issued for highway construction.

Authority. North Carolina General Statute 113, Article 4C, Subsection 60.21-60.31. Regulations promulgated in 14 NCAC 9C.0200-.0203.

### **S.7.1.4 UNITED STATES ARMY CORPS OF ENGINEERS**

Section 404 Permit. A permit from the US Army Corps of Engineers is required for any activity in water or wetlands that would discharge dredged or fill materials into Waters of the United States and adjacent wetlands. To obtain permit approval, impacts to wetlands must be mitigated through avoidance, minimization, and compensation measures in accordance with the "Memorandum of Agreement (MOA) between the Environmental Protection Agency and the Department of the Army Concerning the Determination of Mitigation Under the Clean Water Act Section 404(b)(1) Guidelines" (February, 1990).

Authority. Federal Water Pollution Control Act Amendments of 1972 and Section 404 of the Clean Water Act of 1977. Regulations promulgated in 33 CFR Part 323.

Section 10 Permit. A permit is required for construction of structures such as piers and jetties and excavation and placement of fill material in or affecting navigable waterways, including the Cape Fear River.

Authority. River and Harbor Act of 1899, Section 10.

### **S.7.1.5 UNITED STATES COAST GUARD**

Section 9 Permit. A permit must be obtained for any new bridge over navigable waterways, including the Cape Fear River. Bridge clearances are reviewed under this permit.

Authority. River and Harbor Act of 1899, Section 9.

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### S.7.1.6 UNITED STATES FISH AND WILDLIFE SERVICE

Section 404 and Section 10 Permit Review. The US Fish and Wildlife Service's (USFWS) responsibilities include review of Section 404 and Section 10 Permits to determine a project's impact on public fish and wildlife resources. The USFWS provides recommendations to the US Army Corps of Engineers on how the proposed project could avoid or minimize impacts to existing fish and wildlife resources and their habitats, including wetlands.

Authority. Fish and Wildlife Coordination Act, as amended.

Section 7 Consultation. Consultation with the USFWS is required for any project that may impact endangered or threatened plants and animals and their Designated Critical Habitat. Informal; Section 7 Consultation regarding Red cockaded woodpecker foraging habitat and shortnose sturgeon was undertaken during the FEIS phase of the project and is documented in Section 4.1.5.6 of this FEIS.

Authority. Endangered Species Act of 1973, Section 7.

### S.7.2 SUBSEQUENT ACTIONS

NCDOT in consultation with FHWA selected Alternative 9 as the Preferred Alternative for implementation. The following studies have been prepared so that a roadway design can be developed that avoids and minimizes environmental impacts:

- A **reevaluation** was conducted to determine whether there have been changes in the project, its surroundings, or other new information that would require a supplement to the DEIS.
- Additional **wetland delineation studies** (detailed determination of wetland locations and classifications in accordance with USACE procedures) were conducted to account for conditions with the expanded study corridor. Supplemental assessment of water resources was conducted to reevaluate information in the DEIS and to study shifts in the project alignment.
- Additional **archaeological surveys** were conducted near the Cape Fear River floodplain and major tributaries, including a survey and documentation for underwater sites in the Cape Fear River.
- **Historic architecture studies** and **106 effects consultations** on the Goodman House and Doctor's Office Property were conducted.
- **Hazardous materials investigations** were performed to further review sites that could potentially impact the selected alternative.
- Additional **threatened and endangered species surveys** were conducted to account for conditions within the expanded study corridor and to reevaluate data in the DEIS.
- **Informal Section 7 consultations** took place with the US Fish and Wildlife Service and the National Marine Fisheries Service.
- An **environmental justice assessment** was conducted to reevaluated information in the DEIS and to evaluated potential shifts in the alignment.

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- An **indirect and cumulative effects assessment** was conducted to reevaluate information presented in the DEIS and to provide a more in depth analysis of indirect and cumulative effects associated with the project.
  - A **supplemental noise analyses** were conducted to update the previous analysis with the new noise model and to study effects of alignment shifts.
  - A **supplemental air quality analysis** was conducted to update the previous analysis.

As part of the preliminary engineering design phase, the following studies have also been conducted:

- a **design study** was conducted to determine which roadway segments should bridge wetlands, which should be constructed on fill, and the feasibility and practicability of each method;
- a **traffic capacity analysis** was prepared to design ramps, lane and turning movement configurations, traffic storage requirements, etc.;
- **drainage and hydrological studies** were performed for preliminary design of major drainage structures;
- a **service road study** was conducted to determine if access can be provided to residences and businesses whose access would be restricted due to construction of the selected alternative;
- **preliminary right of way limits** were delineated on plans; and
- **preliminary geotechnical investigations** were performed to identify geology and soil types and limitations

After the FEIS is completed, the project implementation process will remain incomplete. The following is a description of the actions that would be taken, events that would occur, and studies that would be completed prior to project right of way acquisition. Coordination with resource agencies would be maintained throughout the entire process. The FEIS has been prepared based on the results of the studies listed above and the preliminary roadway design plans. The FEIS will be circulated for public and agency review. After approval of the Record of Decision (ROD), a Design Public Hearing will be held to receive public comments on the preliminary plans.

The final roadway design plans would be developed, taking into consideration all public comments received on the preliminary design plans and this FEIS. The following studies may be prepared as part of the final design:

- **drainage and hydrological studies** to identify and design minor drainage structures;
- a study for **bridge type** for crossing the Cape Fear River;
- a **scour analysis** for the Cape Fear River Bridge;
- design of a **traffic control plan** to provide access during the construction phase;
- a **survey for wells** within and adjacent to proposed right of way limits;

- 
- a **noise analysis** based on updated traffic and detailed design plans to evaluate whether potential noise barriers are feasible and reasonable, and if so, to determine their locations. Additionally, public involvement related to the construction of noise abatement will be conducted;
  - a **design public hearing** will be held after completion of the Record of Decision;
  - a **geotechnical investigation** to recommend techniques and materials to overcome any soil limitations along the selected alternative identified during the investigation; and
  - **right of way limits** will be finalized.

Other actions that must be completed prior to the start of project construction include, but are not limited to:

- preparation of an erosion control plan that incorporates BMPs;
- coordination with utilities for relocation/reconfiguration of systems;
- implementation of the Relocation Assistance Program; and
- approval of all required permits and certifications.

During project construction, the NCDOT would implement Best Management Practices and will comply with all permit conditions. Any additional measures that would minimize environmental impacts that have been agreed upon during the ongoing consultations with resource agencies would also be implemented.

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<sup>i</sup> North Carolina Department of Transportation, *Strategic Highway Corridor, Southeast Vision Plan*. Adopted by North Carolina Board of Transportation. Plan date: September 2, 2004. Available: [http://www.ncdot.org/doh/preconstruct/tpb/SHC/PDF/SHC\\_Vision\\_Plan\\_Southeastern\\_NC.pdf](http://www.ncdot.org/doh/preconstruct/tpb/SHC/PDF/SHC_Vision_Plan_Southeastern_NC.pdf). Accessed: January 2006.

<sup>ii</sup> Wilbur Smith and Associates. "Wilmington Area Transportation Study." June, 1972.

<sup>iii</sup> North Carolina Department of Transportation, Planning and Research Branch. "Wilmington Transportation Study," Technical Report 2. March 1986.

<sup>iv</sup> North Carolina Department of Transportation, Planning and Research Branch. "Wilmington Transportation Study," Technical Report 2. March. 1986.

<sup>v</sup> North Carolina Department of Transportation. *1994-2001 Transportation Improvement Program, The Transportation 2001 Plan*. 1994.

<sup>vi</sup> Personal communication. Wilmington Bypass, New Hanover and Brunswick Counties. Letter from Mr. H. Franklin Vick, PE, Manager, Planning and Environmental Branch, North Carolina Department of Transportation to Greiner, Inc.. August 24. 1994.

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- Appendix C: Relocation and Right of Way Reports
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- Appendix F: Summary of Hazardous Materials Studies
- Appendix G: Natural Environment
- Appendix H: Public Involvement

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**CHAPTER 1.**  
**PURPOSE OF AND NEED FOR THE PROJECT**



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## **CHAPTER 1. PURPOSE OF AND NEED FOR THE PROJECT**

### **1.1 INTRODUCTION**

This Final Environmental Impact Statement (FEIS) was prepared in accordance with the requirements set forth in the National Environmental Policy Act (NEPA) of 1969, as amended, and the North Carolina (State) Environmental Policy Act (SEPA). This FEIS is an informational document intended for use by both decision makers and the public. As such, it represents a disclosure of relevant environmental information concerning the proposed action.

Since the Draft Environment Impacts Statement (DEIS) for R-2633A/B (proposed action) was released on December 24, 1996, the North Carolina Department of Transportation in cooperation with the Federal Highway Administration has conducted a Reevaluation of the DEIS in accordance 23 CFR Part 771 Section 771.129. The Reevaluation of the DEIS concluded that no substantial changes in the proposed action or significant new circumstances relevant to environmental concerns and bearing on the proposed action have occurred since approval of the DEIS, and that a supplemental draft environmental impacts statement is not required. The Reevaluation has been approved by, and is on file with the Federal Highway Administration.

The content of this FEIS conforms to the requirements of the Council on Environmental Quality (CEQ) guidelines, which provide direction regarding implementation of the procedural provisions of NEPA, and the Federal Highway Administration's (FHWA) *Guidance for Preparing and Processing Environmental and Section 4(f) Documents*, 1987.<sup>1</sup>

The North Carolina Department of Transportation (NCDOT) and FHWA are the lead agencies for the project and the US Army Corps of Engineers (USACE) and the US Coast Guard are cooperating agencies.

### **1.2 PROPOSED ACTION**

The proposed action is the construction of a freeway on new alignment from US 17 in Brunswick County, north of the NC 87 intersection, to US 421 in New Hanover County. The proposed action is designated as project number R-2633A/B in the NCDOT 2006-2012 Transportation Improvement Program (TIP) and is referred to as the 'the project' throughout this FEIS.

The project is the continuation of an urban loop around Wilmington, North Carolina. Construction of the initial section of the urban loop, which extends from US 421 to Interstate 40 (I-40) (referred to as R-2633C in the TIP and in this FEIS) in New Hanover County, was completed in 2006. The project and R-2633C, together are referred to as the Wilmington Bypass. When completed, the Wilmington Bypass, coupled with a third project extending from I-40 to US 17 in New Hanover County (referred to as R-2405 in the TIP and this FEIS) will be designated as Interstate 140 (I-140). The general location of the project and other components of Future I-140 are shown in Figure 1-1.

The project would be a fully controlled access freeway with a design speed of 70 miles per hour (mph). Interchanges are proposed at US 17, US 74/76, SR 1426 (Mt. Misery Road), SR 1430 (Cedar Hill Road), and US 421. The US 17/NC 87 intersection would be relocated farther south on US 17 to provide safe spacing between the intersection and the US 17/Future I-140 interchange. The project includes bridges over stream crossings and a bridge over the Cape Fear River. Additionally, two bridges and a box culvert are provided for wildlife passage.

As part of Future I-140, the project will facilitate travel around the Wilmington urban area and expedite travel from I-40 to the beaches southwest of Wilmington. The project will improve

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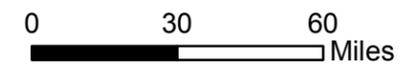
access to and from northeast Brunswick County and the industrial areas located in this section of the county, including the Leland Industrial Park located on US 74/76 in Leland and industries in the Town of Navassa. Additionally, this project includes an additional crossing of the Cape Fear River which will improve hurricane evacuation routes. As part of the US 17 Intrastate Corridor, the project will provide a free-flowing, controlled access freeway that bypasses the Greater Wilmington Urban Area.

Figure 1-1  
Location Map



**Legend**

-  R-2633A/B Recommended Alignment
-  R-2633 C
-  R-2405
-  Interstate Highways
-  US Highways
-  State Highways
-  Counties





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### 1.3 SUMMARY OF NEED FOR THE PROPOSED ACTION

As part of the US 17 Intrastate Corridor, the project will provide a free-flowing, controlled access freeway that bypasses the Greater Wilmington Urban Area. Construction of the project will complete a vital link in this strategic transportation corridor. The need for the proposed action is summarized as follows:

- **Improve traffic capacity deficiencies**

The project is needed to alleviate project capacity deficiencies in the design year. Traffic studies show the base year (2000) level of service (LOS) on the roadway segments studied range from free-flow conditions (LOS A) to full capacity (LOS E). Roadway segments on US 17 that are at or approaching capacity include US 17 between NC 133 and US 421, which operates at LOS E with an average daily traffic (ADT) volume of 69,000 and US 17 between US 421 and the bridge over the Cape Fear River, which operates at LOS D with an ADT volume of 54,600. Other roadway segments in the study area at capacity include NC 133 south of US 17 and SR 1472 (Village Road) north of US 17, both of which are LOS E. In the 2025 design year over half the roadway segments studied would operate at LOS D or worse. The segment of US 17 from NC 133 to the Cape Fear Memorial Bridge would operate at an unacceptable level of service (LOS F) with ADT volumes ranging from 86,200 to 131,100. The project will remove through traffic, reducing the number of vehicles on this section of US 17.

- **Increase mobility within the region**

The project is needed to improve the existing regional transportation system by providing a continuous freeway route for through traffic to bypass downtown Wilmington. The US 17 corridor is the state's major north-south route east of Interstate 95 (I-95) and serves the major coastal cities of Myrtle Beach and Charleston, South Carolina; and Wilmington, Jacksonville, New Bern, Washington, Williamston, and Elizabeth City in North Carolina. The current US 17 route passes through downtown Wilmington with no control of access. This section of US 17 is heavily used by local traffic as well as by through traffic traveling to destinations north and south of Wilmington on US 17 and I-40. Through-traffic must travel across one of two bridges over the Cape Fear River. The northern bridge is part of NC 133 and the southern bridge is part of US 17/74/76. Both bridges are movable span bridges and the raising of the spans to accommodate river-going vessels stops traffic, causes queues to form in both directions, and adds to congestion and delays, especially during peak-hour periods and summer beach travel.

As part of the planned urban loop around Wilmington, the project will extend the four-lane divided, controlled-access freeway under construction (R-2633C) between US 421 and I-40. As such, the project is a vital link in the Intrastate and Interstate systems. The project, R-2633C, and R-2405 will complete a bypass of the Greater Wilmington Urban Area. Prior to completion of the project, southbound and northbound through traffic will use US 421 between US 17/74/76 and R-2633C.

US 17, US 74/76 and Future I-140 are identified as NCDOT Strategic Highway Corridors.<sup>2</sup> The proposed I-140 Loop around the Wilmington area has been designated a Strategic Highway Corridor by the North Carolina Board of Transportation (BOT). The BOT adopted the Strategic Highway Corridors (SHC) initiative on September 2, 2004 as a part of the Statewide Transportation Plan. The purpose of the SHC initiative is to provide a network of high-speed, safe, reliable highways throughout North Carolina for the efficient movement of people and goods. These corridors are critical to statewide mobility and connectivity and promote a vision of modern transportation, supportive of economic opportunities, and environmental excellence.

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The initiative offers NCDOT and its stakeholders an opportunity to consider long-term vision when making land use decisions and design and operational decisions on the highway system. The creation of a long-term vision identifies the ultimate desired facility type (freeway, expressway, boulevard, or thoroughfare) for each corridor.

The Strategic Highway Network (STRAHNET) is a network of highways which are important to the United States' strategic defense policy and which provide defense access, continuity and emergency capabilities for defense purposes. NC 87, US 17 and US 74/76 are identified as non-Interstate STRAHNET routes in southeast North Carolina. Once built, Future I-140 will become an Interstate STRAHNET route. The Wilmington Bypass will also provide the US Marine Corps Base at Camp Lejeune with the most direct access to I-95 via I-40 and US 74 and will improve access to the Sunny Point Military Ocean Terminal. Construction of the Wilmington Bypass would "expand the spectrum of equipment that could be carried over the road and expedite the movement of military traffic with minimal disruption and hazard to other users".<sup>3</sup>

- **Hurricane Evacuation**

A controlled access freeway with a new, fixed-bridge crossing the Cape Fear River north of Wilmington is needed to provide connectivity between existing evacuation routes and facilitate access to I-40 and I-95. As expected growth and development continues within Brunswick County, the need for additional evacuation routes leading away from coastal areas will also increase. State designated hurricane evacuation routes in the vicinity of the project include US 17, US 74/76, and US 421. NC 87, US 17, and US 74/76 are identified as Brunswick County evacuation routes. It is anticipated that once completed, I-140 will become a designated hurricane evacuation route and would be the only evacuation route with fully controlled access. None of the other identified routes are fully controlled access facilities.

## **1.4 PURPOSE OF THE PROPOSED ACTION**

The purpose of the proposed action and the needs that will be fulfilled by the action are presented below:

- **Increase traffic capacity and reduce traffic volumes on congested roadway segments**

The project will provide a controlled access freeway bypassing the Wilmington Urban Area and will provide additional traffic capacity. Through traffic will be separated from local traffic thereby reducing the number of vehicles on congested segments of US 17 and US 421. If the project is not constructed, traffic that would otherwise be routed on the project will contribute to congestion on these routes in the future, further deteriorating traffic operations.

- **Complete a critical link in the National Highway System (NHS) and the Intrastate transportation system that will increase mobility, support economic growth and improve military transportation routes within the region**

The project will increase mobility within the region by facilitating connectivity of Brunswick County to the Intrastate and Interstate systems. The project is identified as a NCDOT SHC and is included in the NCDOT 2006-2012 TIP. It is also identified as a future component of the NHS. The NHS "includes the Interstate Highway System as well as other roads important to the nation's economy, defense, and mobility."<sup>4</sup> Congress approved the NHS in 1995 as "a way of focusing resources on the nation's most important roads."<sup>5</sup>

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The I-140 loop is designated as SHC #6D. This corridor is an associated “spur” of the major corridor (#6, I-40). The primary purpose of spur routes is to facilitate high-speed, efficient travel in or near an urban area. Spurs provide connections between SHCs and/or activity centers (such as a military base, major airport, or seaport). The I-140 loop connects US 17 (Corridor #51, #52, and #53), I-40 (Corridor #6 and #50), and US 74-76/Future I-20 (Corridor #24, #43, #49) in the Wilmington Urban Area, while providing connections to nearby Wilmington International Airport (ILM) and the State Port in Wilmington. The Wilmington Urban Area, ILM, and the State Port in Wilmington are each defined as an activity center.<sup>6</sup>

The project is consistent with the *Brunswick County Thoroughfare Plan* and the *Wilmington Urban Area 2030 Long Range Transportation Plan*. The Wilmington Bypass will provide an important connection between US 17 and US 74/76 (both of which are included in the NHS and identified as SHCs and I-40 and will improve transportation access for existing industries along US 421 and US 74/76. Improved access to and from the northern portion of Brunswick County, particularly in the vicinity of the Leland Industrial Park, will enhance the opportunity for future economic development within Brunswick County. The project will also provide a fixed-span bridge crossing of the Cape Fear River north of Wilmington and provide an alternative route for traffic crossing the existing lift-span bridges on NC 133 and US 17/74/76.

The Wilmington Bypass will also facilitate transport of military personnel and equipment. US 17, US 74/76, and NC 87 link important military installations and ports, and as such, are part of the US Department of Defense STRAHNET ). The STRAHNET is a network of highways which are important to the United States' strategic defense policy and which provide defense access, continuity and emergency capabilities for defense purposes.<sup>7</sup> Once built, Future I-140 will become an Interstate STRAHNET route.

- **Facilitate Hurricane Evacuation**

The Wilmington Bypass will facilitate evacuation of growing coastal areas in Brunswick County by providing a controlled access freeway evacuation route. It will also provide connectivity between the existing hurricane routes of US 17, US 74/76, US 421 and I-40. Improved connectivity among evacuation routes increases choices during emergencies and provides options to state and local emergency managers.

## **1.5 PROJECT DESCRIPTION**

### **1.5.1 PROJECT SETTING**

The R-2633A/B original study area, shown in Figure 1-2, is located in Brunswick and New Hanover counties, on the southeast coast of North Carolina. The study area boundaries are approximately US 421 to the east, NC 87 to the west, US 17 to the south, and the DuPont Cape Fear Plant to the north.

Due to its location on a coastal plain, the topography of the study area is flat. The dominant natural features are the Cape Fear River and Brunswick River, and their associated floodplains and wetland systems.

The study area is predominantly rural in nature. The towns of Leland and Navassa are within the study area. There are also several major industrial complexes in the study area, including Progress Energy's (formerly Carolina Power & Light Company) power plant, DuPont's fiber manufacturing plant, the CSX Davis Rail Yard, Rampage Yachts, P & W Waste Oil Service, and the Leland Industrial Park.

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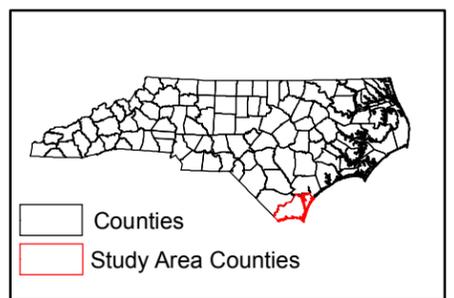
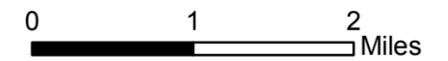
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TIP R-2633A/B  
Wilmington Bypass

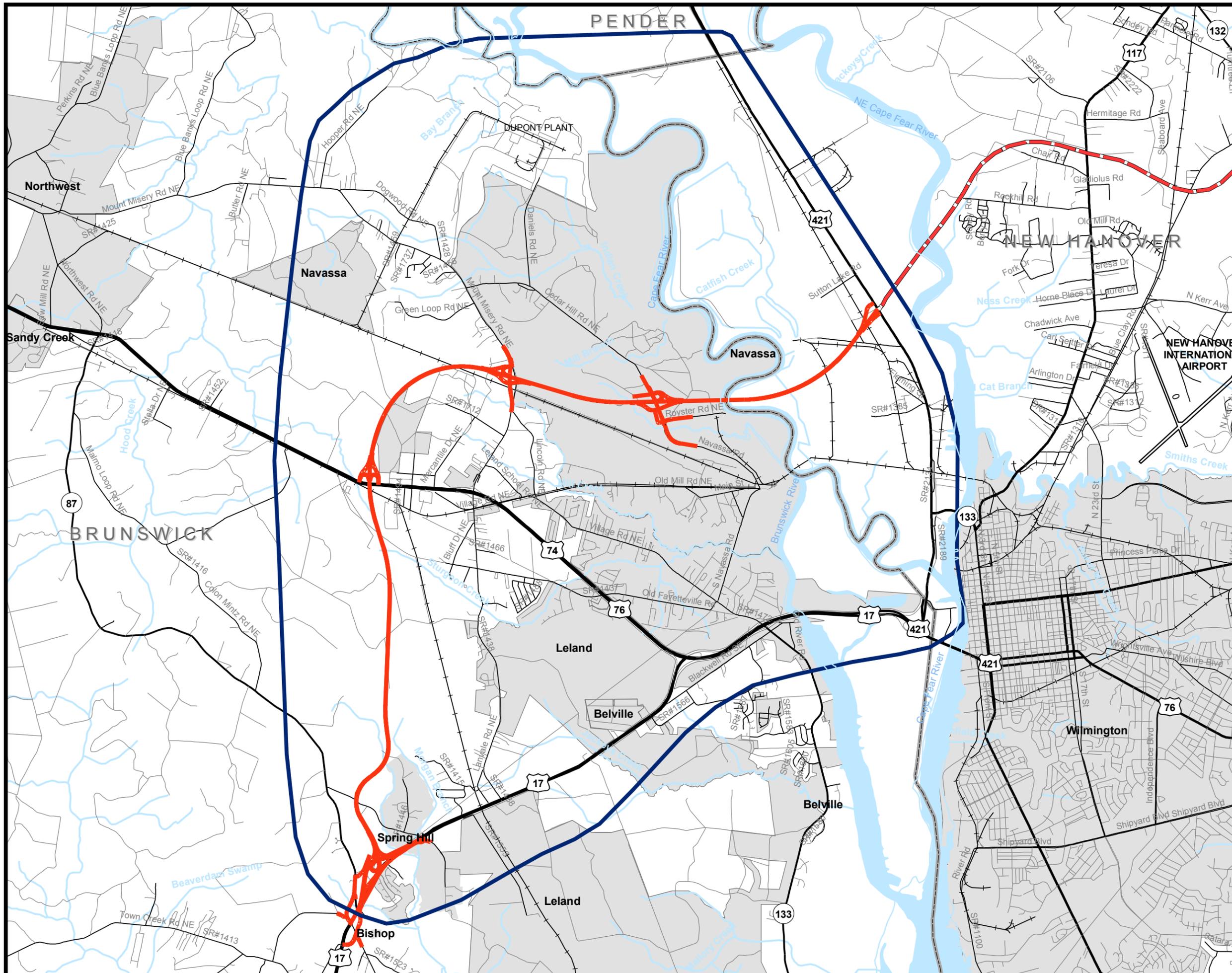
Figure 1-2  
R-2633A/B Original  
Study Area

Legend

-  R-2633 A/B Original Study Area
-  R-2633 A/B Recommended Alignment
-  R-2633 C
-  Interstate Highways
-  US Highways
-  State Highways
-  State Routes
-  Local Roads
-  Railroad
-  Municipal Boundaries
-  County Boundaries
-  Water
-  Streams (Non-delineated)



April 2007  
This map is for reference only.  
Sources: ESRI, CGIA, Brunswick County,  
New Hanover County, USDOT, NCDOT, URS.





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The City of Wilmington, east of the study area, is the major urban center for New Hanover and Brunswick counties. Wilmington is home to the state's largest seaport and is also served by a major regional airport, ILM, serving over a half million domestic and international passengers annually.

## **1.5.2 HISTORY OF THE PROJECT**

The 1972 Wilmington Transportation Study was the first study to identify the need for a circumferential route around the City of Wilmington.<sup>8</sup> The northern half of this recommended loop extended from US 17 in Brunswick County, west of Wilmington, to US 17 in New Hanover County, east of Wilmington, and was proposed as a four-lane divided freeway.

In the 1985 update of the Wilmington Transportation Study, a number of changes were made to the recommended northern outer loop. Notably, the corridor was shifted northward to take into account the extension of I-40.<sup>9</sup> In addition, the recommended size of the outer loop was downgraded from a four-lane freeway to a four-lane expressway and a separate thoroughfare plan was established for Brunswick County.<sup>10</sup>

Following adoption of the 1985 Wilmington Transportation Study, the Wilmington Urban Area Metropolitan Planning Organization (WMPO) requested that the northern outer loop be added to the NCDOT's TIP. In November 1989, the northern outer loop was added to NCDOT's 1990-1996 TIP as a four-lane freeway and was renamed the Wilmington Bypass. The project was designated as R-2633 and extended from US 17 in Brunswick County to I-40 in New Hanover County. Funding was included in fiscal year 1990 for the start of the planning and environmental studies. The studies began in August 1990. In December 1991, documentation focusing on protected species and cultural resources was converted to federal NEPA standards. Other studies, including land use analyses, were also being conducted. In 1994, Governor James Hunt's *Transportation 2001 Plan* recognized the immediate need to relieve traffic congestion in downtown Wilmington.<sup>11</sup> The NCDOT, in consultation with the FHWA, determined that two environmental impact statements (EISs) should be prepared; one for R-2633C and one for R-2633A/B.<sup>12</sup> The Draft EIS (DEIS) for R-2633C was approved on January 31, 1995. During the DEIS review period, citizens, and state and federal environmental resource and regulatory agencies expressed concern about R-2633A/B. The agencies requested that further studies be conducted for R-2633A/B before commenting on the R-2633C DEIS.

The NCDOT postponed preparation of the FEIS for R-2633C until a Supplemental DEIS for R-2633C and a Draft EIS for R-2633A/B were prepared. This allowed for simultaneous review of both documents. The Supplemental DEIS for R-2633C was released on December 5, 1996, and the DEIS for R-2633A/B was released on December 24, 1996. The FEIS for R-2633C was released on November 7, 1997 and the Record of Decision (ROD) was signed on January 29, 1998. Construction of R-2633C was completed in July 2006.

In 1998 Alternative 9 was selected as the Preferred Alternative. Since selection of the Preferred Alternative, preliminary engineering has proceeded and efforts to further avoid and minimize impacts to the social, physical, and natural environment have been studied and are documented throughout this FEIS. These efforts include, but are not limited to, shifting the alignment, bridging streams and wetlands, inclusion of wildlife crossings, and adjusting interchange configurations.

The project is included in the NCDOT 2006-2012 as project number R-2633A/B. Right-of-way acquisition is scheduled to begin in NCDOT fiscal years 2007 and 2008 and construction is scheduled to begin in NCDOT fiscal years 2009 and 2010.

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In a letter dated January 24, 2002, NCDOT requested FHWA to add the Wilmington Bypass to the Interstate System under 23 USC 103(c) (4) (b). NCDOT also submitted an application for consideration by the American Association of State Highway and Transportation Officials (AASHTO) Route Numbering Committee for the Wilmington Bypass to be designated as I-140. FHWA approved NCDOT's request in a letter dated September 11, 2002, noting that it will not be added to the Interstate System until completion of construction of the project. In a letter dated June 30, 2003, AASHTO approved the application for establishment of I-140 noting that until it is added to the Interstate System by FHWA, it should be referred to only as "Future I-140."

### **1.5.3 INDEPENDENT UTILITY OF THE PROJECT**

FHWA regulations (23 Code of Federal Regulations [CFR] 771.111 (f)) states that a project must: connect logical termini and be of sufficient length to address environmental matters on a broad scope; not restrict consideration of alternatives for other reasonably foreseeable transportation improvements; and have independent utility or independent significance.

The project's termini were chosen based on analysis of constraints conducted at the project's initiation to determine the least environmentally damaging locations for interchanges. The location of the southern terminus on US 17 at Bishop was based on a combination of minimizing impacts to residences and businesses, the sensitive headwaters of Morgan Branch and related wetlands, the historic Goodman property (listed on the National Register of Historic Places (NRHP)), a cemetery, churches in the area, the Spring Hill community, the length and associated cost of the alternatives, and the location of existing NC 87 (Maco Road). In addition to these avoidances, the engineering of a tie-in to existing US 17 was limiting, as the project is a controlled access facility required to meet interstate standards and would involve a system interchange requiring a large footprint and lengthy controlled access limits on each leg. The large footprint of this interchange would be best suited for a large, relatively undeveloped area of land. Large undeveloped areas are limited along US 17 in the study area. The selection of an interchange location with US 17 east of Bishop is constrained by the location of the Sunny Point Military Ocean Terminal railroad line and urban development. Potential interchange locations with US 17 south of Bishop are undesirable as US 17 turns southward, thus substantially lengthening the amount of roadway on new location which would result in additional environmental impacts as well as a circuitous route.

To form a continuous bypass, the project terminus at US 421 in New Hanover County must connect to the terminus of R-2633C at US 421. Location of this interchange was fully evaluated for environmental impacts in the R-2633C EIS.<sup>13</sup>

The construction of Future I-140 from US 17 in Brunswick County to I-40 in New Hanover County and the I-40 Connector from I-40 to US 17 would provide a key component to the US 17 Intrastate Corridor. However, the construction of the project between US 17 and US 421 would also have additional, independent utility. This portion of Future I-140 would help alleviate congestion on local highways (US 17, US 74/76, and US 421) by separating through-traffic from local traffic and by providing another crossing over the Cape Fear River. Furthermore, future I-140 would provide a high-speed controlled access freeway that would facilitate travel within Brunswick County and between north New Hanover County and north Brunswick County.

The project's termini at US 17 and US 421 are logical endpoints. The project would have independent utility and its construction would be a reasonable expenditure of funds. The proposed project is of sufficient length to allow for evaluation of alternatives and environmental issues on a broad basis and would not restrict the consideration of alternatives for other reasonably foreseeable transportation improvement projects. Project U-4738, commonly known as the Cape Fear Skyway, is a candidate project selected for environmental study only by the

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North Carolina Turnpike Authority (NCTA). There is no current schedule in the TIP for right of way acquisition or construction of the project, no environmental documents have been completed for the project, and no preferred alternative has been identified. The Cape Fear Skyway is described as a new facility from US 17 in Brunswick County to the Independence Boulevard/Carolina Beach Road intersection in New Hanover County. Its terminus at US 17 could be located near the terminus of the Wilmington Bypass, or elsewhere along US 17. There is considerable uncertainty associated with the viability of the project and whether the NCTA will continue to pursue it. It is not considered to be reasonably foreseeable at this time. Please see Section 4.2.7 for more discussion of the Cape Fear Skyway.

## **1.6 SYSTEM LINKAGE**

### **1.6.1 EXISTING ROAD NETWORK**

Figure 1-2 shows the existing primary and secondary roadways in the study area. Currently, there are no continuous northeast-southwest routes around Wilmington. Prior to construction of R-2633C, through-traffic had to travel through the Wilmington downtown business district and across one of two bridges; one over the Northeast Cape Fear River and one over the Cape Fear River. The northern bridge over the Northeast Cape Fear is part of NC 133 and the southern bridge over the Cape Fear River is part of US 17/74/76. Both bridges are movable span bridges and the periodic raising of the spans to accommodate river-going vessels can cause delays, especially during peak-hour periods and summer beach travel. Queues caused by the US 17 bridge affect north bound traffic on US 421/NC 133 due to the lack of alternative routes and connectivity in the local network.

Travelers from northeast Brunswick County can use existing US 17 to travel south into South Carolina and US 74/76 to travel west. Traveling to points north is more difficult. As discussed, prior to completion of R-2633C vehicles had to use the two bridges into Wilmington to reach the region's major north/south roads; I-40 and US 17. Since construction of R-2633C and R-2405, travelers are able to avoid traveling through downtown Wilmington, but have to travel on existing US 421 between US 17/74/76 and R-2633C.

### **1.6.2 MODAL INTERRELATIONSHIPS**

Several transportation modes are active within the Wilmington region including railroads, an international airport, transit, rideshare, bicycle, and navigable waterways. These various modes of transportation and their relationships to the project area, as well as to other modes of transportation, are presented in this section of the FEIS.

#### **1.6.2.1 Railroads**

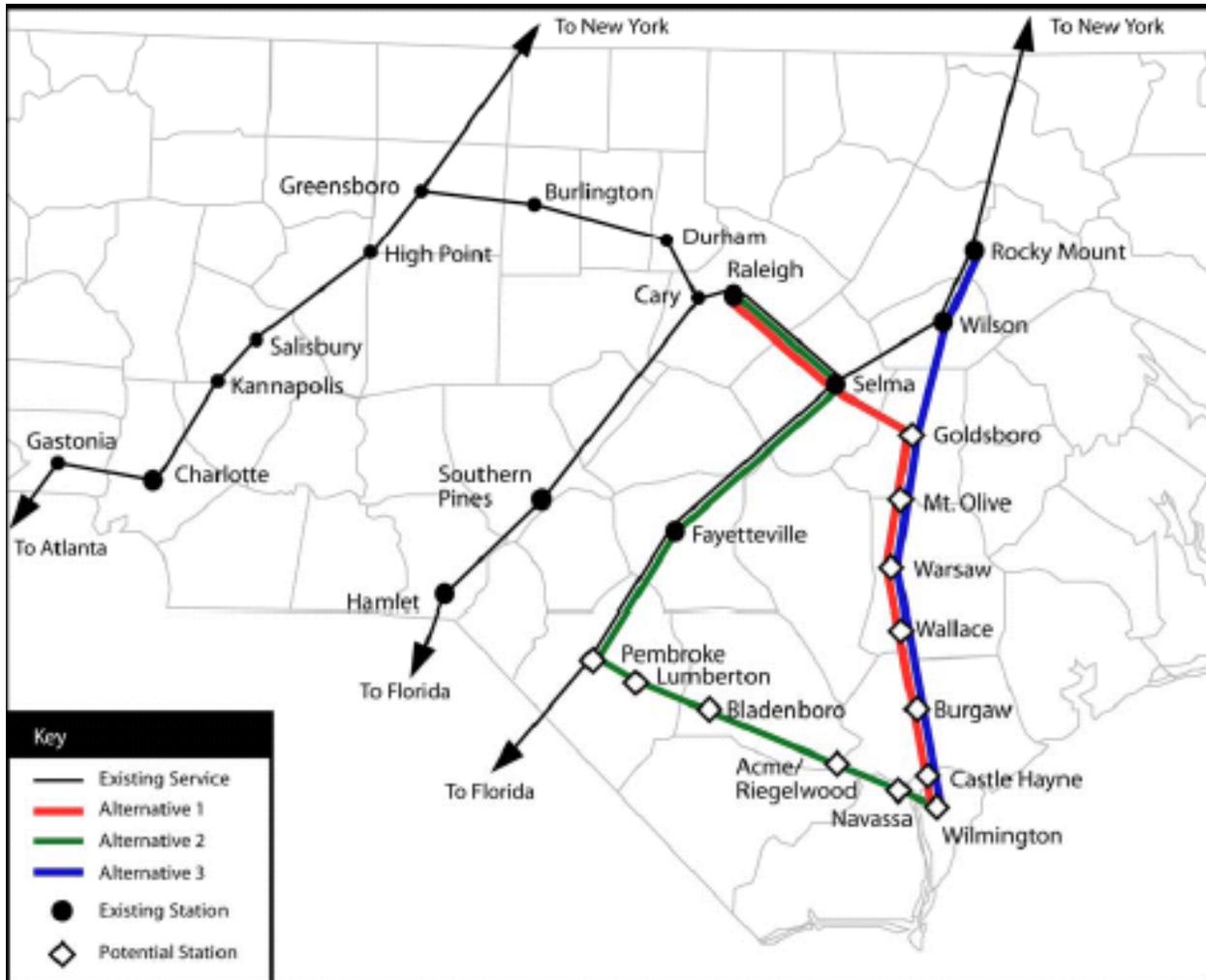
The Wilmington region contains several active and inactive rail corridors as well as two major switching stations. The Davis Yard is located in northern Brunswick County and the other, a Department of Defense switching yard, known locally as the military railroad "turn-around", is located southwest of Leland.

The rail lines in the study area provide both commercial and military services, connecting the Port of Wilmington and Sunny Point Military Ocean Terminal to urban areas within North Carolina and the southeastern United States, as well as major military installations such as Fort Bragg and Camp Lejeune.

The project is proposed as a controlled-access freeway; therefore, grade-separated crossings of all railroad tracks would be provided. These grade-separated crossings would provide safe, uninterrupted travel for vehicles and rail operations alike.

Currently there is no passenger rail service serving the Wilmington Metropolitan area or southeastern North Carolina. In 2005, a study was completed by NCDOT that evaluated the possibility of restoring passenger rail service to the Wilmington area. The report identified three possible routes and the expected ridership, but no timeframe for when service might possibly begin was given. The three routes studied were: (1) Wilmington to Raleigh via Goldsboro, (2) Wilmington to Raleigh via Fayetteville, and (3) Wilmington to Rocky Mount. The following map (Figure 1-3) shows the proposed alternatives, as well as existing routes. Table 1-1 shows the projected annual ridership of the routes, as well as the estimated travel times.

**Figure 1-3: Proposed Passenger Rail Route Alternatives**



Source: NC DOT Rail Division. Southeast North Carolina Passenger Rail Study, 2005. Available: <http://www.bytrain.org/future/southeastern.html>. Accessed: 10 March 2006.

**Table 1-1: Forecasted Results for Wilmington Passenger Rail Service**

	Alternative 1	Alternative 2	Alternative 3
	Wilmington-Goldsboro - Raleigh	Wilmington – Fayetteville -Raleigh	Wilmington -Rocky Mount
Route Length	132 mi.	188 mi.	124 mi
Travel Time	2 hrs 30 min	3 hrs 22 min	2 hrs 11 min
Ridership (annual)	74,100	58,900	32,000

Source: NC DOT Rail Division. Southeast North Carolina Passenger Rail Study, 2005. Available: <http://www.bytrain.org/future/southeastern.html>. Accessed: 10 March 2006.

### **1.6.2.2 Airports**

Presently no commercial airlines serve Brunswick County; however, the Brunswick County Airport in Southport, the Ocean Isle Beach Airport, as well as the privately owned Winnabow Airport in Winnabow serves other air travel.

The Wilmington International Airport (ILM) is located north of Wilmington in New Hanover County and provides the closest commercial air service. It is a major regional airport serving over one half million domestic and international passengers. In 2005 over 700,000 passengers and over 4.1 million pounds of cargo passed through ILM.<sup>14</sup> The airport is developing a 230 acre business/industrial park. Implementation of the proposed action would facilitate access to the airport and its associated business and industrial park.

### **1.6.2.3 Transit**

The study area is served by the Brunswick Interagency Transit System (BITS) and the Cape Fear Public Transit Authority, operated as the “Wave”. BITS operates shuttle service for seniors and the physically disabled providing transportation to and from resources that include the senior center and the community college. The intent of the program is to provide transportation services between government centers for both senior citizens and the physically disabled. Additionally, there is a Dial-a-Ride program that provides on-call service for a fee.

The Wave provides fixed route, bus transit service within the Wilmington Urban Area. It provides service into Brunswick County via the Brunswick Connector continuously on a fixed bus route connecting the towns of Navassa and Leland with downtown Wilmington. The route has 12 stops and follows US 74/76 out of Wilmington to SR 1472 (Village Road) and then north to SR 1432 (Old Mill Road) where it proceeds east to loop through Navassa and return west down SR 1432 (Old Mill Road) to Leland School Road N.E. Following Leland School Road N.E. to SR 1426 (Mt. Misery Road), the route turns south to US 74/76 and back to downtown Wilmington. The Wave also operates the Columbus Connector, which is a fixed bus route that connects Columbus County and the Lake Waccamaw area to Wilmington. It operates once in the morning and once in the evening.

Currently, there are no plans for either system to operate fixed routes along the project. It is possible that the project could be used for express routes connecting northeast Brunswick County to points in the central and southern portions of Brunswick and northern New Hanover County as future transit demand develops.

Greyhound Bus Lines offer transportation service throughout the country from two stops/stations located in the vicinity of the project. One location is in downtown Wilmington (New Hanover County) and the other location is at a Bojangles restaurant in Shallotte (Brunswick County).

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#### **1.6.2.4 Rideshare**

A few rideshare initiatives have been developed in the Wilmington area, but are not widely utilized within the study area. Elements of the *Transportation Demand Management (TDM) Plan* being implemented within the Wilmington Urban Area address the expansion and use of ridesharing, carpooling, and vanpooling to reduce vehicle miles traveled and average daily traffic within the region. The effects of ridesharing will be more beneficial in the long term (2025) as population and land use densities increase within the urban area.

#### **1.6.2.5 Bicycles**

Both Brunswick County and the Greater Wilmington Metropolitan Urban Area have bicycle plans that designate future bicycle routes within the study area. The Greater Wilmington Urban Area Transportation Plan addresses bicycle needs that serve to promote a fun, healthy, and environmentally friendly transportation alternative. The plan seeks to increase bicycle use through the identification, improvement, and designation of a network of streets and trails that allows individuals to travel safely by bicycle.<sup>15</sup> Development of the bicycle trails would be around points of interest that include residential areas, recreational facilities, and places of education and employment. None of Wilmington's high priority bicycle routes are within the study area; however, US 421 is identified as having a need for future bicycle lanes. The Brunswick County Bicycle Plan also identifies bicycle routes that would provide an alternative mode of transportation linking community resources within the study area. The plan identifies SR 1472 (Village Road) in Leland as a high priority bicycle route.

#### **1.6.2.6 Navigable Waterways**

The study area is located adjacent to the navigable waterways of the Cape Fear River and Northeast Cape Fear River and would cross the Cape Fear River. The Port of Wilmington, also located in the vicinity of the study area, is North Carolina's largest seaport. The port includes piers, wharves, and docks located on the Cape Fear River and the Northeast Cape Fear River.

#### **River Traffic**

River traffic is active on both the Cape Fear River and the Northeast Cape Fear River and consists of a variety of private and commercial vessels. However, vessel size on the Cape Fear River within the study area is restricted by the 55-foot (16.8-meter) height of the US 421 fixed-span bridge over the river, which is located downstream of the proposed project. For this reason, the majority of commercial port vessel traffic travels up the Northeast Cape Fear River. Commercial vessel traffic crossing the project area consists of coal barges that service the Progress Energy power plant located upstream of the project area. Other vessels crossing the project area include recreational and pleasure craft. The Port of Wilmington generates the majority of commercial vessel traffic on the Cape Fear River. During 2005, the port accommodated 362 ships and 14 barges. Other waterfront cargo facilities on the Cape Fear River are upstream of the downtown area and downstream of the project area.

#### **Inland Cargo Transport**

A total of 3,004,064 tons of cargo passed through the Port of Wilmington in fiscal year 2005. The top five imports were forest products, chemicals, cement, general merchandise and metal products. The top five exports were woodpulp, general merchandise, forest products, food products and chemicals. This cargo is transported to and from manufacturers and industries throughout North Carolina. According to one study, the ports at Wilmington and Morehead City directly and indirectly supported 48,300 jobs and contributed almost 30 million dollars in state

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and local tax revenues in calendar year 2004. Only 4,000 of these jobs were at the port or directly related to maritime activity.

In his “State of the Ports” speech given at the end of 2005, the Chief Executive Officer (CEO) of the North Carolina State Port Authority (NCSPA) indicated that the Port of Wilmington is in the process of a 130 million dollar expansion program that will double throughput in the next five years. Changes include the purchase of new equipment, new processes, and infrastructure.

The majority of berths at the Port of Wilmington, including the complex owned by the NCSPA, are located along the eastern shore of the Cape Fear River, concentrated along the city’s downtown waterfront area. By land, most of these berths can be accessed from River Road and Maritime Boulevard. Most berths on the western shore can be reached from US 421.<sup>16</sup>

## **1.7 LAND USE PLANNING**

The project area is in Brunswick and New Hanover counties and is within the planning jurisdictions of the towns of Navassa and Leland and the City of Wilmington. Documents and data relevant to population and employment trends, land use planning and zoning, economic development planning, and other planning activities for these counties are presented in this section.

### **1.7.1 POPULATION AND EMPLOYMENT TRENDS**

When the easternmost segment of I-40 opened in 1990, it became a gateway to rapid population growth in both New Hanover and Brunswick counties.<sup>17</sup> The completion of I-40 tied the Wilmington area to the national Interstate Highway System and the opportunities this provided. Improved access resulted in a positive economic effect on the region from increased trade and tourism.

The Brunswick County/New Hanover County/Wilmington area is one of the most rapidly growing regions in the state. Between 1980 and 1990, the population of Brunswick County grew 43 percent, from 35,777 to 50,985 persons. Between 1990 and 2000, the population grew from 50,985 to 73,143 persons, a 43.5 percent increase. During the same decades, the population of New Hanover County grew 16.2 percent (1980 to 1990) from 103,471 to 120,284, and 33.3 percent (1990 to 2000) from 120,284 to 160,327 persons.<sup>18</sup> The towns of Leland and Navassa experienced approximately eight percent growth between 1990 and 2000. In contrast, North Carolina grew 6.5 percent between 1980 and 1990 and 21.4 percent between 1990 and 2000.<sup>19</sup> By 2020, it is projected that Brunswick County’s population will be 112,992 and New Hanover County’s population will be 231,402.<sup>20</sup>

The City of Wilmington, in New Hanover County, is southeast North Carolina’s center for regional trade and services, and as such, has attracted people and jobs to the area. The Brunswick County civilian labor force has grown substantially from 11,250 in 1970 to 35,068 in 2000.<sup>21</sup> New Hanover County has also experienced a substantial growth in its civilian labor force during this period, growing from 33,580 to 86,314.<sup>22</sup>

In Brunswick County the three largest employment sectors are trade (24.8 percent), services (19.1 percent), and government (18.0 percent). The total number of employees in the manufacturing sector has continually decreased in Brunswick County since 1970. The number of employees in this sector in 1990 declined to a total of 2,570. The proportion of manufacturing jobs declined between 1970 and 1980 from 33.1 to 12.3 percent, while employment in services and trade sectors increased. Like Brunswick County, New Hanover County’s largest employment sectors are also trade (25.9 percent), services (27.0 percent), and government

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(17.1 percent).<sup>23</sup> In New Hanover County, the number of persons employed in the manufacturing sector also declined from 1970 to 2000.<sup>24</sup> This decline is consistent with overall nationwide trends. Substantial decreases in manufacturing employment have occurred in the fabricated metals and textiles industries in New Hanover County, while substantial increases in employment have occurred in the chemicals and machinery industries.<sup>25</sup>

Brunswick County and New Hanover County both have strong tourism industries. In 2004, Brunswick County was ranked 10th in travel impact among North Carolina's 100 counties and generated an economic impact of \$313.65 million in domestic tourism. This was a 15.1 percent increase over 2003. Area attractions include historic Southport and Brunswick Town, Bald Head and Oak Island Lighthouses, Fort Caswell, Calabash seafood and ocean beaches along the Atlantic coast.<sup>26</sup> In the same year, New Hanover County was ranked eighth in travel impact among North Carolina's 100 counties and generated an economic impact of \$327.98 million in domestic tourism. This was a five percent increase over 2003. Area attractions include the U.S.S. North Carolina, Cape Fear Botanical Garden, Fort Fisher, Screen Gems Studios, Bellamy Mansion, North Carolina Aquariums, Cape Fear Museum and Atlantic beaches such as Wrightsville.<sup>27</sup>

## **1.7.2 LAND USE PLANNING AND ZONING**

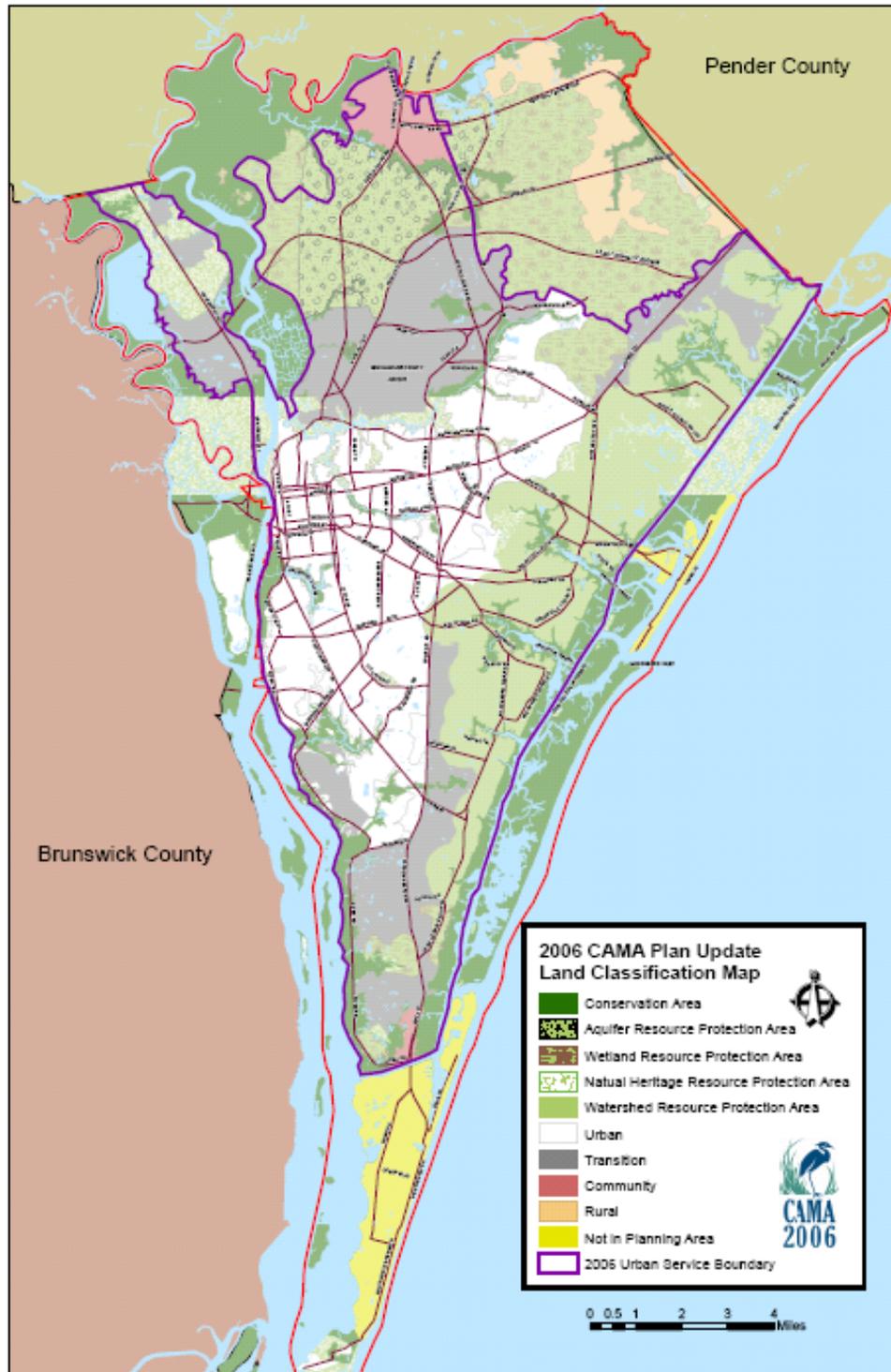
### **1.7.2.1 Land Use Planning**

Future land use proposals for the Brunswick County portion of the project area are depicted in the *Brunswick County Land Use Plan*, 1997 update. The Planning and Development Department for the City of Wilmington and the New Hanover County Planning Department are jointly responsible for the preparation, updating and implementation of the *Wilmington-New Hanover Land Use Plan*. The plan is designed to permit continued expansion of the area's economy while preserving its natural resources and quality of life. New Hanover County developed a land classification system and map to assist in the implementation of their land use plan. The land use classification is meant to coincide with zoning. The portion of the project area that falls in New Hanover County crosses watershed resource protection and transition areas (see Figure 1-4). According to documentation for the classification system, the watershed resource protection area subclass "...occurs along the tidal creeks and is defined as the area within ½ mile of the 100-year flood plain for those creeks. The impact that the resources are being protected from is pollutant laden stormwater runoff from impervious surfaces within the watershed. The protection strategy for this subclass of resource protection area focuses on minimizing new impervious surface, retrofitting protection measures to improve water quality of runoff from existing impervious surfaces and to promote low impact best management practices for development and redevelopment." Transition areas, on the other hand, are meant to "...provide for future intensive urban development on lands that have been or will be provided with necessary urban services." The location of these areas is based upon land use planning policies requiring optimum efficiency in land utilization and public service delivery. As shown in the map, the project is taken into account in the land classification system.<sup>28</sup>

In 2004, the City of Wilmington adopted a future land use plan covering the period from 2004 to 2025. The vision for Wilmington as established in the future land use plan is as follows: "Wilmington will be an attractive, safe place to live, work, raise a family, and retire. The City will be known for historic character and culture, a vibrant downtown and beautiful waterfront, environmental assets, thriving neighborhoods with convenient access to amenities, quality educational and health care institutions and its strong economy with exceptional employment opportunities, shopping and services." The six "pillars of a strong community" identified in the plan are historic assets, environment, public spaces, neighborhoods, infrastructure, and commerce. The three purposes served by the plan are to: (1) serve as the primary policy guid

for evaluating all future rezoning proposals, (2) serve as a policy guide for preparing capital improvement programs and budgets, and (3) act as a guide for future revisions to development regulations necessary to implement the strategies of the plan.<sup>29</sup>

**Figure 1-4: New Hanover County Land Classification Map**



Source: New Hanover County, North Carolina. "Land Classification Map." Available: [http://www.wilmingtonnc.gov/Portals/0/devlserv/CAMA\\_LandClassMap.pdf](http://www.wilmingtonnc.gov/Portals/0/devlserv/CAMA_LandClassMap.pdf). Accessed 16 March 2006.

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In 2005 New Hanover County began a community planning effort for the Castle Hayne area. Ideas for the redevelopment project revolved around traffic (circulation, lighting, and access), buildings, aesthetics, business needs, and public areas.<sup>30</sup>

Both Brunswick and New Hanover counties have documented visions and goals for their jurisdictions. In its 2003 “Visioning Goals and Strategies” document, Brunswick County developed several mission statements. Some of those include the following: (1) “to set high standards for responsible, well-managed growth and guide development patterns through comprehensive planning and community involvement,” (2) to “provide an infrastructure system that meets our citizens’ present and future needs, supports a vibrant economy, protects the environment and adds to the overall quality of life,” (3) to “protect the natural environment that contributes to the health, recreation, and well being of the county,” and (4) “provide a transportation network which will meet the safety and security needs of the Brunswick County residents and visitors.” A concern noted in the document relating to the 2004-2010 TIP is that “Brunswick County is home to a nuclear power plant, a major Army ocean terminal for ammunitions shipments and is prone to wildfires, hurricanes and floods, yet all evacuation routes out of the beach and surrounding communities along the coastal area are two lane roads.” As part of the strategy for the goal of road system improvements, Brunswick County supports the planning and implementation of regional roadways.<sup>31</sup> In their comprehensive plan, planners in New Hanover County outlined a vision for transportation that, “Our highways will meet the appropriate levels of service and scheduled plans will be ahead of anticipated growth patterns. There will be an inter-modal transportation system serving our County, State and Region.”<sup>32</sup>

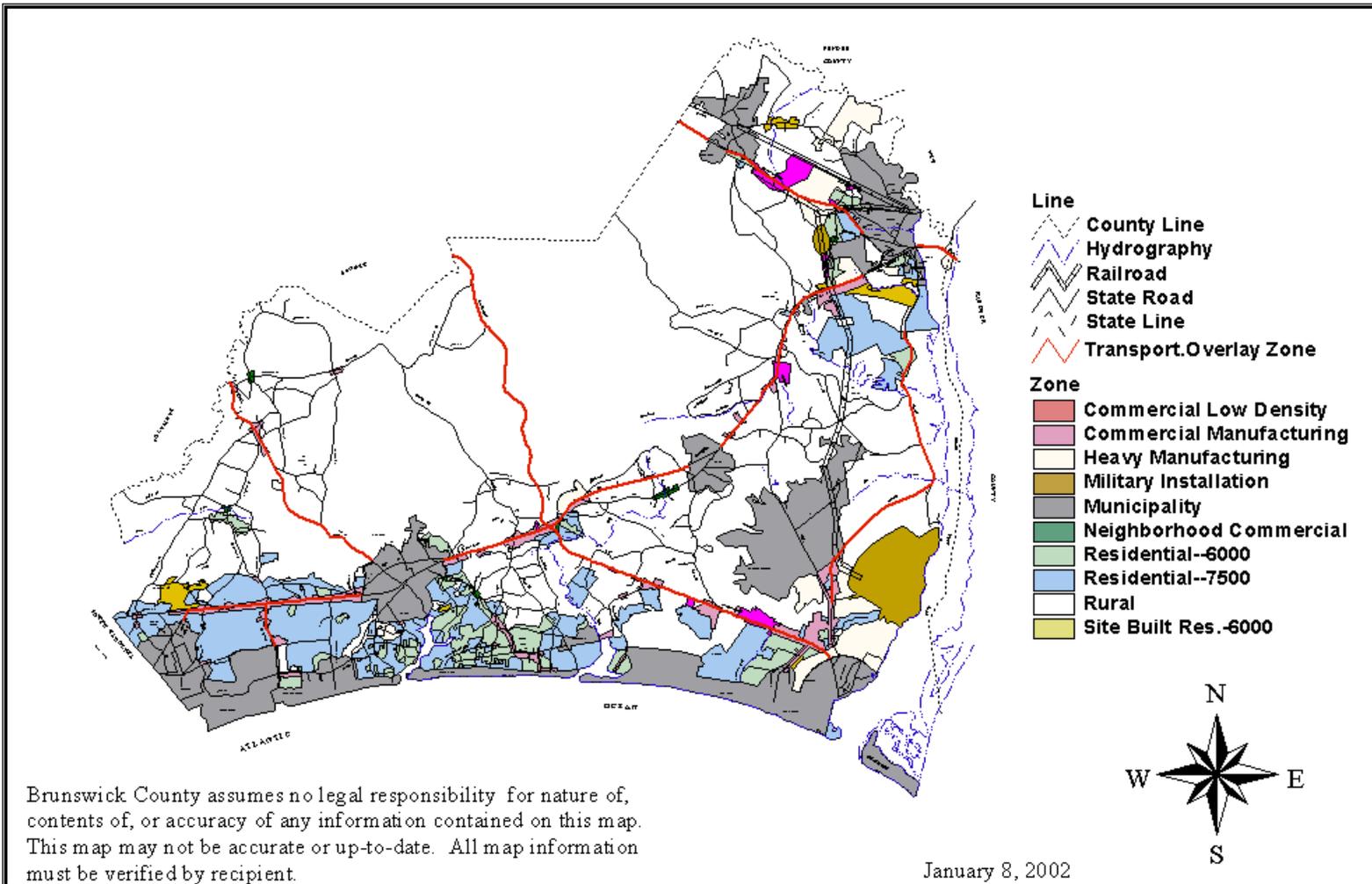
### **1.7.2.2 Zoning**

The project area falls under the zoning jurisdictions of Brunswick and New Hanover counties, the towns of Leland and Navassa, and the City of Wilmington. Zoning under each of these jurisdictions is described below.

#### **Brunswick County**

In addition to the standard zoning classifications including: rural, residential, commercial, manufacturing, industrial, and military installation; Brunswick County has three overlay districts that are applied in conjunction to the traditional zoning districts to support specific public policy objectives. One overlay district is for Economic Development. This district makes appropriate land available for development projects that will result in the creation of non-service jobs. Another overlay district is for Water Quality Protection with the purpose to bolster state and federal regulations to protect the unique environmental features of the Lockwood Folley River. Finally, the last overlay district is for Transportation. This district ensures that land adjacent to major roadways is developed in a manner that preserves scenic beauty, promotes efficient movement of traffic, eliminates strip development, and encourages prudent site layout. While a portion of the study area falling in Brunswick County is under the jurisdiction of municipalities, applicable Brunswick County zoning districts include rural, residential, low density commercial and transportation overlay. The zoning districts in Brunswick County are shown in Figure 1-5.

Figure 1-5: Brunswick County Zoning Districts



Source: Brunswick County, Planning Department. "Zoning Map." January 2002. Available: <http://www.brunsko.net/modules.php?name=Departments&sop=viewarticle&artid=89>



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## **Town of Leland**

The Town of Leland has established zoning ordinances with the purpose of providing for orderly growth and development of the town. Standard zoning districts of residential, commercial, office and institutional, multi-family, and planned unit development are established in the ordinance. No overlay districts are specified.<sup>34</sup> According to the town's Planning Director, current zoning and land use plans do not sufficiently address future development needs, transportation improvements and environmental protection. Future zoning and land use plans would be greatly affected by the project, and the town is currently in the process of looking into new codes and ordinances to address the project.<sup>35</sup> The zoning map for Leland is shown in Figure 1-7.

## **Town of Navassa**

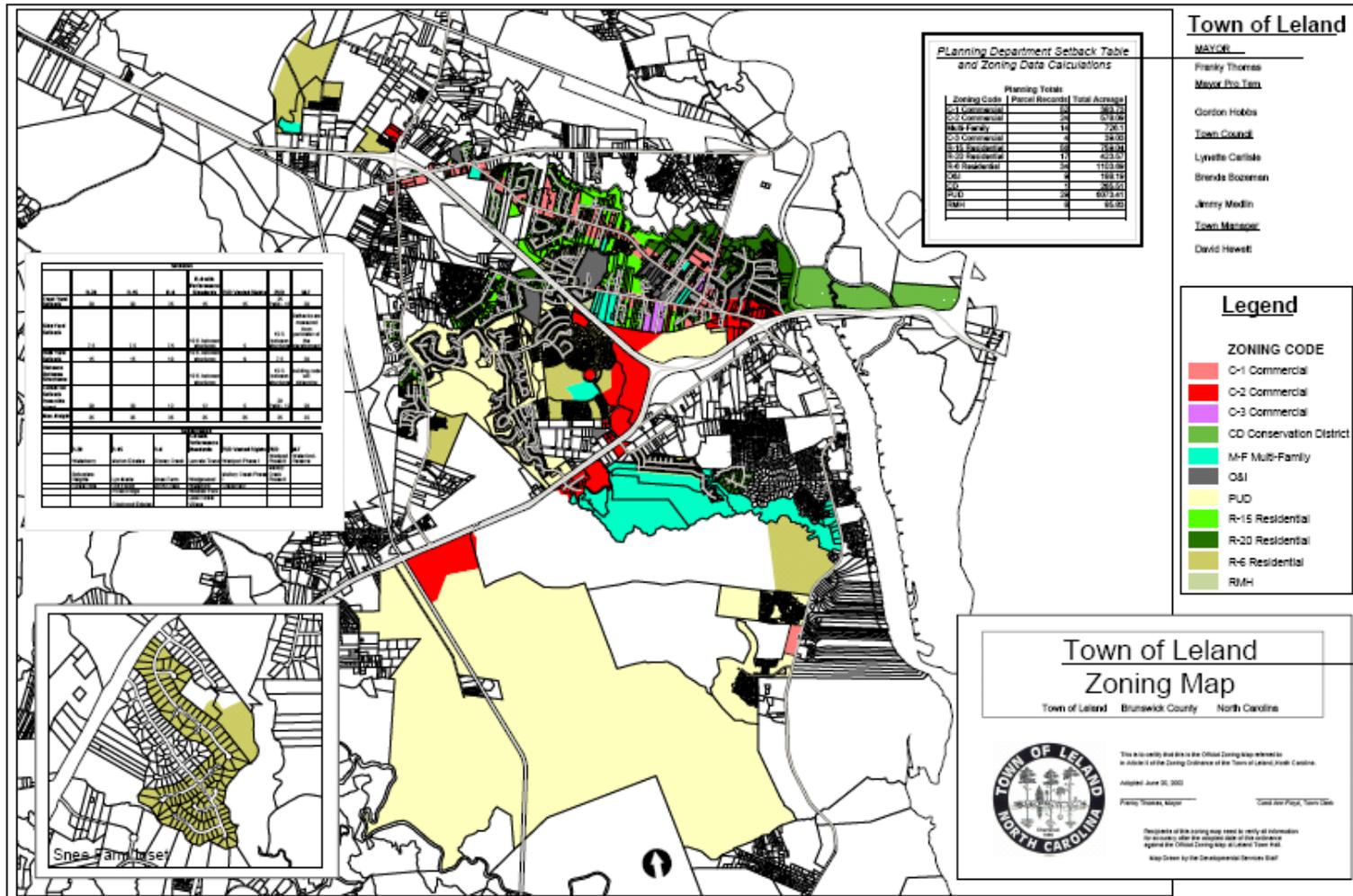
The Town of Navassa also has traditional zoning ordinances. According to the "Town of Navassa Collector Street Plan," areas zoned for commercial and heavy manufacturing account for a large portion of the land mass in Navassa. Areas zoned for residential use are concentrated in the southern portion of town and are mostly developed. Heavy industrial uses are designated in the eastern and southeastern part of town. There are also some areas designated for rural land uses.<sup>36</sup>

## **City of Wilmington**

The City of Wilmington adopted an updated "Land Development Code" in January of 2005.<sup>37</sup> The "Land Development Code" has standard zoning classifications for residential districts; a planned development district; historic districts; commercial, community, neighborhood, regional and central business districts; industrial districts; a cemetery district; offices and institutional districts; and an airport industrial district. In addition to these classifications, Wilmington also established five overlay districts described in more detail below.

- Flood-Plain- designed to minimize private and public losses of life, property, commerce and services from the hazards of floods through the enforcement of the "Flood Plain Management Regulations of the City of Wilmington."
- Special Highway- designed to protect the natural beauty and scenic vistas along interstate highways and other specifically designated roadways that serve as major accesses and gateways into the City of Wilmington.
- Corridor Overlay- established to provide a series of overlapping regulations for specific roadway corridor areas with the purposes of: (1) recognizing the importance that different roadway corridor areas play in defining the City's character at city entryways and/or significant cultural or historic thoroughfares, (2) protecting and preserving the aesthetics and traffic handling capabilities of the roadways, and (3) satisfying the policies and objectives of the South 17<sup>th</sup> Street and Land Use Plan update. Specific regulations are made for Dawson-Wooster, Wrightsville Avenue, and the South 17<sup>th</sup> Street/ Independence Boulevard Corridor.
- Historic District- designed with the purpose of protecting and preserving areas which, as a result of their architectural significance, historic importance, or their overall aesthetic qualities, are important elements of the character and heritage of the City, County and State; safeguarding the qualities of a Historic District-Overlay as a whole and individual property therein which embodies important elements; promoting the conservation of the City's neighborhood resources; and stabilizing property values within a Historic District-Overlay.

Figure 1-7: Town of Leland Zoning Map



Source: Town of Leland, Developmental Services Department. September 2005.

- 
- Conservation Overlay- created with the purpose of protecting important environmental and cultural resources within the City. The overlay district is designed to protect certain “conservation resources.” Those resources include: swamp forest, pocosin, savannah, natural ponds, freshwater marsh, brackish marsh, primary nursery areas, barrier island-beach complex, maritime shrub thicket, salt marsh, and animal and plant areas of special significance. Archaeological and historic resources are also protected in the conservation overlay districts.

### **1.7.3 ECONOMIC DEVELOPMENT PLANNING**

Transportation systems are seen as integral to the continued growth of expanding areas. The City of Wilmington is located in New Hanover County and is considered the regional trade and service center for southeast North Carolina. Due to the coastal location of the metro area, the port and tourist industries are vital to the local economy. In recent years growth in these sectors has been complemented with the addition and expansion of high tech industries.

#### **Brunswick County**

In their “Visioning Goals and Strategies” document, Brunswick County describes goals for the county’s employment and economic outlook and measures taken to reach those goals. The Brunswick Tomorrow Economic Development Action Team was formed to “Identify strategies for attracting companies, primarily other than service-oriented industries, to locate in Brunswick County.” The goals and strategies outlined in Brunswick County’s plan include the promotion of ecotourism, adventure sports, new farm crops, expansion of local incentives to attract industry and development of training and education programs.<sup>38</sup>

#### **New Hanover County**

New Hanover County established goals for employment and economic development in their “Comprehensive Plan.” Issues identified include the need to attract diverse employers with high paying jobs, a need to balance tourism with a diversified economy, and the need to increase workforce preparedness. Also stressed is the economic contribution of the port. According to the plan, “To remain competitive into the next decade the State port will need to deepen its harbor, improve inland highway and rail access, and upgrade the terminal.”<sup>39</sup>

## **1.8 TRANSPORTATION PLANS**

### **1.8.1 NATIONAL TRANSPORTATION PLANS**

The Strategic Highway Network (STRAHNET) is a network of highways which are important to the United States’ strategic defense policy and which provide defense access, continuity and emergency capabilities for defense purposes. NC 87, US 17 and US 74/76 are identified as non-Interstate STRAHNET routes in southeast North Carolina. Once built, Future I-140 will become an Interstate STRAHNET route. Future I-140 is also identified as a future component of the NHS on the FHWA National Highway System: North Carolina map.<sup>40</sup>

### **1.8.2 STATE TRANSPORTATION PLANS**

The NCDOT annually updates a priority list of its projects with schedule and funding goals for the next six years. The projects in the vicinity of the study area that are included in the 2006-2012 TIP are listed in Table 1-2 and shown in Figure 1-8.

The NCDOT’s BOT adopted the *Strategic Highway Corridors Vision Plan for Southeastern NC* on September 2, 2004. The plan identifies the Future I-140 as a recommended new freeway and identifies US 17 and US 74/76 as freeways that need upgrading.

The *North Carolina Intrastate System Map* identifies US 17, US 74/76, and I-40 as existing multi-lane roadways in the North Carolina Interstate System. The map identifies Future I-140 as an urban loop in the system.

**Table 1-2: 2006 - 2012 TIP Projects in the Vicinity of the Study Area**

PROJECT NO.	MAP ID NO.	PROJECT NAME	PROPOSED IMPROVEMENT	PROJECTED SCHEDULE
R-4732	1	US 17 from South Carolina State Line to US 74/76	Access management improvements	Planning in progress Construction – FFY 2010
R-4002	2	SR 1472 (Village Rd), west of SR 1437 (Old Fayetteville Rd)-SR 1435 (Navassa Rd) to east of US 17 interchange ramps	Widen to multi-lanes, construct dual left turn lanes on north ramp to US 17	ROW - in acquisition Construction - FFY 2008
U-0092	3	Smith Creek Parkway, US 117 to US 74	Four-lane divided facility on new location	Under Construction
R-2405	4	I-40 in Wilmington to Corporate Limits of Holly Ridge	New location and widening to multi-lanes	Under construction
U-4751	5	SR 1409 to Wilmington Bypass	Multi-lanes on new location	Planning – underway ROW – SFY 2012, PY Construction - PY
R-2633C	6	Wilmington Bypass, US 421 north of Wilmington to I-40	Four-lane divided freeway on new location	Under construction
U-3337	7	US 74 and SR 1437 (Old Fayetteville Road)	Convert grade separation to interchange	Planning – underway ROW – FFY 2012 Construction - PY
B-4437	8	US 17-74-76; Alligator Creek	Replace deck on Bridge No. 107 and No. 108	Construction - FFY 2010
R-4462	9	US 74/76 Whiteville to the Wilmington Bypass	Upgrade to interstate standards	Unfunded future project
R-4063	10	SR 1472 (Village Rd) from SR 1435 (S. Navassa Rd) to SR 1438 (Lanvale Rd)	Widen road to multi-lanes	Planning and environmental study only – not funded for construction
U-4738	11	US 17 to Independence Boulevard-Carolina Beach Road intersection	New facility with structure over the Cape Fear River	Planning and environmental study
R-3601	12	US 17/74/76 from NC 133-SR 1472 interchange to US 421-NC 133 interchange	Add additional north and southbound lanes and widen Bridge Nos. 107 and 108	Unfunded future project
B-4590	13	US 117/NC 133; Smith Creek	Replace Bridge No. 29	ROW - FFY 2009 Construction - FFY 2010

Source: North Carolina Department of Transportation. Transportation Improvement Program, 2006-2012. Available: <http://www.ncdot.org/planning/development/TIP/TIP/> Note: FFY – Federal Fiscal Year, SFY – State Fiscal Year, PY – Post Years

TIP R-2633  
Wilmington Bypass

Figure 1-8  
TIP Projects in the Vicinity  
of R-2633A/B

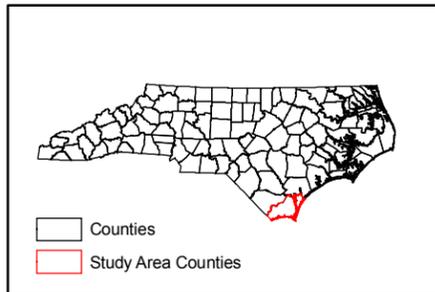
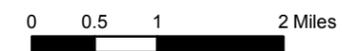
Legend

-  R-2633 A/B Recommended Alignment
-  Interstate Highways
-  US Highways
-  State Highways
-  State Routes
-  Local Roads
-  Railroads
-  Municipal Boundaries
-  County Boundaries
-  Water
-  Streams (Non-delineated)
-  TIP Projects
-  TIP Project Points

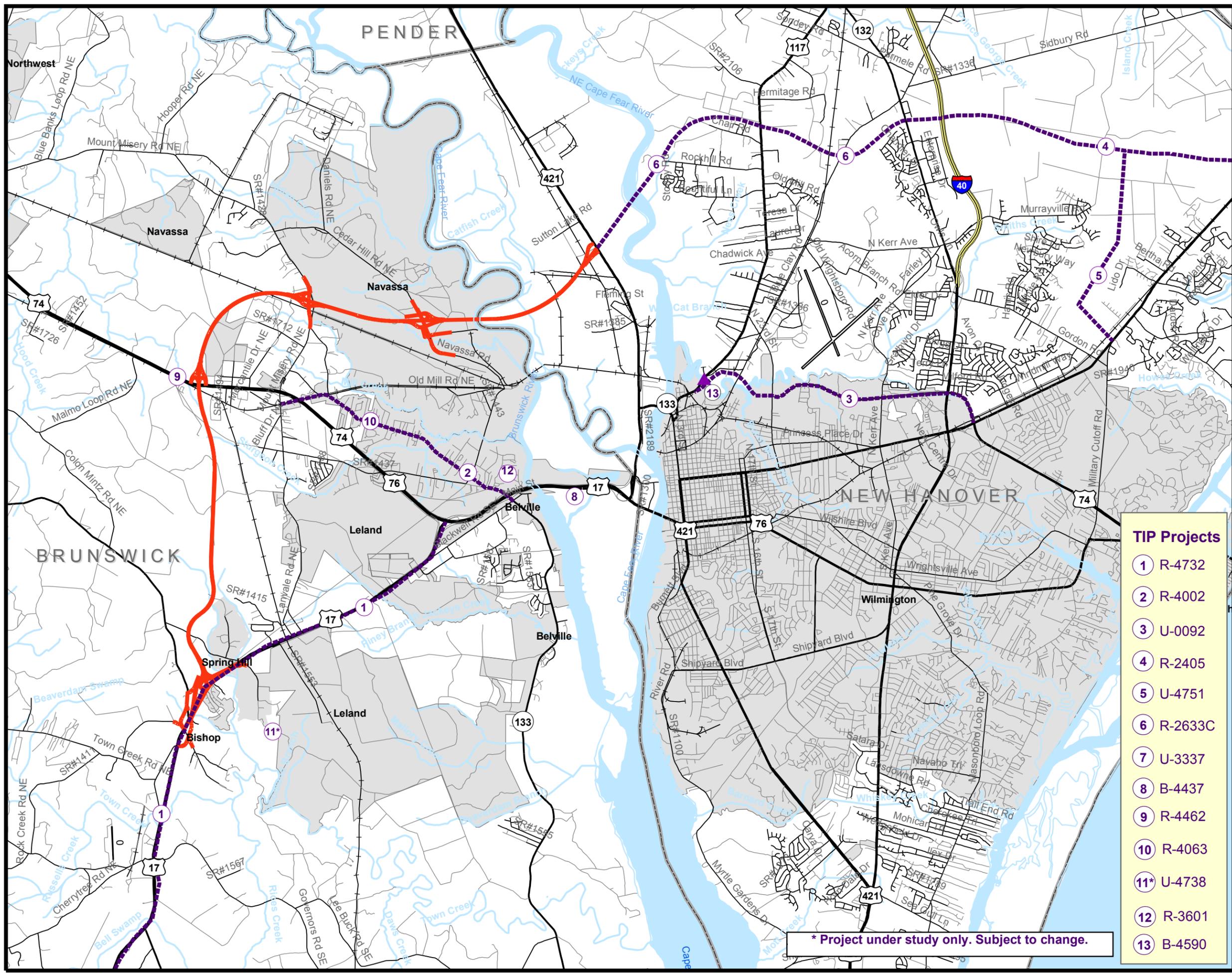
TIP Projects

-  1 R-4732
-  2 R-4002
-  3 U-0092
-  4 R-2405
-  5 U-4751
-  6 R-2633C
-  7 U-3337
-  8 B-4437
-  9 R-4462
-  10 R-4063
-  11\* U-4738
-  12 R-3601
-  13 B-4590

\* Project under study only. Subject to change.



April 2007  
This map is for reference only.  
Sources: ESRI, CGIA, USDOT, Brunswick County, New Hanover County, NCDOT, URS.





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### 1.8.3 LOCAL TRANSPORTATION PLANS

The NCDOT, in cooperation with Brunswick County and the FHWA, developed a *Thoroughfare Plan* for Brunswick County in 1988. This plan reflects the transportation improvements proposed for the county through 2005 and recommends the Shallotte and Bolivia bypasses and the I-40 loop extension to US 17.<sup>41</sup> In addition, many recommendations are made for other major and minor thoroughfares. The *Thoroughfare Plan* was updated in May 2001 and subsequently adopted by the county on October 1, 2001, recommended by the NCDOT Transportation Planning Branch (formerly Statewide Planning) on October 10, 2001, and adopted by NCDOT on November 8, 2001. The updated plan is shown in Figure 1-9.

Brunswick County also has adopted thoroughfare plans from WMPO, Southport Urban Area, Oak Island Urban Area, and the Shallotte Urban Area. Those plans are based on population growth forecasts, future land use plans, and development trends. Historical trends, growth areas, regulations and zoning ordinances, availability of public utilities, transportation facilities, topographic, and other physical features of the area are also considered.

The WMPO oversees transportation planning for a region that encompasses the City of Wilmington and surrounding towns in New Hanover County and portions of Brunswick County. The WMPO boundary and roadway functional classification map is shown in Figure 1-10. In 2005, the WMPO published the *2030 Long Range Transportation Plan* (LRTP). The LRTP is intended to meet the future travel demand of people and goods within the Wilmington urban area and is a “comprehensive 25-year plan for transportation improvements in the WMPO. Its goal is to provide a well balanced transportation network for residents, employees, visitors, and firms doing business within the WMPO.”<sup>42</sup> The Planned Improvements Map, as presented in the LRTP, is shown in Figure 1-11.

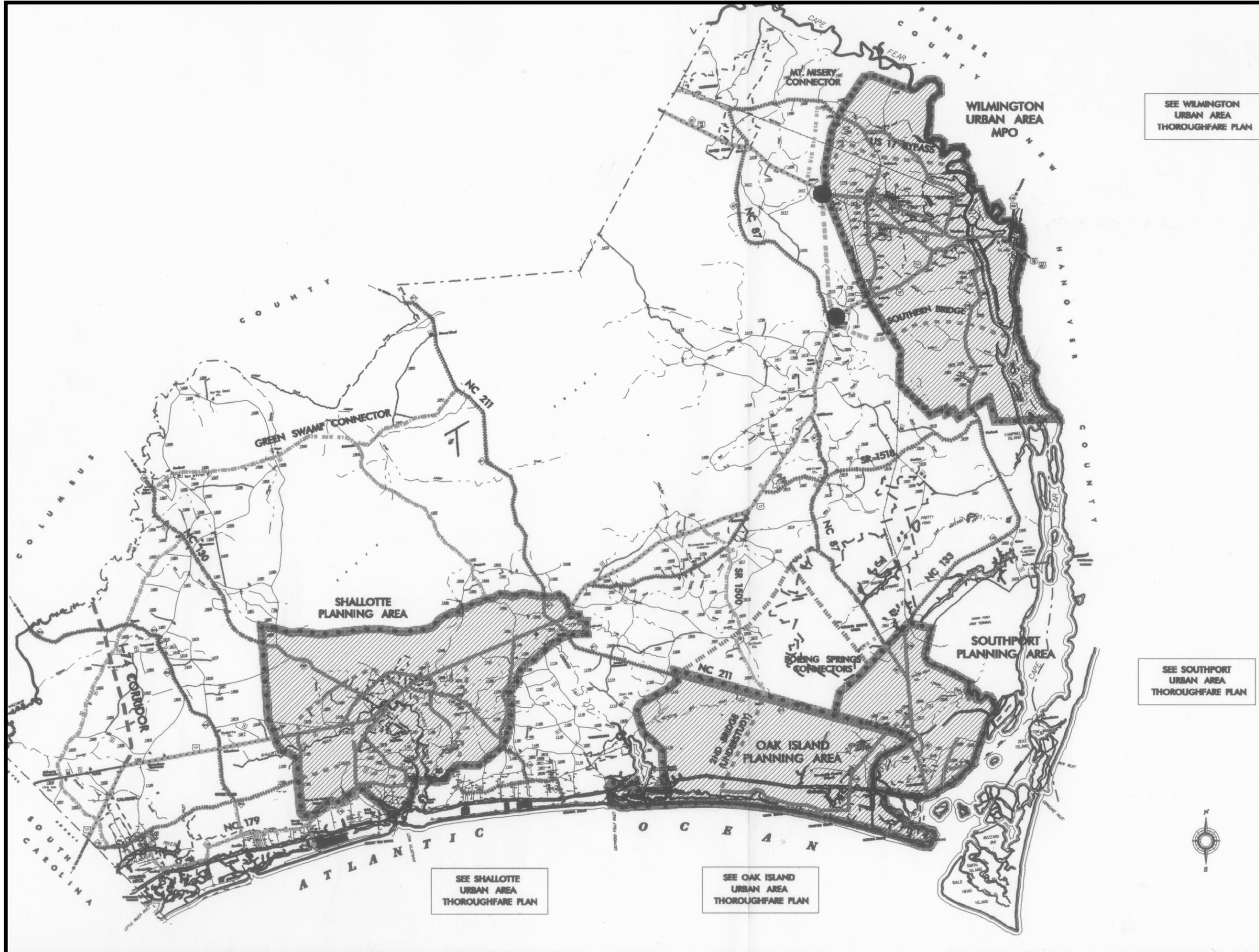
Portions of the project area are within the planning jurisdiction of the Cape Fear Area Rural Planning Organization (CFRPO), which covers the rural areas of Brunswick, Columbus and Pender counties. The CFRPO serves as the intergovernmental organization for local elected officials, NCDOT and residents of the region to work cooperatively to address transportation issues. Chartered in 2001, the CFRPO has not sponsored specific transportation plans regarding the project, but has been an active participant in the public involvement and agency coordination process for the project.

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TIP R-2633A/B  
Wilmington Bypass

Figure 1-9  
Updated Brunswick County  
Thoroughfare Plan, 2001



SEE WILMINGTON  
URBAN AREA  
THOROUGHFARE PLAN

SEE SOUTHPORT  
URBAN AREA  
THOROUGHFARE PLAN

SEE SHALLOTTE  
URBAN AREA  
THOROUGHFARE PLAN

SEE OAK ISLAND  
URBAN AREA  
THOROUGHFARE PLAN

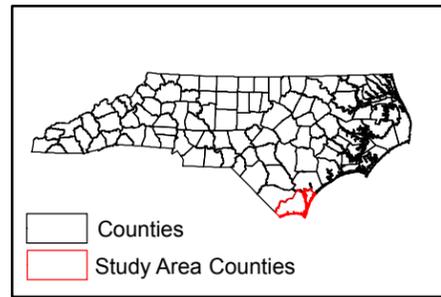
**LEGEND**

	EXISTING	PROPOSED
INTERSTATE		
OTHER PRINCIPAL ARTERIAL		
MINOR ARTERIAL		
MAJOR COLLECTOR		
MINOR COLLECTOR		
URBAN MAJOR THOROUGHFARE		
INTERCHANGE		
PLANNING AREA BOUNDARY		

ADOPTED BY:

BRUNSWICK COUNTY	_____
Recommended by STATEWIDE PLANNING BRANCH	_____
NC DEPARTMENT OF TRANSPORTATION	_____
PUBLIC HEARING	_____
PUBLIC FORUMS	_____
OAK ISLAND	SEPTEMBER 9, 2000
LOCKWOOD FOLLY	SEPTEMBER 12, 2000
SUNSET BEACH	SEPTEMBER 21, 2000
LELAND	SEPTEMBER 19, 2000
WACCAWAM	SEPTEMBER 21, 2000

Not to Scale

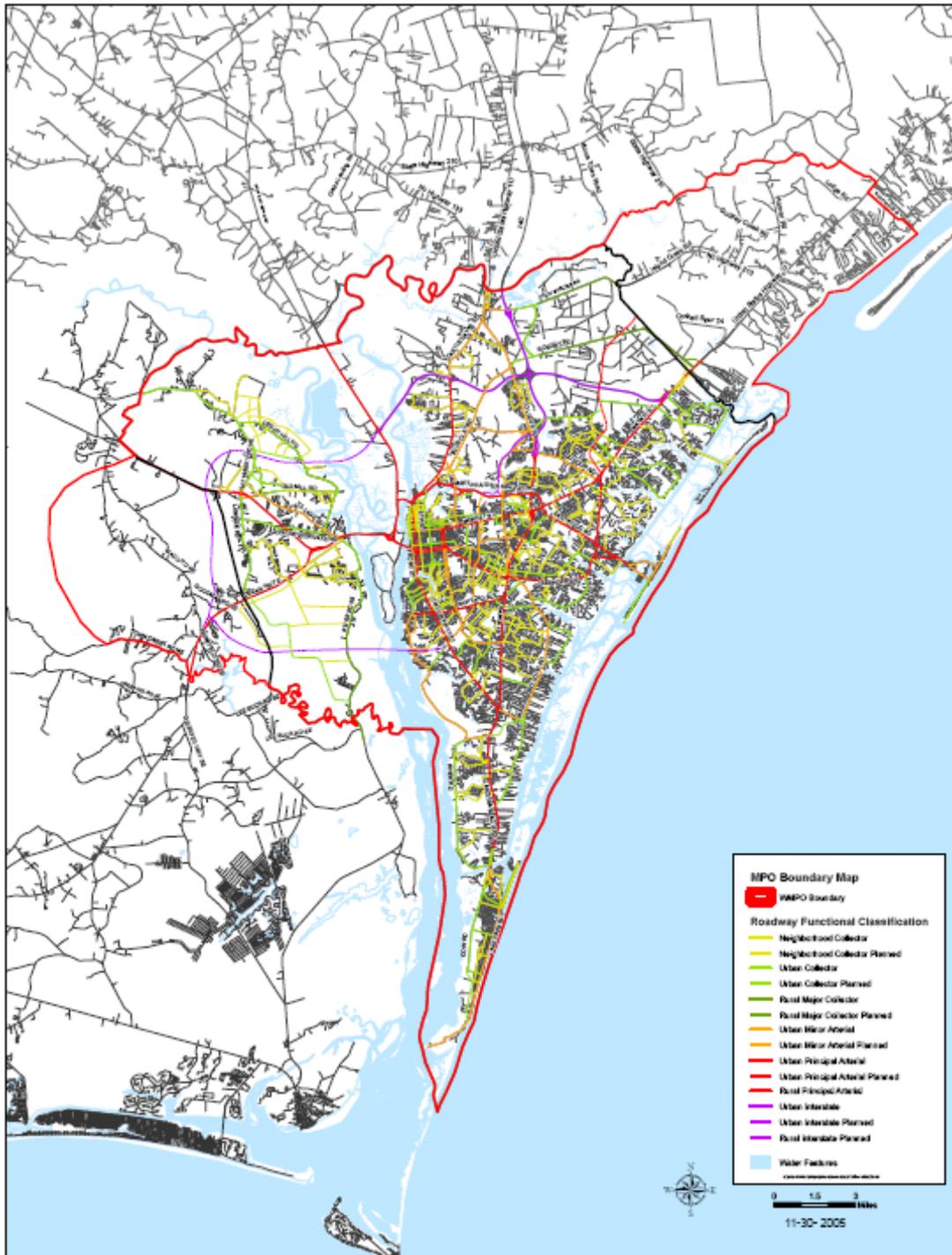


Counties  
 Study Area Counties





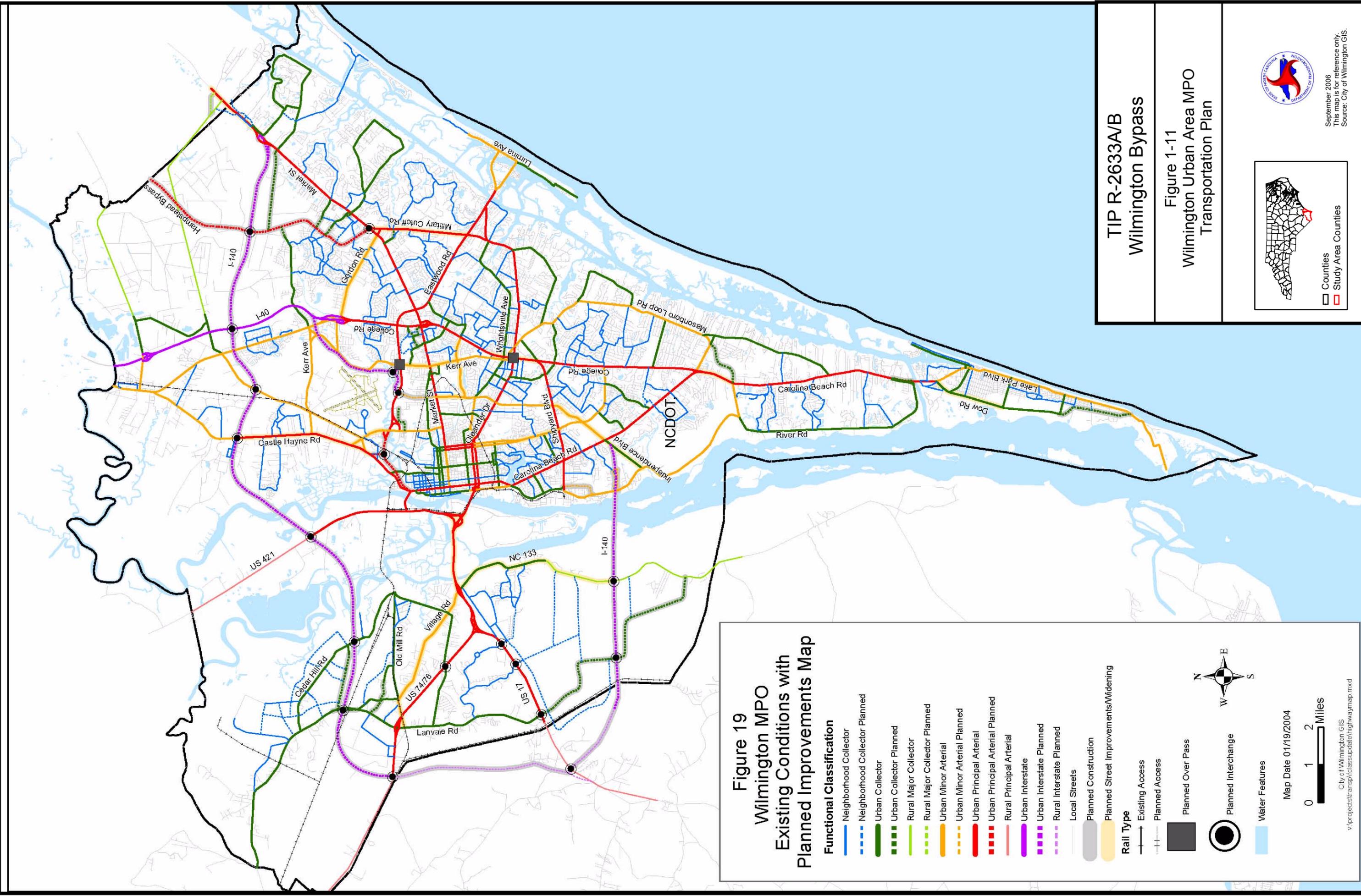
Figure 1-10: WMPO Boundary and Roadway Functional Classification Map 2006



Source: Wilmington Urban Area Metropolitan Planning Organization. "WMPO Boundary and Roadway Functional Classification Map 2006." Available: [http://www.wmpo.org/PDF/2005-11\\_WMPO\\_Boundary.pdf](http://www.wmpo.org/PDF/2005-11_WMPO_Boundary.pdf).

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**Figure 19**  
**Wilmington MPO**  
**Existing Conditions with**  
**Planned Improvements Map**

**Functional Classification**

- Neighborhood Collector
- Neighborhood Collector Planned
- Urban Collector
- Urban Collector Planned
- Rural Major Collector
- Rural Major Collector Planned
- Urban Minor Arterial
- Urban Minor Arterial Planned
- Urban Principal Arterial
- Urban Principal Arterial Planned
- Rural Principal Arterial
- Urban Interstate
- Urban Interstate Planned
- Rural Interstate Planned
- Local Streets
- Planned Construction
- Planned Street Improvements/Widening

**Rail Type**

- Existing Access
- Planned Access
- Planned Over Pass
- Planned Interchange
- Water Features

Map Date 01/19/2004

0 1 2 Miles

City of Wilmington GIS  
 v:\projectstrans\classupdate\highwaymap.mxd

**TIP R-2633A/B**  
**Wilmington Bypass**

**Figure 1-11**  
**Wilmington Urban Area MPO**  
**Transportation Plan**

Counties  
 Study Area Counties

September 2006  
 This map is for reference only.  
 Source: City of Wilmington GIS.



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## **1.9 TRAFFIC OPERATIONS ANALYSES**

This section presents a description of the existing roadway system including the roadway network, traffic volumes, and levels of service. Also presented are year 2025 traffic projections for thoroughfares in the project area.

### **1.9.1 EXISTING ROADWAY CHARACTERISTICS**

Traffic volumes for 2000 were collected for major roads throughout the study area. They are displayed in Table 1-3 and shown in Figure 1-12.

### **1.9.2 EXISTING TRAFFIC CONDITIONS**

The (LOS) is defined as a qualitative measure describing operational conditions within a traffic stream, generally in terms of such service measures as speed and travel time, freedom to maneuver, traffic interruptions, and comfort and convenience.<sup>43</sup> The LOS is given as a letter designation from A through F, which can be applied to both roadway segments and intersections (Table 1-4). LOS A represents the best operating conditions and LOS F the worst.

The methodologies contained in the *2000 Highway Capacity Manual* were used to determine the existing LOS on the road segments within the study area. To calculate the LOS, it was assumed that the terrain was level and that trucks comprised between seven and 11 percent of the traffic volume. A summary of the LOS calculations for the road segments within the study area are presented in Table 1-3, and detailed analysis is included in the "*Traffic Capacity Analysis Memorandum*".<sup>44</sup> Additional link data associated with R-2633C is included in the EIS completed for that project in November 1997.

### **1.9.3 YEAR 2025 NO-BUILD TRAFFIC PROJECTIONS AND CAPACITY ANALYSIS**

Average daily traffic (ADT) volumes for the year 2025 were projected to determine whether the existing roadway system would have sufficient capacity to accommodate future travel demand. The traffic projections were based on a trend analysis that included 1997 and 2000 traffic counts; and 2025 modeled data, turning movements, classification counts taken on SR 1472 (Village Road), building permits in the northeast region of Brunswick County and current/future land use. Additionally, proposed developments were considered in the projections of 2025 traffic volumes including the 200-acre development along SR 1472 (Village Road), and the 5,800-acre International Paper (IP) development between US 17 and NC 133 north of Daw's Creek. Also, the Town of Navassa has a new yacht building industry that will employ 800 people and has a proposal for a juvenile detention facility that will have 100 beds.

The *Revised Traffic Forecast* details the assumptions used in projecting the future traffic volumes.<sup>45</sup> The future "no-build" highway network included other area projects listed in the TIP that were funded, including TIP project number R-4002 (Village Road in Leland), TIP R-2405 (I-40 Connector), TIP project number U-0092 (Smith Creek Parkway), and R-2633C. There are no funded TIP projects currently in the *Brunswick County Thoroughfare Plan* in the vicinity that would directly impact the Wilmington Bypass.

**Table 1-3: 2000 ADT Volumes and Peak Hour LOS – Existing Conditions (2000 No-Build Alternative)**

ROAD	SEGMENT	LANES <sup>a</sup>	TWO-WAY ADT VOLUME <sup>b</sup>	PEAK HOUR <sup>c</sup>		
				TWO-WAY VOLUME	DIRECTIONAL VOLUME	LOS
US17	NC 87 TO BYPASS	4LD	29,800	2,682	1,475	B
	BYPASS TO SR 1553	4LD	29,800	2,682	1,475	B
	SR 1553 TO SR 1438	4LD	29,800	2,682	1,475	B
	SR 1438 TO US 74/76	4LD	28,000	2,520	1,386	B
	US 74/76 TO NC 133	4LD	44,000	3,960	2,178	C
	NC 133 TO US 421	4LD	69,000	6,210	3,416	E
	US 421 TO BRIDGE OVER CAPE FEAR	4LD	54,600	4,914	2,703	D
US 74/76	JUST NORTH OF BYPASS	4LD	21,500	1,935	1,065	A
	JUST SOUTH OF BYPASS	4LD	21,500	1,935	1,065	A
	BETWEEN SR 1426 & US 17	4LD	20,000	1,800	990	A
SR 1426 (MT MISERY RD)	JUST NORTH OF BYPASS	2L	3,800	380	209	C
	JUST SOUTH OF BYPASS	2L	3,800	380	209	C
SR 1438 (LANVALE RD NE)	BETWEEN US 74/76 & US 17	2L	3,800	342	206	D
SR 1430 (CEDAR HILL RD)	JUST NORTH OF BYPASS	2L	2,000	200	100	B
	JUST SOUTH OF BYPASS	2L	2,000	200	100	B
US 421	JUST NORTH OF BYPASS	5L	13,600	1,224	674	A
	BYPASS TO SMITH CREEK PARKWAY	5L	17,200	1,548	852	A
	SMITH CREEK PARKWAY TO US 17	5L	26,000	2,340	1,287	B
SMITH CREEK PARKWAY	EAST OF US 421	4LD	21,200	1,908	1,050	A
NC 133	SOUTH OF US 17	2L	15,900	1,590	875	E
SR 1472 (VILLAGE RD)	BETWEEN US 17 AND SR 1435	2L	26,900	2,690	1,480	E
NC 87	NORTH OF US 17	2L	1,500	150	90	B
SR 1552 (SLOAN RD)	SOUTH OF US 17 OPPOSITE NC 87	2L	200	20	12	D
SR 1701 (ZION CH RD)	NORTH OF US 17 WEST OF BYPASS INTERCHANGE	2L	400	40	24	C
SR 1412 (OLD TOWN CR RD)	NORTH OF US 17	2L	400	40	24	D
SR 1522 (SNOWFIELD RD)	SOUTH OF US 17	2L	800	80	48	D
SR 1414 (GOODMAN RD)	NORTH OF US 17	2L	200	20	12	D
SR 1461 (MORGAN CR OR HEWITT BURTON RD)	SOUTH OF US 17	2L	200	20	12	C
SR 1553 (BRUNSWICK FOREST)	SOUTH OF US 17 (FUTURE IP DEVELOPMENT)	2L	N/A	N/A	N/A	N/A

a L = Number of lanes, D = Divided highway, C&G = Curb and gutter, N/A = Link does not exist under given alternative.

b 2000 ADT Volume from NCDOT Statewide Planning Branch. \*Highest volume on segment utilized which yields worst LOS.

c a. LOS based on 2000 *Highway Capacity Manual* (Transportation Research Board, 2000), Chapters 12 (Highway Concepts), 20 (Two-lane Highways), and 21 (Multilane Highways).

b. Multilane segments have a LOS for each direction; LOS shown is direction with worst LOS.





**Table 1-4: Level of Service Definitions**

LEVEL OF SERVICE	SIGNALIZED INTERSECTION	ROAD SEGMENT
A	Very low delay (<10.0 seconds per vehicle). Most vehicles do not have to stop at all.	Free flow. Individuals are unaffected by other vehicles and operations are constrained only by roadway geometry and driver preferences. Maneuverability within traffic stream is good. Comfort level and convenience are excellent.
B	10.0-20.0 second delay. Good progression and short cycle length.	Free flow, but the presence of other vehicles begins to be noticeable. Average travel speeds are the same as in LOS A, but there is a slight decline in freedom to maneuver and level of comfort.
C	20.1 to 35.0 second delay. Fair progression and/or longer cycles. The number of vehicles stopping is significant.	Influence of traffic density on operations becomes marked. The ability to maneuver within the traffic stream is clearly affected by other vehicles. Multi-lane highways with a free flow speed (FFS) above 50 mph, the speeds reduce somewhat. Minor disruptions can cause serious local deteriorations and queues will form behind any significant traffic disruption.
D	35.1 to 55.0 second delay. Many vehicles stop. Individual cycle failures are noticeable.	The ability to maneuver is severely restricted due to traffic congestion. Travel speed is reduced by the increasing volume. Only minor disruptions can be absorbed without extensive queues forming and the service deteriorating.
E	55.1 to 80.0 second delay. Individual cycle failures are frequent	Operating conditions at or near the capacity level, usually unstable. The densities vary, depending on the FFS. Vehicles are operating with the minimum spacing for maintaining uniform flow. Disruptions cannot be dissipated readily. Most multi-lane highways with FFS between 45 and 60 mph vehicle mean speeds at capacity range from 42 to 55 mph, but are highly variable and unpredictable.
F	Delay in excess of 80.0 seconds. Considered unacceptable to most drivers.	Breakdown flow. Traffic is over capacity at points. Queues form behind such locations, which are characterized by extremely unstable stop-and-go waves. Travel speed within queues are generally less than 30 mph.

Source: Transportation Research Board, 2000.

The 2025 traffic projections are listed in Table 1-5 and shown on Figure 1-13. The table also includes the two-way and directional peak-hour traffic volumes, proposed typical sections, and LOS. A review of Table 1-5 indicates that, despite several planned improvements shown on the WMPO Thoroughfare Plan and in the TIP, a number of roadway segments (15 out of 29) would operate at LOS D or worse during the peak hour under the "No-Build" alternative. In addition, the congestion that would occur on these roadway segments would likely lengthen the duration of peak-hour traffic. Year 2025 traffic data for the project alternative is included in Section 2.4.1.

**Table 1-5: 2025 ADT Volumes and Peak Hour LOS – 2025 No Build Alternative**

ROAD	SEGMENT	LANES <sup>a</sup>	TWO-WAY ADT VOLUME <sup>b</sup>	PEAK HOUR <sup>c</sup>		
				TWO-WAY VOLUME	DIRECTIONAL VOLUME	LOS
US 17	NC 87 TO BYPASS	4LD	52,300	4,707	2,588	C
	BYPASS TO SR 1553	4LD	52,800	4,752	2,614	C
	SR 1553 TO SR 1438	4LD	64,300	5,787	3,183	D
	SR 1438 TO US 74/76	4LD	53,800	4,842	2,664	D
	US 74/76 TO NC 133	4LD	86,200	7,758	4,267	F
	NC 133 TO US 421	4LD	131,100	11,799	6,490	F
	US 421 TO BRIDGE OVER CAPE FEAR	4LD	102,400	9,216	5,069	F
US 74/76	JUST NORTH OF BYPASS	4LD	48,000	4,320	2,376	C
	JUST SOUTH OF BYPASS	4LD	48,000	4,320	2,376	C
	BETWEEN SR 1426 & US 17	4LD	39,600	3,564	1,961	C
SR 1426 (MT MISERY RD)	JUST NORTH OF BYPASS	2L	7,200	720	396	C
	JUST SOUTH OF BYPASS	2L	7,200	720	396	C
SR 1438 (LANVALE RD NE)	BETWEEN US 74/76 & US 17	2L	20,300	1,827	1,097	E
SR 1430 (CEDAR HILL RD)	JUST NORTH OF BYPASS	2L	4,600	460	253	C
	JUST SOUTH OF BYPASS	2L	4,600	460	253	C
US 421	JUST NORTH OF BYPASS	5L	25,100	2,259	1,243	B
	BYPASS TO SMITH CREEK PARKWAY	5L	40,100	3,609	1,985	C
	SMITH CREEK PARKWAY TO US 17	5L	55,700	5,013	2,758	D
SMITH CREEK PARKWAY	EAST OF US 421	4LD	37,600	3,384	1,862	B
NC 133	SOUTH OF US 17	2L	27,600	2,760	1,518	E
SR 1472 (VILLAGE RD)	BETWEEN US 17 AND SR 1435	2L	49,900	4,491	2,471	F
NC 87	NORTH OF US 17	2L	9,900	990	594	E
SR 1552 (SLOAN RD)	SOUTH OF US 17 OPPOSITE NC 87	2L	600	60	36	D
SR 1701 (ZION CH RD)	NORTH OF US 17 WEST OF BYPASS INTERCHANGE	2L	800	80	48	C
SR 1412 (OLD TOWN CR RD)	NORTH OF US 17	2L	900	90	54	D
SR 1522 (SNOWFIELD RD)	SOUTH OF US 17	2L	1,600	160	96	D
SR 1414 (GOODMAN RD)	NORTH OF US 17	2L	1,100	110	66	D
SR 1461 (MORGAN CR OR HEWITT BURTON RD)	SOUTH OF US 17	2L	800	80	48	C
SR 1553 (BRUNSWICK FOREST)	SOUTH OF US 17 (FUTURE IP DEVELOPMENT)	2L	22,900	2,290	1,374	E

a L = Number of lanes, D = Divided highway, C&G = Curb and gutter, N/A = Link does not exist under given alternative.

b 2000 ADT Volume from NCDOT Statewide Planning Branch. \*Highest volume on segment utilized which yields worst LOS.

c a. LOS based on 2000 *Highway Capacity Manual* (Transportation Research Board, 2000), Chapters 12 (Hwy Concepts), 20 (Two-lane Hwys), and 21 (Multilane Hwys).

b. Multilane segments have a LOS for each direction; LOS shown is direction with worst LOS.





## 1.10 ACCIDENT ANALYSIS

Average accident rates for various types of roads in North Carolina are shown in Table 1-6. As indicated by the data, accident rates generally tend to decrease as access control increases. Table 1-7 shows the August 2000 to July 2003 accident data for selected roadways in the study area. These roadways included:

- US 17 from NC 87 to Wilmington;
- NC 87 from US 17 to US 74/76;
- US 74/76 from Columbus County line to NC 87 and from NC 87 to US 17; and

US 421/NC 133 from US 17/74/76 to New Hanover County line, from New Hanover County line to North of SR 2145 (Sutton Lake Road), and from North of SR 2145 (Sutton Lake Road) to Pender County line.

The average total accident rates for some area roadways were higher than the statewide average for the same roadway type. The roadways of concern include US 17 and NC 87. As traffic increases and travel conditions deteriorate on these roadways in the future, it is expected that safety will also deteriorate. Table 1-6 shows that accident rates decrease with increased access control.

**Table 1-6: North Carolina Average Accident Rates (2000-2002)**

ROUTE TYPE	ROAD TYPE	TOTAL ACCIDENT RATE*
Rural Interstate	Four-lane divided - full control access	67.62
US Rural	Two-lane undivided	170.47
	Four-lane undivided	156.36
	Four-lane divided - no control access	131.76
	Four-lane divided - partial control access	83.22
	Four-lane divided - full control access	64.29
US Urban	Two-lane undivided	321.84
	Four-lane undivided	631.41
	Four-lane cont. left turn lane	374.08
	Four-lane divided - no control access	432.42
	Four-lane divided - partial control access	245.66
	Four-lane divided - full control access	155.81
NC Rural	Two-lane undivided	182.95
	Four-lane undivided	248.01
	Four-lane divided - no control access	150.30
	4-lane divided - partial control access**	132.80
	Four-lane divided - full control access	25.79

Notes: Includes only route segments with computerized traffic volumes

\* Accident rates = # accidents / 100 million vehicle miles

\*\*Rates are not statistically significant

Source: 2000-2002 Three Year Crash Rates. North Carolina Department of Transportation, Traffic Engineering and Safety Systems Branch, Traffic Safety Systems management Unit.

**Table 1-7: 2000-2003 Study Area Accident Summary**

ROAD	SEGMENT	ROAD TYPE	LENGT H miles	TOTAL ACCIDENT S	*TOTAL ACCIDENT RATE	**STATEWIDE AVERAGE ACCIDENT RATE	# FATALITY ACCIDENT S	# INJURY ACCIDENT S	# PROPERTY -ONLY ACCIDENT S	PROPERTY DAMAGE
US 17	NC 87(S) to Wilmington	Rural Four-Lane Divided	9.25	252	84.34	70.98	1	99	153	\$1,109,319
NC 87	US 17 to US 74/76	Rural Two-Lane Undivided	12.79	150	563.71	193.40	4	63	83	\$924,715
US 74/76	Columbus Co. line to NC 87	Rural Four-Lane Divided	3.57	44	70.5	70.98	1	13	30	\$327,550
US 74/76	NC 87 to US 17	Rural Four-Lane Divided	9.09	110	64.25	70.98	2	41	67	\$667,250
US 421/NC 133	US 17/74/76 to New Hanover Co. line	Urban Four-Lane Divided	0.48	27	271.02	165.63	0	12	15	\$139,100
US 421/NC 133	New Hanover Co. line to North of SR 2145	Urban Four-Lane Undivided / Five-Lane	4.34	95	121.95	380.17	1	45	49	\$521,630
US 421/NC 133	North of SR 2145 to Pender Co. line	Rural Four-Lane Divided	3.21	11	14.12	76.75	0	3	8	\$29,300

Notes: Full access control was assumed when actual access limits were not known.

\* Accident rates = # accidents / 100 million vehicle miles

\*\* Statewide Average Accident Rates are for 2000-2002 per NCDOT Traffic Engineering and Safety Systems Branch.

Source: NCDOT Traffic *Engineering Accident Analysis System Strip Analysis Report*, March 2004.

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**CHAPTER 2.**  
**DESCRIPTION OF ALTERNATIVES CONSIDERED**



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## **CHAPTER 2. DESCRIPTION OF ALTERNATIVES CONSIDERED**

A discussion of the alternatives considered for the project, the process of selecting the Preferred Alternative, and a description of the Preferred Alternative, are provided in this section.

### **2.1 ALTERNATIVES CONSIDERED**

#### **2.1.1 TRANSPORTATION SYSTEM MANAGEMENT ALTERNATIVES**

Transportation System Management (TSM) alternatives involve increasing the available capacity of an existing facility within its right-of-way and with minimum capital expenditures. TSM-related activities may include improving signals and signal progression, installing a computerized signal system, adding high occupancy vehicle lanes, or adding turn lanes.

There are no contiguous or direct routes within the study area (Figure 1-2) that could be adequately improved by TSM methods to provide facilitated access for through-traffic around the Wilmington central business district (CBD). While computerized traffic signals and additional turn lanes could improve capacity, through traffic would continue traveling across the downtown portion of the city. According to the FHWA Technical Advisory (T6640.8A), "Guidance for Preparing and Processing Environmental and Section 4F Documents," high occupancy vehicle (HOV) lanes should be considered for all major projects in urbanized areas, or those areas with a population over 200,000.<sup>46</sup> According to the 2000 U.S. Census, the population of Wilmington's urbanized area is 161,149.<sup>47</sup> Since the population lies below the threshold for an urban area as defined by FHWA, HOV lanes were not addressed as a TSM alternative. Therefore, TSM improvements were not considered as alternatives to the proposed action.

#### **2.1.2 MULTI-MODAL ALTERNATIVES**

Multi-modal or mass transit options include expanding bus or passenger rail services. The advantages of these forms of mass transit would not address the needs associated with this project. Construction of this project would complete a portion of the Interstate Highway System that is also an important link in the US 17 Intrastate Corridor and would provide motorists a direct bypass around the Wilmington urban area. Mass transit services are typically oriented to serve an urban area, not avoid it. In addition, the densities needed to increase mass transit services do not exist in the study area. According to the 2000 U.S. Census, the Wilmington urbanized area had a population of 161,149. The FHWA considers urbanized areas with populations greater than 200,000 as areas where mass transit alternatives should be considered.<sup>48</sup>

Transit service was not considered a viable alternative to circumferential roadway improvements because of the low densities in the area, the needs for a northern route around the Wilmington urban area, and because the need for a link in the US 17 Intrastate Corridor would not be addressed.

#### **2.1.3 PRELIMINARY BUILD ALTERNATIVES**

The development of preliminary alternatives for the Wilmington Bypass commenced with the first citizens informational workshop held on November 30, 1990 (See Section 7.2 for a summary of the public involvement program). The only alternative corridor shown at this meeting was the corridor depicted in the adopted Thoroughfare Plan, which has since been updated.<sup>49</sup> Citizens were encouraged to provide comments on corridor selection and a "draw your own corridor" map was available.

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A set of 36 preliminary alternatives for the Wilmington Bypass (prior to separation of the Wilmington Bypass into R-2633A/B and R-2633C) were developed using the R-2633 original study area (see Figure 2-1), design criteria consistent with the North Carolina Intrastate System requirements (see Section 2.2.2.2) and input from the first citizens informational workshop. As described in the project background (Section 0), the Wilmington Bypass was divided into two separate projects in 1994; TIP project numbers R-2633A/B (the project) and R-2633C.

Prior to division of the projects, two termini locations, an eastern and a western interchange, were identified on US 17 (see Figure 2-1). The five alternative corridors associated with the eastern terminus had high potential for residential relocations. The number of relocations ranged between 163 and 257 residences which were among the highest of the 36 alternatives studied. These alternatives passed through the western portion of the Town of Leland and were inconsistent with the town's Land Use Plan.<sup>50</sup> Furthermore, the selection of an US 17 interchange location east of Bishop was constrained by the location of the Sunny Point Military Ocean Terminal railroad line and urban development. Potential interchange locations with US 17 south of Bishop were undesirable as US 17 turns southward, thus substantially lengthening the amount of roadway on new location which would result in a circuitous route.

In 1994, it was determined that further studies would be conducted for R-2633A/B to identify potential corridors throughout Brunswick County that would connect to the terminus of R-2633C at US 421 and a terminus at US 17, thus completing this link in the US 17 Intrastate Corridor System. At that time, the alternative screening process began for R-2633A/B. This process included the reevaluation of two alternatives developed before projects R-2633C and R-2633A/B were separated. These alternatives were carried forward for further study under R-2633A/B as Alternatives 1 and 3. A complete reevaluation of the study area in Brunswick County was conducted and 13 preliminary alternatives were developed.

Figure 2-2 shows the segments comprising the 13 alternatives and Table 2-1 relates the composition of segments into the various alternatives developed through the study area and analyzed during the Preliminary Alternatives Phase.<sup>51</sup> A comparative screening matrix (Table 2-2) of all 13 preliminary alternatives was developed during the screening evaluation procedure. The matrix includes estimates of impacts based on 300-foot wide right-of-way within the 1000-foot corridor for new location corridors, and 500-foot wide right-of-way within the 1000-foot corridor for existing roadway location corridors. Impact estimates continued to be further refined as studies progressed.

Based on the results of the screening evaluation provided in Table 2-3, nine segments were eliminated from further study. Four of the alternatives on new alignment (Alternatives 2, 3, 8, and 9) were identified for further study, along with two of the alternatives that would improve existing roadways (Alternatives 10 and 11). Alternative 10 was the same as Alternative 11, but included an additional segment of US 421 that connected to a potential northern alternative terminus of R-2633C that was later eliminated. Upon elimination of the potential northern terminus of R-2633C, Alternative 10 was no longer a feasible alternative and was dropped from further consideration for this project.

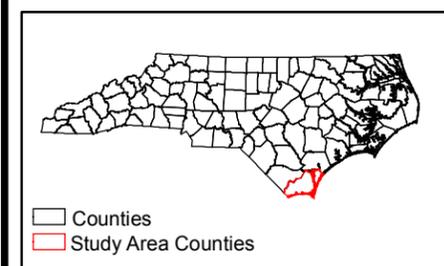
The remaining five preliminary alternatives were evaluated and compared. The results of that comparison showed that the impacts of Alternative 11 were greater than those of the other four alternatives.<sup>52</sup> The results of the analysis were presented at the October 7, 1996 Joint Steering/Agency Committee Meeting, where a general consensus was reached to eliminate Alternative 11 from further study. Further evaluation of the reasonable and feasible alternatives (Alternatives 2, 3, 8, and 9) continued and was reported in the DEIS. The four reasonable and feasible alternatives evaluated in the DEIS are described in Section 1.2.

TIP R-2633A/B  
Wilmington Bypass

Figure 2-1  
Original Study Area  
and Preliminary Alternatives

Legend

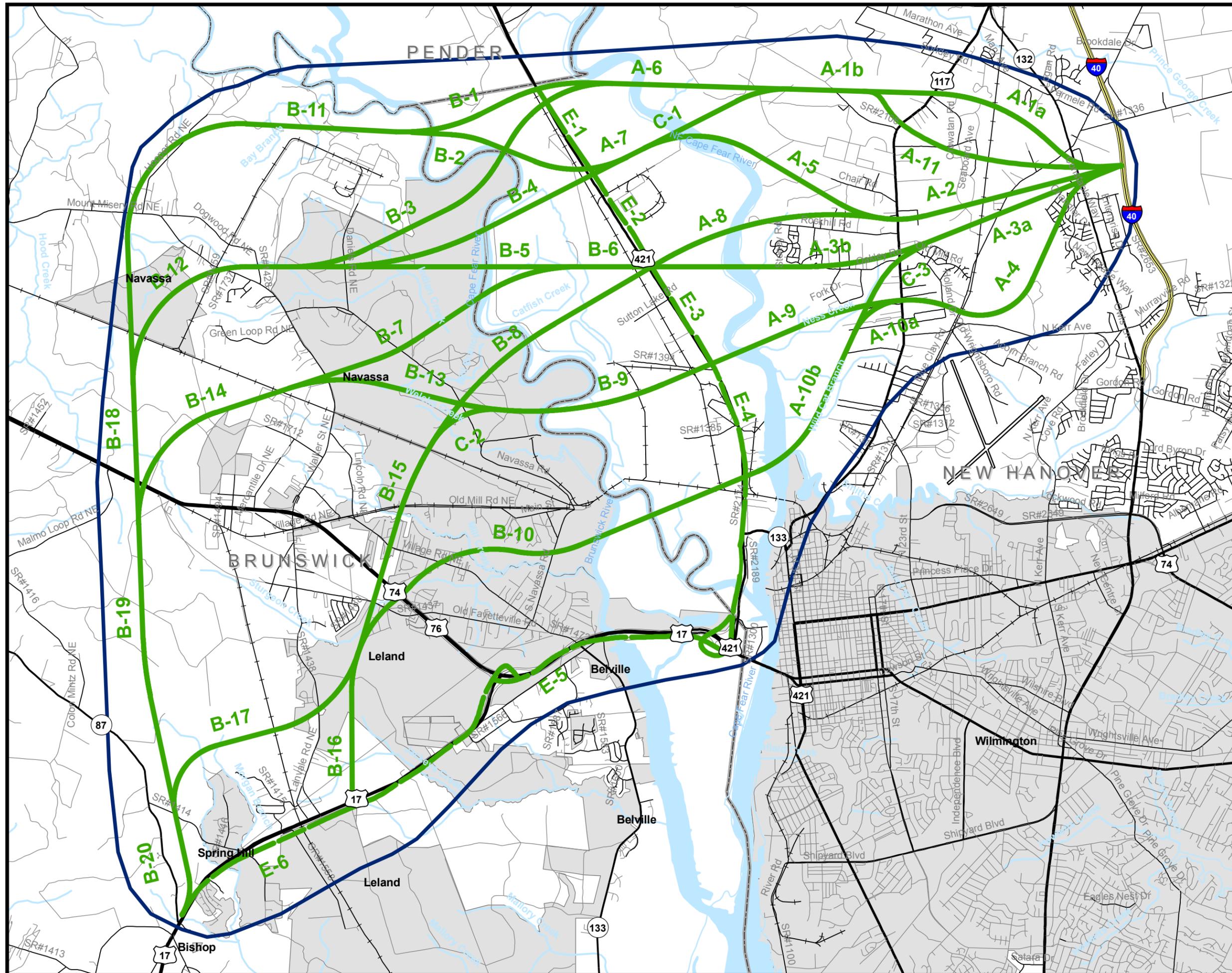
-  R-2633 Original Study Area
-  Preliminary Alternatives
-  Interstate Highways
-  US Highways
-  State Highways
-  State Routes
-  Local Roads
-  Railroads
-  Municipal Boundaries
-  County Boundaries
-  Water
-  Streams (Non-delineated)



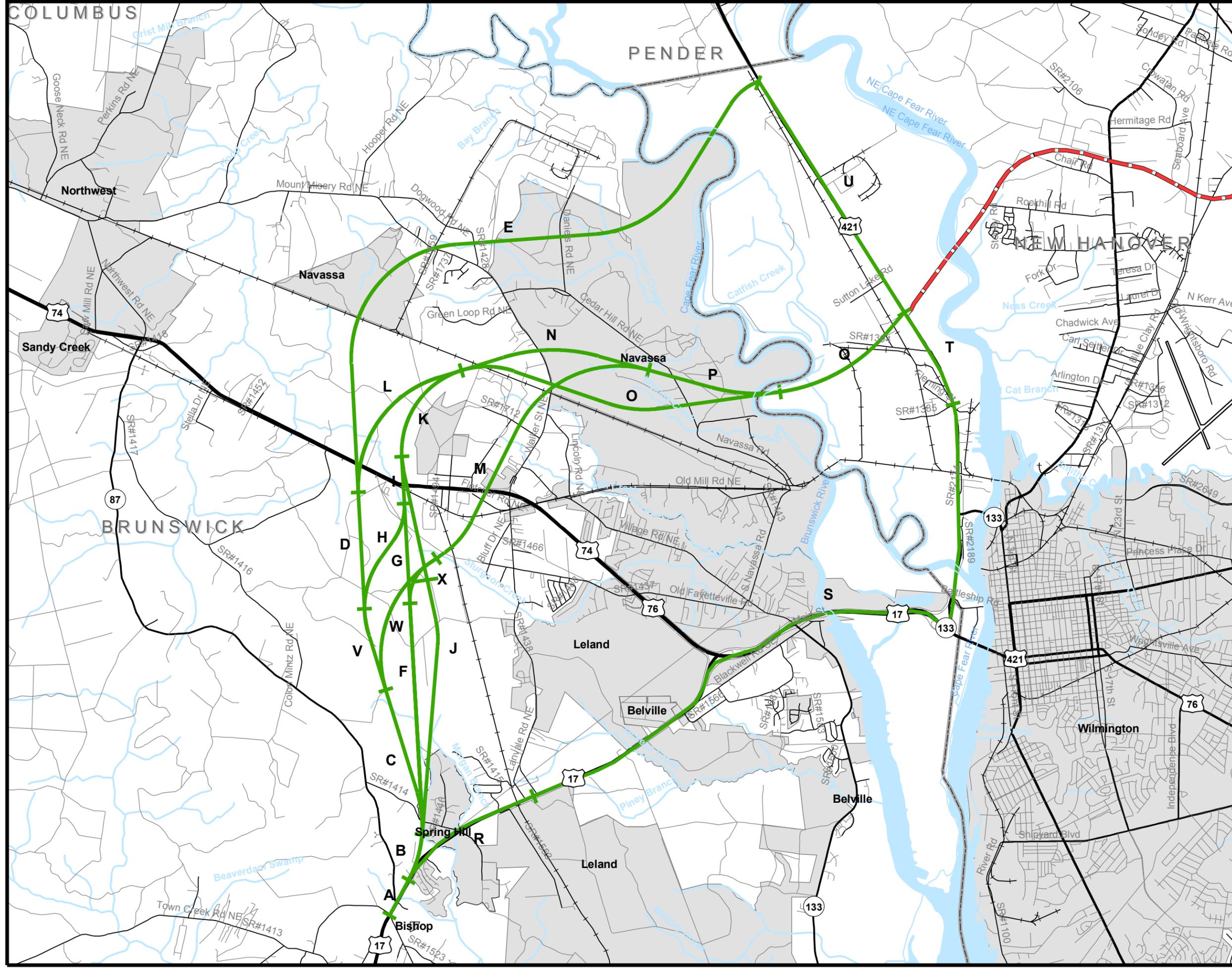
-  Counties
-  Study Area Counties



May 2006  
This map is for reference only.  
Sources: ESRI, CGIA, Brunswick County,  
New Hanover County, USDOT, NCDOT, URS.



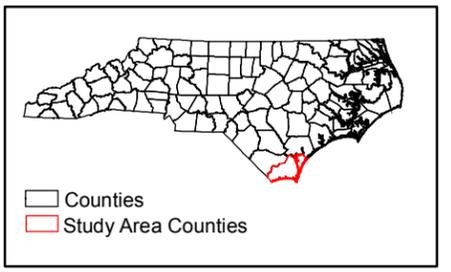
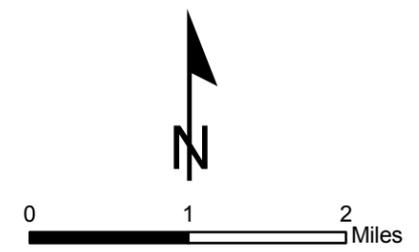




TIP R-2633A/B  
Wilmington Bypass

Figure 2-2  
Schematic Diagram of  
Segments and Breakpoints

- Legend**
- Segments and Breakpoints
  - R-2633 C
  - Interstate Highways
  - US Highways
  - State Highways
  - State Routes
  - Local Roads
  - Railroad
  - Municipal Boundaries
  - County Boundaries
  - Water
  - Streams (Non-delineated)



May 2006  
This map is for reference only.  
Sources: ESRI, CGIA, Brunswick County,  
New Hanover County, USDOT, NCDOT, URS.



**Table 2-1: Alternative Segment Composition**

<b>ALTERNATIVE</b>	<b>SEGMENT</b>
1	A, B, C, V, D, E
2	A, B, C, V, D, L, O, Q
3	A, B, C, V, D, L, N, P, Q
4	A, B, C, V, H, I, K, O, Q
5	A, B, C, V, H, I, K, N, P, Q
6	A, B, F, G, I, K, N, P, Q
7	A, B, F, G, I, K, O, Q
8	A, B, J, K, N, P, Q
9	A, B, J, K, O, Q
10	A, R, S, T, U
11	A, R, S, T
12	A, B, F, X, M, P, Q
13	A, B, C, W, M, P, Q

**Table 2-2: Initial Alternatives Screening Matrix**

	ALTERNATIVE												
	1	2	3	4	5	6	7	8	9	10	11	12	13
LENGTH (ft) [m]	75,141 [22,903]	73,692 [22,461]	73,697 [22,463]	72,588 [22,125]	72,593 [22,126]	71,221 [21,708]	71,216 [21,707]	71,602 [21,824]	71,597 [21,823]	86,277 [26,297]	67,891 [20,693]	65,401 [19,934]	66,411 [20,242]
INTERCHANGES	4	4	4	4	4	4	4	4	4	3	3	4	4
BUSINESS RELOCATIONS	1	2	2	2	2	3	3	4	4	83	50	3	2
RESIDENTIAL RELOCATIONS	2	15	9	16	10	10	16	9	15	14	14	9	9
STREAM CROSSINGS	11	10	10	9	9	10	10	11	11	7	7	10	9
NAVIGABLE RIVER CROSSINGS	1	1	1	1	1	1	1	1	1	2	2	1	1
RAILROAD CROSSINGS	3	5	5	5	5	5	5	5	5	4	3	6	6
POWERLINE CROSSINGS	6	6	5	6	5	5	6	5	6	6	6	4	4
MAJOR WATER SUPPLY CROSSINGS	1	3	3	3	3	3	3	3	3	4	2	3	3
GAS LINE CROSSINGS	2	1	3	1	3	3	1	3	1	2	1	3	3
SCHOOLS	0	0	0	0	0	0	0	0	0	0	0	0	0
PARKS	0	0	0	0	0	0	0	0	0	0	0	0	0
CHURCHES	0	0	0	0	0	0	0	0	0	0	0	0	0
CEMETERIES	1	0	0	0	0	0	0	0	0	1	1	0	0
FORESTED UPLANDS (ac) [ha]	214 [87]	236 [96]	197 [80]	225 [91]	186 [75]	167 [68]	206 [83]	192 [78]	231 [93]	75 [30]	47 [19]	158 [64]	174 [70]
URBAN/DISTURBED AREA (ac) [ha]	92 [37]	105 [42]	128 [52]	101 [41]	124 [50]	141 [57]	118 [48]	145 [59]	122 [49]	607 [246]	426 [172]	148 [60]	136 [55]
AGRICULTURAL AREA (ac) [ha]	11 [4]	7 [3]	11 [4]	7 [3]	11 [4]	13 [5]	9 [4]	15 [6]	11 [4]	3 [1]	3 [1]	21 [8]	19 [8]
PRIME/UNIQUE FARMLAND (ac) [ha]	175 [71]	144 [58]	196 [79]	111 [45]	163 [66]	164 [66]	112 [45]	139 [56]	87 [35]	19 [8]	19 [8]	103 [42]	97 [39]
STATEWIDE IMPORTANT FARMLAND (ac) [ha]	38 [15]	40 [16]	42 [17]	40 [16]	42 [17]	47 [19]	45 [18]	47 [19]	45 [18]	6 [2]	6 [2]	47 [19]	42 [17]
TOTAL WETLANDS (ac) [ha]	212 [85]	167 [68]	182 [74]	175 [71]	190 [77]	181 [73]	166 [67]	155 [63]	140 [57]	296 [120]	294 [119]	144 [58]	147 [59]
Marsh	0 [0]	0 [0]	0 [0]	0 [0]	0 [0]	1 [0.4]	1 [0.4]	0 [0]	0 [0]	162 [66]	162 [66]	1 [0.4]	0 [0]
Swamp Forest	95 [38]	41 [17]	42 [17]	41 [17]	42 [17]	42 [17]	41 [17]	42 [17]	41 [17]	7 [3]	6 [2]	42 [17]	42 [17]

**Table 2-2: Initial Alternatives Screening Matrix (continued)**

	ALTERNATIVE												
	1	2	3	4	5	6	7	8	9	10	11	12	13
Bottomland Hardwood	30 [12]	15 [6]	17 [7]	12 [5]	14 [6]	29 [12]	27 [11]	5 [2]	3 [1]	28 [11]	28 [11]	48 [19]	33 [13]
Pocosin	20 [8]	13 [5]	56 [23]	28 [11]	71 [29]	87 [35]	44 [18]	65 [26]	22 [9]	47 [19]	47 [19]	24 [10]	34 [14]
Wet Flat	46 [19]	59 [24]	46 [19]	66 [27]	53 [21]	12 [5]	25 [10]	33 [13]	46 [19]	44 [18]	44 [18]	29 [12]	38 [15]
Headwater Forest	21 [8]	39 [16]	21 [8]	28 [11]	10 [4]	10 [4]	28 [11]	10 [4]	28 [11]	8 [3]	7 [3]	0 [0]	0 [0]
FLOODPLAINS (ft) [m]	29,300 [8,930]	32,800 [9,997]	32,300 [9,845]	30,600 [9,327]	30,100 [9,174]	24,100 [7,346]	24,600 [7,498]	26,600 [8,108]	27,100 [8,260]	29,600 [9,022]	29,600 [9,022]	23,600 [7,193]	27,100 [8,260]
PROTECTED SPECIES SITES	2	1	1	1	1	1	1	1	1	2	2	1	1
NCNHP - IDENTIFIED PRIORITY AREAS	2	1	1	1	1	0	0	0	0	3	3	0	1
HAZARDOUS MATERIAL SITES	1	1	1	1	1	1	1	1	1	59	49	1	1
NATIONAL REGISTER SITES	0	0	0	0	0	0	0	0	0	0	0	0	0
RECORDED HISTORIC SITES	2	2	2	2	2	1	1	1	1	0	0	1	2

Source: North Carolina Department of Transportation. "Preliminary Alternatives Analysis Report." September, 1996.

**Table 2-3: Alternatives Eliminated from Further Study**

ALTERNATIVES	REASONS FOR ELIMINATION
1	Eliminated as a result of the elimination of the Northern Alternative for R-2633C.
4	Eliminated due to relative proximity to active red cockaded woodpecker (RCW) colonies, with substantial impacts to foraging habitat. In addition, there would be relatively high impacts to wetlands and residential communities.
5	Eliminated due to relative proximity to active RCW colonies with substantial impacts to foraging habitat. In addition, there would be relatively high impacts to wetlands.
6	Eliminated due to relative proximity to active RCW colonies with substantial impacts to foraging habitat. In addition, there would be relatively high impacts to wetlands.
7	Eliminated due to relative proximity to active RCW colonies with substantial impacts to foraging habitat. In addition, there would be relatively high impacts to wetlands.
10	Eliminated as a result of the elimination of a potential northern terminus for R-2633C.
11	Eliminated as a result of the impacts to both the natural and built communities which would result from the widening needed to meet adequate LOS.
12	Eliminated as a result of difficult interchange design issues associated with Segment M, as well as, impacts of both segments M and W to RCW habitat.
13	Eliminated as a result of difficult interchange design issues associated with Segment M, as well as, impacts of both segments M and W to RCW habitat.

Source: North Carolina Department of Transportation. *Preliminary Alternatives Analysis Report*. September, 1996.

Following the selection of the four reasonable and feasible preliminary alternatives and the issuance of the DEIS in 1996, new data and refinement of the functional designs required alignment shifts within and outside of the 1000-foot corridor. These changes, and the configurations of the alternatives evaluated in this FEIS, are described in Section 2.3.

## **2.2 ALTERNATIVES EVALUATED IN THE DEIS**

Alternatives studied through detailed environmental analysis in the DEIS included the No-Build Alternative and several construction, or build alternatives. The build alternatives studied are all on new location connecting US 17 and US 421 at R-2633C.

### **2.2.1 NO-BUILD ALTERNATIVE**

In accordance with NEPA and FHWA guidelines, the environmental consequences of taking no action to meet future travel demand, or the consequences of the No-Build Alternative, are given full consideration. As a necessary component of alternatives analysis, the No-Build Alternative provides a baseline condition with which to compare the improvements and consequences associated with each build alternative. The No-Build Alternative does not include construction of R-2633A/B, but does assume that other road improvements planned and funded in the TIP would be in place, including R-4002 (Village Road in Leland), U-0092 (Smith Creek Parkway), R-2405 (US 17 in New Hanover County), and R-2633C. There are no funded TIP projects currently in the Brunswick County Thoroughfare Plan in the vicinity that would directly impact the Wilmington Bypass.

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There are some benefits associated with the No-Build Alternative. Without the new alignment, there would be no residential or business displacements or disruptions, no implementation costs, and no impacts to natural communities.

The No-Build Alternative, however, is not consistent with local and state transportation goals and would result in adverse economic and quality of life impacts related to projected roadway deficiencies. Furthermore, the No-Build Alternative does not meet the need for and purpose of the project. The No-Build Alternative is projected to result in a number of adverse traffic impacts on roadways in and around the study area. As shown in Table 1-5, several roadway segments are projected to operate at LOS D or worse during future peak hours. In addition to degraded LOS, the number of hours that congestion occurs during the morning and evening peak periods would increase on these road segments. These segments would be especially congested during the summer months when travel to the beaches north and south of Wilmington is at its peak. The increased congestion would also result in a greater diversion of traffic from arterial facilities to local and collector streets, as travelers seek shorter and/or less congested routes.

## **2.2.2 BUILD ALTERNATIVES**

### **2.2.2.1 Alternatives Evaluated**

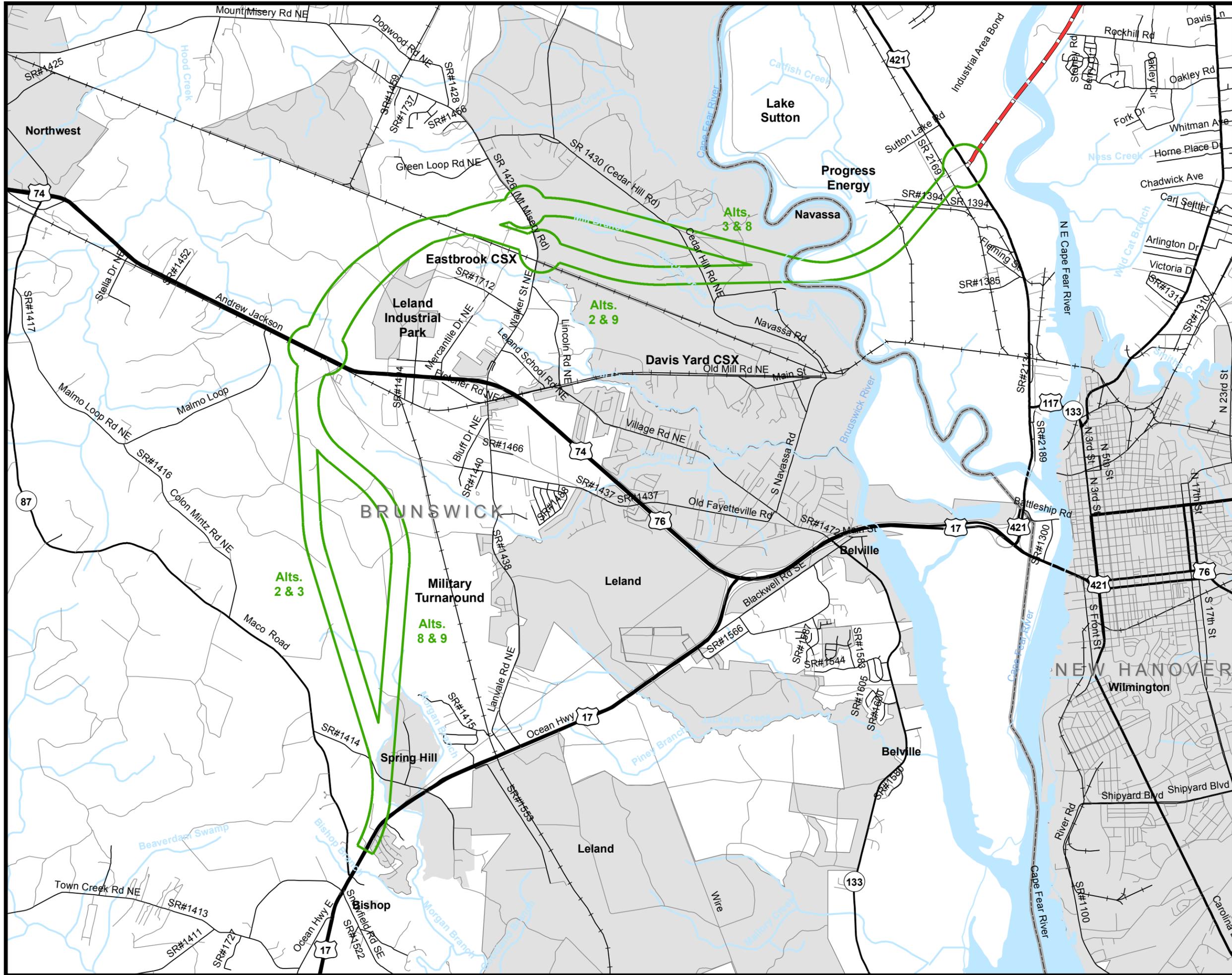
As described in Section 2.1.3, the preliminary build alternatives carried forward as reasonable and feasible alternatives to be evaluated in the DEIS were Alternatives 2, 3, 8, and 9. All four reasonable and feasible build alternatives are shown in Figure 2-3. These alternatives are described in more detail in the September 1996, *Preliminary Alternatives Report* and in the following sections of this chapter of the FEIS. All build alternatives would bridge the Cape Fear River. Interchanges would be constructed at US 17, US 74/76, and SR 1426 (Mt. Misery Road) in Brunswick County and US 421 in New Hanover County.

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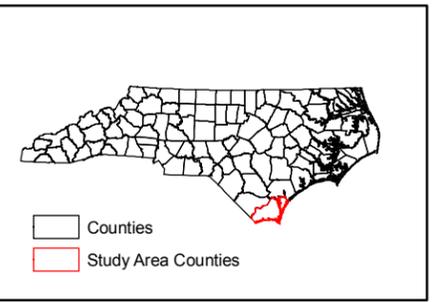
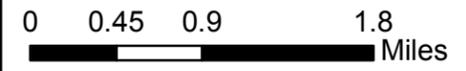
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TIP R-2633 A/B  
Wilmington Bypass

Figure 2-3  
Build Alternatives  
Evaluated in the DEIS



- Legend**
- Build Alternatives
  - R-2633 C
  - Interstate Highways
  - US Highways
  - State Highways
  - State Routes
  - Local Roads
  - Railroads
  - Municipal Boundaries
  - County Boundaries
  - Water
  - Streams (Non-delineated)



April 2007  
This map is for reference only.  
Sources: ESRI, CGIA, Brunswick County,  
New Hanover County, USDOT, NCDOT, URS.



### 2.2.2.2 Design Criteria

Roadway design criteria used to develop the proposed alternatives are presented in Table 2-4. These criteria are based on the project's functional classification, and design speed; and conform to the AASHTO's standards.

**Table 2-4: Roadway Design Criteria**

DESIGN CONTROL	MAINLINE/ RAMP/LOOP	VALUE
Design Speed	Mainline	70 miles per hour (mph) (110 kilometers per hour (kph))
	Ramp	50 mph (80 kph)
	Loop	30 mph (50 kph)
Right-of-Way Width		300 feet (ft) typical (90 meters (m) typical)
Median Width		46 ft (14 m)
Lane Width	Mainline	12 ft (3.6 m)
	Ramp	16 ft (4.8 m)
	Loop	20 ft (6.0 m)
Shoulder Width	Mainline	Outside - 12 ft [10 ft paved] (3.6 m [3.0 m paved]) 17 feet with guardrail
		Median - 6 ft [4 ft paved] (1.8 m [1.2 m paved])
	Ramp	Outside - 14 ft [4 ft paved] (4.2 m [1.2 m paved]) Inside - 12 ft [4 ft paved] (3.0 m [1.2 m paved])
		Loop
	Grades	Mainline
Ramp		5% maximum
Loop		7% maximum
Superelevation*		Typical cross-slope – 2.5%
		e(max) – 10% mainline
		ramps and loops – 8%
Horizontal Curvature	Mainline	1,640 ft (455 m) minimum radius
	Ramp	760 ft (230 m) minimum radius
	Loop	250 ft (80 m) minimum radius
Vertical Curvature - Crest**	Mainline	K = 247 (74)
	Ramp	K = 84 (26)
	Loop	K = 19 (7)
Vertical Curvature - Sag**	Mainline	K = 181 (55)
	Ramp	K = 96 (30)
	Loop	K = 37 (13)
Vertical Clearance		Railroad - 23.0 – 23.5 ft (7.0 – 7.2 m)
		Interstates/Freeways/ Arterials - 16.5 – 17.0 ft (5.0 – 5.2 m)
		Local Roads - 15.0 – 15.5 ft (4.6 – 4.7 m)
		Northeast Cape Fear River - 55.0 ft (16.8 m)

SOURCE: American Association of State Highway and Transportation Officials. A Policy on Geometric Design of Highways and Streets, Fifth Edition. Washington, D.C.. 2004.

NOTES: \*Typical cross-slope = slope of road from middle or side to side on straight sections; helps with drainage.

Typical cross-slope on ramps, loops, and mainline - 2.5%; otherwise - 2.0% (-Y- lines and service roads).

e(max) = maximum slope from one side of a highway to the other on a curve; helps with banking.

Mainline - 10%; -Y- lines, service roads, ramps, loops – 8%

\*\* Sag or Crest K = rate of change of a vertical curve at the crest of a hill or at the lowest point of a valley. Rate of allowed change dependent on design speed. Faster speeds require gentler rates of change.

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A typical mainline cross-section applicable to all of the reasonable and feasible DEIS alternatives is presented in Figure 2-4. As shown in the figure, two 12-foot wide lanes are proposed for each direction of travel, separated by a 46-foot wide median. The total right-of-way is proposed to be a minimum of 300 feet. In addition, typical sections for associated ramps, loops, and service roads are included in Figure 2-5.

The study corridors established for the DEIS build alternatives were 1,000 feet wide and were expanded at interchange locations. For the initial corridor evaluation and screening, a preliminary centerline through the middle of the study corridor was assumed for assessing and quantifying environmental impacts at 300 feet for new construction and 500 feet for improving existing roads. This reduced width within the 1,000-foot corridor was reflective of the actual width of the expected roadway impacts.

### **2.2.2.3 Description of Alternatives Evaluated in the DEIS**

The four preliminary alternatives determined to be reasonable and feasible and retained for further study (Alternatives 2, 3, 8, and 9) follow a similar corridor. Each alternative begins at US 17 at Bishop, passes north and west of the towns of Leland and Navassa, and terminates at US 421 (Figure 2-3). All alternatives would provide interchanges at US 17, US 74/76, SR 1426 (Mt. Misery Road), and US 421. Grade separations would be provided at SR 1430 (Cedar Hill Road), SR 1394 (Sutton Steam Plant), and SR 2169 (Fredrickson Road). In the remainder of this section, each interchange location and configuration studied in the DEIS as well as differences among the four alternatives are described.

#### **Description of Interchanges**

##### **US 17**

The interchange at US 17 is a trumpet configuration and would provide free-flow traffic movements between the project and US 17. NC 87 and SR 1522 (Snowfield Road) would be realigned to tie into US 17 and provide a four-leg intersection. Three service roads would be required to maintain access to properties in this area. In lieu of a grade separation, SR 1414 (Goodman Road) will be cut-off to through traffic with cul-de-sacs between US 17 and NC 87. Existing access to SR 1414 would be maintained at US 17 and at NC 87.

##### **US 74/76**

The interchange at US 74/76 is a partial cloverleaf with all ramps and loops placed in the northern quadrants of the interchange due to the railroad tracks that parallel US 74/76 to the south. The ramps and loops would have stop conditions at their termini on US 74/76.

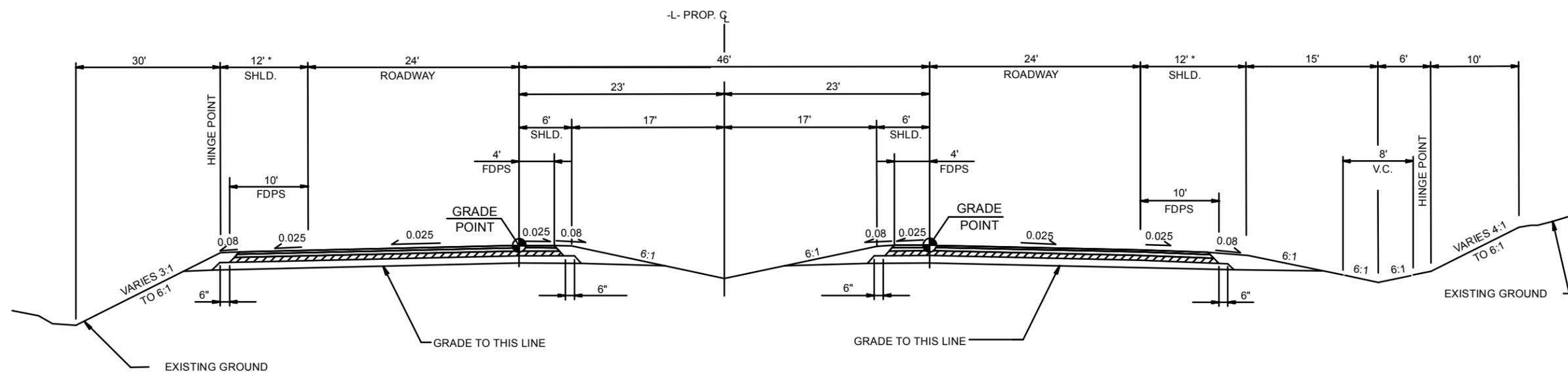
##### **SR 1426 (Mt. Misery Road)**

A diamond interchange is provided at SR 1426 (Mt. Misery Road) and all ramps have stop conditions at their termini on SR 1426 (Mt. Misery Road).

##### **US 421**

The interchange at US 421 would provide a one half-diamond and one-quadrant cloverleaf. The ramps would have stop conditions at their termini on US 421, while the loop would have both free-flow and stop condition at its termini on US 421. A portion of this interchange would be constructed under R-2633C.

Figure 2-4  
Typical Mainline  
Cross-Section



TYPICAL MAINLINE CROSS-SECTION

\* 17' SHOULDER WITH GUARDRAIL



Not to Scale

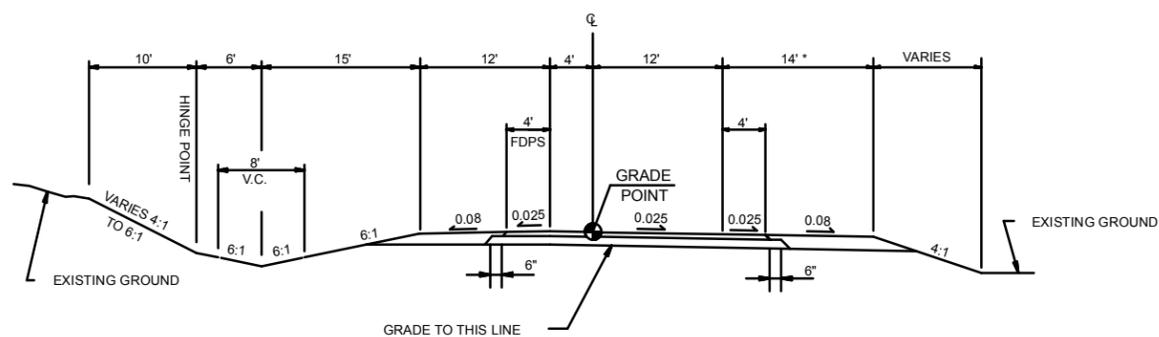


□ Counties  
■ Study Area Counties





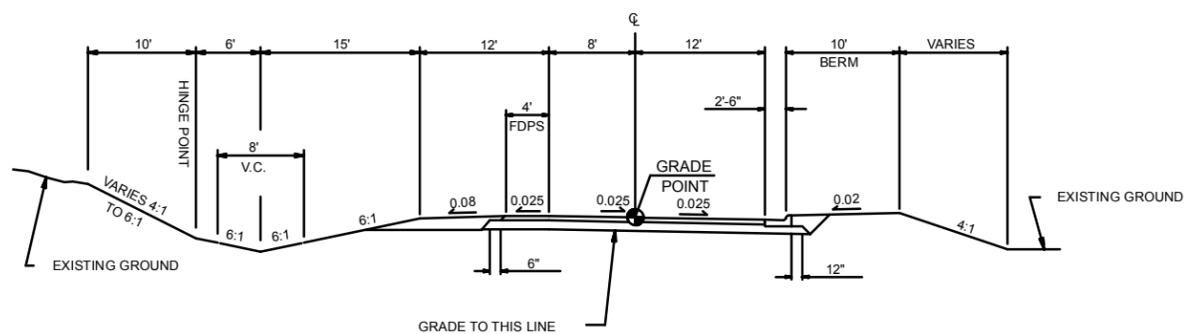
Figure 2-5  
Typical Cross-Sections  
of Ramps and Loops



**RAMP TYPICAL SECTION**

- INTERCHANGE: BYPASS AND US 17
- INTERCHANGE: BYPASS AND US 74/76
- INTERCHANGE: BYPASS AND SR 1426
- INTERCHANGE: BYPASS AND SR 1430
- INTERCHANGE: BYPASS AND US 421

\* 17' SHOULDER WITH GUARDRAIL

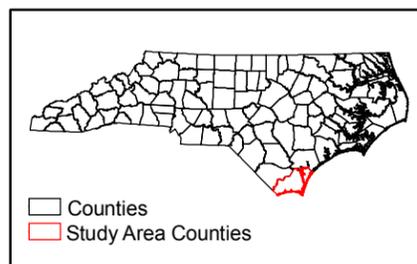


**LOOP TYPICAL SECTION**

- INTERCHANGE: BYPASS AND US 17
- INTERCHANGE: BYPASS AND US 74/76
- INTERCHANGE: BYPASS AND SR 1426
- INTERCHANGE: BYPASS AND SR 1430



Not to Scale





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## **Description of Alternatives**

### **Alternative 2**

Alternative 2 is a corridor extending northward from Bishop, just east of NC 87 (Maco Road) and west of Spring Hill. This corridor intersects with US 74/76 at the west end of the Leland Industrial Park, curving eastward through the Leland Industrial Park to cross the railroad tracks west of Davis Yard. This corridor parallels the north side of the railroad tracks through Eastbrook, turning northeastward at Davis Yard. The terminus of this corridor is at US 421, south of Lake Sutton and the Progress Energy Plant.

### **Alternative 3**

Alternative 3 is the same as Alternative 2, as it travels northward from Bishop, crossing US 74/76 at the west end of Leland Industrial Park, curving northeastward to the railroad tracks. At this point, the corridors diverge, as Alternative 3 takes a more northerly curve (approximately 1/4 mile north at the widest separation), traveling south of Cedar Hill to rejoin Alternative 2 and cross SR 1430 (Cedar Hill Road), to terminate at US 421.

### **Alternative 8**

Alternative 8 begins similarly to Alternatives 2 and 3 at a point along US 17, between Bishop and Spring Hill, traveling north toward the military railroad “turn-around” yard to parallel the western fence line of the yard. The corridor then turns northwesterly and crosses US 74/76 at the west end of the Leland Industrial Park. This alternative then rejoins the corridor used for Alternative 3 to terminate at US 421.

### **Alternative 9**

Alternative 9 is the same as Alternative 8 as it travels northward from Bishop to parallel the military railroad “turn-around” yard. This corridor diverges from Alternative 8 near the railroad tracks west of Eastbrook. Here, Alternative 9 follows the corridor used for Alternative 2 to terminate at US 421.

## **2.3 SELECTION OF THE PREFERRED ALTERNATIVE**

The DEIS was submitted for agency and public review in December 1996, with the Public Hearing on the DEIS held on October 9, 1997. After agency and public comments were reviewed, the NCDOT held a post-hearing meeting on November 21, 1997. At this time, it was brought to NCDOT’s attention that Martin Marietta Corporation had proposed to develop an industrial site along US 74/76, within an area where all four build alternatives studied in the DEIS come together for a proposed interchange. The results of preliminary studies that evaluated alternative corridors avoiding the Martin Marietta site were presented at the post-hearing meeting. Findings revealed that there were two alternative interchange locations, one on either side of the proposed Martin Marietta site, which were reasonable and feasible, and would possibly impact fewer wetlands. However, both of these locations were outside of the study corridors presented in the DEIS and at the Public Hearing. It was decided at the post-hearing meeting that the corridor modifications be presented at an agency meeting and that a Preferred Alternative be established at that time. The study corridor was expanded and environmental investigations, including wetland delineations, were conducted in both the existing and expanded study corridor in order to evaluate the wetland impacts of shifting the alignment westward at US 74/76.

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A Joint Steering Committee/Agency Meeting was held on December 9, 1997. A summary of impacts for the four build alternatives and the impacts anticipated from the corridor modifications to avoid the Martin Marietta site were presented. Based on the impact summary, information presented in the DEIS, and agency and public comments received on the DEIS; Alternative 9 was determined to be the Preferred Alternative. However, the agency representatives were requested to formally respond to the USACE with their recommendations for the Preferred Alternative. It was decided that the modifications to the corridor should be further evaluated to determine if wetland impacts could be minimized. In a letter dated March 16, 1998, the USACE concurred that Alternative 9 is the Preferred Alternative but stated that efforts should be made to avoid and minimize impacts to the stream systems near the southern terminus (see Appendix A).

The decision that Alternative 9 should be adopted as the Preferred Alternative for the project was based primarily on an analysis of relevant environmental and social public interest factors, including impacts to wetlands, fish and wildlife habitat, flood hazards and floodplain functions, water quality, protected species, residential and business relocations, cultural and historic resources, indirect and cumulative effects, and other social and economic factors. A list of the attendees at the Post-Hearing Meeting and at the Joint Steering Committee/Agency Meeting is included in Appendix E.

### **2.3.1 ACTIONS TAKEN SINCE SELECTION OF THE PREFERRED ALTERNATIVE**

After the selection of Alternative 9 as the Preferred Alternative, it was decided that additional traffic and environmental analyses were necessary before beginning preliminary design and preparation of the FEIS. In early 1999, preliminary design and preparation of the FEIS was initiated. At this time the project entered into the Section 404/NEPA Merger Process, the environmental streamlining process newly implemented by NCDOT, USACE and the North Carolina Department of Environment and Natural Resources (NCDENR).

The Section 404/NEPA Merger Process requires agency concurrence at major decision points in the NEPA and Section 404 processes. The federal and state agencies that form the Merger Team for the project are listed in Section Chapter 7 of this FEIS. The major decision points reached during the FEIS phase of the project include Concurrence Point 2A, decisions on bridge lengths; and Concurrence Point 4A, avoidance and minimization of impacts.

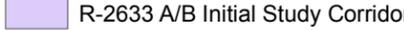
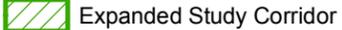
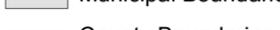
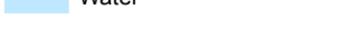
During preliminary design, discoveries were made in the course of additional environmental analysis which resulted in a widening of the Preferred Alternative study corridor. Expansion of the study corridor allowed for changes in the preliminary alignment to avoid and minimize impacts to environmental resources. For example, the alignment immediately north of US 17 was modified to avoid multiple crossings of a stream and wetland system. The expanded study corridor and several alignments studied for avoidance and minimization purposes are presented on Figure 2-6. Several opportunities were provided for the public to provide input on the expanded study corridor (see Section 7.2 for a record of public involvement activities).

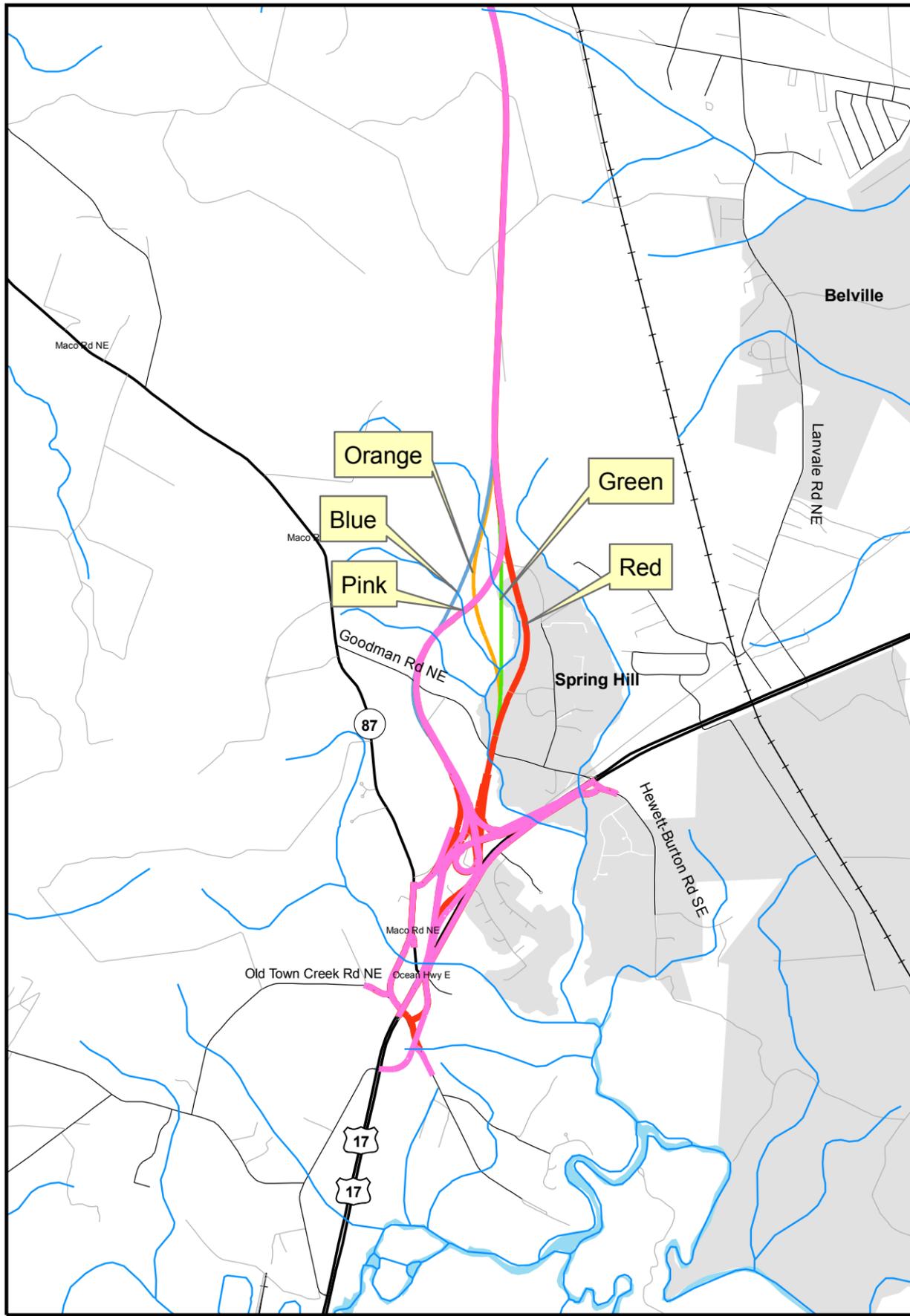
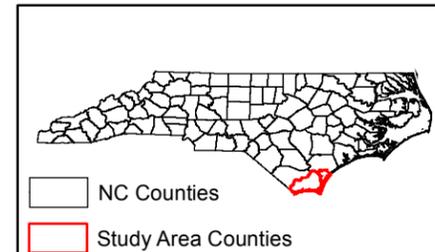
Alternative 9, as presented in the DEIS, included interchanges at US 17, US 74/76), SR 1426 (Mount Misery Road), and US 421. During the course of preliminary design the Town of Navassa requested that NCDOT provide an interchange at SR 1430 (Cedar Hill Road). An interchange at this location would provide interstate access to this minority community and to industrial property within the town. The decision was made by NCDOT to provide an additional interchange at Cedar Hill Road. The addition of this interchange also resulted in a widening of the study corridor.

TIP R-2633A/B  
Wilmington Bypass

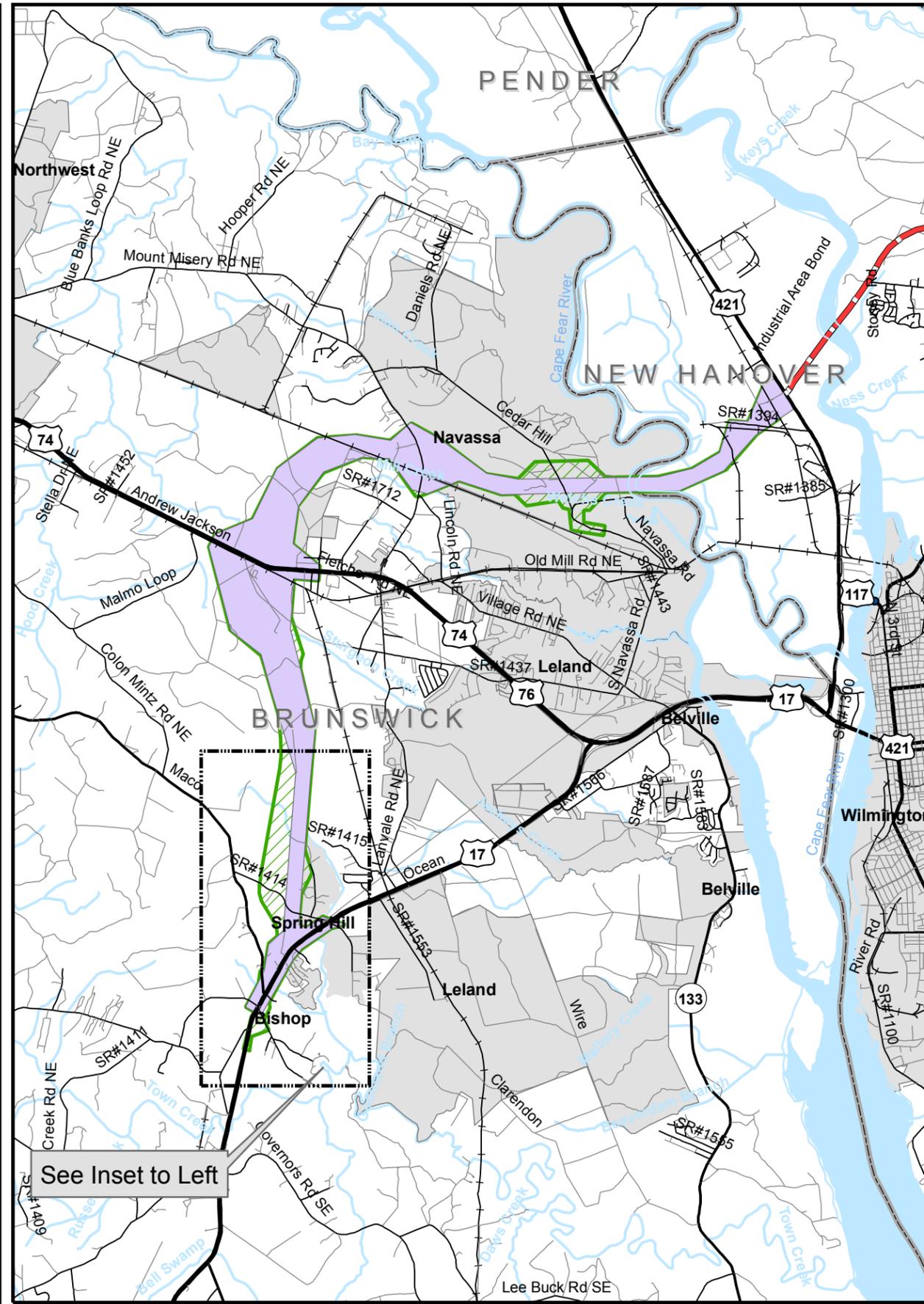
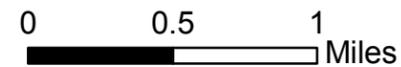
Figure 2-6  
Expanded Study Corridor and  
Alternative Alignments

Legend

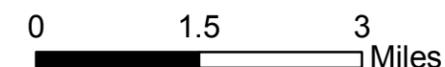
-  R-2633 A/B Initial Study Corridor
-  Expanded Study Corridor
-  R-2633 A/B Recommended Alignment
-  R-2633 C
-  Interstate Highways
-  US Highways
-  State Highways
-  State Routes
-  Local Roads
-  Railroads
-  Municipal Boundaries
-  County Boundaries
-  Water
-  Streams (Non-delineated)



Alternative Alignments



Corridor Study Area



See Inset to Left



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Projected traffic that would be generated by the addition of the SR 1430 (Cedar Hill Road) interchange was found to exacerbate an existing safety problem on SR 1430 (Cedar Hill Road) south of the project at a reverse curve with a substandard design speed. Additionally, a stream and associated wetlands were located on either side of the road at this location, which is prone to flooding. Thus, the study corridor again was widened to include this area. The preliminary design of the Preferred Alternative includes increasing the radius of the curve and providing a bridge over the stream and wetlands.

A community meeting for the Town of Navassa was held on February 11, 2003 to provide the community with an opportunity to review the preliminary design of the SR 1430 (Cedar Hill Road) interchange and comment on any potential project related impacts. Given the developments in the project's preliminary design, the expanded study corridor, and the length of time that elapsed since the last public meeting; a corridor-wide, citizens informational workshop was held on February 20, 2003. The purpose of the workshop was to update the public on the progress of the project and provide the public with an opportunity to review and comment on the preliminary design and potential environmental impacts. See Section 7.2 for a record of public involvement activities.

Several changes and additions were made to the alignment during the preliminary design process to avoid and minimize impacts to the human and natural environment. These changes included shifts in the alignment, changes in interchange design, inclusion of bridges over streams, and inclusion of wildlife crossings. Many of the changes were a direct result of agency and public input.

The diamond interchange proposed at SR 1426 (Mount Misery Road) was changed to a modified diamond interchange with an internal loop in the southeast quadrant to minimize wetland impacts in the northeast quadrant of the interchange. The US 74/76 interchange was shifted slightly eastward to minimize wetland and stream impacts at the interchange and the alignment south of the interchange was shifted to the east to avoid a wetland mitigation site located south of the interchange. Shifting the alignment south of US 74/76 also eliminated the need to provide service roads that would otherwise impact wetlands.

Because the project traverses large tracts of rural land, three wildlife crossings were included in the project and additional bridge length was added at stream crossings to mitigate barrier effects of the project by allowing for wildlife passage.

The US 17 interchange was modified such that a proposed frontage road could be located within the existing right-of-way of US 17 along the northbound lanes, thereby avoiding impacts to homes and wetlands along the northbound side of the roadway. Further modifications were made to the US 17 interchange as a result of coordination with the ongoing US 17 corridor improvement study (TIP R-4732), which is being conducted to evaluate short and long term improvements to increase traffic flow and protect this vital transportation route that has been designated as a Strategic Highway Corridor by the NCDOT. The changes were made to improve safety and traffic flow on US 17 in the vicinity of the proposed interchange and included minor relocations of proposed access roads and u-turn locations. The changes made included extending the frontage road paralleling US 17 to the south and relocating SR 1525 (Snowfield Road) to access US 17 further south. Other modifications included incorporating elements of the "superstreet" design proposed by the TIP R-4732, which includes median u-turns with bulb-outs and restricted left turns from minor roads at intersections.

Through the course of preliminary design, it was discovered that a minority community, Spring Hill, which was located adjacent to the originally selected study corridor, would be affected by

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alignment modifications developed to reduce project impacts to the tributary stream to Morgan Branch. After meeting with the community of Spring Hill, it was determined that members of the community had unintentionally not been included in the project development process. A Merger Team meeting was held on June 10, 2004 to inform the team of the oversight in not involving the community in the project development process, to convey the community's concerns, and to determine if the team would be receptive to re-opening Concurrence Point 4A (CP4A), which is, Avoidance and Minimization of Impacts. The Merger Team agreed to reevaluate alternative alignments in the vicinity of Spring Hill to avoid and minimize impacts to the natural, social, and physical environments.

In an effort to avoid impacts to the Spring Hill community as well as impacts to the notable features of the human and natural environment; four alternative alignments (Orange, Green, Blue, and Pink), were designed, studied for environmental impacts and presented to the Merger Team for consideration at a meeting held in January, 2005. The original Preferred Alternative, which became known as the Red alignment, and the four alternative alignments in the vicinity of Spring Hill are shown in Figure 2-6. As shown on the figure, the alternative alignments all branch from a common point on the alignment north of Spring Hill. A series of Merger Team meetings and public involvement activities that included several small group meetings with the Spring Hill community and a public informational meeting were held between January and December 2005 (see Section 7.2 for a record of public involvement activities).

A Merger Team Meeting was held on November 17, 2005. The threefold purpose of the meeting was: (1) to revisit selection of the LEDPA (Preferred Alternative) and formally adopt the expanded study corridor, (2) rescind the original CP 4A alignment, and (3) discuss and concur on a new CP 4A alignment. At the conclusion of the meeting, after consideration of the environmental impacts of each alternative alignment, the Merger Team formally adopted the expanded study corridor and concurred on rescinding the original CP 4A alignment and selection of a new CP 4A alignment. The Pink alignment combined with the common alignment north of Spring Hill was selected as the CP 4A alignment, or the recommended alignment. Figure 2-7 shows a comparison of the Red Alignment and the Pink Alignment.

## **2.3.2 DESCRIPTION OF THE RECOMMENDED ALIGNMENT**

### **2.3.2.1 Description of Alignment**

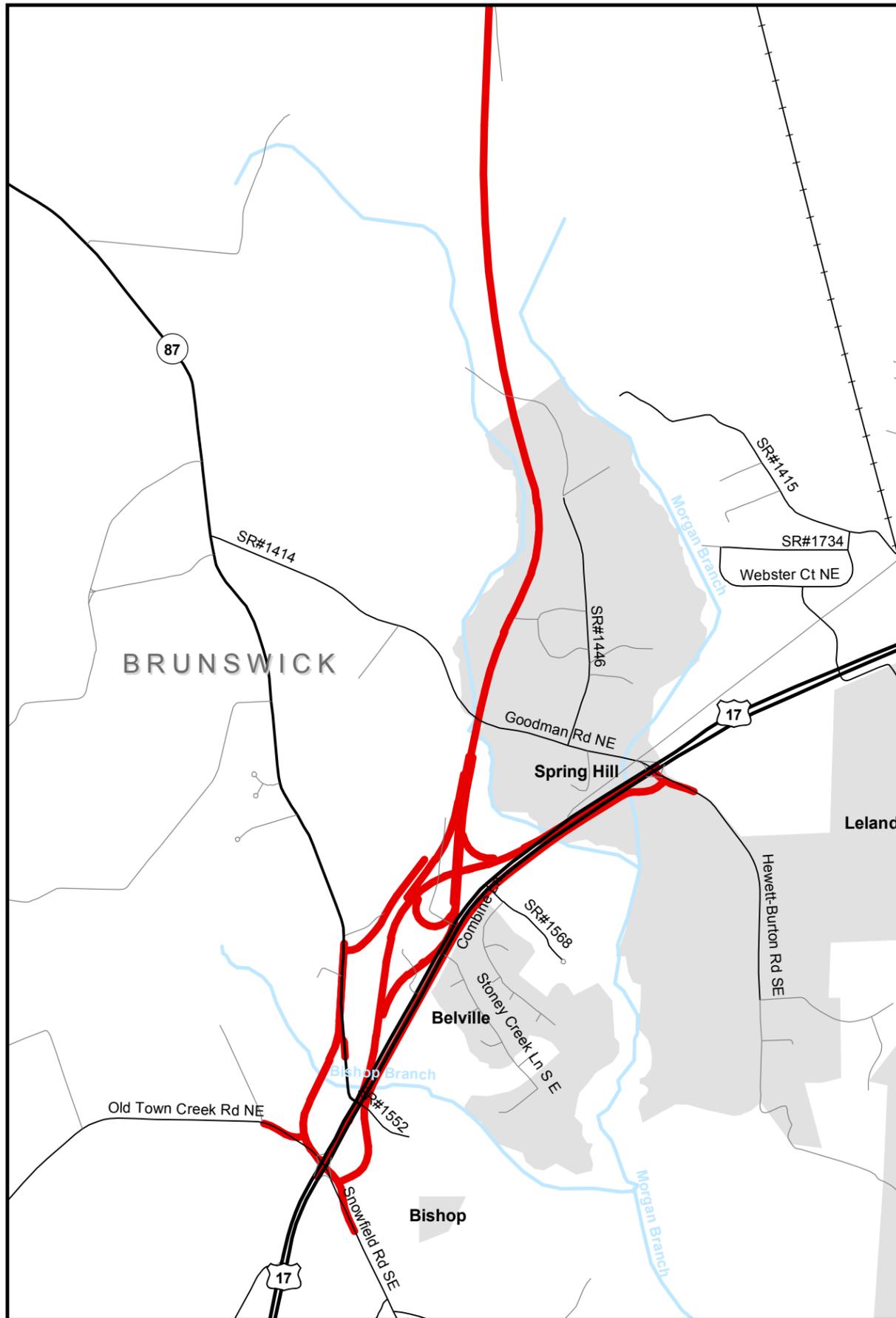
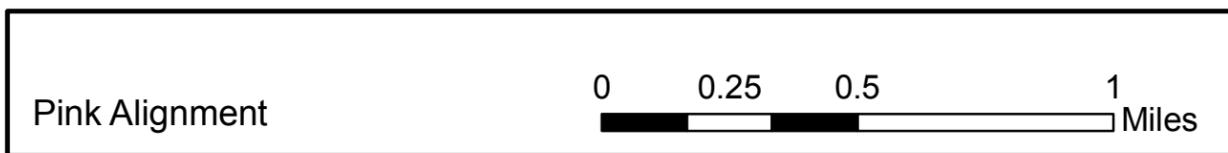
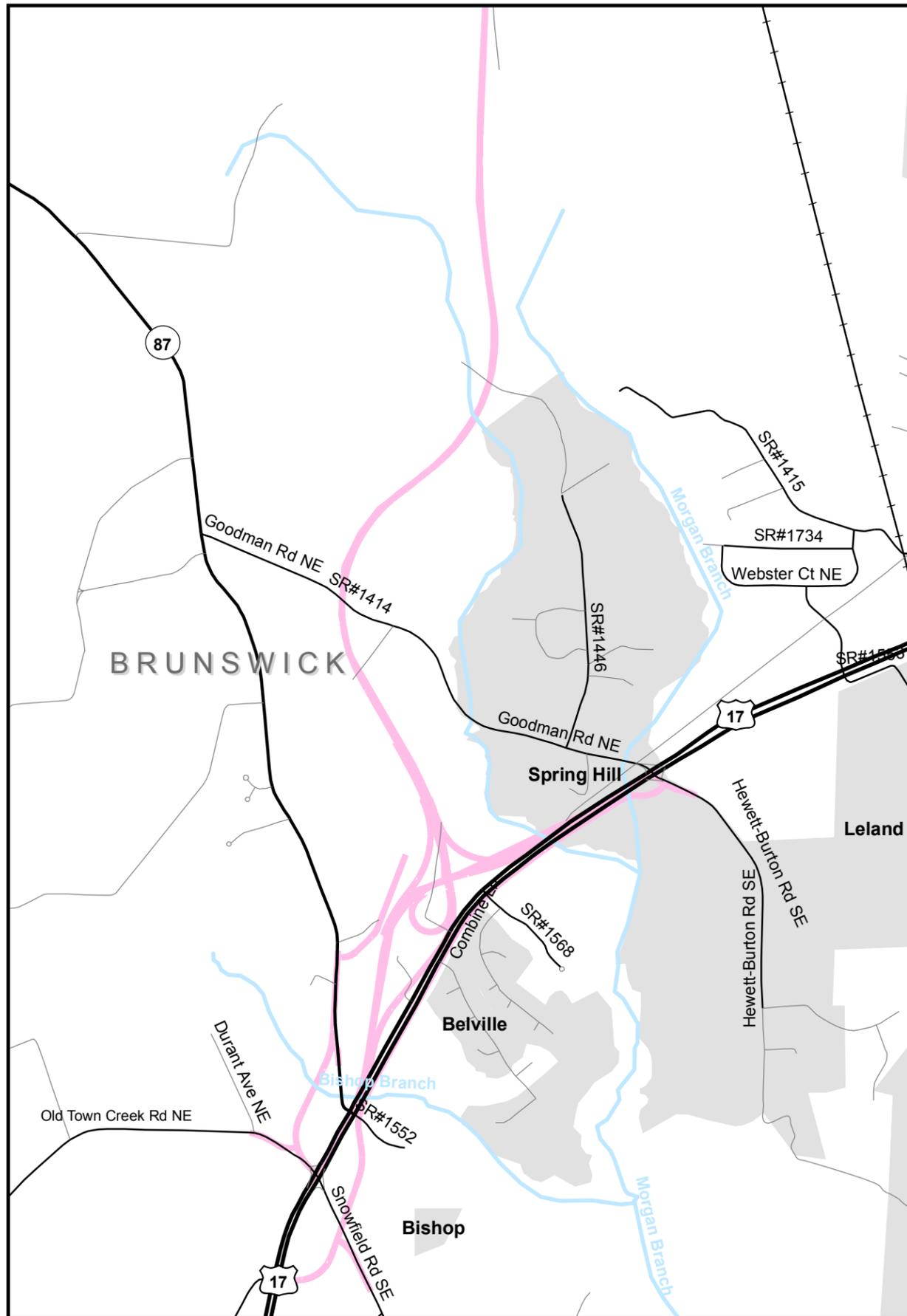
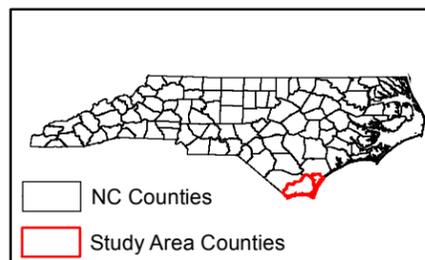
The recommended alignment of the Preferred Alternative (described as the recommended alignment throughout the remainder of this FEIS and shown in Figure 2-8) begins at a point along US 17, between Bishop and Spring Hill, traveling north toward the military railroad "turn-around" yard to parallel the western fence line of the yard. The alignment then turns northwesterly and intersects with US 74/76 at the west end of the Leland Industrial Park. It then curves eastward through the Leland Industrial Park to cross the railroad tracks west of Davis Yard. The recommended alignment parallels the north side of the railroad tracks through Eastbrook, turning northeastward at Davis Yard toward the Cape Fear River. The alignment crosses the Cape Fear River and associated wetlands on a high-level, fixed-span bridge. The project terminus aligns with R-2633C at US 421, south of Lake Sutton and the Progress Energy Plant. The proposed centerline, the slope stake limits, and proposed right of way were established upon completion of the preliminary design of the recommended alignment.

Three wildlife crossings, two of which are bridges and one of which is a culvert, are provided at various locations along the alignment. In addition to the bridge over the Cape Fear River and Toomers Creek, four bridges are provided at stream crossing locations along the mainline alignment. Additionally, two bridges are provided at stream crossings on NC 87 and SR 1430 (Cedar Hill Road).

Figure 2-7  
Alignment Comparison

**Legend**

- Red Alignment
- Pink Alignment
- Interstate Highways
- US Highways
- State Highways
- State Routes
- Local Roads
- Railroads
- Municipal Boundaries
- County Boundaries
- Water
- Streams (Non-delineated)





TIP R-2633 A/B  
Wilmington Bypass

Figure 2-8  
Recommended Alignment

Legend

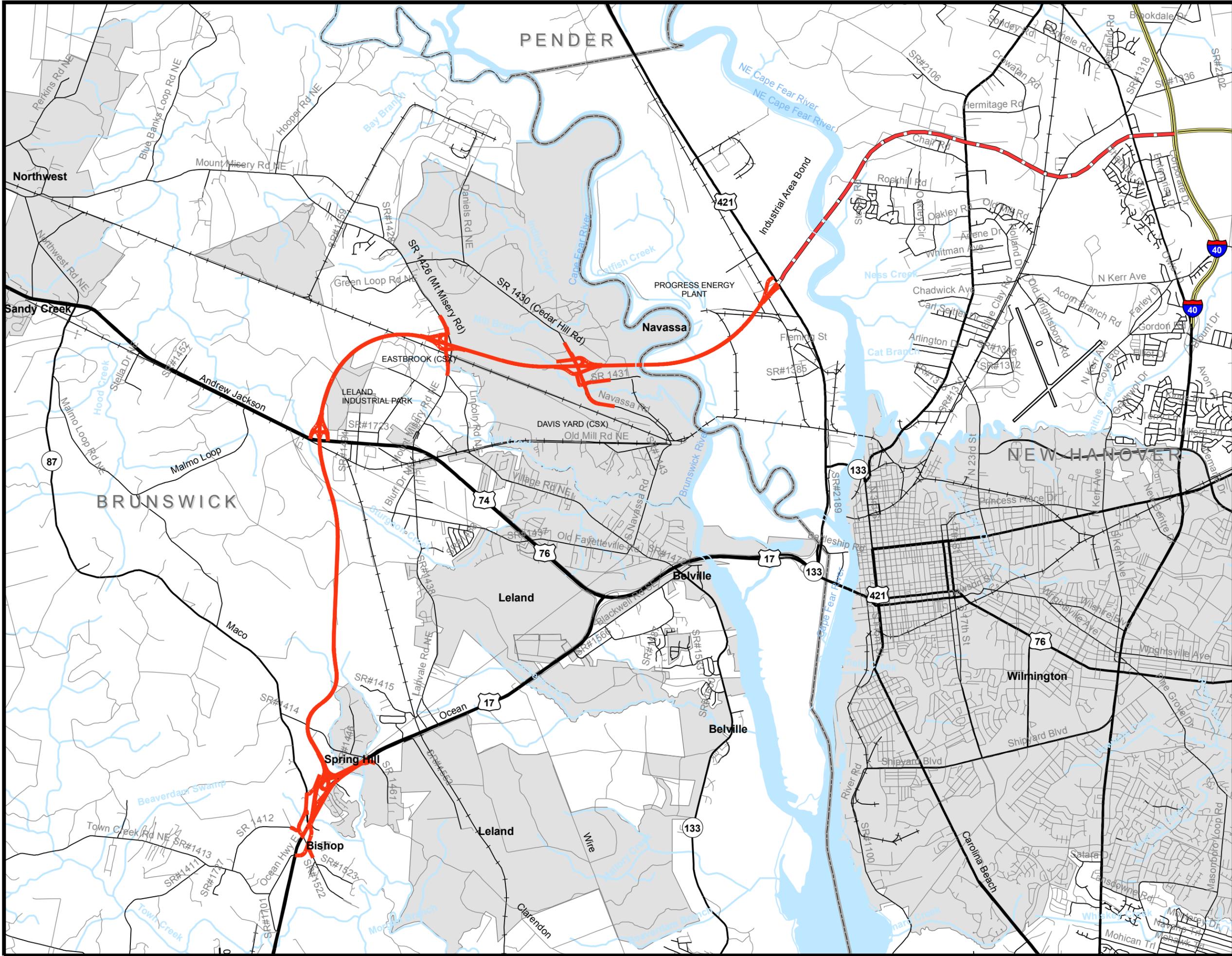
-  R-2633 A/B Recommended Alignment
-  R-2633 C
-  Interstate Highways
-  US Highways
-  State Highways
-  State Routes
-  Local Roads
-  Railroads
-  Municipal Boundaries
-  County Boundaries
-  Water
-  Streams (Non-delineated)



-  Counties
-  Study Area Counties



April 2007  
This map is for reference only.  
Sources: ESRI, CGIA, Brunswick County,  
New Hanover County, USDOT, NCDOT, URS.





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### **2.3.2.2 Description of Interchanges**

Grade separation is provided at each of the project's five interchanges (US 17, US 74/76, SR 1426 (Mt. Misery Road), SR 1430 (Cedar Hill Road) and US 421) as well as at three locations where the alignment crosses a railroad. The project also provides grade separation at two roads near US 421. Each interchange location and configuration is described in this section.

#### **US 17**

The interchange at US 17 is a trumpet configuration and would provide free-flow traffic movements between the project and US 17. NC 87 and SR 1522 (Snowfield Road) would be realigned to tie into US 17 so that a desirable control of access distance from the interchange can be provided as part of US 17 Strategic Highway Corridor. SR 1522 (Snowfield Road) would be realigned to provide a four-legged intersection with SR 1701 (Zion Church Road). Three service roads would be required to maintain access to properties in this area and cul-de-sacs would be provided on SR 1414 (Goodman Road) in lieu of a grade separation. Existing access to SR 1414 (Goodman Road) would be maintained at US 17 and at NC 87.

#### **US 74/76**

The interchange at US 74/76 is a modified diamond with all ramps and loops placed in the northern quadrants of the interchange due to the railroad tracks that parallel US 74/76 to the south. The ramps and loops would have stop conditions at their termini on US 74/76. The mainline of the project will be grade separated over US 74/76 and the CSX railroad.

#### **SR 1426 (Mt. Misery Road)**

A modified diamond (3-Leg) interchange is provided at SR 1426 (Mt. Misery Road) and all ramps have stop conditions at their termini on SR 1426. SR 1426 (Mt. Misery Road) will be realigned to the west to have grade separated crossings over the CSX railroad and the project.

#### **SR 1430 (Cedar Hill Road)**

A modified diamond (3-Leg) interchange is provided at SR 1430 (Cedar Hill Road) and all ramps have stop conditions at their termini on SR 1430 (Cedar Hill Road). Restriction of access through the interchange on SR 1430 (Cedar Hill Road) requires that access roads be provided to residences on the north and south sides of the interchange. South of the interchange, SR 1431 (Royster Road) will be realigned to a perpendicular intersection with SR 1430 (Cedar Hill Road). South of the interchange, SR 1430 currently has a reverse curve with a substandard design speed and is prone to flooding. This section of SR 1430 will be improved to mitigate the safety problems from flooding and future traffic generated by the project. A bridge will be provided over a stream and wetland system and the reverse curve will be eliminated and the curve radius will be increased to improve the design speed of the road.

#### **US 421**

The interchange at US 421 would provide a modified diamond interchange. The ramps would have stop conditions at their termini on US 421, while the loop would have both free-flow and stop condition at its termini on US 421. A portion of this interchange will be constructed under R-2633C. To the southwest of the interchange, a grade separation would be provided for SR 1394 (Sutton Steam Plant). Grade separations will be provided over SR 1394 (Sutton Steam Plant) and SR 2169 (Fredrickson Road).

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## **2.4 TRAFFIC OPERATIONS**

### **2.4.1 YEAR 2025 TRAFFIC PROJECTIONS**

Average daily traffic (ADT) volumes for the year 2025 were projected to estimate whether the existing roadway system would have sufficient capacity to accommodate future travel demand. The traffic projections were based mostly on the Greater Wilmington Area Travel Model that is based on 20-year land use forecasts. The *Traffic Technical Memoranda* in addition to the *Revised Traffic Forecast, TIP # R-2633A/B, US 17 Bypass* detail the assumptions used in projecting the future traffic volumes.<sup>53</sup> The future highway network modeled under the No-Build Alternative included other area projects listed in the TIP that were funded, including R-4002 (Village Road in Leland), U-2405 (I-40 Connector), U-0092 (Smith Creek Parkway now named Martin Luther King, Jr. Boulevard), and R-2633C. There are no funded TIP projects currently in the Brunswick County Thoroughfare Plan in the vicinity that would directly impact the Wilmington Bypass.

The future year 2025 traffic projections for the Build Alternative are shown in Table 2-5 and in Figure 2-9. The table also includes estimates of two-way and directional peak hour traffic volumes, proposed lanes, and LOS for the Build Alternative. Level of service analysis for the project under the Build Alternative is included in Table 2-6.





**Table 2-5: Year 2025 (Build Alternative) ADT Volume and Peak Hour LOS**

ROAD	SEGMENT	LANES <sup>a</sup>	TWO-WAY ADT VOLUME <sup>b</sup>	PEAK HOUR <sup>c</sup>		
				TWO-WAY VOLUME	DIRECTIONAL VOLUME	LOS
US 17	NC 87 TO BYPASS	4LD	58,100	5,229	2,876	D
	BYPASS TO SR 1553	4LD	40,900	3,681	2,025	C
	SR 1553 TO SR 1438	4LD	52,400	4,716	2,594	C
	SR 1438 TO US 74/76	4LD	39,600	3,564	1,961	C
	US 74/76 TO NC 133	4LD	72,000	7,200	3,960	F
	NC 133 TO US 421	4LD	116,900	11,690	6,430	F
	US 421 TO BRIDGE OVER CAPE FEAR	4LD	93,700	9,370	5,154	F
US 74/76	JUST NORTH OF BYPASS	4LD	43,800	3,942	2,169	C
	JUST SOUTH OF BYPASS	4LD	39,700	3,573	1,966	C
	BETWEEN SR 1426 & US 17	4LD	39,600	3,564	1,961	C
SR 1426 (MT MISERY RD)	JUST NORTH OF BYPASS	2L	16,000	1,600	880	E
	JUST SOUTH OF BYPASS	2L	13,300	1,330	732	D
SR 1438 (LANVALE ROAD)	BETWEEN US 74/76 & US 17	2L	18,000	1,620	891	E
SR 1430 (CEDAR HILL RD)	JUST NORTH OF BYPASS	2L	14,800	1,480	740	E
	JUST SOUTH OF BYPASS	2L	17,500	1,750	875	E
US 421	JUST NORTH OF BYPASS	5L	25,100	2,259	1,243	B
	BYPASS TO SMITH CREEK PARKWAY	5L	29,400	2,646	1,456	B
	SMITH CREEK PARKWAY TO US 17	5L	45,000	4,050	2,228	C
SMITH CREEK PARKWAY	EAST OF US 421	4LD	37,600	3,384	1,862	B
NC 133	SOUTH OF US 17	2L	22,700	2,270	1,249	E
SR 1472 (VILLAGE ROAD)	BETWEEN US 17 AND SR 1435	2L	45,000	4,500	2,475	F
SR 1472 (VILLAGE ROAD)	NORTH OF SR 1435	2L	33,500	3,350	2,010	F
NC 87	NORTH OF US 17	2L	2,900	290	174	C
SR 1552 (SLOAN RD)	SOUTH OF US 17 OPPOSITE NC 87	2L	600	60	36	D
SR 1701 (ZION CH RD)	NORTH OF US 17 WEST OF BYPASS INTERCHANGE	2L	800	80	48	C
SR 1412 (OLD TOWN CR RD)	NORTH OF US 17	2L	900	90	54	D
SR 1522 (SNOWFIELD RD)	SOUTH OF US 17	2L	1,600	160	96	D
SR 1414 (GOODMAN RD)	NORTH OF US 17	2L	600	60	36	D
SR 1461 (MORGAN CR OR HEWITT BURTON RD)	SOUTH OF US 17	2L	800	80	48	C
SR 1553 (BRUNSWICK FOREST)	SOUTH OF US 17 (FUTURE IP DEVELOPMENT)	2L	22,900	2,290	1,374	E

NOTES: a. L = Number of lanes, D = Divided highway, C&G = Curb and gutter, N/A = Link does not exist under given alternative

b. 2025 ADT Volume from NCDOT Statewide Planning Branch

\* Highest volume on segment utilized which yields worst LOS

c. a. LOS based on 2000 *Highway Capacity Manual* (Transportation Research Board, 2000), Chapters 12 (Hwy Concepts), 20 (Two-lane Hwy), and 21 (Multi-lane Hwy)

b. Multi-lane segments have a LOS for each direction; LOS shown is direction with worst LOS

Source: NCDOT Traffic Technical Memorandum, 2004

**Table 2-6: 2025 Design Year Recommended Alignment Level of Service Analysis**

A. Freeway Segments	DDHV*	Peak Hour LOS
US 17 Bypass - US 17 to US 74/76	1,339	B
US 17 Bypass - US 74/76 to SR 1426 (Mt. Misery Road)	1,534	B
US 17 Bypass - SR 1426 (Mt. Misery Road) to SR 1430 (Cedar Hill Road)	1,642	B
US 17 Bypass - SR 1430 (Cedar Hill Road) to US 421	1,793	B
B. Ramps and Ramp Junctions	2025 AM Peak	2025 PM Peak
US 17 Bypass Northbound Flyover at US 17 - Diverge	A	A
US 17 Bypass Southbound Ramp at US 17 Southbound - Merge	A	B
US 17 Bypass Southbound Ramp at US 17 Bypass - Diverge	A	A
US 17 Bypass Southbound Loop at US 17 Northbound - Merge	B	B
US 17 Bypass Northbound Ramp at US 17 Southbound - Diverge	B	B
US 17 Bypass Northbound Ramp at US 17 Bypass - Merge	A	A
US 74/76 Ramp A at Bypass - Diverge	A	B
US 74/76 Loop A at Bypass - Merge	A	A
US 74/76 Ramp D at Bypass - Merge	B	A
US 74/76 Loop D at Bypass - Diverge	A	A
SR 1426 (Mt. Misery Road) Loop B at Bypass - Diverge	A	B
SR 1426 (Mt. Misery Road) Ramp B at Bypass - Merge	A	B
SR 1426 (Mt. Misery Road) Ramp C at Bypass - Diverge	B	A
SR 1426 (Mt. Misery Road) Ramp D at Bypass - Merge	B	A
SR 1430 (Cedar Hill Road) Ramp A at Bypass - Diverge	B	B
SR 1430 (Cedar Hill Road) Loop A at Bypass - Merge	A	B
SR 1430 (Cedar Hill Road) Ramp C at Bypass - Diverge	B	A
SR 1430 (Cedar Hill Road) Ramp D at Bypass - Merge	B	A
US 421 Ramp B at Bypass - Merge	A	B
US 421 Loop B at Bypass - Diverge	A	B
US 421 Ramp C at Bypass - Diverge	B	B
US 421 Ramp D at Bypass - Merge	B	A
C. Signalized Intersections	2025 AM Peak	2025 PM Peak
US 17 Bypass Ramp/Loop A and US 74/76 (Overall LOS)	B	C
US 17 Bypass Ramp/Loop D and US 74/76 (Overall LOS)	C	C
US 17 Bypass Ramp/Loop B and SR 1426 (Mt. Misery Road) (Overall LOS)	B	C
US 17 Bypass Ramp C / Ramp D and SR 1426 (Mt. Misery Road) (Overall LOS)	A	A
US 17 Bypass Ramp/Loop A and SR 1430 (Cedar Hill Road) (Overall LOS)	B	B
US 17 Bypass Ramp C / Ramp D and SR 1430 (Cedar Hill Road) (Overall LOS)	C	B
US 17 Bypass Ramp/Loop B and US 421 (Overall LOS)	C	C
US 17 Bypass Ramp C / Ramp D and US 421 (Overall LOS)	D	C

\* Daily Design Hour Volume expressed in number of vehicles per hour

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## 2.4.2 CAPACITY ANALYSES

Traffic volumes in and through the area are expected to continue to increase due to increased development. This growth is based on the past growth trends in population and development for the study area. Under the current road conditions, traffic volumes for the critical links along US 421 and US 17 within the study area will decrease as a result of the Build Alternative, as compared the project volumes in 2025 under the No-Build Alternative.

As described in Section 1.9.3, a review of Table 1-5 indicates that, despite several planned improvements shown on the *Brunswick County Thoroughfare Plan*, the *Wilmington Urban Area Transportation Plan*, and TIP, a substantial number of roadway segments would operate at LOS D or worse under the no-build scenario. Under this scenario, the critical links along US 421 and US 17 are expected to operate at LOS D or worse during the peak hours for five out of 10 roadway segments analyzed. A review of Table 2-5 indicates that of the 10 critical links, four of the roadway segments operating at LOS D or worse for the peak hours in the No-Build Alternative remain at LOS D or worse for the Build alternatives. Traffic volumes along US 17/74/76/421 from NC 133 (south) in Brunswick County to Front Street in downtown Wilmington exceed projected 2025 capacities for the no-build and build alternatives.

Although the LOS on these links may not be improved by the proposed project, a substantial reduction in traffic volume occurs, ranging from 8,700 to 14,200 ADT with a corresponding percent reduction of 8.5 to 26.4 percent. The traffic volume reductions on these segments, shown in Table 2-7, would result in an improvement to the operational characteristics of the roadways. These high volume projections indicate that extreme levels of congestion and queuing would occur in the peak hours and the peak hour congestion would likely lengthen in duration. Additionally, these conditions would be further exacerbated during times when the lift-span bridge (Memorial Bridge) over the Cape Fear River is closed to vehicular traffic to allow passage of maritime traffic. In both the future Build and No-Build Alternatives roadway segments operate at LOS F, Table 1-4 defines LOS F as breakdown flow characterized by extremely unstable stop and go waves, with travel speeds less than 30 miles per hour. Therefore any decrease in traffic volume on the critical links as a result of the project will reduce this effect even though it does not result in improvement of the level of service. Table 2-7 shows the reduction in traffic volume, both in vehicle and percent reduction as a result of the construction of the recommended alignment.

The project would create a controlled access freeway bypassing the central business district of Wilmington. The LOS for the project segments, shown in Table 2-6, includes the LOS for freeway segments, ramp junctions, and the signalized ramp terminals. All freeway segments of the project operate at LOS B or better. Therefore, additional capacity is available to accommodate any shift in traffic flows as a result of the over capacity segments on US 421 and US 17 beyond the design year.

**Table 2-7: Reduction in Traffic**

ROADWAY	SEGMENT	2025 NO-BUILD ADT <sup>a</sup>	2025 BUILD ADT	CHANGE IN ADT	PERCENT CHANGE
US 17	NC 87 to Bypass	58,700	58,700	0	0.0 %
	Bypass to SR 1553 (Kay Todd Road)	52,800	40,900	(11,900)	(22.5)%
	SR 1553 (Kay Todd Road) to SR 1438 (Lanvale Road)	64,300	52,400	(11,900)	(18.5)%
	SR 1438 (Lanvale Road) to US 74/76	53,800	39,600	(14,200)	(26.4)%
	US 74/76 to NC 133	86,200	72,000	(14,200)	(16.5)%
	NC 133 to US 421	131,100	116,900	(14,200)	(10.8)%
	US 421 to Bridge over Cape Fear River	102,400	93,700	(8,700)	(8.5)%
US 421	North of Bypass	25,100	25,100	0	0.0 %
	Bypass to Martin Luther King Jr. Blvd	40,100	29,400	(10,700)	(26.7)%
	Martin Luther King Jr. Blvd to US 17	55,700	45,000	(10,700)	(19.2)%

( ) - DENOTES REDUCTION

<sup>a</sup> ADT = Averaged Daily Traffic

Source: North Carolina Department of Transportation, Transportation Planning Branch. *Traffic Technical Memoranda* for the Wilmington Bypass Project, TIP No. R-2633A/B. 2004.

### 2.4.3 SAFETY

As noted in Section 1.10, it is expected that safety on local roadways will deteriorate with worsening traffic and travel conditions. Table 1-6 shows that accident rates decrease with increased access control. The project will be a fully controlled interstate freeway that will provide an alternative travel route to locally congested roadways.

### 2.5 COST ESTIMATES

Cost for the four alternatives evaluated in detail in the DEIS have not been updated. However, combined estimated construction and right-of-way costs for the alternatives in 1996 dollars ranged from \$133,225,000 for Alternative 8 to \$136,650,000 for Alternative 9. These costs were not calculated based on preliminary design drawings and did not include cost for bridging wetlands or for wildlife crossings as was done for the recommended alignment. It is assumed that the difference in cost between alternatives would be similar if they were recalculated in 2006 dollars using the same methods as were used for the recommended alignment. Subsequent construction costs for the recommended alignment were developed in March 2006 based on preliminary design plans and consider the costs for right-of-way, bridging of wetlands, wildlife crossings and temporary work bridges.

Construction Costs = \$273,700,000

Part A: \$70,000,000

Part B: \$203,700,000

Right-of-way Costs = \$6, 989,000

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## **CHAPTER 3. EXISTING ENVIRONMENTS**



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## **CHAPTER 3. EXISTING ENVIRONMENTS**

The existing human, physical, cultural and natural environments within the project area are described in this chapter of the FEIS. Since the release of the DEIS, reevaluation of the existing environmental characteristics and conditions of the project area has been conducted. Information pertaining to the affected environment that has changed or is new since the publication of the DEIS is specifically noted. As determined in the *Reevaluation of the Draft Environmental Impact Statement*, prepared in January 2007, there have been no substantial changes in the affected environment since the preparation of the DEIS that would alter the outcome of the DEIS. The inventory and evaluation of the existing environment presented in this chapter provides the necessary baseline from which to further assess and document the impacts of the recommended alignment. Assessments made of the affected environment in the expanded study corridor are also relevant to the corridors studied in the DEIS, as much of the corridors are encompassed by the expanded study corridor and the existing conditions have remained relatively unchanged. The potential environmental consequences of the proposed action are presented in Chapter 4 of this FEIS.

### **3.1 HUMAN CHARACTERISTICS**

The human environment considered in this section of the FEIS includes characteristics of the population, the economy, and communities in the project area. General trends in population growth, the economy and community facilities remain largely unchanged since the publication of the DEIS.

#### **3.1.1 POPULATION CHARACTERISTICS**

Population growth directly impacts land use and consumption of resources. As population increases, more living spaces are required which demand expanded urban infrastructure and public utilities. Nationwide, land consumed for building far outpaces population growth as urban areas expand at about twice the rate the population is growing.<sup>54</sup> In North Carolina, prior population growth trends have been found to be critical in determining future growth. Near urban regions, growth goes primarily to census tracts that have available land. In rural areas, prior density has less impact in determining future growth trends.<sup>55</sup> In this section, characteristics of population growth trends in the project area and surrounding municipalities are illustrated. Projections of future population growth are also provided.

##### **3.1.1.1 Project Area Characteristics – Past and Current Population**

When the easternmost segment of I-40 opened in 1990, it became a gateway to rapid population growth in both New Hanover and Brunswick counties.<sup>56</sup> According to the US Census, these two counties were among the top ten in the State in population growth from 1990 to 2000. Proximity to beaches and mild climate drew people to this southern coastal area known as the Cape Fear Coast. Retirees have been a big part of this population gain with the number of retirement-age residents in New Hanover County growing by 36 percent from 1990 to 2000, and in Brunswick County by 66 percent. In comparison, the number of retirement-age residents in the State of North Carolina grew by 21 percent for the same period.<sup>57</sup> In Table 3-1, population trends from 1980 to 1990 and 1990 to 2000 are presented for the State of North Carolina, New Hanover County, Brunswick County, and the City of Wilmington.

**Table 3-1: Past Trends in Population Change**

	1980	1990	2000	CHANGE (%)	
				1980-1990	1990-2000
North Carolina	5,880,095	6,632,448	8,046,813	12.8%	21.3%
New Hanover County	103,471	120,284	160,327	16.2%	33.3%
Brunswick County	35,777	50,985	73,141	42.5%	43.5%
Wilmington	44,000	55,530	75,838	26.2%	36.6%

Source: North Carolina State Data Center, 2006.

### 3.1.1.2 Region and District Level Projections

Population projections for the Wilmington region were available from a 2004 study conducted for the Wilmington Urban Area Metropolitan Planning Organization (WMPO), the organization responsible for transportation planning in the Wilmington region. The actual boundary of the area included in the WMPO is shown in Figure 1-10: WMPO Boundary and Roadway Functional Classification Map 2006

. Four counties were included in the study; Pender, New Hanover, Brunswick, and Columbus. While Columbus County is not officially part of the Wilmington metropolitan area, it was included in the WMPO study as it was assumed that Columbus County would probably attain metropolitan status during the forecasting period. In the WMPO study, demographic and economic forecasting was performed for the four-county region as a whole and for eight districts within the region. While the districts do not fully correspond with the project area for this assessment; the four districts identified as: (1) North New Hanover, (2) Central New Hanover, (3) Northeast Brunswick and (4) Central and South Brunswick primarily encompass the project area. All eight of the districts used in the WMPO study are shown in Figure 3-1.

Data forecasted in the WMPO study for the four districts encompassing the project area is referenced in this section. The referenced document should be reviewed for a complete discussion of methods used for the forecast.

Population projections for the relevant districts from the WMPO study are presented in Table 3-2. While the 2000 population for the region studied is shown as 329,281, the 2000 population for the smaller Wilmington urban area was 161,149 according to the U.S. Census.<sup>58</sup> The percent changes for forecasted periods for each district are presented in Table 3-3. Data for the period between 1990 and 2000 is included for comparison purposes. Population growth by district is depicted visually in Figure 3-2.

**Table 3-2: Projected Populations by District**

AREA	1990	2000	2010	2020	2030
Four County Region	249,711	329,281	413,586	529,934	647,192
<b>Districts</b>					
Central New Hanover	NA	92,306	106,933	124,968	132,936
North New Hanover	NA	39,786	53,327	68,835	82,126
Northeast Brunswick	NA	12,015	16,871	24,848	35,297
Central and South Brunswick	NA	58,663	79,897	108,867	139,360

Source: Hammer, Dr. Tommy, Ph.D.. "Demographic and Economic Forecasts for the Wilmington Region and Component Areas, Summary Document." Prepared for: Wilmington Urban Area Metropolitan Planning Organization. 2 April 2004. Accessed: 6 June 2005.

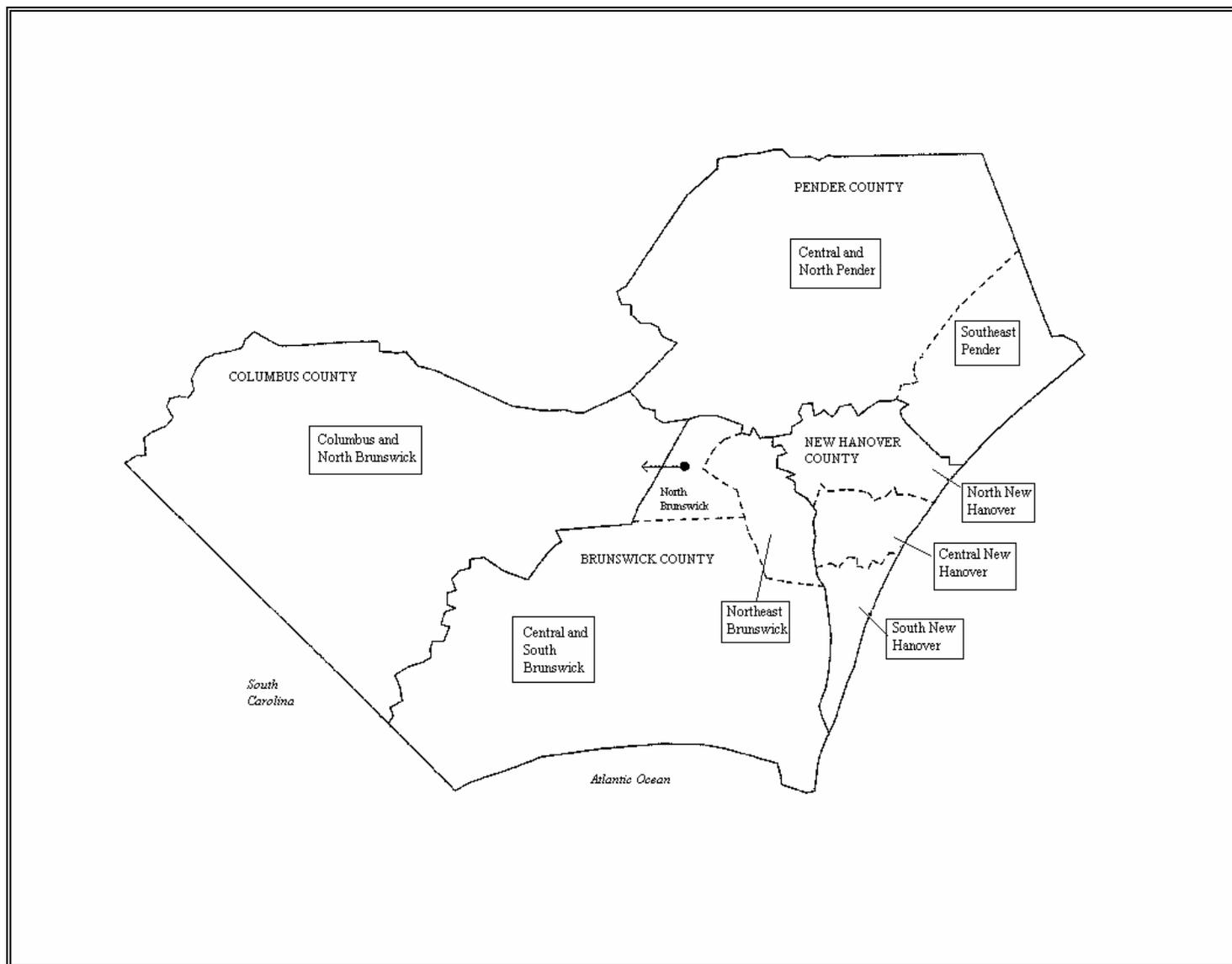
**Table 3-3: Percent Change in Projected Populations by District**

AREA	1990-2000	2000-2010	2010-2020	2020-2030	2000-2020	2000-2030
Four County Region	32%	26%	28%	22%	61%	97%
Central New Hanover	21%	16%	17%	6%	35%	44%
North New Hanover	52%	34%	29%	19%	73%	106%
Northeast Brunswick	35%	40%	47%	42%	107%	194%
Central and South Brunswick	45%	36%	36%	28%	86%	138%

Source: Hammer, Dr. Tommy, Ph.D.. "Demographic and Economic Forecasts for the Wilmington Region and Component Areas, Summary Document." Prepared for: Wilmington Urban Area Metropolitan Planning Organization. 2 April 2004. Accessed: 6 June 2005. Available: <http://www.wmpo.org/MapsDocuments.htm>.

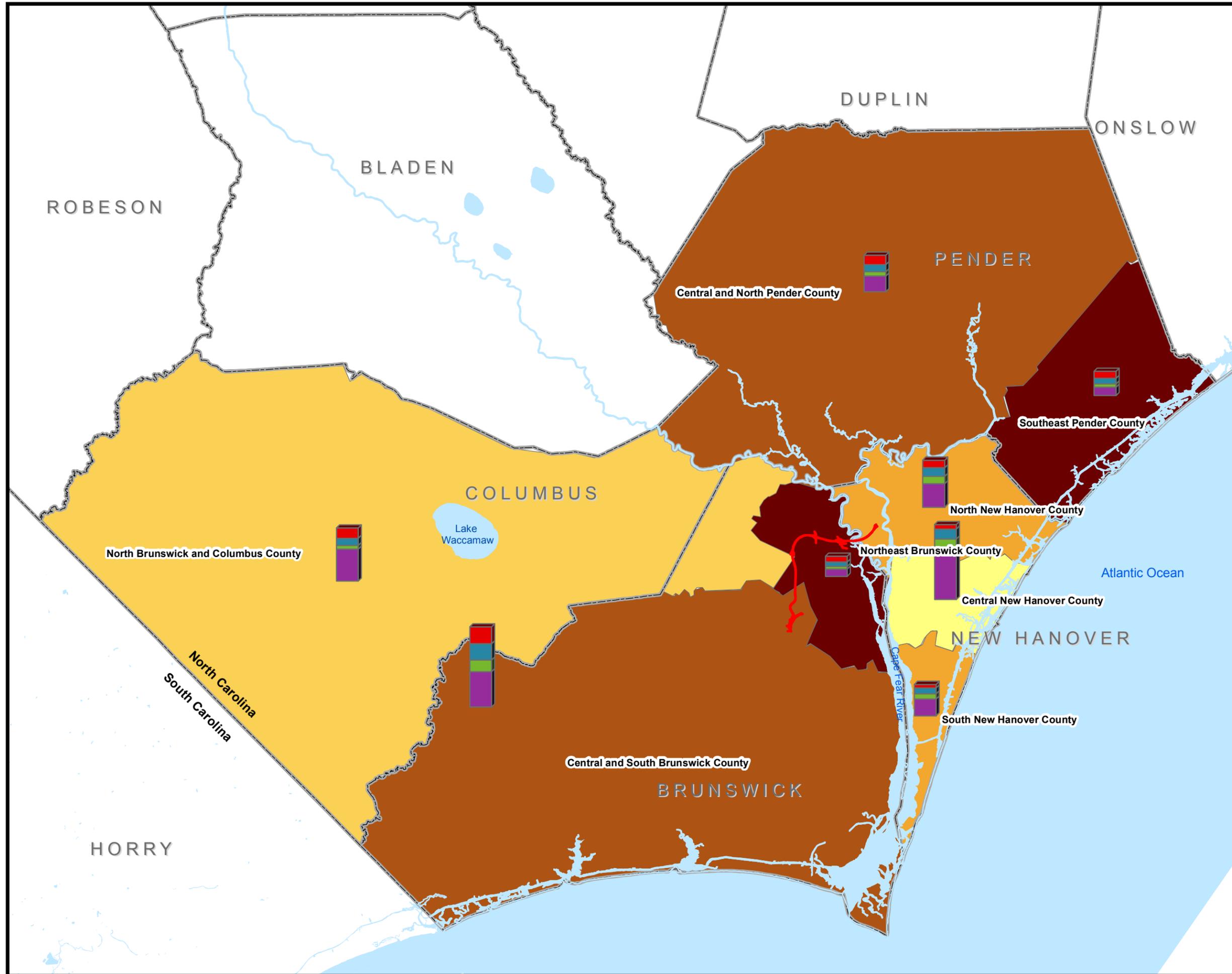
According to the WMPO study, a relative boom in growth for the four-county region, driven partly by immigration of baby-boomer retirees, is expected during the next decade. During the period from 2020 to 2030, it was assumed in the study that there would be some easing of growth as the region matures. At the district level, it was forecasted that population growth will reflect the rapid expansion of the Wilmington region as a whole and the tendency in the US of urban land development to disperse geographically over time. The Northeast Brunswick district is expected, on a percentage basis, to exceed all other districts in growth (while remaining the least populated district in absolute numbers). According to the WMPO study, the area will be "rapidly transformed from an industrial enclave with scattered population into a good-sized bedroom suburb." While in New Hanover County, Central New Hanover is expected to remain the most populated district in terms of absolute growth and population, the North New Hanover district is expected to have the highest percentage growth in New Hanover County for each time period forecasted.<sup>59</sup>

**Figure 3-1: Districts used in WMPO Demographic Forecasting Study**



Source: Hammer, Tommy, Ph.D.. *Demographic and Economic Forecasts for the Wilmington Region and Component Areas, Technical Report 2*. Prepared for: Wilmington Urban Area Metropolitan Planning Organization. 19 March, 2004. (Modified by removing original figure number, title and labels with population data.)

Figure 3-2  
Population Growth by  
Forecasting District



**Legend**

R-2633 A/B Recommended Alignment

County Boundaries

Water

Population Growth By Years

2020 - 2030 Growth

2010 to 2020 Growth

2003 to 2010 Growth

2003 Population

**Percent Growth 2003-2030**

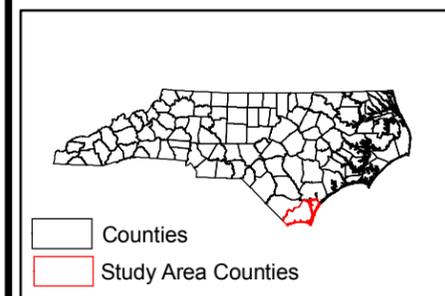
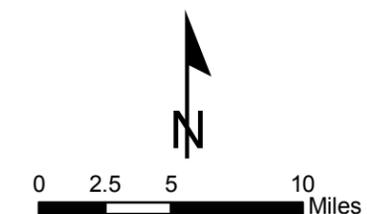
41

42 - 65

66 - 95

96 - 131

132 - 187





### 3.1.1.3 County Level Projections

Population projections for North Carolina, Brunswick County and New Hanover County are shown in Table 3-4. The percent change in growth for each decade and each county is shown in Table 3-5.

**Table 3-4: Projected Populations by County**

AREA	1990	2000	2010	2020
North Carolina	6,632,448	8,046,962	9,491,372	10,966,139
Brunswick County	50,985	73,143	93,776	112,992
New Hanover County	120,284	160,327	196,508	231,402

Source: North Carolina State Demographics, 2003; North Carolina Center for Geographic Information and Analysis, 2002.

**Table 3-5: Percent Change in Projected Populations by County**

AREA	1990-2000	2000-2010	2010-2020	2000-2020
North Carolina	21%	18%	16%	36%
Brunswick County	44%	28%	20%	54%
New Hanover County	33%	23%	18%	44%

Source: North Carolina State Demographics, 2003; North Carolina Center for Geographic Information and Analysis, 2002.

Another indication of future conditions is population density. The number of people per square mile for Brunswick and New Hanover counties in 2000 and the projected densities in 2020 are shown in Table 3-6.

**Table 3-6: Population Density by County**

COUNTY	LAND AREA (SQUARE MILES)	PERSONS/SQUARE MILE		PERCENT CHANGE 2000-2020
		2000	2020	
Brunswick	854.79	85.57	135.02	58%
New Hanover	198.93	805.93	1,154.17	43%

Source: North Carolina State Demographics, 2005

### 3.1.2 ECONOMIC CHARACTERISTICS

The City of Wilmington, in New Hanover County, is southeast North Carolina's regional trade and service center. Trade and service activity in Wilmington has attracted people and jobs to the area. The Brunswick County civilian labor force has grown substantially from 11,250 in 1970 to 35,068 in 2000.<sup>60</sup> New Hanover has also experienced a substantial growth in its civilian labor force during the same 30 year period, growing from 33,580 to 86,314.<sup>61</sup> Changes in Brunswick and New Hanover counties' unemployment rates, listed in Table 3-7, have been fairly consistent with trends in statewide unemployment rates. Since 1980, the unemployment rates in Brunswick County have been higher than New Hanover County and North Carolina.

**Table 3-7: State/County Unemployment Rates**

YEAR	BRUNSWICK COUNTY	NEW HANOVER COUNTY	NORTH CAROLINA
1970	3.9%	4.1%	4.3%
1980	8.4%	7.6%	6.5%
1990	4.6%	4.2%	4.1%
2000	4.6%	3.5%	3.3%

Source: North Carolina Department of Commerce, 2003.

Table 3-8 shows the percent of total employment for each industry type in Brunswick and New Hanover counties for 1970, 1980, 1990, and 2000. The total number of employees in the manufacturing sector has continually decreased in both counties since 1970. Both counties have experienced steady growth in the service sector. Brunswick County has also experienced growth in the trade sector.<sup>62</sup>

A decline in employment in the manufacturing sector is consistent with nationwide trends. Substantial decreases in manufacturing employment have occurred in the fabricated metals and textiles industries in New Hanover County, while substantial increases in employment have occurred in the chemicals and machinery industries. According to the Brunswick County Development Commission, several businesses located in the project area during the 1990s. These businesses include the Armada Group, HydroChem Industrial Services, the Carrerra Corporation and Rampage Yachts.<sup>63</sup>

**Table 3-8: Employment by Industry Type**

INDUSTRY	PERCENT OF TOTAL EMPLOYMENT BY INDUSTRY TYPE							
	BRUNSWICK COUNTY				NEW HANOVER COUNTY			
	1970	1980	1990	2000	1970	1980	1990	2000
Construction/Mining	4.3%	16.3%	10.3%	8.4%	6.5%	6.0%	6.6%	7.9%
Manufacturing	33.1%	28.5%	16.9%	12.3%	30.5%	22.9%	15.1%	10.2%
Transportation/ Communication/ Utilities	19.8%	13.2%	14.4%	8.2%	9.0%	8.2%	5.8%	4.7%
Trade	14.3%	12.9%	19.5%	24.8%	22.8%	25.5%	29.1%	25.9%
Financial Services	2.2%	2.7%	5.1%	7.7%	3.8%	3.5%	3.9%	3.7%
Services	3.7%	6.7%	15.2%	19.1%	13.0%	14.1%	21.4%	27.0%
Government	22.7%	19.7%	18.4%	18.0%	14.4%	19.7%	18.1%	17.1%
Total Number Employed	5,110	11,250	15,180	22,046	32,240	43,560	62,750	87,057

Note: Employment by place of work reflects total employment working in county noted and not the total employment of residents of that county. Source: North Carolina Department of Commerce, 2004

Census data for Brunswick County suggests that 65.3 percent of the residents residing in the county commuted outside of Brunswick County for work in 2000.<sup>64</sup> A large portion of these commuters likely travel across the Cape Fear River to the region's largest employment centers located in Wilmington. In 2000 there were 19,078 employees in New Hanover County who commuted into the county from elsewhere.<sup>65</sup>

There are approximately 18 existing major businesses, identified in the following list, in the project area in Brunswick County. They are generally situated along US 74/76 in Leland and Navassa, with others located along US 17.

Air Vide	General Wood Preserving
Barefoot Bedding Company	Industrial Electric Sales & Service
Bolivia Lumber Company	Industrial Pump Service
Carolina Furniture Design	Lifescape Industries
Coatings & Adhesives Corporation	National Starch & Chemical
Columbia Nitrogen	Striplap Hose Manufacturing
E.I. DuPont De Nemours & Company	Victaulic Company of America
G.R. Ennis Sons Foundry	GA Distribution Service
Exide Electronics	Infinger Transportation

Large manufacturing-related employers in New Hanover County include Takeda Chemical Products, Invista, Progress Energy and the Arcadian Corporation. These employers are all located along US 421, north of Wilmington. General Electric Company's (GE) nuclear power and aircraft engine complex is on US 117/NC 133, in the northern part of the project area.

The Port of Wilmington is the largest trade-oriented center in the region. A total of 3,004,064 tons of cargo passed through the port in Fiscal Year 2005. Products shipped through and/or received by the port include forest products, chemicals, cement and metal products.<sup>66</sup> This cargo is transported to and from manufacturers and industries throughout North Carolina.

The median household incomes for Brunswick County, New Hanover County, and the state for 1980, 1990 and 2000 are shown in Table 3-9. The median household income for Brunswick and New Hanover counties has been increasing in past decades, consistent with statewide trends. Between 1980 and 1990 the median household income for Brunswick and New Hanover counties rose by 82 percent and 78 percent, respectively, while the state median household income rose by 84 percent. Between 1990 and 2000 the median household income for Brunswick and New Hanover counties rose by 53 percent and 47 percent, respectively; while the state median household income rose by 47 percent.<sup>67</sup>

**Table 3-9: Median Household Income**

YEAR	BRUNSWICK COUNTY	NEW HANOVER COUNTY	NORTH CAROLINA
1980	\$12,883	\$15,341	\$14,481
1990	\$23,480	\$27,320	\$26,647
2000	\$35,888	\$40,172	\$39,184

Source: Log into North Carolina. NC Census Lookup. Available: [http://data.osbm.state.nc.us/pls/linc/dyn\\_linc\\_main.show](http://data.osbm.state.nc.us/pls/linc/dyn_linc_main.show).

### 3.1.3 COMMUNITY FACILITIES AND SERVICES

The existing community facilities within the project area are shown in Figure 3-3. These facilities and services include; schools, parks, churches and cemeteries.

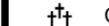
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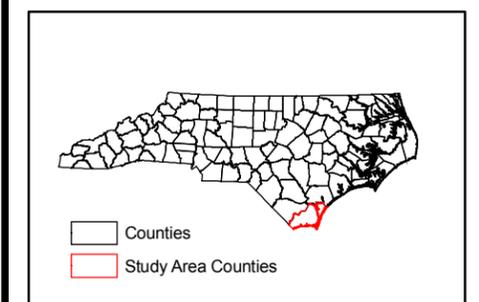
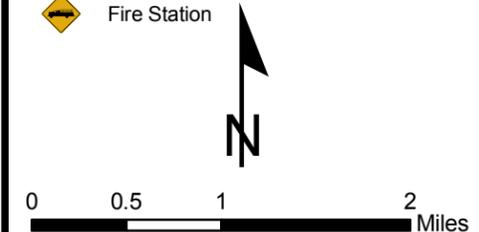
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TIP R-2633 A/B  
Wilmington Bypass

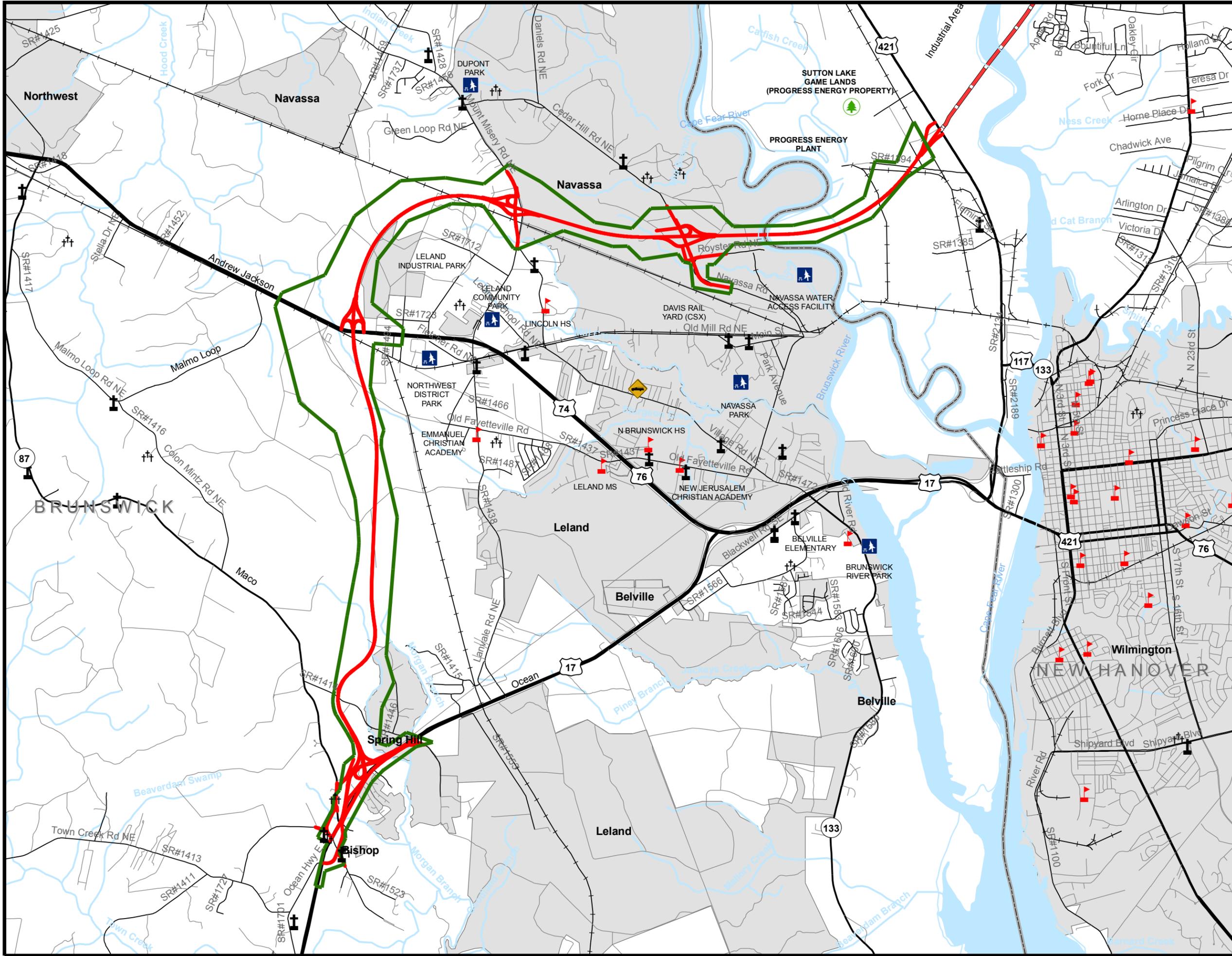
Figure 3-3  
Community Facilities

Legend

-  Expanded Study Corridor
-  R-2633 A/B Recommended Alignment
-  R-2633 C
-  Interstate Highways
-  US Highways
-  State Highways
-  State Routes
-  Local Roads
-  Railroads
-  Municipal Boundaries
-  County Boundaries
-  Water
-  Streams (non-delineated)
-  Church
-  Cemetery
-  Schools
-  Parks
-  Game Lands
-  Fire Station



April 2007  
This map is for reference only.  
Sources: ESRI, CGIA, Brunswick County,  
New Hanover County, NCDOT, USDOT, URS.





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### **3.1.3.1 Schools**

Brunswick County operates the county-wide school system. There are currently 16 public schools in the county, compared to 11 schools at the time of the writing of the DEIS.<sup>68</sup> As shown in Figure 3-3, four public schools and two private schools are located within the project area, compared to three at the time of the writing of the DEIS. North Brunswick High School and Leland Middle School are located on Old Fayetteville Road. The high school is just east of US 74/76 and the middle school is just west of US 74/76. Lincoln High School is located on Lincoln Road, just north of Old Mill Road. These three schools serve Brunswick County north of US 17. Bellville Elementary is located just south of US 17 on NC 133. Emmanuel Christian Academy is located on Lanvale Road near the intersection of Old Fayetteville Road and New Jerusalem Christian Academy is located on Old Fayetteville Road between US 74/76 and Navassa Road.

### **3.1.3.2 Parks/Community Centers**

There are a number of public and private parks and recreation sites within Brunswick and New Hanover counties. Figure 3-3 shows the parks and recreation areas within the project area. The Northwest District Park, owned and operated by Brunswick County, is the largest park in the project area. The park is located on US 74/76 across from the Leland Industrial Park. It is 35 acres in size and contains multi-purpose fields, baseball fields, tennis courts, basketball courts, picnic shelters, a concession stand, and public restrooms.<sup>69</sup>

Brunswick County also leases from DuPont a five-acre site at the northeast corner of Cedar Hill Road (SR 1430) and Mt. Misery Road (SR 1426). This site has one baseball field and several picnic benches.

Leland Community Park is located on SR 1432 (Leland School Road) at the former Leland High School. The 11-acre park has two lighted baseball fields, a playground, picnic shelters, a concession stand and public restrooms. There are two buildings on the site; one is a senior citizens' community center and public meeting facility and the other houses the Brunswick County Fifth District Civic Association.

The Navassa Town Park is jointly owned by the town and Brunswick County. This ten-acre park is located in the center of town at the end of Park Avenue. The park has a tennis court, basketball court, a baseball field, and open space.

Using a Coastal Area Management Act (CAMA) grant, the Town of Navassa built an 8.4-acre water access facility on Davis Creek (Navassa Water Access Facility). This access area is located just north of the CSX Davis Rail Yard and has a boat ramp, boardwalk, and wetland areas.

### **3.1.3.3 Churches and Cemeteries**

Several churches and cemeteries are located in the project area. Two cemeteries and one church are located in the vicinity of the project terminus at US 17 and are within the expanded study corridor. The St. James A.M.E. Zion Church and associated cemetery are located east of SR 1412 just north of US 17. An unnamed cemetery is located on private property just north of the proposed US 17 interchange. Figure 3-3 shows locations of the churches and cemeteries in the Brunswick County portion of the project area.

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### 3.1.4 COMMUNITY COHESION AND NEIGHBORHOODS

Community cohesion has been studied in further detail since the preparation of the DEIS. Well defined neighborhoods that were identified are located in Brunswick County near the southern terminus of the project and include Snee Farm, Stoney Creek, Planters Walk and Spring Hill. Other neighborhoods are located in the vicinity of the interchanges at Mt. Misery Road and Cedar Hill Road.

A determination of whether a community is cohesive is complicated in that it is largely subjective and relies heavily on the professional judgment of the analyst. In their reports, *Effective Methods for Environmental Justice, Report 532* (NCHRP Report 532) and *Guidebook for Assessing the Social and Economic Effects of Transportation Projects, Report 456* (NCHRP Report 456), the National Cooperative Highway Research Program (NCHRP) stresses the importance of public involvement, spending time in the community, and developing an intimate relationship with the affected neighborhood.<sup>70</sup>

Public involvement methods including public workshops and small group meetings were used to identify and collect data, form relationships with community leaders, and develop an understanding of community characteristics. A record of relevant public involvement activities is presented in Section 7.2.

Communities in the project area were evaluated for indicators of community cohesion such as long average lengths of residency, single family households, frequent personal contact, homogeneous ethnicity, common religion, common values, shared institutions and meeting places, and other unique identifying characteristics.<sup>71</sup> Other factors that can contribute to the cohesiveness of a community include the history of the community, development patterns, and the presence of community-supported businesses and institutions.

Several field trips were taken to the project area and were valuable in gauging community cohesion. Interviews were conducted with residents and community leaders. Spending time in the project area allowed project analysts to talk with community residents and observe social interactions. Important elements of the community were recorded and levels of community cohesion were estimated.

The Spring Hill community exhibits qualities and characteristics that identify it as a distinctive and uniquely cohesive community within the project area. It is a well established minority community dating back several generations. The foundation of the community is comprised of a deep family heritage that bears the history of the community. The ancestry of community members is interwoven by familial and cultural bonds. There is great pride among residents of family and community heritage. Land ownership patterns indicate that property has been subdivided over the years and given to other family members for home sites. Information obtained through meetings with the community indicates that this pattern of residential development will continue in the future. Field visits to the community were conducted at various times of the day and at various times of the year. Pedestrians and neighbor-to-neighbor interactions were observed on several occasions. In meetings, the community and community leaders identified a strong interdependency among neighbors for their mutual well being. Anecdotal evidence is present in a local street which was constructed and is maintained by members of the community. The community also installed traffic calming devices. According to community leaders, many members of the community belong to the same church; the St. James AME Zion Church located on Old Town Creek Road.

Late in the project development process for R-2633A/B project development commenced for the Cape Fear Skyway. The Cape Fear Skyway, project U-4738 in NCDOT's 2006-2012 TIP, is

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described as a new facility from US 17 to the Independence Boulevard/Carolina Beach Road (US 421) intersection with a structure over the Cape Fear River. In the TIP, it is also indicated that the Cape Fear Skyway is a North Carolina Turnpike Authority Project programmed only for planning and environmental study. According to the feasibility study conducted for the Cape Fear Skyway, the new roadway will extend as a new facility from US 17 in Brunswick County to the Independence Boulevard/Carolina Beach Road intersection in New Hanover County<sup>72</sup>

Three neighborhoods, Snee Farms, Stoney Creek, and Planters Walk, located southeast of Spring Hill were not initially identified as cohesive communities. Since the initial public meetings were held for the Cape Fear Skyway in April of 2006, these communities have been organized and active in seeking information about both the Cape Fear Skyway and the Wilmington Bypass and, often, in voicing opposition to the proposed termini of both projects. On June 27, 2006, the *Wilmington Star-News* reported that the three communities met at the University of North Carolina in Wilmington to discuss actions to take to acquire more information about the Cape Fear Skyway. In the article it was reported that one community member said, "...the bonds that residents have formed with each other will be lost if they're forced to give up their homes."<sup>73</sup> While some of the qualities used to gauge cohesiveness that were apparent in Spring Hill, such as familial and cultural bonds and land development patterns, have not been exhibited in the more recently developed Snee Farms, Stoney Creek and Planters Walk communities; other characteristics of these communities indicate that they have some social interaction and networking.

Residential areas along Mount Misery Road and Cedar Hill Road exhibited a few characteristics consistent with a cohesive community but did not demonstrate interdependent social interaction. During public meetings and field visits, residents of these communities did not indicate that they perceived themselves as cohesive communities, nor did they present a united opposition to the location of the proposed project alignment.

### **3.1.5 CULTURAL RESOURCES**

This project is subject to compliance with Section 106 of the National Historic Preservation Act of 1966, as amended, and implemented by the Advisory Council on Historic Preservation's Regulations of Compliance with Section 106, codified as 36 CFR Part 800. Section 106 requires Federal agencies to take into account the effect of their undertakings (federally-funded, licensed, or permitted) on properties included in or eligible for inclusion in the National Register of Historic Places (NRHP) and to afford the Advisory Council a reasonable opportunity to comment on such undertakings.

Cultural resources reports prepared for the project include an archaeological background research report, an underwater archaeological survey and evaluation report, a terrestrial archaeological survey and evaluation report, and historic architectural survey reports. The results of these studies are summarized in this section and the reports themselves are appended by reference.

The results of the multi-phase historic architectural survey are presented in An Historical Architectural Survey Report for Wilmington Bypass and A Photographic Inventory of An Historical Architectural Survey for Wilmington Bypass (1994), Addendum to an Historical Architectural Survey Report for the Wilmington Bypass (1995), which were conducted prior to the issuance of the DEIS, and in the Addendum to an Historical Architectural Survey Report for the Wilmington Bypass (1996); Letter Report Re: Newly Discovered Standing Resources, Wilmington Bypass, Brunswick County (1997); and Eligibility Consultation for Wilmington Bypass, Brunswick County (2002) conducted after the issuance of the DEIS. Each report is appended by reference.<sup>74</sup>

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The results of the archaeological resource background study are presented in *Part I, Archaeological Background Report, Wilmington Bypass, New Hanover and Brunswick Counties, North Carolina* (1996), conducted prior to the issuance of the DEIS and the subsequent archaeological field studies conducted after the DEIS and presented in *Archaeological Survey and Evaluation for the Western Portion of the Wilmington Bypass New Hanover and Brunswick Counties, North Carolina* (2003).<sup>75</sup> Potential archaeological resources submerged in the Cape Fear River are discussed in *Underwater Archaeological Investigations for the Proposed Wilmington Bypass Crossing Over the Cape Fear River* (2006), *New Hanover and Brunswick Counties, North Carolina*.<sup>76</sup> Letters and forms describing points of concurrence among relevant agencies are included in Appendix E.

All work performed during these investigations was conducted pursuant to the National Historic Preservation Act of 1966, as amended; the Advisory Council on Historic Preservation regulations for compliance with the Act codified in 36 CFR 800, the Department of Transportation Act of 1966, as amended; the Department of Transportation regulations and procedures (23 CFR 771 and Technical Advisory T 6640.8A); the North Carolina Office of State Archaeology's (OSA) Archaeological Report Guidelines; the NCDOT's Scope of Work for the archaeological studies; and NCDOT guidelines for conducting historic architectural surveys.

It should be noted that the various cultural resource studies were conducted over a time span of several years, and during that time, multiple alternatives were considered and modified. For this reason, some of the regulatory review correspondence discusses cultural resources that are no longer associated with the alternatives presented in the EIS. The sections below summarize the research findings relevant to this FEIS.

### **3.1.5.1 Historic Architectural Resources**

A multi-phase historic architectural survey of the project corridors began with background research on the historical and architectural development and significance of New Hanover County and Brunswick County, concentrating on the project area. Following the research, a survey of the DEIS preferred alternative corridor was conducted by automobile as well as on foot with the following goals: (1) to determine the "area of potential effects" (APE), defined as the geographic area or areas within which an undertaking may cause changes in the character or use of historic properties, if any such properties exist; (2) to identify potential historic resources within this area; and (3) to evaluate these resources according to the Criteria of the NRHP.

Utilizing the combined historical research and fieldwork, the APE was determined in consultation with FHWA and NCDOT during preparation of the DEIS, and delineated on US Geological Survey (USGS) topographic quadrangle maps. By and large, it was the lay of the land and the location of residential development that determined the APE, with the boundary running along topographic contours, tree lines, and the edges of residential development near the DEIS alternative study corridors. Because of the heavily forested nature of portions of the APE and the wetland nature of others, it is estimated that approximately 50 percent of the APE was accessible and surveyed during the initial phase of the historic architectural survey.

Historic architectural resources which appear to be 50 years old or older were identified during the initial reconnaissance-level survey. At a meeting held between the North Carolina State Historic Preservation Office (HPO) and NCDOT on June 9, 1994, most of these resources were determined not eligible for NRHP listing. It was requested that three resources, Wrightsboro School (#16) in New Hanover County and the Reeves A.M.E. Zion Church (#39) and the Goodman Property (#57) in Brunswick County, be evaluated at the intensive level (this was before NCDOT developed a concurrence form, so none can be appended to this document).

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These were reported on in the 1994 *Historic Architectural Survey Report* and accompanying *Photographic Inventory*, which recommended that the church and the Goodman House and Office were NRHP-eligible.<sup>77</sup> By letter dated November 16, 1994, HPO concurred that Reeves A.M.E Church and the Goodman property were eligible for NRHP listing. Subsequent changes to the project placed the church outside of the APE or corridor of the preferred alternative. The concurrence letter requested further information concerning the appropriate NRHP-eligible boundaries of the Goodman property. By memorandum of October 15, 1996, this information was provided and, in a concurrence form signed after a June 13, 1996 meeting between NCDOT and HPO, it was agreed that the appropriate boundaries for the Goodman property were the approximately 9.5 acres recommended in the 1994 *Historic Architectural Survey Report*.<sup>78</sup> Figure 3-4 shows the location of the Goodman Property

In July 1996 two additional reconnaissance-level surveys were conducted on two additional alternative corridors within New Hanover and Brunswick counties. One of these – for TIP No. R-2633A/B – identified 18 previously unrecorded resources. Following a meeting on August 8, 1996, between FHWA, NCDOT, and HPO, a concurrence form was signed that identified all of these resources - A through F and H through S - as not eligible for NRHP listing. In a 1996 second addendum to the *Historic Architecture Survey Report*, these resources were reported on in a summary fashion.<sup>79</sup>

In 1997 a letter report was prepared evaluating two additional Brunswick County resources that were not previously recorded.<sup>80</sup> These two resources and two additional resources were reported on in a photograph review with HPO and a summary *Eligibility Consultation for Wilmington Bypass* report in August 2002.<sup>81</sup> On March 15, 2004, FHWA, NCDOT, and HPO concurred that these four resources\_(T, U, V, and W) were not eligible for NRHP listing. In the same concurrence form, the agencies also reviewed photographs of a ruinous former packing plant near the Cape Fear River in Navassa\_(Resource X) and concurred that it was not eligible for NRHP listing.

### **3.1.5.2 Archaeological Resources**

#### **Method**

The NCDOT, in consultation with the HPO determined that Part I of an archaeological study of the project would consist of detailed background research on existing terrestrial and underwater sites, as well as an assessment of the potential for as yet unrecorded sites within the corridors. One objective of this research was to develop prehistoric and historic contexts for the project area. These contexts would provide a framework for evaluating the archaeological potential of the proposed alternatives and the NRHP eligibility of any archaeological resources that may be present within the alternatives. These contexts were then used to develop a field strategy for conducting a survey of the DEIS preferred alternative, which was conducted after the publication of the DEIS, and is summarized in this FEIS.

Background historical and archaeological research consisted of consultation of files, historic maps, reports, monographs, and other relevant documents at several repositories, including the Division of Archives and History, the OSA, the Underwater Archaeology Unit at Fort Fisher, and the Southern Historical Collection at the University of North Carolina, Chapel Hill. The focus of the background research was on secondary sources and primary cartographic data. However, some primary sources such as deeds and wills were examined as part of the investigation of the large eighteenth- and nineteenth-century rice plantations and other historic properties that existed within the project area. An important component of the background research was the incorporation of the results of a Phase I archaeological sample survey of the proposed corridor for R-2633C.<sup>82</sup>*This page intentionally left blank.*

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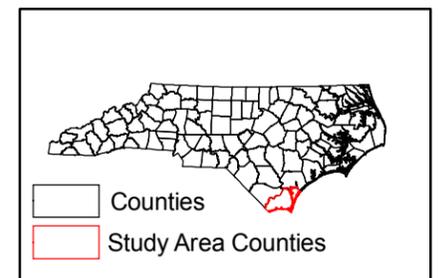
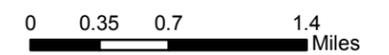
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TIP R-2633 A/B  
Wilmington Bypass

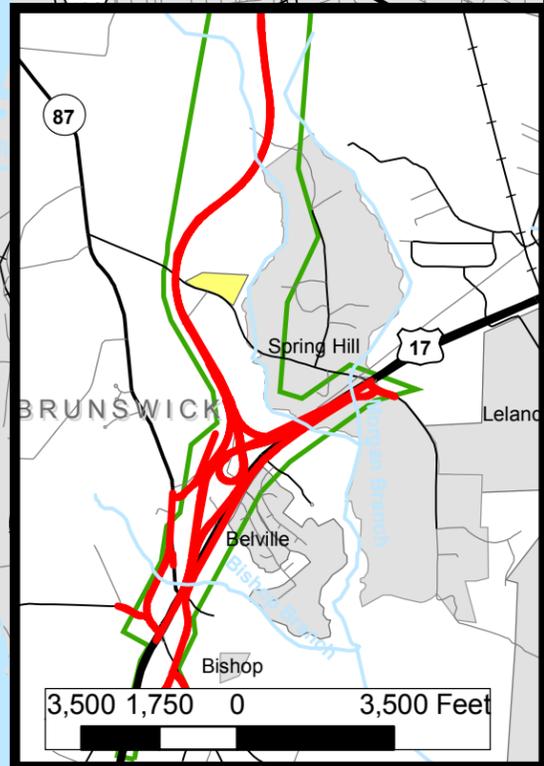
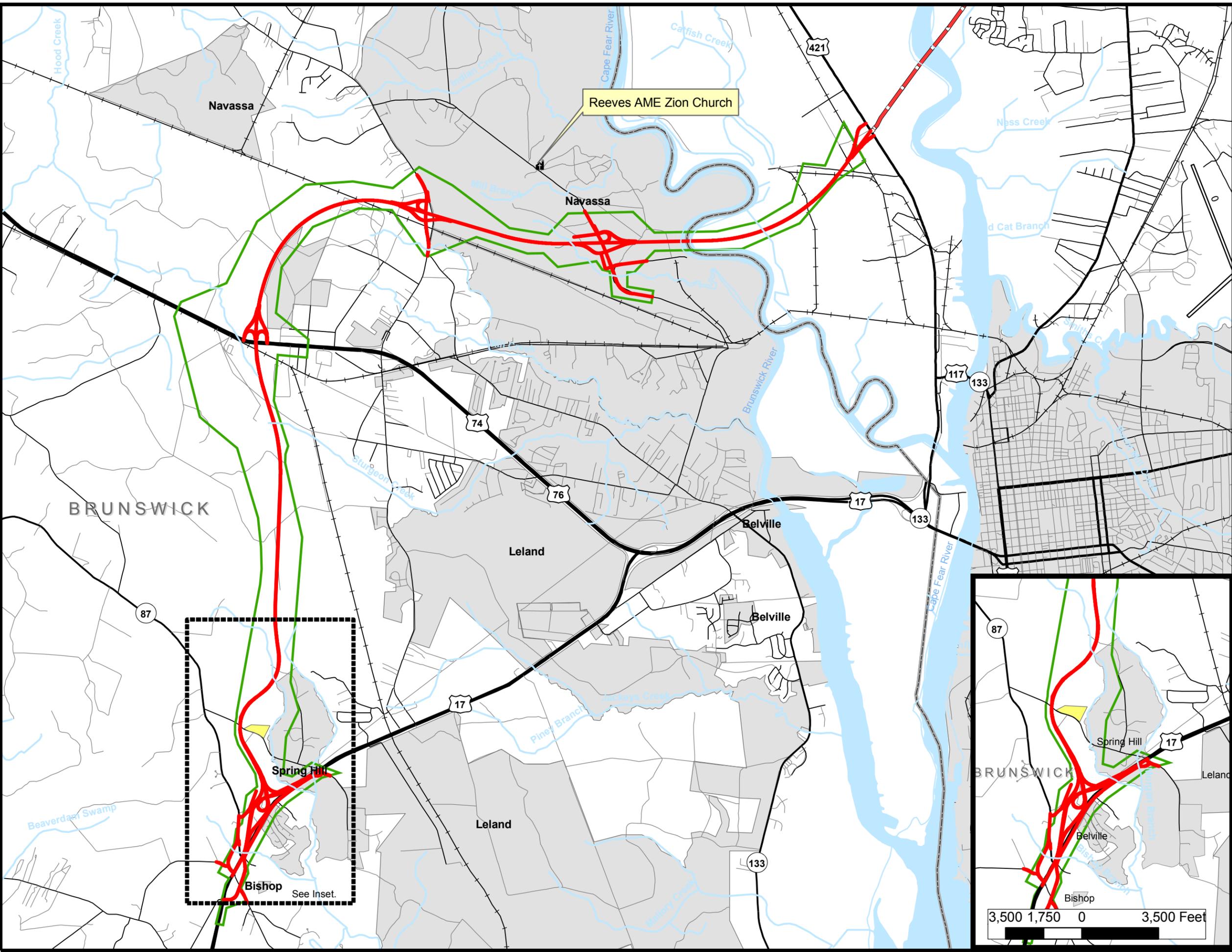
Figure 3-4  
Goodman Property Location

Legend

-  Expanded Study Corridor
-  R-2633 A/B Recommended Alignment
-  R-2633 C
-  Interstate Highways
-  US Highways
-  State Highways
-  State Routes
-  Local Roads
-  Railroads
-  Municipal Boundaries
-  County Boundaries
-  Water
-  Streams (non-delineated)
-  Goodman House



April 2007  
This map is for reference only.  
Sources: ESRI, US Census, NCDOT,  
National Parks Service, Brunswick County,  
USDOT, CGIA, URS.





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## **Results**

### **Background Research and Archaeological Site Potential**

The expanded study corridor in New Hanover County crosses Site 31NH39\*\*, a previously recorded historic period site located west of US 421 and east of the Cape Fear River. No other recorded archaeological sites are located within the corridor. Based on this background study, it was determined that there were probably additional, currently unrecorded archaeological resources within the corridor. It was anticipated that such sites would most likely include prehistoric woodland base camps and temporary procurement camps, and structures and features associated with the eighteenth- and nineteenth- century rice plantations that were once located along the bluffs and rises adjacent to the Cape Fear River.

Few historic period archaeological sites were present in the interior, non-riverine areas investigated during a 1994 Phase I sample survey of R-2633C.<sup>83</sup> When found, they dated to the early-twentieth century. These early-twentieth century artifact loci consisted of field scatters of mixed late-nineteenth- and twentieth-century artifacts and remains of twentieth-century dwellings. The former were not defined as sites since they lacked any definitive historic context and appeared to represent a ubiquitous pattern of dumping trash in fields. Given the results of the 1994 field effort and the historic background research, the project corridor was judged likely to contain such field scatters and remains of small dwellings dating to the early-twentieth century. Standing examples of the latter type of site exist throughout the two counties. As noted below, none of these strictly early-twentieth century properties with historic standing structures have been determined to be eligible for listing in the NRHP under any criteria.

The staff of the Underwater Archaeology Branch (UAB) of the OSA noted that there have been no underwater archaeological surveys of the waters crossed by the DEIS preferred alternative corridor. Thus, the potential for such resources could not be eliminated, especially given that the rivers served as the primary transportation route for goods and people between the various plantations that lined the river in the eighteenth and nineteenth centuries. Using criteria established by the staff of the UAB, the river location crossed by the DEIS preferred alternative corridor can be assigned a "High Potential Area" value. In addition to the potential for shipwrecks, there is also the potential for currently unrecorded landings/docks associated with the plantations that lined the river. Such sites would include remains of docks, bulkheads, and other waterfront structures, in addition to goods discarded from these structures and vessels docked at these structures.

### **Underwater Archaeological Field Survey**

Following the issuance of the DEIS, two-stage underwater field studies of the Cape Fear River crossing were undertaken. First, a remote sensing survey was completed that included systematic magnetometer and side-scan sonar sweeps of the entire corridor. Second, potential cultural resource targets found by the remote sensing survey were examined by divers who identified them and evaluated their significance. Two magnetic targets and two sonar targets were found in the project corridor and were evaluated by divers. All four targets were found to be associated with the remains of a wharf associated with the mid-19th-century terminus of the Wilmington, Charlotte & Rutherford Railroad at the west bank of the river. Identified as the Riverside Landing site, this site was recommended as eligible for the NRHP under Criterion A<sup>a</sup>

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<sup>a</sup> Criterion A: associated with events that have made a significant contribution to the broad patterns of our history.

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and Criterion D<sup>b</sup> within the context of the historic development of 19th century rail and marine transport and commerce in the coastal region.

Although this resource was recommended as eligible for the NRHP, no additional mitigation measures were recommended. The remaining wharf structure primarily consists of a large number of pilings that are exposed only at low tide. There also are numerous pilings that have eroded from their original locations, and now are lying loose at the base of the steep channel slope. It is evident that continuing erosion has destroyed the majority of the historic wharf. The underwater portion consists only of lower structural remains (pilings). With the low-water survey and general site mapping completed, further underwater archaeological investigations would provide very limited additional archaeological data. It was concluded that the studies conducted to date have provided adequate documentation of this historic resource. OSA underwater staff members provided concurrence with this recommendation in a letter written on May 26, 2006 (Appendix A).

### Archaeological Survey and Evaluation

Following the publication of the DEIS, a sample survey strategy was implemented based on the earlier background research and surveys of the R-2633C portion of the Wilmington Bypass to investigate the DEIS preferred alternative corridor for R-2633A/B. Developed in consultation with the HPO, the sample survey strategy concentrated on areas of slightly elevated and drier soils adjacent to waterways or wetland margins. During the project, areas were surveyed from a wide variety of locales. The areas surveyed spanned the entire length of the DEIS preferred alternative corridor and targeted several different micro environmental areas such as near rivers, streams, ponds, pocosins, wetland margins, and tidal marshes.

An initial survey for the DEIS preferred alternative was conducted in 2002, and supplemental fieldwork of the expanded study corridor was completed in 2006. The survey began with a drive-through of the entire corridor to evaluate the terrain and the surface conditions. This initial vehicle reconnaissance was then followed by systematic surveys targeting the higher and drier landforms located adjacent to or near bodies of water and/or wetland margins. Following the survey, limited evaluation fieldwork was conducted on sites that warranted further investigations.

Background research had documented one previously recorded historic archaeological site within the DEIS preferred alternative corridor. This site, 31NH39\*\*, is located near the eastern end of the project in New Hanover County and was revisited during the course of fieldwork. In addition, eight new archaeological sites were documented as a result of this project, for a total of nine sites within the corridor. Site 31NH39\*\* (the previously recorded site) and site 31BW604\*\* (a historic cemetery) represent the two historic resources within the project area. The other seven sites are prehistoric in nature and were assigned state site numbers 31BW602, 31BW603, 31BW605, 31BW606, 31BW607, 31BW608, and 31BW609.

Of the nine sites within the corridor, only two required further consideration. These two sites—31NH39\*\* and 31BW604\*\*—are discussed below. The other seven sites, 31BW602 to 31BW603 and 31BW605 to 31BW609 represent low-density scatters of prehistoric artifacts. At several of these sites, artifacts were recovered from sub-plowzone strata. However, the limited horizontal extent, low density of recovered artifacts, and the probability that many of these “sub-plowzone” artifacts actually represent downward drifting of cultural materials indicates these

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<sup>b</sup> Criterion C: embodies distinctive characteristics of a type, period, or method of construction, or represents the work of a master, or possesses high artistic values, or represents a significant and distinguishable entity whose components may lack individual distinction.

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sites are recommended as not eligible for inclusion on the NRHP. As such, no further work was recommended at these seven sites, and the HPO concurred with this recommendation.<sup>84</sup>

#### *Site 31NH39\*\**

Site 31NH39\*\* is a previously recorded historic site dating to the nineteenth century. The site is situated on a knoll and two terraces leading down to the tidal marshes of the Cape Fear River, on the east side of the river, between the river and a railroad. The site is located just outside of the edge of the proposed right-of-way of the recommended alignment. East Carolina University first recorded the site during Phase I studies for the Lower Cape Fear regional water supply system.<sup>85</sup> In “An Archaeological Survey of the Lower Cape Fear Regional Water Supply System Project Area,” the author states, “This historic farmstead dates somewhere between AD 1800 and 1887, and appears to have been the only occupation of the site.” He later states that based on deed research, the site might be the “Lyrias” plantation, but that the deed for this plantation was in 1894 (the earliest deed for that property). The 1894 date is a little too recent to correspond to the datable materials he recovered from the site.<sup>86</sup> At a later date, another study referred to the site as probably relating to naval store processing and dating to circa 1880. Unfortunately, it was not stated in the study why it was believed the site is a circa 1880 naval store processing site. At this point, it is unclear whether the site is an early to mid nineteenth century farmstead and/or a circa 1880 naval store plantation.<sup>87</sup> Ceramic data from the current project suggest an occupation that spans the early to late nineteenth century, which overlaps both of the above interpretations.

Shovel testing and test unit excavation at the site indicate that the site is comprised of three loci and contains sub-plowzone deposits. All three loci are defined by (1) flatter topography, (2) higher concentrations of artifacts, and (3) denser surface brick scatters. The site is bounded on all four sides by natural or man-made boundaries, and as such, close interval shovel testing was utilized to further investigate Loci A and B rather than to define the boundaries of the site. The site is bounded on the southeast, southwest, and northwest by wetlands and on the northeast by a railroad.

Based upon the presence of intact deposits, the apparently single component occupation of the site, and its likely association with the broader context of agricultural/industrial pursuits prior to and immediately after the Civil War, it was recommended that site 31NH39\*\* is eligible for the NRHP. The HPO concurred with this recommendation.<sup>88</sup>

#### *Site 31BW604\*\**

Site 31BW604\*\* is a small family cemetery, originally documented during architectural studies as “Resource U”. The cemetery and a nearby house were evaluated in a 1997 letter report.<sup>89</sup> These two resources and two additional houses were reported in a photograph review with HPO and a summary *Eligibility Consultation for Wilmington Bypass* report in August 2002.<sup>90</sup> On March 15, 2003, FHWA, NCDOT, and HPO concurred that the cemetery (and the three houses) were not eligible for listing in the NRHP. The site is located on the north side of the proposed US 17 interchange on private property within the expanded study corridor, but outside of the currently proposed right-of-way. Although federal Section 106 requirements have been completed for this site, NC State laws governing treatment of cemeteries (NC General Statutes, Chapter 65, Article 5) will apply if the right of way of the proposed road is changed such that construction activities will affect this site.

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## **3.2 LAND USE AND TRANSPORTATION PLANNING**

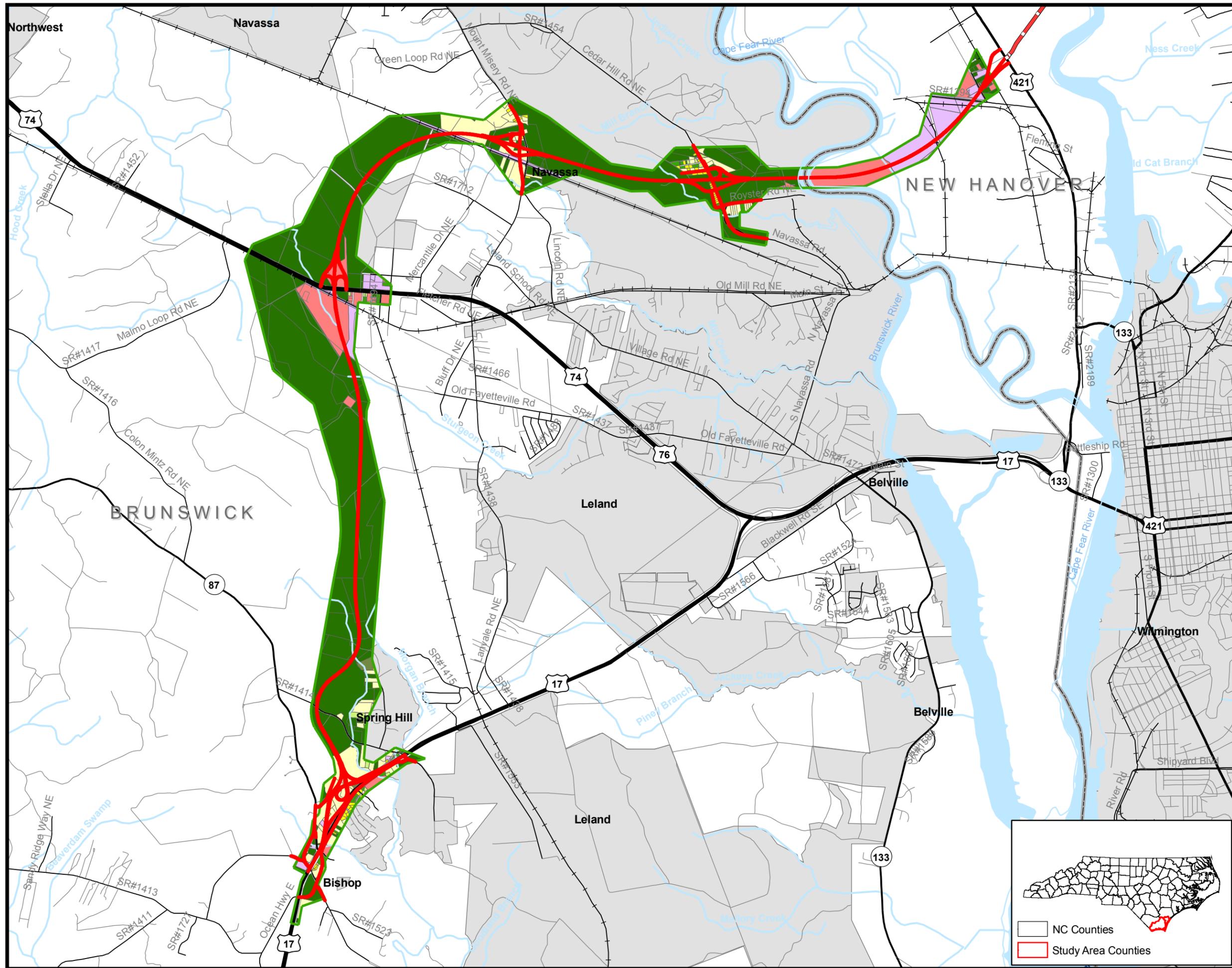
### **3.2.1 LAND USE PLANS**

#### **3.2.1.1 Existing Land Use**

Substantial changes in land use or the residential and commercial character of the expanded study corridor has not occurred since the publication of the DEIS. Recent development activity has primarily occurred south of the proposed interchange at US 17, along US 17 and between the proposed interchange and the US 17/US 74/76 interchange. Sparse construction of individual homes has occurred elsewhere within the expanded study corridor. Figure 3-5 shows existing land use within the expanded study corridor. As shown in the figure, the recommended alignment traverses predominantly rural woodland/forest areas with a mix of low- density residential, industrial, and commercial land uses in proposed interchange areas. A detailed discussion of land use in the project area is provided in Section 1.7.

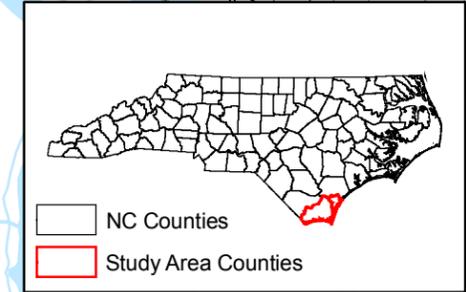
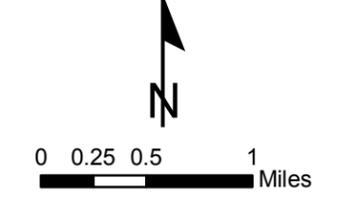
TIP R-2633A/B  
Wilmington Bypass

Figure 3-5  
Existing Land Use within  
Expanded Study Corridor



- Legend**
- Expanded Study Corridor
  - R-2633 A/B Recommended Alignment
  - R-2633 C
  - Interstate Highways
  - US Highways
  - State Highways
  - State Routes
  - Local Roads
  - Railroads
  - Municipal Boundaries
  - County Boundaries
  - Water
  - Streams (non-delineated)

- Land Use**
- Commercial
  - Industrial
  - Cropland
  - Golf Course/Pasture/Grass
  - Woods/Grassland
  - Woodland/Forest
  - Housing, Low
  - Housing, Low/Medium
  - Housing, Medium
  - Housing, Medium/High
  - Housing, High



April 2007  
This map is for reference only.  
Sources: ESRI, US Census, CGIA,  
Brunswick County, NewHanover County,  
NCDOT, USDOT, URS.



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### **3.2.1.2 Zoning Characteristics**

Zoning is a legal mechanism that local governments use to: (1) promote the health, safety, and general welfare of the people by facilitating development that does not hinder these core values; (2) promote the most appropriate land uses by taking into account the character of the land; (3) provide adequate provisions in relation to the infrastructure improvements that accompany development (transportation, water, sewer, schools, parks, etc.); and (4) prevent a conflict of land use by regulating the size, use, and type of structure. These principles are carried out by various zoning classifications, such as residential, commercial, or industrial that set limitations for how the land may be used. In addition to standard classifications, many jurisdictions often implement overlay districts. Overlay districts are applied in addition to regular zones to support specific public policy objectives, such as protecting a watershed. Therefore, understanding the zoning within the project area will help determine how and where the land uses may change in the future.

As presented in Section 1.7.2.2, the project area falls under the zoning jurisdiction of Brunswick and New Hanover counties, the towns of Leland and Navassa, and the City of Wilmington; however, the expanded study corridor is predominantly within Brunswick and New Hanover counties. Within Brunswick County, the expanded study corridor traverses a mix of rural, residential, heavy manufacturing and commercial low density zoning districts (see Figure 1-5). Within New Hanover County, the expanded study corridor traverses the zoning category of I-2, an industrial district with the purpose to "...provide for uses that would produce excessive noise, odor, smoke, dust, air borne debris, or any other objectionable characteristics which might be detrimental to the health, safety, and welfare of surrounding neighborhoods and/or communities (see Figure 1-6)."<sup>91</sup>

### **3.2.1.3 Future Land Use**

Similar to zoning, land use planning is set up to guide the development and redevelopment process of land. However, instead of identifying and restricting the land use at the individual parcel level, land use plans are set up to consider the use of land on a larger-scale in context to the character, vision, and goals of the local communities. Similar to zoning, compatibility of land uses and the availability of resources are taken into consideration in land use planning. In addition, land use plans are often based on future projections and consider the dynamics of a community to determine what the best future land use of an area may be. Thus, many changes made to the zoning of individual parcels are made based on land use plans.

As presented in Section 1.7.2.1, land use planning for the project area is under the jurisdiction of Brunswick and New Hanover counties, the towns of Leland and Navassa and City of Wilmington. However, the expanded study corridor is predominantly within Brunswick and New Hanover counties. A detailed discussion of future land use is provided in Section 4.2.2.1.

## **3.2.2 TRANSPORTATION PLANS**

Federal highway and transit statutes require, as a condition for spending federal highway or transit funds in urbanized areas, the designation of Metropolitan Planning Organizations (MPO). MPOs have responsibility for planning, programming, and coordination of federal highway and transit investments.<sup>92</sup> This applies to any metropolitan area with a population over 50,000. The requirement came out of a need for local jurisdictions to work collaboratively on transportation planning. Considering transportation issues from a regional perspective encourages more efficient transportation systems. Typical members of an MPO include representatives from municipalities, counties, transit authorities, and the state DOT.

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**Portions of Brunswick County and Pender County and all of New Hanover County are considered part of the greater Wilmington area and are part of the Wilmington Metropolitan Planning Organization (WMPO). The boundary of the WMPO is shown in Figure 1-10: WMPO Boundary and Roadway Functional Classification Map 2006**

. The WMPO specifically consists of the Wilmington City Council, Wrightsville Beach Board of Aldermen, Leland Town Council, Navassa Town Council, Belville Board of Commissioners, Brunswick County Board of Commissioners, New Hanover County Board of Commissioners, the NCDOT, a Transportation Advisory Committee, a Technical Coordinating Committee, and various other agencies and units of local and State government that participate in the transportation planning process for the area.

Transportation planning within the project area is the responsibility of the WMPO and the Cape Fear Area Rural Planning Organization (CFRPO). Rural Planning Organizations are voluntary organizations composed of local elected officials and local transportation system representatives that serve in an advisory role. They help develop long-range local and regional multi-modal transportation plans. RPOs will also develop and prioritize suggestions for transportation projects to be included in the TIP. The CFRPO represents portions of the counties of Brunswick, Columbus and Pender that are not within the WMPO.<sup>93</sup> A portion of the expanded study corridor near the southern terminus is within the CFRPO area while the remaining portion is within the WMPO area.

### **3.2.2.1 Highway Plans**

#### **Local Plans**

The NCDOT, in cooperation with Brunswick County and the FHWA, developed a thoroughfare plan for Brunswick County in 1988. This plan reflects the transportation improvements proposed for Brunswick County through 2005 and recommends the Shallotte and Bolivia bypasses and the I-40 loop extension to US 17.<sup>94</sup> In addition, many recommendations are made for other major and minor thoroughfares. The *Brunswick County Thoroughfare Plan* was updated in May 2001 and subsequently adopted by Brunswick County on October 1, 2001; recommended by the NCDOT Office of Statewide Planning on October 10, 2001; and adopted by NCDOT on November 8, 2001.

Brunswick County has adopted thoroughfare plans developed by the WMPO. These plans are based on population growth forecasts, future land use plans, and development trends. Historical trends, growth areas, regulations and zoning ordinances, availability of public utilities, transportation facilities, topographic and other physical features of the area are also considered.

In 1999, the WMPO updated the *Greater Wilmington Urban Area Metropolitan Planning Organization Thoroughfare Plan*. The updated plan is based on an analysis of 1997 travel and land use, design year 2025 projections of travel based on projected population, economic conditions, anticipated land use patterns, and field investigations of proposed thoroughfare alternatives.<sup>95</sup>

In March of 2005 the WMPO adopted an updated long range transportation plan using 2030 as the forecast year. The Wilmington Bypass was listed as one of the community's priorities. The *2030 Long Range Transportation Plan (2030 LRTP)* is designed to serve as a guide for implementing the future transportation system in the area. The goals, as listed in the *2030 LRTP*, are as follows:

- 
- Goal 1 – Provide an adequate system of regional highway facilities to serve the vehicular movement of people and goods into, out of, across, and through the Wilmington Urban area;
  - Goal 2 - Provide an adequate level of mobility on the regional highway system for all users;
  - Goal 3 - Provide safe regional highway facilities within the Wilmington Urban Area;
  - Goal 4 - Provide an efficient system of regional highway facilities within the Wilmington Urban Area;
  - Goal 5 - Provide a regional highway system that minimizes adverse neighborhood, environmental, and energy impacts associated with regional travel demand; and,
  - Goal 6 - Provide an integrated system of regional highway facilities in the Wilmington Urban area.

Of particular importance to this assessment are the objectives of Goal 5. Those objectives, as identified in the *2030 LRTP*, are as follows:

In cooperation with local jurisdiction, actions to provide sufficient mobility on the regional system and/or discourage through trips on local streets will be considered in order to minimize neighborhood infiltration by “regional” travel movements;

The design and construction of new regional transportation facilities shall minimize adverse effects on environmentally sensitive areas such as wetlands and endangered species habitat(s);

Analysis of potential future highway facilities shall consider potential impacts to the environmentally sensitive areas. Facilities that avoid those areas shall be encouraged;

Facility modernization and construction improvements shall include measures for environmental remediation, where necessary; and,

The Regional Road System should minimize adverse effects on water quality in the Wilmington Urban Area. Potential impacts from increased surface run-off associated with facility modernization and construction improvements shall be evaluated when comparing alternative projects for inclusion in the LRTP.<sup>96</sup>

The WMPO calls for the development of collector street plans in the *2030 LRTP*. Two such plans are relevant information to the project area, the *Town of Navassa Collector Street Plan* and the *US 17/NC 133 Collector Street Plan*.<sup>97</sup> While both plans provide extensive information, some of the most relevant to the project area is summarized here. According to the *Town of Navassa Collector Street Plan*, “A collector street plan supplements a Long-Range Transportation Plan by planning for streets designed to handle access issues within specific areas of study...collector streets provide both land access and traffic circulation within residential, commercial, and industrial areas.” A system of twelve collector streets is proposed in the plan for the Town of Navassa. The system would serve the Town of Navassa both north and south of the project. In the *US 17/NC 133 Collector Street Plan*, a system is proposed for a study area over 32 square miles in expanse that stretches from the Cape Fear River to north and south of US 17, encompassing a portion of Leland and Belville. A collector street running parallel to NC 133 and intersecting US 17 is included among the recommendations in the plan.

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Other recommendations include improvements to NC 133 and strategies to keep US 17 free-flowing.

The *Greater Wilmington Urban Area MPO Thoroughfare Plan* was adopted in November of 1999. The current and projected transportation improvements planned for the Wilmington Urban Area through 2025 are outlined in the plan. It was created with the philosophy that a wide range of integrated transportation alternatives must be made available to the residents of the Wilmington Urban Area to provide a safe and efficient transportation network.

The *Cape Fear River Corridor Plan* was developed through a coordinated effort by Brunswick County, New Hanover County, and the City of Wilmington. In the plan, goals for water quality, environmental resources, public access to the river, economic development, preservation of historic resources and improvement of transportation linkages are established for the area surrounding the Cape Fear River. Portions of the plan are applicable to features assessed in this document and are included where appropriate.<sup>98</sup>

### **State Transportation Improvement Program**

The NCDOT annually updates a priority list of its projects with schedule and funding goals for the next six years. The TIP projects in the vicinity of R-2633A/B that are included in the 2006-2012 TIP, are listed in Table 1-2. TIP projects in the project area are shown in Figure 1-8.

#### **3.2.2.2 Transit Plans**

Transit and transit plans in the project area are discussed in Section 1.6.2.3.

#### **3.2.2.3 Bicycle/Pedestrian Plans**

Both Brunswick County and the Greater Wilmington Metropolitan Urban Area have bicycle plans that designate future bicycle routes within the project area. The Greater Wilmington Urban Area Transportation Plan addresses bicycle needs that serve to promote a fun, healthy, and environmentally friendly transportation alternative. The plan seeks to increase bicycle use through the identification, improvement, and designation of a network of streets and trails that allows individuals to travel safely by bicycle.<sup>99</sup> Development of the bicycle trails would be around points of interest that include residential areas, recreational facilities, and places of education and employment. None of Wilmington's high priority bicycle routes are within the project area; however, US 421 is identified as having a need for future bicycle lanes. The Brunswick County Bicycle Plan also identifies bicycle routes that would provide an alternative mode of transportation linking community resources within the project area. The plan identifies Village Road in Leland as a high priority bicycle route.

### **3.2.3 COASTAL MANAGEMENT PLANS**

The Coastal Area Management Act (CAMA) of 1974 established a cooperative program of coastal land management between local governments and the State of North Carolina for preparing, adopting and enforcing land use plans. As part of the permitting process, the project will be reviewed for consistency with state, federal, and local regulations and CAMA land use plans. New Hanover (in cooperation with the City of Wilmington), and Brunswick counties have developed CAMA plans, as have the Towns of Navassa, Belville, and Leland.<sup>100</sup>

New Hanover County and the City of Wilmington are in the process of reviewing the 2006 draft CAMA Plan Update. In the draft update, issues, policies, and implementation strategies for eight topic areas; natural resources, land use and urban design, transportation, community infrastructure, housing, economic development, historic preservation, and storms and natural

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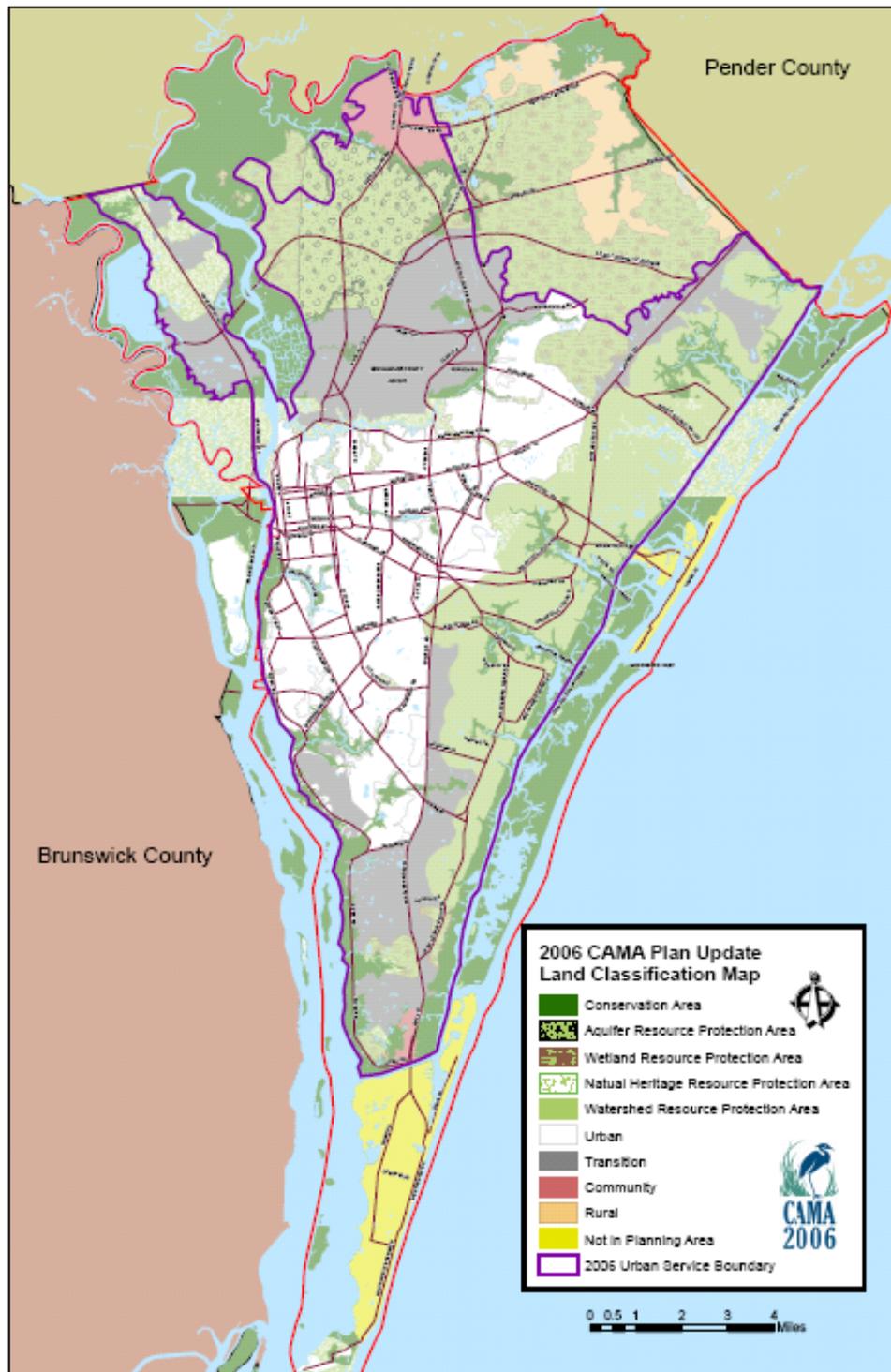
hazards are outlined.<sup>101</sup> The plan is designed to prepare for continued expansion of the area's economy and increased development while preserving its natural resources and quality of life. Wilmington and New Hanover County jointly developed a public hearing draft of a land classification system and map to assist in the implementation of their joint 2006 Coastal Area Management Act (CAMA) Plan update. The portion of the project area that falls in New Hanover County crosses watershed resource protection and transition areas (Figure 3-6). According to documentation for the classification system, the watershed resource protection area subclass "...occurs along the tidal creeks and is defined as the area within ½ mile of the 100-year flood plain for those creeks. The impact that the resources are being protected from is pollutant laden stormwater runoff from impervious surfaces within the watershed. The protection strategy for this subclass of resource protection area focus on minimizing new impervious surface, retrofitting protection measures to improve water quality of runoff from existing impervious surfaces and to promote low impact best management practices for development and redevelopment." Transition areas, on the other hand, are meant to "...provide for future intensive urban development on lands that have been or will be provided with necessary urban services. The location of these areas is based upon land use planning policies requiring optimum efficiency in land utilization and public service delivery. As shown in the map, the project is taken into account in the land classification system."<sup>102</sup>

Under state CAMA rules, permits are required for development in Areas of Environmental Concern (AEC). According to the North Carolina Department of Environment and Natural Resources (NCDENR), Division of Coastal Management (DCM), a project is likely to be in an AEC if it is:

- In or on navigable waters within the 20 CAMA counties,
- On a marsh or wetland,
- Within 75 feet of the mean high water line along an estuarine shoreline,
- Near the ocean beach,
- Near an inlet,
- Within 30 feet of the normal high water level of areas designated as inland fishing waters by the North Carolina Marine Fisheries Commission, or
- Near a public water supply.

Areas of Environmental Concern can include riverfront areas. Activities subject to rules under CAMA include dredging and the building of bridges. The DCM *Handbook for Development in Coastal North Carolina* is available on the Internet and provides detailed information about the permitting process, rules applying to AECs, and rules applying to specific types of projects.<sup>103</sup>

Figure 3-6: New Hanover County Land Classification Map



Source: New Hanover County, North Carolina. "Land Classification Map." Available: [http://www.wilmingtonnc.gov/Portals/0/devlserv/CAMA\\_LandClassMap.pdf](http://www.wilmingtonnc.gov/Portals/0/devlserv/CAMA_LandClassMap.pdf). Accessed 16 March 2006.

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### 3.3 PHYSICAL ENVIRONMENT CHARACTERISTICS

Aspects of the existing physical environment presented in this section are noise, air quality, farmlands, utilities, visual quality, hazardous materials, mineral resources, floodplains/floodways and protected lands.

#### 3.3.1 NOISE CHARACTERISTICS

This section is based on the *Noise Technical Memorandum* prepared for the project (1995), its addendum (1996), an updated analysis for the DEIS preferred alternative, *Noise Technical Memorandum* (2004), as well as updated analyses which included the expanded study corridor alternatives (2005) and a memorandum for the recommended alignment (2006).<sup>104</sup> The appended memoranda are incorporated by reference into this FEIS. The addendum contains a noise impact analysis for Alternatives 2, 3, 8, and 9, which were studied in the DEIS using the STAMINA noise model which is no longer used by FHWA. The analysis was updated for the recommended alignment to incorporate the FHWA's Traffic Noise Model (TNM) software Version 2.1.

Noise can be defined as any sound that is undesirable. The magnitude of noise is defined by its sound pressure level (SPL), which is related to the ratio of the measured sound pressure over a reference sound pressure. The reference pressure is the pressure of the weakest sound audible to a healthy human hearing system. The resulting quantities from the ratio equation are expressed in terms of decibels (dB) on the SPL scale. A dB is an interval on the SPL scale, with 0 dB as the threshold of hearing and 130 dB as the level which causes pain.

A-weighted sound level quantities often correlate well with the subjective response of people to the magnitude of a sound level. For example, A-weighting takes into account the fact that humans are more sensitive to higher frequency sounds than lower frequency sounds. The term decibel is often abbreviated as dBA, meaning the sound, or noise, levels are A-weighted.

Noise descriptors have been developed to more fully describe the noise environment and its effects on human activities. The most commonly used descriptor for vehicular traffic noise is the equivalent sound level (Leq), which is defined as the steady state sound level which contains the same acoustic energy as the actual time-varying sound level occurring over the same time period. Sound levels in this section are given as Leq for a one-hour time period.

##### 3.3.1.1 Ambient Noise Measurements for DEIS Alternatives

Noise monitoring was conducted in the project area to measure existing noise levels, identify predominant noise sources, and to validate the computer model used in the noise prediction analysis. The noise monitoring procedures were based on the methodologies contained in the two FHWA reports: *Fundamentals and Abatement of Highway Traffic Noise*, and *Sound Procedures for Measuring Highway Noise*.<sup>105,106</sup>

Noise measurements were taken at 9 sites in New Hanover County, located in proximity to several existing roads in the study area. Measurements were taken with a Larson-Davis Model 700 sound level meter. Concurrent traffic volumes, speed, and mix were also recorded. Table 3-10 shows the noise monitoring results. As shown in the table, measured Leq noise levels ranged from 54 dBA to 67 dBA.

**Table 3-10: Ambient Noise Levels (Leq) for DEIS Alternatives**

SITE	HOURLY Leq measured/estimated	HOURLY VEHICLE VOLUME			DISTANCE FROM NEAR LANE CENTER LINE (FT)	SPEED (MPH)	SITE DESCRIPTION
		A	MT	HT			
1	61/62	60	0	6	50	55	Single-family residence on SR 87
2	55/54	45	0	0	50	55	On side of SR 1416
3	56/56	27	3	0	50	50	Single-family residence on SR 1426
4	55/55	51	0	0	50	50	On SR 1426 near historic site
5	55/58	57	0	3	50	55	Reeves Chapel on SR 1430
6	64/61	174	0	6	50	45	Leland Pentecostal Free Will Baptist Church
7	60/63	315	0	9	50	45	Single-family residence on SR 1432
8	58/60	30	0	6	50	55	On side of SR 1438
9	55/56	3	0	6	50	30	On side of Flemington Road

Source: NCDOT, 1992b

\* A = Automobiles, MT = Medium Trucks, HT = heavy trucks

Several sites were also monitored to establish ambient noise levels where traffic was not the predominant noise source. A sound level of approximately 50 dBA Leq was established for areas where the predominant noise sources were aircraft overflights, distant traffic, bird song, etc. In communities served by a network of low volume, residential streets, ambient noise levels were estimated to be about 55 dBA.

For the purpose of evaluating noise impacts, existing and future year noise levels within the study area were estimated using the FHWA computer model STAMINA 2.0. Existing traffic volumes recorded during the noise monitoring program were modeled and the resulting noise levels were compared with the actual measured noise levels. As shown in Table 3-10, the differences between the measured and modeled noise levels are within an acceptable margin of 3 decibels.

### 3.3.1.2 Ambient Noise Measurements for the DEIS Preferred Alternative

Noise monitoring was conducted in the project area to measure existing (ambient) noise levels, identify predominant noise sources, and to validate the computer model used in the noise prediction analysis. The noise monitoring procedures were based on the methods contained in the FHWA report *Measurement of Highway Related Noise*.<sup>107</sup> Ten measurement sites were selected as representative of the typical noise sensitive land uses within the project area. The purpose of the measurements are to document existing noise levels and to compare the measured noise levels with the predicted noise levels to verify that the model is properly calibrated. Additionally, two of the measurements were used to determine the base ambient noise level for receptors that are not located adjacent to the roadways where measurements were taken. The locations where measurements were taken, measured noise levels, and calculated noise levels are listed in Table 3-11. As indicated in the table ambient noise levels in the project study area range from near 55 dBA to just over 71 dBA. Ambient noise levels documented in the DEIS ranged between 55 dBA and 61 dBA. The difference in ambient level is likely accounted for by increased human activity, such as more frequent aircraft flyovers and

increased traffic levels, in the project study area or differences in natural conditions such as time of year / season when insect and bird activities differ.

**Table 3-11: Ambient Noise Levels (Leq) for the Recommended Alignment**

SITE	LOCATION	NOISE LEVEL (DBA) MEASURED	NOISE LEVEL (DBA) CALCULATED
<b>Ambient Noise Levels for Model Calibration</b>			
A1	US 17 - 200 feet southwest of US 17 / Town Creek Road intersection	70.1	71.4
A2	NC 87 – 2,000 feet northeast of US 17 intersection	58.2	60.5
A3	US 17 - 600 feet southwest of Goodman Road intersection	67.0	68.8
A5	US 74/76 – 1,000 feet west of Wood Treatment Plant Road	68.4	71.1
A6	Mt. Misery Road - 1200 feet northwest of Quail Hollow Road	63.3	62.4
A8	Cedar Hill Road - 50 feet south of Davis Way	57.3	56.5
A9	US 421 – 2,500 feet northwest of Wilmington Bypass	66.2	67.3
A10	US 421 - 200 feet south of Sutton Steam Plant Road	70.2	68.9
<b>Ambient Noise Levels to Determine Base Ambient Noise Levels</b>			
A4	Wolfridge Road - 250 feet south of James Way Road	58.7	N/A
A7	Cul-de-sac at end of Quail Hollow Road	54.7	N/A

Source: *Final Addendum to the Noise Technical Memorandum*. Prepared for North Carolina Department of Transportation by URS Corporation. 2005.

### 3.3.1.3 Noise Prediction Model Validation for the Recommended Alignment

Traffic counts based on vehicle classifications were collected concurrently with the ambient noise measurements. Based on the traffic data, ambient noise levels were predicted using the FHWA’s TNM computerized highway noise prediction model and compared to the measured noise levels.

The noise level prediction model is approved for use if measured and predicted noise levels are within the accepted tolerance standard of  $\pm$  three dBA. As shown in Table 3-11, the ability of the TNM model to accurately predict noise levels for this project was confirmed as the predicted levels are within the acceptable tolerance.

### 3.3.1.4 Existing Noise Levels for the Recommended Alignment

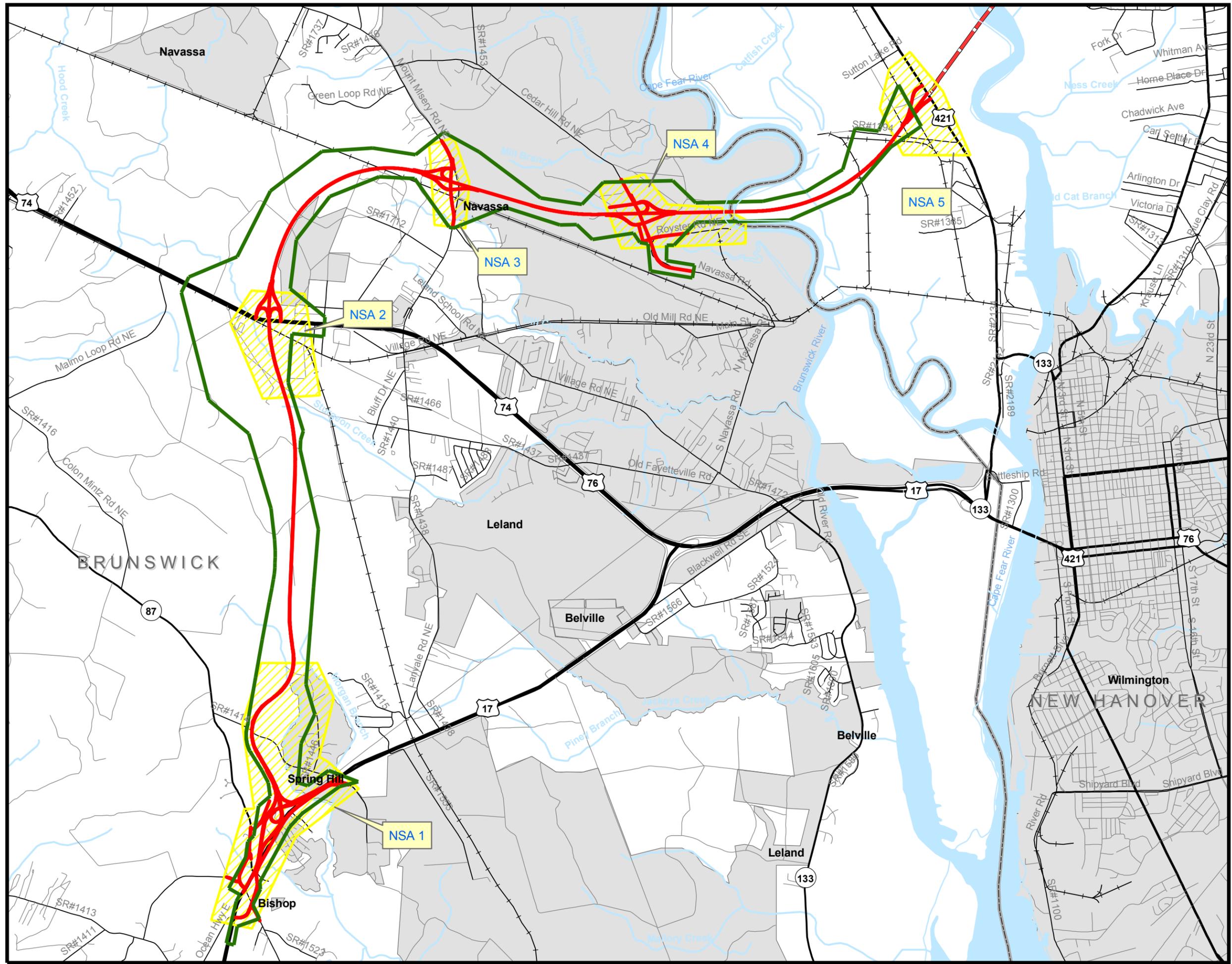
A noise sensitive site, commonly referred to as a receptor or receiver, is any property (owner occupied, rented or leased) where frequent exterior human use occurs, and where a lowered noise level would be beneficial. As a result of this analysis five noise sensitive areas (NSA) were identified and are shown in Figure 3-7. All five of the NSAs are located along existing roadways that either cross or run adjacent to the project and are characterized by the roadway that will be intersected by the project. The predicted ambient (existing) noise levels at each of the NSAs using TNM are shown in Table 3-12.

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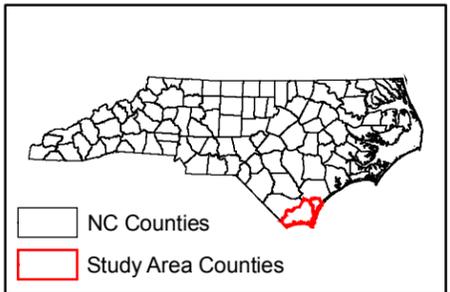
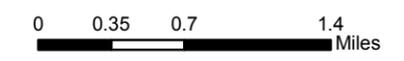
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TIP R-2633A/B  
Wilmington Bypass

Figure 3-7  
Noise Sensitive Areas



- Legend**
- Expanded Study Corridor
  - R-2633 A/B Recommended Alignment
  - R-2633 C
  - Interstate Highways
  - US Highways
  - State Highways
  - State Routes
  - Local Roads
  - Railroads
  - Municipal Boundaries
  - County Boundaries
  - Water
  - Streams (non-delineated)
  - Noise Sensitive Area



April 2007  
This map is for reference only.  
Sources: ESRI Inc. US Census, NCDOT, Brunswick County, New Hanover County, CGIA, USDOT, and URS.



**Table 3-12: Noise Sensitive Areas**

NSA NO.	DESCRIPTION	NO. OF RECEIVERS	AMBIENT NOISE RANGE (DBA)	MEDIAN AMBIENT NOISE LEVEL (DBA)
1	US 17 Interchange Area	149	54.7-68.7	59.6
2	US 74/76 Interchange Area	13	54.7-66.6	56.1
3	SR 1426 Interchange Area	18	54.7-60.7	58.4
4	SR 1430 Interchange Area	36	54.7-57.0	54.7
5	US 421 Interchange Area	26	54.7-69.6	63.7

Source: *Final Addendum to the Noise Technical Memorandum*. Prepared for North Carolina Department of Transportation by URS Corporation. 2005.

### **3.3.2 AIR QUALITY**

#### **3.3.2.1 National Ambient Air Quality Standards**

This section is based on the *Air Quality Technical Memorandum* prepared in 1992 for the DEIS preferred alternative corridor and the final addendum to the *Air Quality Technical Memorandum* prepared in 2004. An air quality analysis for the US 421/Wilmington Bypass interchange and a free-flow segment west of the interchange are included in the final addendum. Both memoranda are appended by reference into this FEIS.<sup>108</sup>

The project is located within the jurisdiction for air quality of the Wilmington Regional Office of the NCDENR and the US EPA Region IV.

The EPA has established primary and secondary National Ambient Air Quality Standards (NAAQS) for seven criteria air pollutants: carbon monoxide (CO), nitrogen dioxide (NO<sub>2</sub>), sulfur dioxide (SO<sub>2</sub>), Ozone (O<sub>3</sub>), particulate matter less than 10 microns in diameter (PM-10), particulate matter less than 2.5 microns in diameter (PM-2.5) and lead (Pb). These standards are listed in Table 3-13. The primary NAAQS must "protect the public health with an adequate margin of safety", and the secondary standards must "protect the public welfare from known or anticipated adverse effects (aesthetics, crops, architecture, etc.)" (Federal Clean Air Act 1990: Section 109). The primary standards were established, with a margin of safety, considering long-term exposures for the most sensitive groups in the general population (i.e., children, senior citizens, and people with breathing difficulties). The State of North Carolina has adopted these standards, with some minor differences.

Monitoring is the most reliable means of determining ambient air quality conditions. Based on information contained in the most recent NCDENR statewide monitoring report, the Division of Air Quality operated several air quality monitoring stations in New Hanover County. No monitors were operated in Brunswick County. This report provides information on maximum measured concentrations and the location of the state operated monitoring stations. The report is available via the Internet at the NCDENR website (<http://daq.state.nc.us/monitor/reports/2002-01.pdf>). A listing of the 2002 measured concentrations in New Hanover County is provided in Table 3-13. These recent measurements are within federal and state ambient air quality standards. Prior to the publication of the DEIS, only PM-10 was monitored. Measured values for PM-10 at that time were also within federal and state standards.

In accordance with the Federal 1990 Clean Air Act Amendments, all areas within the state are designated as attainment or non-attainment with respect to the NAAQS. Areas that meet the

NAAQS are designated as attainment. Brunswick and New Hanover counties have been designated as attainment areas or unclassified for all seven criteria pollutants.

**Table 3-13: National Ambient Air Quality Standards**

POLLUTANT	STANDARD	MEASURED
Carbon Monoxide (CO) Eight-Hour Average	9 parts per million (ppm)	3.8 ppm
Carbon Monoxide (CO) One-Hour Average	35 ppm	6.3 ppm
Nitrogen Dioxide (NO <sub>2</sub> ) Annual Arithmetic Mean	0.053 ppm	Not Available
Ozone (O <sub>3</sub> ) One-Hour Average	0.12 ppm	0.098 ppm
Ozone (O <sub>3</sub> ) Eight-Hour Average	0.08 ppm	0.079 ppm
Lead (Pb) Quarterly Average	1.5 micrograms/cubic meter	Not Available
Particulates less than 10 microns diameter (PM-10) Annual Arithmetic Mean	50 micrograms/cubic meter	17 micrograms/cubic meter
Particulates less than 10 microns diameter (PM-10) 24-Hour Average	150 micrograms/cubic meter	45 micrograms/cubic meter
Particulates less than 2.5 microns diameter (PM-2.5) Annual Arithmetic Mean	15 micrograms/cubic meter	12.4 micrograms/cubic meter
Particulates less than 2.5 microns diameter (PM-2.5) 24-Hour Average	65 micrograms/cubic meter	31.7 micrograms/cubic meter
Sulfur Dioxide (SO <sub>2</sub> ) Annual Arithmetic Mean	0.03 ppm	0.009 ppm
Sulfur Dioxide (SO <sub>2</sub> ) 24-Hour Average	0.14 ppm	0.027 ppm

Source: Environmental Protection Agency. National Ambient Air Quality Standards. Obtained from URL address: <http://www.epa.gov/airs/criteria.html> via Internet on 5 March 2004.

North Carolina Department of Environment and Natural Resources: <http://www.daq.state.nc.us/monitor/reports/2002-01.pdf>.

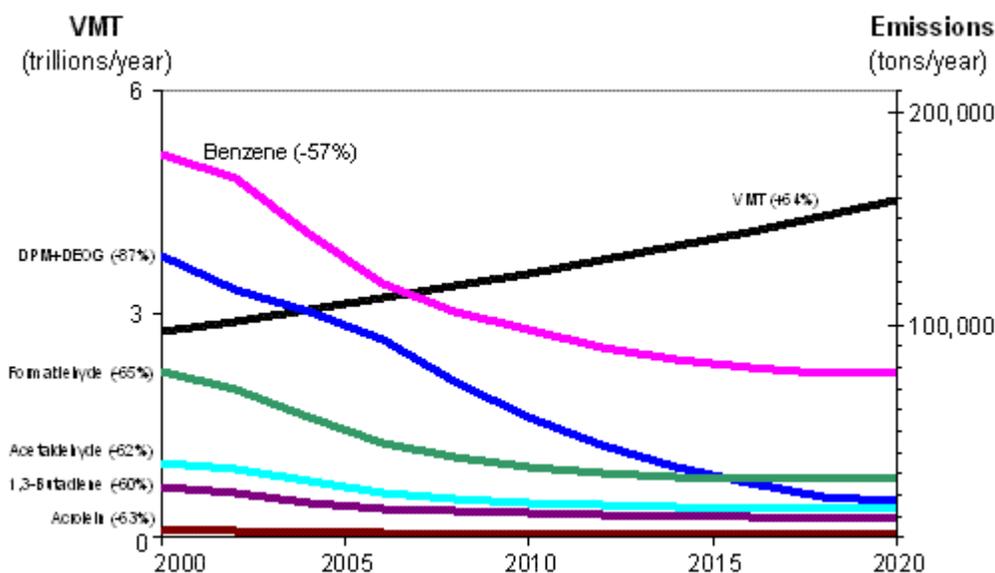
### 3.3.2.2 Mobile Source Air Toxics

In addition to the criteria air pollutants for which there are National Ambient Air Quality Standards (NAAQS), EPA also regulates air toxics. Most air toxics originate from human-made sources, including on-road mobile sources, non-road mobile sources (e.g., airplanes), area sources (e.g., dry cleaners) and stationary sources (e.g., factories or refineries).

Mobile Source Air Toxics (MSATs) are a subset of the 188 air toxics defined by the Clean Air Act. The MSATs are compounds emitted from highway vehicles and non-road equipment. Some toxic compounds are present in fuel and are emitted to the air when the fuel evaporates or passes through the engine unburned. Other toxics are emitted from the incomplete combustion of fuels or as secondary combustion products. Metal air toxics also result from engine wear or from impurities in oil or gasoline.

The EPA is the lead Federal Agency for administering the Clean Air Act and has certain responsibilities regarding the health effects of MSATs. The EPA issued a Final Rule on Controlling Emissions of Hazardous Air Pollutants from Mobile Sources. 66 FR 17229 (March 29, 2001). This rule was issued under the authority in Section 202 of the Clean Air Act. In its rule, EPA examined the impacts of existing and newly promulgated mobile source control programs, including its reformulated gasoline (RFG) program, its national low emission vehicle (NLEV) standards, its Tier 2 motor vehicle emissions standards and gasoline sulfur control requirements, and its proposed heavy duty engine and vehicle standards and on-highway diesel fuel sulfur control requirements. Between 2000 and 2020, FHWA projects that even with a 64 percent increase in VMT, these programs will reduce on-highway emissions of benzene, formaldehyde, 1,3-butadiene, and acetaldehyde by 57 percent to 65 percent, and will reduce on-highway diesel PM emissions by 87 percent, as shown in the following graph:

**U.S. Annual Vehicle Miles Traveled (VMT) vs. Mobile Source Air Toxics Emissions, 2000-2020**



Notes: For on-road mobile sources. Emissions factors were generated using MOBILE6.2. MTBE proportion of market for oxygenates is held constant, at 50%. Gasoline RVP and oxygenate content are held constant. VMT: Highway Statistics 2000, Table VM-2 for 2000, analysis assumes annual growth rate of 2.5%. "DPM + DEOG" is based on MOBILE6.2-generated factors for elemental carbon, organic carbon and SO<sub>4</sub> from diesel-powered vehicles, with the particle size cutoff set at 10.0 microns.

As a result, EPA concluded that no further motor vehicle emissions standards or fuel standards were necessary to further control MSATs. The agency is preparing another rule under authority of CAA Section 202(l) that will address these issues and could make adjustments to the full 21 and the primary six MSATs.

### 3.3.3 FARMLANDS

Criteria for identifying and considering the effects of federal programs on the conversion of farmland to non-agricultural uses are established in the Farmland Protection Policy Act (FPPA) (7 CFR Part 658). For the purposes of the FPPA, important farmland is divided into three categories: prime, unique, or of local or statewide importance (Public Law 97-98, Subtitle 1, Section 1540). The three categories are defined as follows:

- Prime farmland is land which has "the best combination of physical and chemical characteristics for producing food, feed, fiber, forage, oilseed, and other agricultural crops with minimum inputs of fuel, fertilizer, pesticides, and labor, and without intolerable soils erosion" (Public Law 97-98, Subtitle 1, Section 1540). Land already in or committed to urban development or water storage is not included. Table 3-14 lists the soil types considered prime farmlands in Brunswick and New Hanover counties.
- Unique farmland is land used for production of specific high-value food and fiber crops. It has the special combination of soil quality, location, growing season, and moisture supply needed to economically produce sustained high quality or high yields of specific crops when treated and managed (Public Law 97-98, Subtitle 1, Section 1540). Table 3-14 lists the soil types considered unique in Brunswick and New Hanover counties.
- State and Locally Important farmland is land of statewide or local importance for the production of food, fiber, forage, or oilseed crops as determined by the appropriate state or local government agency (Public Law 97-98, Subtitle 1, Section 1540).

Underlying soils types generally determine whether an area is considered important farmland. Table 3-14 lists the soil types considered important farmlands in Brunswick and New Hanover counties.

About 75,598 acres, or about 14 percent, of Brunswick County meets soil requirements for prime farmland.<sup>109</sup> This farmland is mainly in the south-central, western and northeastern parts of the county. Similar information for New Hanover County was not available.

Crops grown in both counties include corn, soybean, and tobacco. Soils identified in Brunswick County as prime farmland are; Foreston loamy fine sand (Fo), Goldsboro (GoA), Johns fine sandy loam (Jo), Norfolk loamy fine sand (two to six percent slopes) (NoB), and Onslow fine sandy loam (On). In New Hanover County, prime farmlands are made up of Craven (Cr), Lynchburg (Ls), Norfolk (No), Onslow (On), Rains (Ra), Stallings (St), Woodington (Wo), and Wrightsboro (Wr).

**Table 3-14: Prime, Unique, and Important Farmland**

FARMLAND CATEGORY	SOIL TYPE SYMBOL	SOIL DESCRIPTION
Prime	New Hanover County	
	Cr	Craven fine sandy loam, 1-4% slopes
	Ls	Lynchburg fine sandy loam (drained areas)
	No	Norfolk fine sandy loam, 0-4% slopes
	On	Onslow loamy fine sand
	Ra	Rains fine sandy loam (drained areas)
	St	Stallings fine sand (drained areas)
	Wo	Woodington fine sandy loam (drained areas)
	Wr	Wrightsboro fine sandy loam, 0-2% slopes
	Brunswick County	
	Fo	Foreston loamy fine sand
	GoA	Goldsboro fine sandy loam, 0-2% slopes
	Jo	Johns fine sandy loam, well drained
	NoB	Norfolk loamy fine sand, 2 - 6% slopes
	On	Onslow fine sandy loam

FARMLAND CATEGORY	SOIL TYPE SYMBOL	SOIL DESCRIPTION
Unique	New Hanover County	
	Cr	Craven fine sandy loam, 1 to 4% slopes
	No	Norfolk fine sandy loam, 0 to 4 % slopes
	On	Onslow loamy fine sand
	Wr	Wrightsboro fine sandy loam, 0 to 2 % slopes
	Brunswick County	
	Mu	Murville fine sand (drained areas)
	Le	Leon sand
State and Locally Important	New Hanover County	
	Ba	Bayboro loam (drained areas)
	Ke	Kenansville fine sand, 0-3% slopes
	Ls	Lynchburg fine sandy loam
	Pn	Pantego loam
	Ra	Rains fine sandy loam
	St	Stallings fine sand
	To	Torhunta loamy fine sand
	Wo	Woodington fine sandy loam
	Brunswick County	
	BaB	Baymead fine sand, 1-6%
	BDC	Baymead-Marvyn Complex, 6-12% slopes
	Fo	Foreston loamy fine sand
	Tm	Tomahawk mucky fine sandy loam

Source: United States Department of Agriculture, Natural Resources Conservation Service. Soil Data Mart. Available: <http://soildatamart.nrcs.usda.gov/State.aspx>.

### 3.3.4 UTILITIES

A description of electric power, natural gas, sewer and water services and facilities in the project area is provided in this section.

#### 3.3.4.1 Electric Power Transmission and Natural Gas Lines

Major electrical transmission lines and substations, the Lake Sutton Power Plant, and major existing and planned natural gas transmission and distribution lines are shown in Figure 3-8.

#### Electric

Electric power service within the project area is provided by Progress Energy (formerly Carolina Power and Light) and Brunswick Electric Membership Corporation (BEMC).

Progress Energy's Lake Sutton Power Plant is located adjacent to the expanded study corridor at the southern end of Lake Sutton, west of US 421 in New Hanover County. The plant is a three-unit, coal-fired, steam plant capable of producing 613 megawatts (MW). Three small combustion turbines located at the plant are capable of generating 64 MW.<sup>110</sup> Progress Energy's major 115 kilovolt (kV) and 230 kV electric transmission lines generally run east-west through the middle of the project area and north-south near US 421, I-40, and cross the project corridor between SR 1430 and SR 1426 east of Leland.<sup>111</sup> Substations are located to supply communities and major industries in the project area with electricity.

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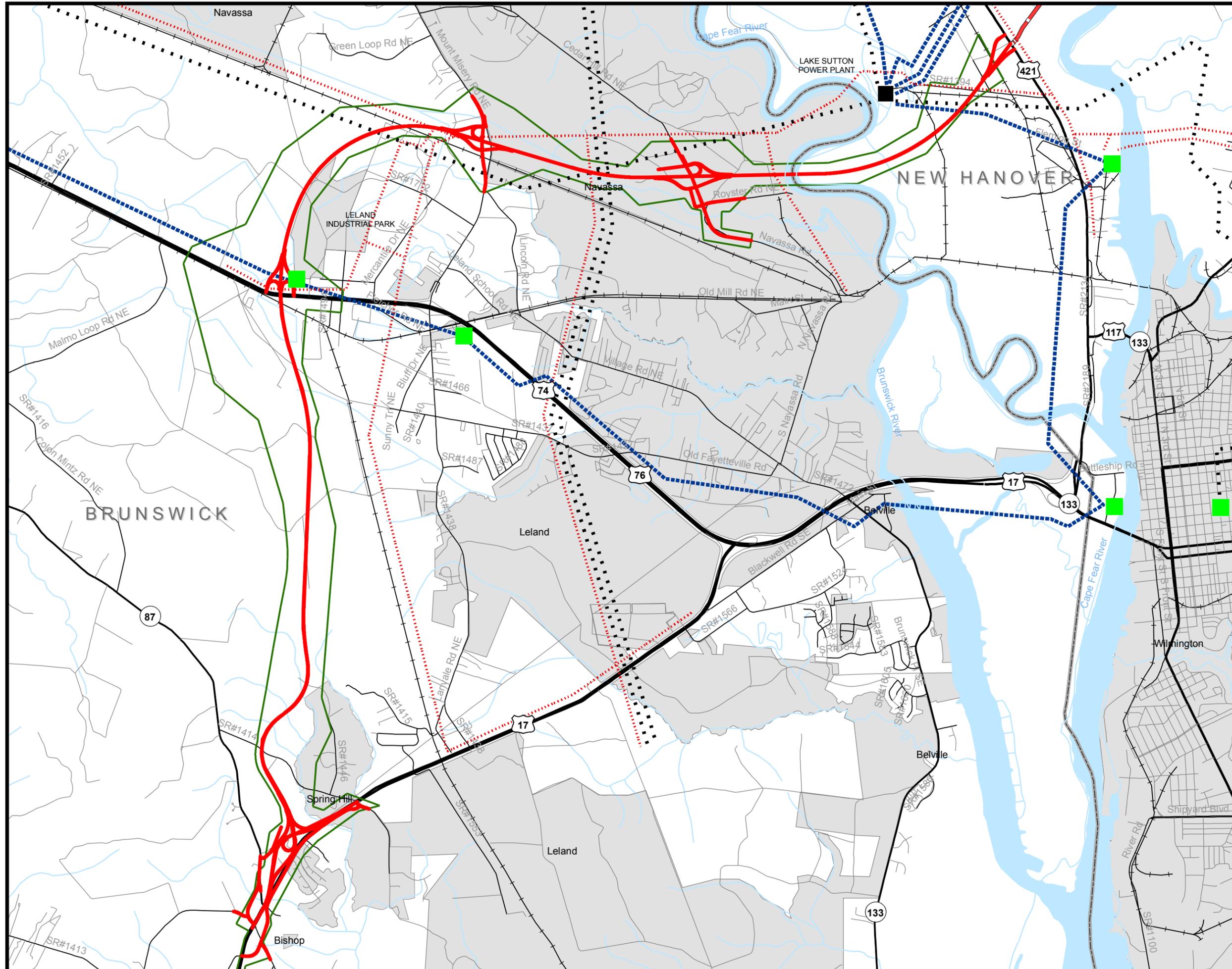
BEMC also has distribution facilities in the project area and an electric transmission line generally running parallel to US 17.<sup>112</sup>

### **Natural Gas**

Natural gas service within the project area is provided by Piedmont Natural Gas.<sup>113</sup> As shown in Figure 3-8, natural gas transmission lines within the project area generally run north and south between US 17 and US 74/76. The lines run east-west, parallel to the recommended alignment to serve the Leland Industrial Park and the industrial area along US 421.<sup>114</sup> The natural gas lines running north and south between US 17 and US 74/76 were identified since the publication of the DEIS.

TIP R-2633A/B  
Wilmington Bypass

Figure 3-8  
Power and Natural Gas Lines



**Legend**

- Expanded Study Corridor
- R-2633 A/B Recommended Alignment
- - - R-2633 C
- Interstate Highways
- US Highways
- State Highways
- State Routes
- Local Roads
- Railroads
- Municipal Boundaries
- County Boundaries
- Water
- Streams (non-delineated)
- - - Natural Gas Lines
- - - 115 kV Power Lines
- - - 230 kV Power Lines
- Substations
- Progress Energy Lake Sutton Power Plant



0 0.7 1.4 Miles



Counties  
 Study Area Counties



April 2007  
 This map is for reference only.  
 Sources: ESRI, Brunswick County, NCDOT,  
 New Hanover County, USDOT, CGIA, URS.



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### **3.3.4.2 Sewer and Water Facilities**

Public and private sewer and water facilities within the project area are shown in Figure 3-9.

#### **Sewer Facilities**

Much of Brunswick County is served by septic systems. Two wastewater treatment facilities are in operation and serve portions of the project area. The Leland Industrial Park Plant was converted to the Northeast Brunswick Regional Wastewater Treatment Plant (WWTP) as part of the North Brunswick Regional Collection System project that began in 1998.<sup>115</sup> The Northeast Brunswick Regional WWTP was placed online in July of 2003.<sup>116</sup> It is constructed to treat 1.6 million gallons per day (MGD) and is designed for expansion to three MGD. The facility is permitted for effluent discharge to the Cape Fear River and also has re-use capability. This facility receives domestic and industrial wastewater and serves the Town of Leland, the Town of Navassa, the North Brunswick Sanitary District, the Leland Industrial Park (Brunswick County Utilities), and the Lincoln Industrial Park. In completing this project, the Clairmont Wastewater Treatment Plant was taken off-line.<sup>117</sup> The sewer lines for Leland and Navassa shown in Figure 3-9 were identified after the issuance of the DEIS. Most of the sewage on the west side of US 17 is treated at the Northeast Brunswick Regional WWTP.<sup>118</sup>

The second plant serving the area is the Belville WWTP on Chappell Loop Road (see Figure 3-9). The Town of Belville turned this plant over to the North Brunswick Sanitary District. The North Brunswick Sanitary District serves the towns of Belville, Leland, a portion of Navassa, and areas between. All sewage on the east side of US 17 is treated at the Belville WWTP.<sup>119</sup>

The New Hanover County Water and Sewer District serves most of New Hanover County with the exception of the City of Wilmington and Carolina Beach. While there is limited sewer service in the northern portion of New Hanover County, there are no sewer lines in the immediate vicinity of the recommended alignment.<sup>120</sup> Larger private treatment facilities in New Hanover County are shown on Figure 3-9.<sup>121</sup>

#### **Water Service**

The Brunswick County portion of the project area receives potable water from private groundwater wells and the Northwest Water Treatment Plant (NWTP) in Leland. The NWTP is capable of treating 24 MGD.<sup>122</sup> Water lines in Brunswick County are shown in Figure 3-9 and generally follow US 17 east to Lanvale Road then follow Lanvale Road north, along Cedar Hill Road toward New Hanover County.<sup>123</sup>

Much of the development within the New Hanover County portion of the project area receives potable water from private well systems or tanks. The Lower Cape Fear Water and Sewer Authority (LCFWASA) distributes raw water to Brunswick County and Wilmington. The LCFWASA is a self-supporting agency with a service area encompassing Bladen, Brunswick, Columbus, New Hanover, and Pender counties.<sup>124</sup>

LCFWASA maintains a 45 MGD pumping station and intake located behind US Lock and Dam Number One in Brunswick County. From this station, 14 miles of 48-inch transmission main run to a reservoir. The three-million gallon reservoir is located in Brunswick County, near the Northwest Water Treatment Plant, and is supplied by the Cape Fear River. From the reservoir, 60-inch and 48-inch transmission lines extend 10 miles to serve Wilmington and industries along US 421 in New Hanover County.<sup>125</sup>

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LCFWASA has proposed a new treated water project near US 421 for 2006-2007. The proposed water main would run from Praxair Incorporated, south along US 421. It would eventually cross the Northeast Cape Fear River to the Sweeney Water Plant (**Error! Not a valid bookmark self-reference.**)<sup>126</sup>.

The City of Wilmington constructed a 48-inch line, which connects its treatment plant with the terminus of the LCFWASA's 48-inch line along US 421. The City of Wilmington also has a single 30 inch main paralleling the railroad track from King's Bluff Lock and Dam Number One on the Cape Fear River to Toomers Creek. At Toomers Creek the main splits into two, 24 inch lines to tie into the 48 inch line coming down US 421.<sup>127</sup>

New Hanover County provides limited water service within the project area (See **Error! Not a valid bookmark self-reference.**). The county operates the Flemington-US 421 Water System. This consists of a well field near the Sutton Power Plant, with an eight-inch line supplying a small number of users along US 421.<sup>128</sup>

### **3.3.5 VISUAL QUALITY**

The visual features in the project area consist of a variety of manmade and natural landscapes that include new subdivisions, older residential neighborhoods, industrial development, scattered homes and agricultural lands, wooded uplands, streams, wetlands, and the Cape Fear River. Generally, urban and suburban landscapes are more prevalent in the central portion of the project area.

The natural features of the landscape which comprise viewsheds and provide vistas in the project area are open agricultural fields, low vegetated marshland, and water bodies such as the Cape Fear River. Other vistas are created by rights-of-way for power lines, gas lines, roadways, drainage ditches, railways, and other infrastructure. These features combine with the flat topography, manmade objects (buildings, towers, transmission lines, etc.), and breaks in tree lines or high vegetation to create views.

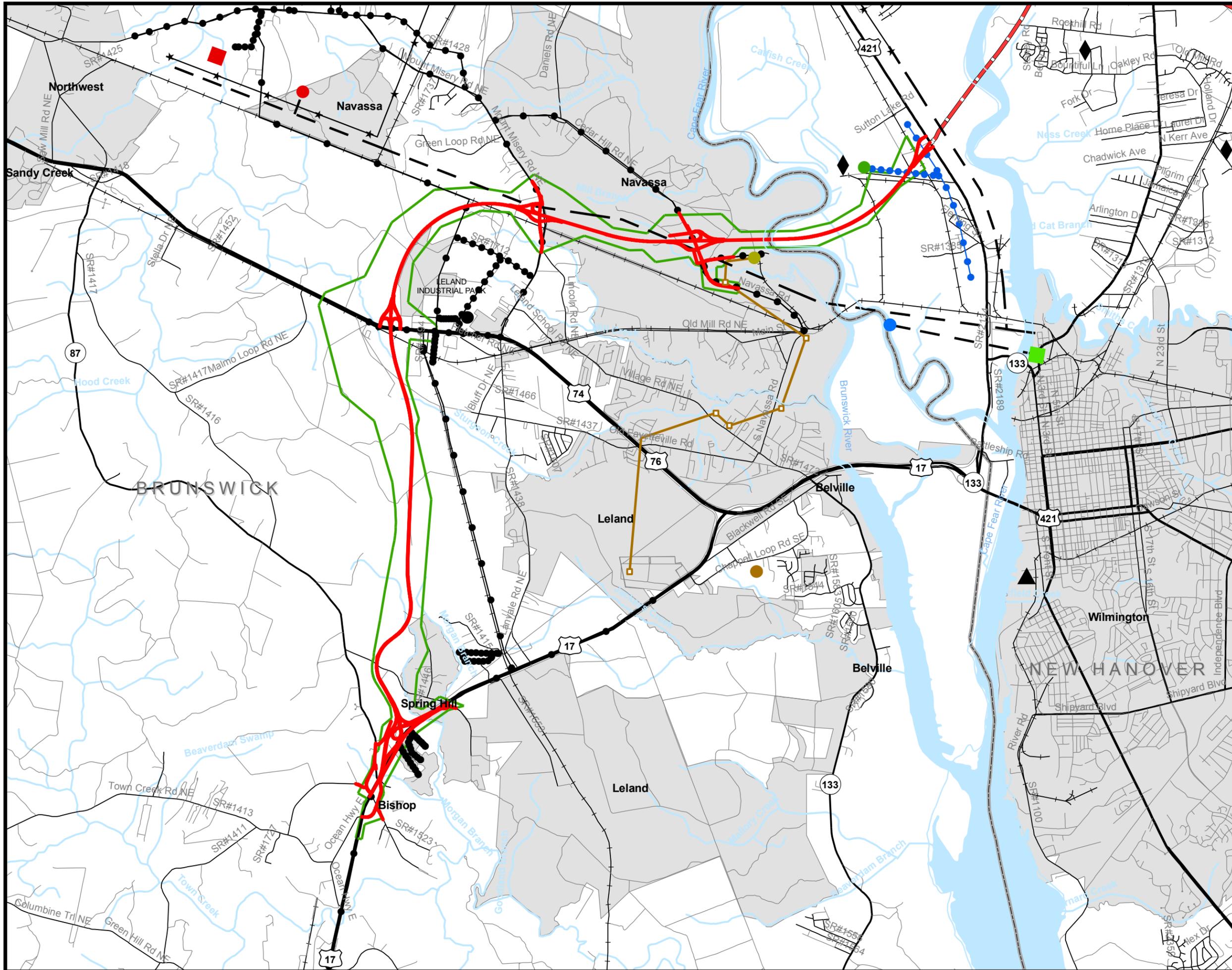
The project area displays a gradual rise from the bluffs along the Cape Fear River (approximately 18 feet above sea level) to the highest point of relief in the area, located west of the military railroad "turn around" yard and south of US 74/76. Between this point of high relief southward, the terrain in the vicinity of the recommended alignment slopes downward toward the Morgan and Bishop branches of Town Creek near Bishop. The project area west of the Cape Fear River is largely undeveloped, with only isolated clearings along existing roadways. In the eastern portion of the project area, the industrial development along US 421 is the prominent visual feature in the area due to the numbers and massive sizes of the buildings.

### **3.3.6 HAZARDOUS MATERIALS**

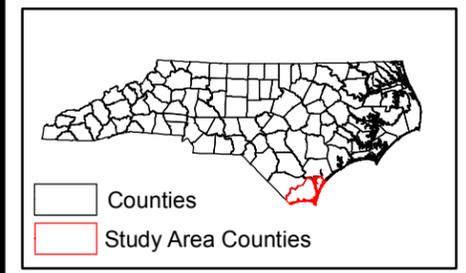
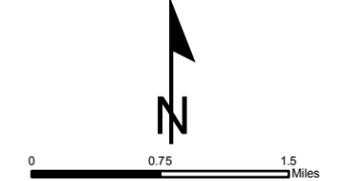
The presence of soil and/or groundwater contamination, or the existence of hazardous substances within existing or proposed right-of-way areas can adversely affect the cost and schedule to complete a transportation improvement project. Contaminated soil located during construction could require special treatment and disposal and would not be usable to backfill excavations. In addition, locating a transportation project adjacent to a site where hazardous materials are present could result in long-term effects on the site by the transportation activities or, conversely, the hazardous materials could pose a future threat to the viability of the facility and the citizens who use it. The early identification of potential contamination sites that could adversely affect the project provides valuable information for project planning and design.

TIP R-2633A/B  
Wilmington Bypass

Figure 3-9  
Water and Sewer Lines



- Legend**
- Expanded Study Corridor
  - R-2633 A/B Recommended Alignment
  - R-2633 C
  - Interstate Highways
  - US Highways
  - State Highways
  - State Routes
  - Local Roads
  - Railroads
  - Municipal Boundaries
  - County Boundaries
  - Water
  - Streams (non-delineated)
  - Lower Cape Fear Water and Sewer Authority
  - Brunswick Co Water Line
  - City of Wilmington Water Line
  - New Hanover Co Water Line
  - Towns of Leland and Navassa Sewer Lines
  - Northwest Water Treatment Plant
  - City of Wilmington Sweeney Water Treatment Plant
  - Lower Cape Fear Water & Sewer Authority Reservoir
  - New Hanover County Well Field
  - Pump Station
  - ▲ Private Water Tanks
  - Belville WWTP
  - Northeast Brunswick Regional WWTP
  - Sewer Pump Stations
  - ◆ Private Sewer Systems



April 2007  
This map is for reference only.  
Sources: ESRI, NCDOT, Brunswick County, New Hanover County, US Census, URS.



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### 3.3.6.1 Method

Prior to the publication of the DEIS, a survey of records on file with State agencies was conducted to identify sites of hazardous material use, storage, and disposal or potential sites of environmental contamination present within the project area. The survey consisted of obtaining information from the Division of Environmental Management, Groundwater Section; Division of Solid Waste Management, Solid Waste and Hazardous Waste sections and the Superfund Section. At that time, state files were reviewed to obtain information about the following types of sites within the project area: solid waste disposal facilities, inactive hazardous waste sites, sites registered on the Resource Conservation and Recovery Act (RCRA) Notifiers List, and sites reporting past spills and other incidents impacting soil and/or groundwater. According to state files, there were about 22 companies within the general project area that registered with the state as handlers of hazardous materials and wastes in accordance with RCRA. The sites are listed in Appendix F.

Research conducted with state files was augmented with a database search and site location report completed by Environmental Risk Information & Imaging Services (ERIIS) of Herndon, Virginia.<sup>129</sup> ERIIS maintains current copies of the following databases: National Priorities List (NPL); Resource Conservation and Recovery Information System - Treatment, Storage and Disposal Facilities (RCRIS\_TS); Comprehensive Environmental Response, Compensation, and Liability Information System (CERCLIS); No Further Remedial Action Planned Sites (NFRAP); Resource Conservation and Recovery Information System - Large Quantity Generators (RCRIS\_LG); Resource Conservation and Recovery Information System - Small Quantity Generators (RCRIS\_SG); Civil Enforcement Docket (DOCKET); Toxic Release Inventory System of 1992 (TRI); Federal Reporting Data System (FRDS); Emergency Response Notification System (ERNS); Facility Index System (FINDS); Open Dumps Report (OPENDUMP); Nuclear Power Facilities (NUCLEAR); Inactive Hazardous Sites Inventory Report (HWS); North Carolina Leaking Underground Storage Tank Incident Report (LRST); North Carolina Solid Waste Facilities List (SWF); and North Carolina Petroleum Underground Storage Tank Data Listing (RST). Three-mile radii searches were completed for three separate points along the DEIS alternative corridors, providing a coverage area ranging in width from three miles to one-mile along the alternative corridors. The three searches were located in the northeast, central, and southwestern portions of the project area. Results of these ERIIS radii searches are contained in Appendix F under the reports named northeast, central, and southwest. Identified sites were plotted by ERIIS where information on the location of these sites was sufficient. It should be noted that several sites may be identified at the same location, reflecting multiple database listings or multiple listings on databases searched by ERIIS. Sites with incomplete addresses on accessed databases were not plotted by ERIIS. Unplottable sites are also presented in ERIIS reports in Appendix F.

Following the issuance of the DEIS, a limited Phase I Site Assessment was conducted for the DEIS preferred alternative corridor. GIS data maintained by New Hanover County, the North Carolina Department of Environment and Natural Resources (NCDENR), and the Environmental Protection Agency (EPA) was utilized to identify known environmentally impacting sites in relation to the project right-of-way (ROW). Interviews of NCDENR personnel in the Wilmington Regional Office were conducted, local oil companies were contacted regarding customers with heating oil underground storage tanks (USTs), and files of historic information were reviewed. In addition, a report documenting the results of a database search of federal and state agency records identifying sites of hazardous material use, storage, and disposal or potential sites of environmental contamination.<sup>130</sup>

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Field reconnaissance surveys along the DEIS preferred alternative corridor were conducted in October and November of 2005. Property owners and/or occupants were interviewed and a visual inspection of potential environmental impacts was conducted. Site location coordinates were obtained from NCDENR files or through use of a global positioning system (GPS) in the field.<sup>131</sup>

It is important to note that this Phase I Site Assessment was conducted for the DEIS preferred alternative corridor. As a result of the avoidance and minimization process, the expanded study corridor differs slightly from that of the DEIS preferred alternative corridor in that it is shifted slightly to the west in the vicinity of the southern terminus near NC 87 and US 17. Only one site was identified in this area as part of the Phase I Site Assessment. Due to the rural nature and current land uses in the vicinity of the southern terminus of the project, it is not expected that any additional sites with potential environmental impact to the project would be identified in an assessment of the shifted alignment. However, additional investigations should be conducted prior to and throughout project construction.

### 3.3.6.2 Results

The following plottable sites were found during the ERIIS queries in November 1996, within the three-mile radii search areas of the DEIS alternative corridors: one Comprehensive CERCLIS site, one NFRAP site, three RCRIS\_SG sites, 28 FRDS sites, three ERNS sites, 14 FINDS sites, one HWS, 54 LRSTs, 15 RSTs, and two RCRIS\_LG sites. Additionally, there were many unplottable sites that are listed in Appendix F. Of particular note are the following unplottable sites: Diamond-Shamrock Martin-Marietta NFRAP site; the Ideal Basic NFRAP site, the Reasor Chemical Company CERCLIS site, the Brunswick County Transfer Station SWF site in Leland, the DuPont SWF site, the Carolina Creosoteing CERCLIS site, the General Wood Preserving CERCLIS site, the National Starch & Chemical Company CERCLIS site, the DuPont EI De Nemours & Company CERCLIS site, three ERNS sites on SR 1426 in Leland, and one ERNS site on Bear Trap Road in Leland.

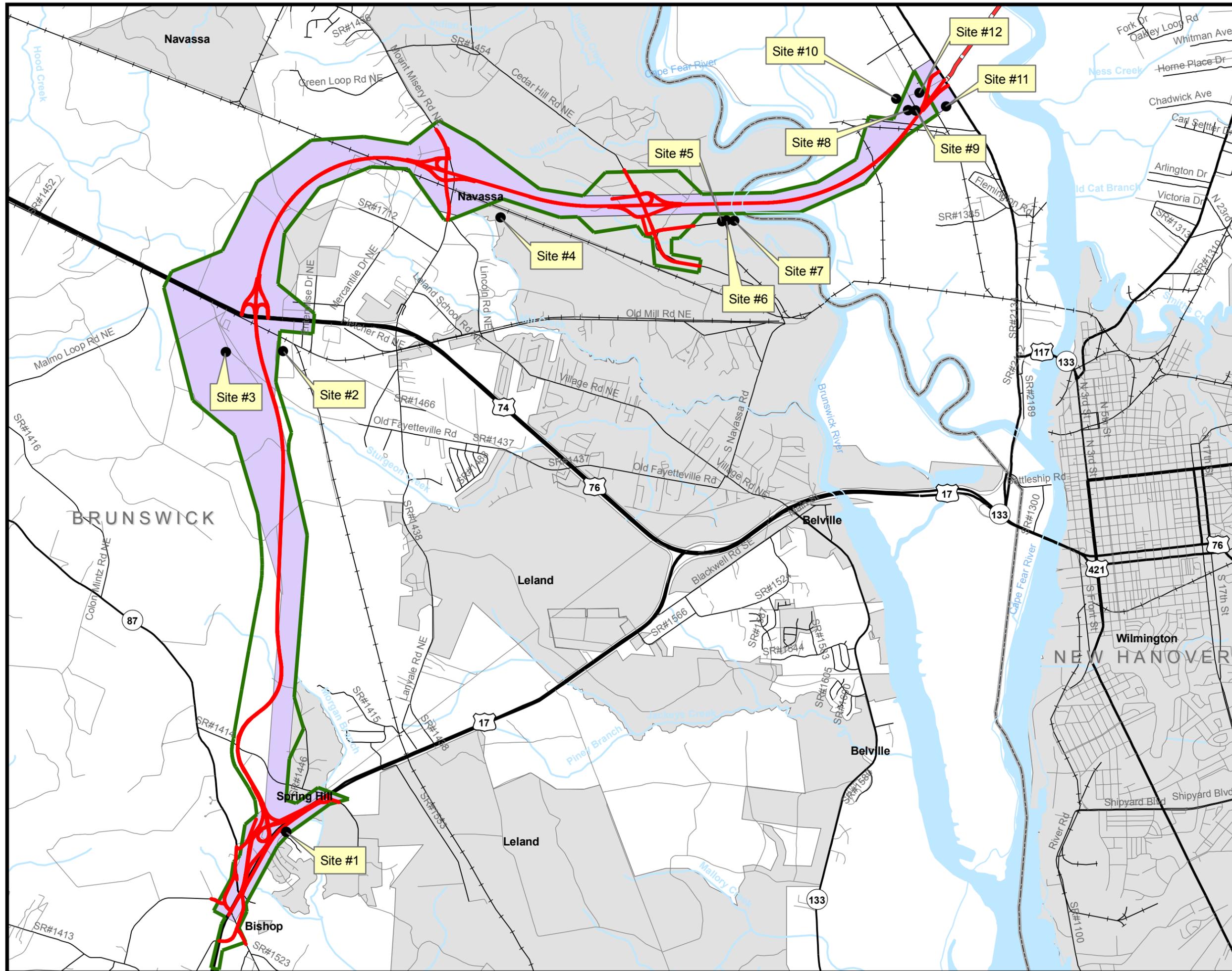
Locations of these unplottable sites were researched for only CERCLIS, SWF, and HWS sites. Locations of all other unplottable sites, consisting largely of registered underground storage tanks from the RST database, were not investigated. No on-site verifications of ERIIS data were made of any plotted or unplotted site listed in the ERIIS reports prior to the publication of the DEIS.

The limited Phase I Site Assessment conducted for the DEIS preferred alternative corridor following the issuance of the DEIS identified twelve sites as having the possibility for UST involvement and/or contamination issues. These sites are summarized in Table 3-15. As shown in the table, several properties are categorized as "RCRA" or "CERCLA". The 1986 amendments to the Resource Conservation and Recovery Act (RCRA) enabled EPA to address environmental problems that could result from UST petroleum and other hazardous substances. RCRA focuses only on active and future facilities and does not address abandoned or historical sites.<sup>132</sup> The Comprehensive Environmental Response, Compensation and Liability Act (CERCLA) provides a Federal "Superfund" to clean up uncontrolled or abandoned hazardous-waste sites as well as accidents, spills, and other emergency releases of pollutants and contaminants into the environment.<sup>133</sup>

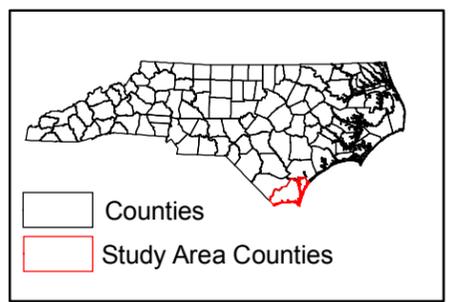
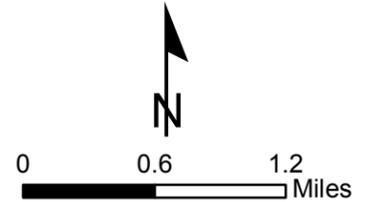
A map showing the approximate location of the identified sites relative to the DEIS preferred alternative corridor (labeled as the R-2633A/B Initial Study Corridor) and the expanded study corridor is included as Figure 3-10. NCDOT memorandums summarizing the findings of the Phase I Site Assessment and references to the technical reports are included in Appendix F.

TIP R-2633A/B  
Wilmington Bypass

Figure 3-10  
HAZMAT Sites with a  
Potential Environmental  
Impact to the Project



- Legend**
- Expanded Study Corridor
  - R-2633 A/B Initial Study Corridor
  - R-2633 A/B Recommended Alignment
  - R-2633 C
  - Interstate Highways
  - US Highways
  - State Highways
  - State Routes
  - Local Roads
  - Railroads
  - Municipal Boundaries
  - County Boundaries
  - Water
  - Streams (non-delineated)
  - Potential Environmental Impact Site



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This map is for reference only.  
Sources: ESRI, CGIA, Brunswick County,  
New Hanover County, NCDOT, USDOT, URS.



It should be emphasized that there may be other sites containing hazardous materials or wastes present within the project area that have not registered with or reported to a state or federal agency. Potential impacts of these sites/incidents are discussed in Section 4.1.2.6.

**Table 3-15: Summary of Sites Identified with Potential to Affect the Project**

SITE NO.	PROPERTY NAME	TYPE	LOCATION
1	Formerly D&J Exxon	UST	8 Sloan Road Leland
2	Carolina Pole (formerly General Wood Preserving)	RCRA/CERCLA	1901 Wood Treatment Road Leland
3	C.T. Specialties (formerly National Starch Company)	RCRA/CERCLA	2271 Andrew Jackson Hwy Leland
4	(Formerly) Carolina Creosote	RCRA/CERCLA	Eastbrook Road Leland
5	Brunswick County Waste Water Treatment Plant	Other	10480 Royster Road Navassa
6	P&W Oil Company, Inc.	Other	10518 Royster Road Leland
7	High Rise Service Company, Inc.	UST RCRA/CERCLA	1690 Northeast Royster Road Leland
8	Old Dominion Freight Line (formerly Fredrickson Motor Express)	UST	3327 Frederickson Road Wilmington
9	Tidewater Transit Company, Inc.	Other	3305 Frederickson Road Wilmington
10	Zambesi Equipment	Other	232 Beval Road Wilmington
11	Precision Cams	Other	211 Beval Road Wilmington
12	Tidewater Holding	Other	201 Beval Road Wilmington

Sources: Memorandum from Eugene Tarascio, GeoEnvironmental Project Manager, Geotechnical Engineering Unit, North Carolina Department of Transportation to Danny W. Gardner, PE, Project Engineer, Roadway Design Unit, North Carolina Department of Transportation. Design/Environmental Conflicts. 5 January 2006.

Memorandum from Eugene Tarascio, GeoEnvironmental Project Manager, Geotechnical Engineering Unit, North Carolina Department of Transportation to Doug Taylor, PE, Project Engineer, Roadway Design Unit, North Carolina Department of Transportation. Design/Environmental Conflicts. 24 October 2005.

### 3.3.7 MINERAL RESOURCES

The project area is underlain by coastal marine limestone formations. The mineral resource potential of the project area is generally low, but sand and crushed limestone are mined in the region.<sup>134</sup>

There are four sandpits located in eastern Brunswick County; however, all but one are located north of the project area. A.D. Royal Pit is located near the US 421 terminus in New Hanover County.<sup>135</sup>

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Sand and crushed limestone are excavated from the Wilmington area outside the project area. The sand and limestone mined in the Wilmington area supply the local construction industry and are also exported to Whiteville, Jacksonville and Camp Lejeune, North Carolina and Myrtle Beach, South Carolina. The reserves of crushed stone and sand in the Wilmington area are sufficient to supply the region into the foreseeable future.<sup>136</sup>

### **3.3.8 FLOODPLAINS/FLOODWAYS**

#### **3.3.8.1 Flood History**

The dominant source of flooding within the expanded study corridor is storm surge generated in the Atlantic Ocean by hurricanes and other severe windstorms. Storm surges are propagated up the Cape Fear River and into its tributaries. These storms occur most frequently during the summer and early fall. In the last few years, the Cape Fear River Basin has been impacted by hurricanes Bertha and Fran (1996), Bonnie (1998), Dennis and Floyd (1999), Isabel (2003) and Ophelia (2005). Fran and Floyd caused the most economic damage and water quality problems.<sup>137</sup>

#### **3.3.8.2 Floodways and Floodplains**

Regulatory floodways and floodplains were identified in accordance with Executive Order 11988 – Floodplain Management. The floodway and floodplain boundaries are denoted on maps prepared by the Federal Emergency Management Agency (FEMA). The Federal Emergency Management Agency's Floodway Boundary and Floodway Map Community-Panel Numbers within the alternative corridors include 370295 0025, 370295 0040, 370295 0045, 370295 0125, 370295 0130, 370168 0020, and 370168 0040.<sup>138</sup>

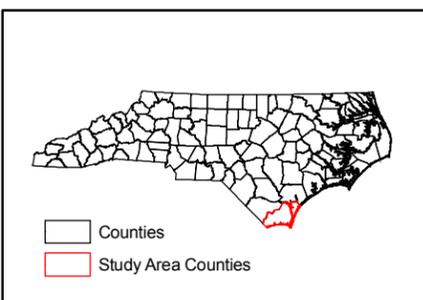
Figure 3-11 shows the floodplain boundaries associated with the surface waters within the project area. Based on FEMA's study, floodways are not applicable for the Cape Fear River, Northeast Cape Fear River, and in downstream reaches of tributaries that are completely dominated by surge.<sup>139</sup>

TIP R-2633 A/B  
Wilmington Bypass

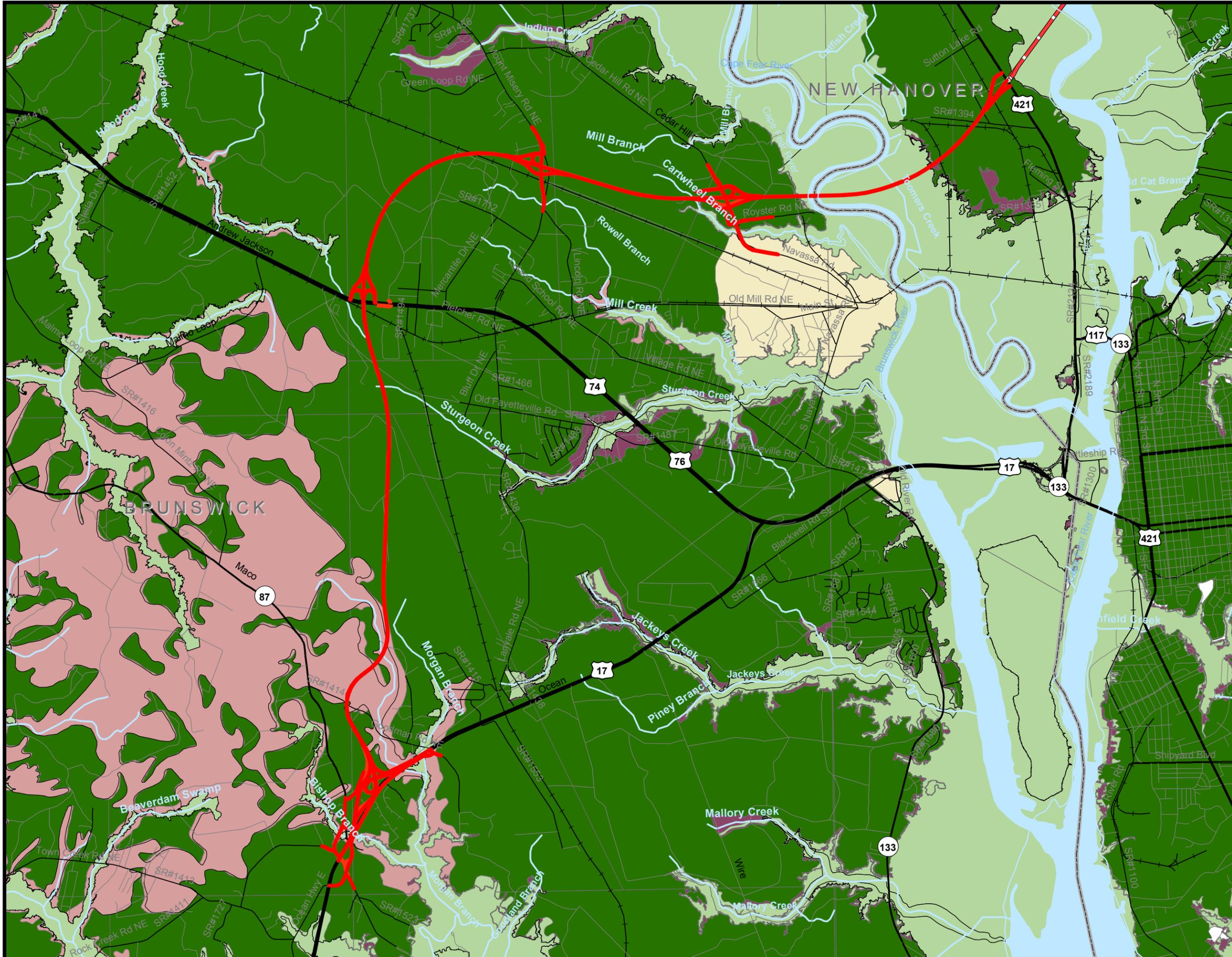
Figure 3-11  
Floodplains

Legend

-  R-2633 A/B Recommended Alignment
-  R-2633 C
-  Interstate Highways
-  US Highways
-  State Highways
-  State Routes
-  Local Roads
-  Railroads
-  County Boundaries
-  Water
-  Streams (non-delineated)
-  Zone A: 100-year floodplains determined by approximate methods
-  Zone AE: 100-year floodplains determined by detailed methods
-  Zone X-500: 500-year floodplains
-  ANI: Areas not included
-  Zone X: Areas outside the 100-year floodplain, areas of 100-year sheet flow flooding where average depths are less than 1 foot, areas of 100-year stream flooding where the contributing drainage area is less than 1 square mile, or areas protected from the 100-year flood by levees



April 2007  
This map is for reference only.  
Sources: ESRI, CGIA, Brunswick County, New Hanover County, NC Floodplain Mapping Program, NCDOT, USDOT, URS.





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### **3.3.9 PROTECTED LANDS**

#### **3.3.9.1 Wild and Scenic Rivers**

Congress adopted the National Wild and Scenic Rivers Act in 1968 (Public Law 90-542; 16 USC 1271) to preserve certain rivers with outstanding natural, cultural, or recreational features in a free-flowing condition. Under this Act, rivers are classified as Wild, Scenic, or Recreational. "Wild" rivers are defined in the Act as rivers free of impoundment, inaccessible except by trail, and having primitive shorelines and unpolluted waters. "Scenic" rivers are similar to "Wild" rivers, except that they are accessible in places by roads. "Recreational" rivers are readily accessible by road or railroad and may have some development along their shorelines. These rivers may have undergone impoundment or diversion in the past.

No rivers or sections of rivers within or near the project area are designated wild, scenic, or recreational under the National Wild and Scenic Rivers Act.

In 1971, North Carolina also passed a Natural and Scenic Rivers Act. There are no rivers or sections of rivers within or near the project area that are designated under the North Carolina Natural and Scenic Rivers Act.

#### **3.3.9.2 State/National Forests**

There are no State or National forests in the expanded study corridor.

#### **3.3.9.3 Game Land and Preservation Areas**

The Sutton Lake Game Land is just outside the project area, on the west side of US 421 (Figure 3-3). This property (approximately 1,585 acres) is owned by Progress Energy. The North Carolina Wildlife Resources Commission (NCWRC) manages the gamelands under an indefinite contract with Progress Energy.

### **3.4 NATURAL ENVIRONMENT CHARACTERISTICS**

Aspects of the existing natural environment in the project area presented in this section are soils and geology; biotic communities and wildlife; water resources; and jurisdictional issues such as wetlands, protected species and essential fish habitat.

#### **3.4.1 SOILS AND GEOLOGY**

##### **3.4.1.1 Soils**

The general soil associations within the project area are defined in Table 3-16 and shown in Figure 3-12. A soil association is defined as a landscape that has a distinctive pattern of soils in defined proportions. It typically consists of one or more major soils and at least one minor soil. The soils within an association can vary in slope, depth, stoniness, drainage, and other characteristics.<sup>140</sup>

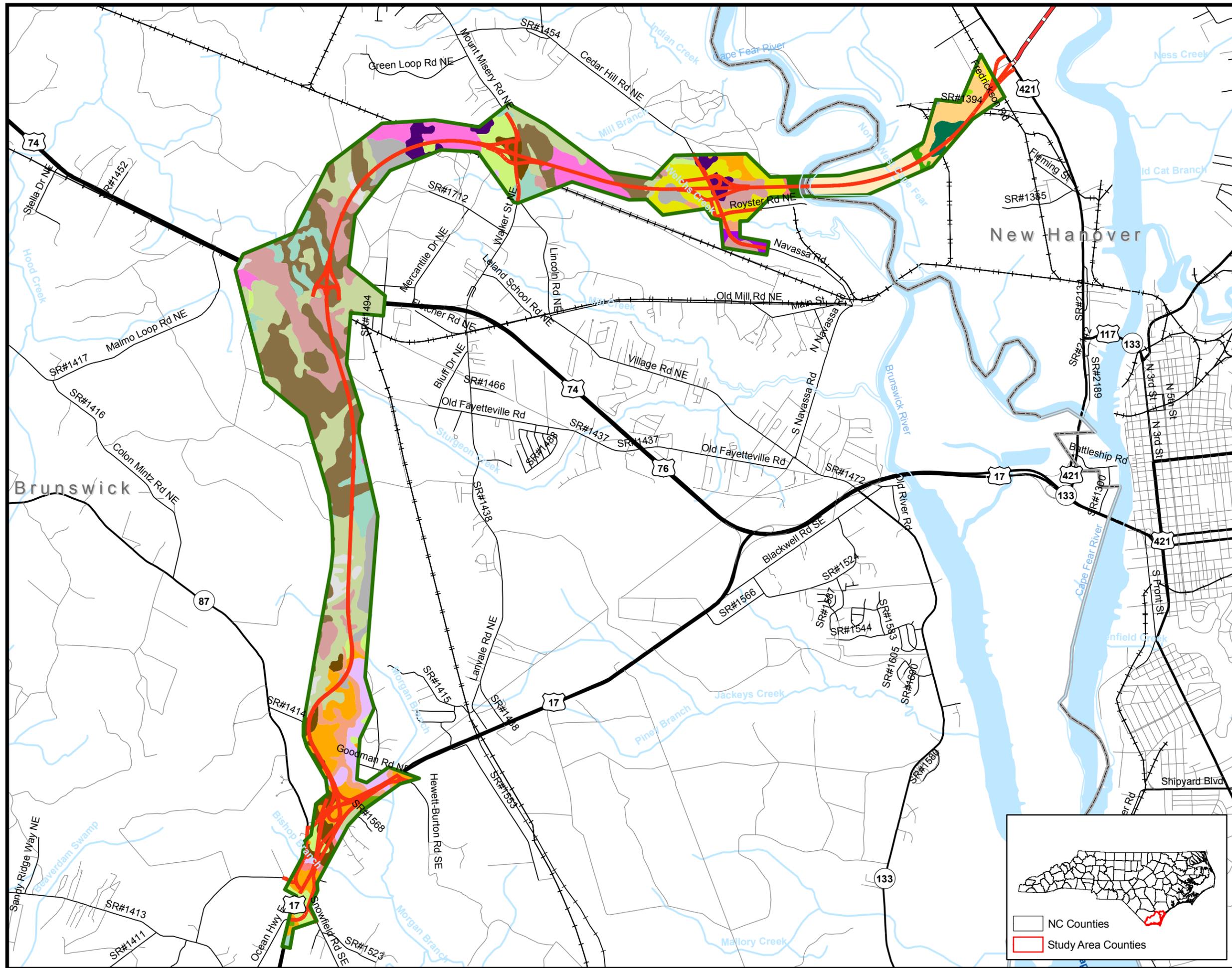
**Table 3-16: Description of General Soil Associations**

SOIL ASSOCIATION*	DESCRIPTION
Leon-Murville-Mandarin	Located within the Leon Series and consists of very poorly drained to somewhat poorly drained soils, sandy subsoils on uplands. The soil is formed in coarse textured sediment. Slopes are less than 1 percent.
Goldsboro-Lynchburg-Rains	Located within the Goldsboro Series and consists of moderately well drained soils to poorly drained soils that have loamy subsoils on uplands. The soil is formed in moderately fine textured sediment. Slopes are 0 to 2 percent.
Torhunta-Croatan-Pantego	Located within the Torhunta Series and consists of very poorly drained soils on uplands and stream terraces. The soil is formed in coarse and medium textured sediment. Slopes are 0 to 2 percent.
Woodington-Foreston	Located within the Woodington Series and consists of poorly and moderately drained soils on uplands. The soil is formed in fine textured sediment. Slopes are less than 1 percent.
Baymeade-Blanton-Norfolk	Located within the Baymeade Series and consists of well-drained and moderately well drained soils on uplands. The soil is formed in moderately coarse textured sediment. Slopes range from 1 to 12 percent.
Muckalee-Dorovan-Chowan	Located within the Muckalee Series and consists of poorly drained soils, sandy or mucky underlying material on low flood plains. The soil is formed in moderately coarse textured recent alluvium. Slopes are 0 to 2 percent.
Dorovan-Johnston	Located within the Dorovan Series and consists of very poorly drained soils that have a muck, loam, or sandy loam surface layer and a muck or sand underlying layer, on low flood plains. The soil is formed in moderately fine textured sediment. Slopes are less than 1 percent.
Kureb-Baymeade-Rimini	Located within the Kureb Series and consists of excessively drained and well drained soils, loamy fine sand subsoil on uplands. The soil is formed in moderately fine textured sediment. Slopes range from 1 to 8 percent.

Source: US Department of Agriculture. Soil Survey of New Hanover County. Prepared by the Natural Resource Conservation Service. April 1977.

US Department of Agriculture. Soil Survey of Brunswick County. Prepared by the Natural Resource Conservation Service. 1986.

Figure 3-12  
Soils in Expanded  
Study Area Corridor



**Legend**

- Expanded Study Corridor
- R-2633 A/B Recommended Alignment
- R-2633 C
- Interstate Highways
- US Highways
- State Highways
- State Routes
- Local Roads
- Railroads
- County Boundaries
- Water
- Streams (Non-delineated)

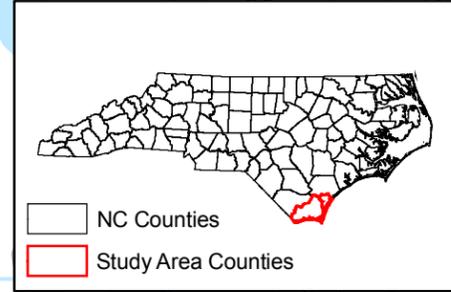
**Brunswick Soil Types**

- BDC - Baymeade
- BaB - Baymeade
- BnB - Blanton
- BrB - Bragg
- CH - Chowan
- Fo - Foreston
- GoA - Goldsboro
- Lo - Leon
- Ly - Lynchburg
- Ma - Mandarin
- Mk - Muckalee
- Mu - Murville
- NoB - Norfolk
- Pn - Pantego
- Pt - Pits
- Ra - Rains
- Tm - Tomahawk
- To - Torhunta
- W

**New Hanover County Soil Types**

- DO - Dorovan
- Kr - Kureb
- La - Lafitte
- Le
- Mu - Murville
- Rm
- Ur - Urban Land

0 0.3 0.6 1.2 Miles





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### **3.4.1.2 Geology**

The oldest sedimentary formation in the project area is the Tuscaloosa Formation of the late Cretaceous Age (about 70-130 million years ago). Where present, the Tuscaloosa is presumed to contain salty water and is not used as an aquifer. Overlying the Tuscaloosa is the Black Creek Formation of the Late Cretaceous age. The Black Creek Formation in the subsurface of Brunswick County consists mainly of clay, but also contains subordinate layers of fine sand and marl.

The Peedee Formation, of the late Cretaceous age, lies conformably on the Black Creek Formation and crops out over several areas in Brunswick County. The PeeDee underlies much of the county north of the coast (roughly north of US 17), where it is covered by thin deposits of Miocene and younger age deposits. There are a few exposures of the Peedee Formation in the banks of the Cape Fear River in Brunswick County, where the formation consists of fine to very fine greenish sand, marl, and silt. The formation is also exposed along the banks of the Waccamaw River near the Town of Freeland, where it occurs as indurated marl.

The Castle Hayne Limestone Formation, of the mid to late Eocene age, lies at or near the surface in the northeastern portion of the project area in Brunswick and New Hanover counties. Generally composed of white to gray shell material and white sand, this formation varies from dense limestone beds to loosely consolidated sand and shell layers. It is generally exposed only in areas along the banks of the Cape Fear River and other deeply incising streams in the eastern portion of the project area.

### **3.4.2 BIOTIC COMMUNITIES AND WILDLIFE**

This section of the FEIS discusses the biotic communities, both terrestrial and aquatic, and their wildlife identified within the expanded study corridor. In addition, this section includes a discussion of North Carolina Natural Heritage Program (NCNHP) Identified Priority Areas (IPAs) that occur within the expanded study corridor. Preliminary information concerning biotic communities and wildlife was presented in detail in the DEIS and subsequent technical memoranda, and is summarized in this FEIS.<sup>141</sup> This report reflects the most current data.

Biotic communities consist of the interdependent groups of plants and animals that live in the same environment. The expanded study corridor falls within the Middle Atlantic Coastal Plain ecoregion of eastern North Carolina. This region primarily spans the Carolinas and areas toward the north, and has a broad transitional boundary with the Southern Coastal Plain ecoregion to the south. The topography of the region is characterized by long flat plains of minimal relief, wide upland surfaces, low rolling slopes, and large areas of poorly drained soils where Carolina bays, pocosins, swamps, and marshes are abundant. Riverine systems support cypress gum swamps and bottomland hardwood forests. Upland areas are populated by a mosaic of pine and hardwood forests. In addition, pine plantations are widespread with an active timber industry; artificial drainage for timber production and agriculture is common. The Middle Atlantic Coastal Plain ecoregion is a significant center of endemic biota, with high biological diversity and occurrence of rare species.<sup>142</sup>

#### **3.4.2.1 Terrestrial Communities and Wildlife**

Terrestrial communities in the expanded study corridor include natural and altered communities. The NCNHP has classified natural communities within North Carolina.<sup>143</sup> Natural communities are relatively undisturbed by human activities, while altered communities are land areas that have been modified through human land use activities.

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## **Terrestrial Communities**

### **Findings Prior to the DEIS**

Prior to the publication of the DEIS, vegetative communities were identified on black and white aerial photographs. Community boundaries were refined and mapped using infrared aerial photographs. Soil surveys, USGS 7.5-minute quadrangle maps, and US Fish and Wildlife Service (USFWS) National Wetland Inventory (NWI) maps were also used in the identification process. Literature reviews were conducted to identify probable species composition of wetland and upland communities potentially occurring within the project area. Field surveys were conducted in several phases by qualified biologists. The first field investigation took place from July 11 through July 15, 1991. During this time, biotic communities existing within the proposed alternative corridors were identified. The corridors were inspected where access was available, and roadside surveys were performed for most areas. Site specific transects to identify vegetative species were conducted within twenty sites. The second field investigation was conducted from August 17 through August 24, 1993. This field survey included review of new areas within the proposed alignments occurring due to corridor shifts.

The estimated acreage of existing biotic communities within the 300-foot proposed right of way for each of the DEIS alternatives, as reported in the DEIS and based on the described methods, is listed in Table 3-17. Acreage was measured based on the functional design drawings available at the time. Descriptions of the communities listed in Table 3-17 are provided in Appendix G.

### **Findings Following the DEIS**

Following the publication of the DEIS, terrestrial community data presented in the DEIS were revised to reflect more detailed data collection methods and survey data. Concurrent with wetland and stream delineations and other natural resource survey tasks, natural communities of the expanded study corridor were identified using categories described in the Classification of the Natural Communities of North Carolina.<sup>144</sup> Where applicable, vegetative community designations described in the DEIS were modified to reflect variations within the expanded study corridor. Prior to field surveys, photographic interpretation of aerial photography depicting the expanded study corridor was conducted. Altered communities were identified as land cover types that are routinely impacted by human activities (e.g., development or agriculture). Land cover polygons were digitized over aerial photography with computer assisted drafting software (Microstation), and geographic information systems (GIS). The land cover polygons were field verified and compared to multiple vector land cover data layers for accuracy, including the USGS 7.5-minute Winnabow, Leland and Castle Hayne topographic quadrangle maps, the North Carolina Center for Geographic Information Analysis (CGIA) land cover data, USFWS NWI data, US Department of Agriculture Natural Resources Conservation Service (USDA NRCS) Soil Survey mapping of Brunswick and New Hanover counties and North Carolina Division of Coastal Management (DCM) wetlands data.<sup>145</sup> Vegetative communities identified within the expanded study corridor are described in the remainder of this section.

**Table 3-17: Inventory of Biotic Communities Conducted for the DEIS Alternative Alignments**

SYSTEM TYPE	INVENTORY DESIGNATION	ACRES PER ALIGNMENT**			
		ALT. 2	ALT. 3	ALT. 8	ALT. 9
Man-Dominated	Utilities	2	1	*	2
	Residential	7	9	9	7
	Transportation	32	22	31	29
	Agriculture	16	22	25	24
	Commercial/ Industrial	36	44	52	52
	Cleared Land	1	1	*	1
	SUBTOTAL	94	99	117	115
	PERCENT OF TOTAL	16%	16%	20%	20%
Natural Systems - Uplands	Mesic Pine Forest	115	136	97	90
	Mixed Hardwood	72	69	78	74
	Pine/Scrub Oak Sandhill	21	21	39	39
	Pine Plantation	69	35	29	42
	Pine Sapling	0	0	24	23
	SUBTOTAL	277	261	267	268
	PERCENT OF TOTAL	46%	44%	45%	46%
Natural Systems - Wetlands	Bottomland Hardwoods	44	35	14	14
	Wet Pine Flats	123	136	125	128
	Small Stream Swamps	15	19	16	20
	Swamp Forest	12	14	14	12
	Scrub/Shrub	20	24	24	20
	SUBTOTAL	214	228	193	194
	PERCENT OF TOTAL	37%	39%	33%	33%
	Open Water	3	4	4	3
	SUBTOTAL	3	4	4	3
	PERCENT OF TOTAL	0.5%	1%	1%	0.5%

Note: \*\*Based on a 300-foot wide proposed right-of-way.

\*Impact measures less than 1 acre. Value is not included in the subtotals or percentages.

### *Natural Communities*

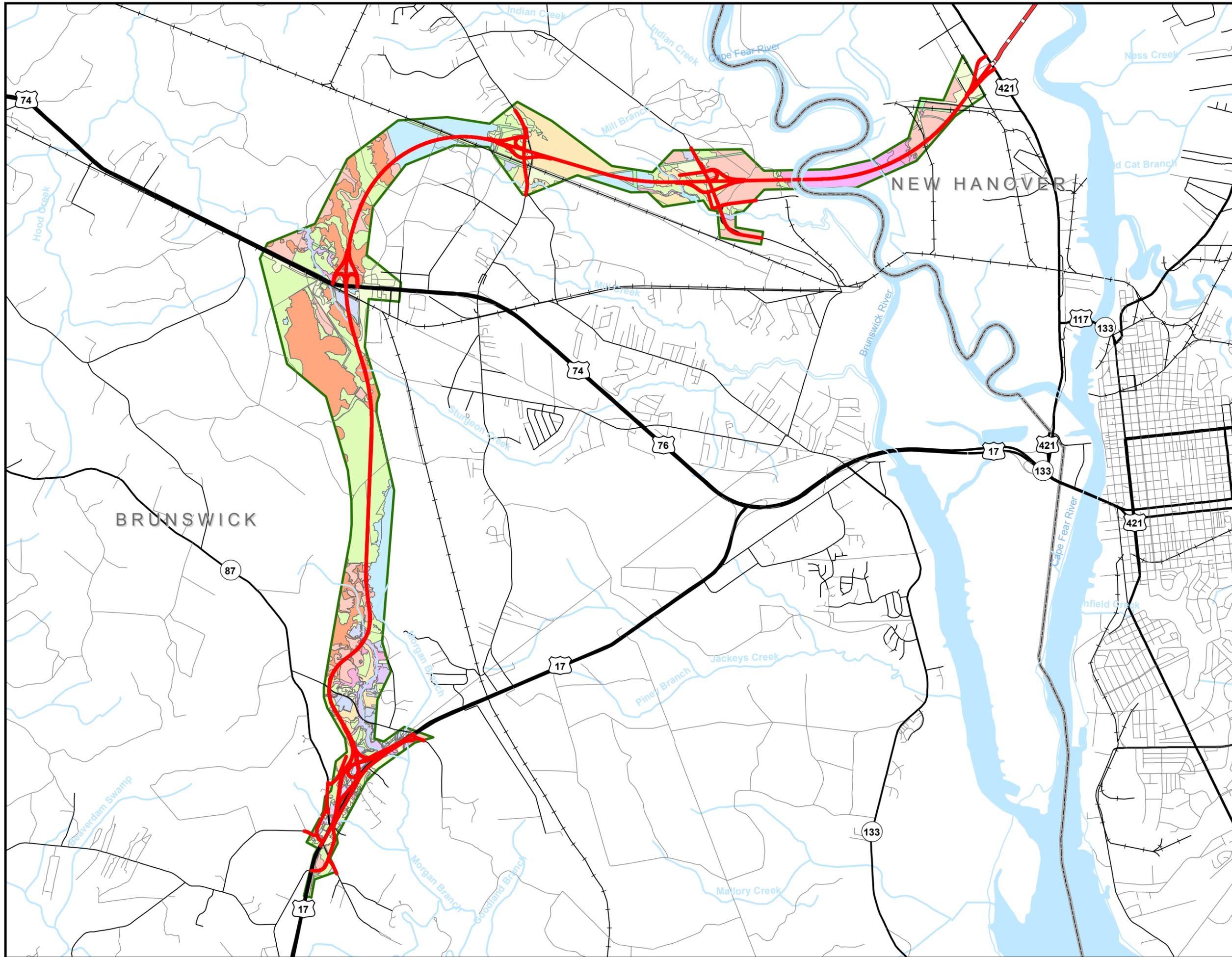
Eleven natural communities were identified within the expanded study corridor: Mesic Pine Flatwoods, Pine/Scrub Oak Sandhills, Mesic Mixed Hardwood Forests, Coastal Plain Semi-permanent Impoundment, Wet Pine Flatwoods, Tidal Freshwater Marsh, Tidal Cypress Gum Swamp/Cypress Gum Swamp, Coastal Plain Bottomland Hardwoods, Small Stream Swamp, Open Water, and Pocosin/Streamhead Pocosin.<sup>146</sup> Figure 3-13 depicts the locations of the natural communities mapped within the expanded study corridor, and Table 3-18 presents the acreage of each of the natural community types. Descriptions of the natural communities identified within the expanded study corridor are provided in this subsection.

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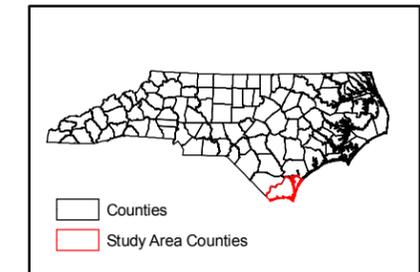
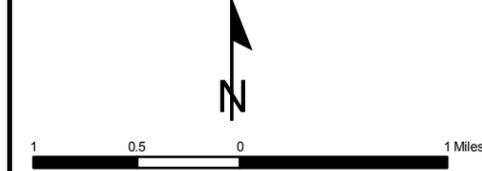
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TIP R-2633 A/B  
Wilmington Bypass

Figure 3-13  
Terrestrial Communities



- Legend**
- ▬ Expanded Study Corridor
  - ▬ R-2633 A/B Recommended Alignment
  - ▬ R-2633 C
  - ▬ Interstate Highways
  - ▬ US Highways
  - ▬ State Highways
  - ▬ State Routes
  - ▬ Local Roads
  - ▬ Railroads
  - ▬ County Boundaries
  - ▬ Water
  - ▬ Streams (non-delineated)
- Natural Communities**
- ▬ Mesic Pine Flatwoods
  - ▬ Pine/Scrub Oak Sandhills
  - ▬ Mesic Mixed Hardwood Forests
  - ▬ Wet Pine Flatwoods
  - ▬ Tidal Freshwater Marsh
  - ▬ Cypress Gum Swamp/ Tidal Cypress Gum Swamp
  - ▬ Coastal Plain Bottomland Hardwoods
  - ▬ Coastal Plain Semipermanent Impoundment
  - ▬ Small Stream Swamp
  - ▬ Pocosin/Streamhead Pocosin
  - ▬ Open Water
- Altered Communities**
- ▬ Urban/Disturbed
  - ▬ Agricultural Land
  - ▬ Maintained Utility Right-of-Way



April 2007  
This map is for reference only.  
Sources: ESRI, CGIA, Brunswick County, New Hanover County, NCDOT, USDOT, URS.



**Table 3-18: Terrestrial Communities within the Expanded Study Corridor**

COMMUNITY TYPE	QUANTITIY IN EXPANDED STUDY CORRIDOR (ACRES)
NATURAL COMMUNITIES (total)	3,442
Mesic Pine Flatwoods	1,075
Pine/Scrub Oak Sandhills	531
Mesic Mixed Hardwood Forests	351
Wet Pine Flatwoods	659
Tidal Freshwater Marsh	87
Tidal Cypress Gum Swamp/ Cypress Gum Swamp	27
Coastal Plain Bottomland Hardwood	78
Coastal Plain Semi-permanent Impoundment	6
Small Stream Swamp	62
Pocosin/Streamhead Pocosin	546
Open Water	20
ALTERED COMMUNITIES (total)	575
Urban/Disturbed	461
Agricultural Land	92
Maintained Utility Right-of-Way	22
TOTAL COMMUNITIES	4,017

Addendum to Natural Systems Technical Memorandum, Wilmington Bypass, US 17 to US 421, Brunswick and New Hanover Counties, North Carolina, Federal Aid Project No. STPNHF-17, State Project No 8.U250901, TIP No R-2633A/B. 2004

### Mesic Pine Flatwoods

Mesic Pine Flatwoods have a mesic to dry-mesic moisture regime (i.e., these communities are typically not found in areas with either excessively drained soils or a significant seasonal high water table). This community generally is found on flat or rolling coastal plain sediments. Within the expanded study corridor this community was typically identified on sloping grades above streams and bottomlands. Longleaf pine (*Pinus palustris*) or loblolly pine (*P. taeda*) typically comprised the open to mostly closed canopy. The scrub oak understory was typically more diverse than the other upland community types, and included southern red oak (*Quercus falcata*), water oak (*Q. nigra*), post oak (*Q. stellata*), blackjack oak (*Q. marilandica*), and bluejack oak (*Q. incana*). Sand hickory (*Carya pallida*), red maple (*Acer rubrum*), sweet gum (*Liquidamber styraciflua*), inkberry (*Ilex glabra*), red bay (*Persea palustris*), Piedmont staggerbush (*Lyonia mariana*), and giant cane (*Arundinaria gigantea*) were also observed in the understory during the field surveys. The herb layer density varied depending on canopy closure and fern species were abundant. These areas include pine plantations in rotation at various age levels. Loblolly pine was the typical crop species.

### Pine/Scrub Oak Sandhills

The Pine/Scrub Oak Sandhill communities were identified on well to excessively drained soils. The more xeric communities were typically found on higher uplands while more mesic communities were found on slopes. Both communities usually had an open canopy of longleaf pine and open to dense understory dominated by scrub oaks. The oak species understory was typically dominated by turkey oak (*Quercus laevis*) with some sand post oak (*Q. margaretta*) found in smaller numbers. Occasionally, sassafras (*Sassafras albidum*) and persimmon (*Diospyros virginiana*) were also found in the understory. Flowering dogwood (*Cornus florida*) and sassafras were also noted in the understory during field surveys. The shrub layers were

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typically thin to sparse in unburned areas to almost absent in frequently burned areas. Dwarf huckleberry (*Gaylussacia dumosa*), deerberry (*Vaccinium stamineum*), sparkleberry (*Vaccinium arboretum*) and poison oak (*Toxicodendron pubescens*) were common shrub species noted during field surveys. Wiregrass (*Aristida stricta*) and bracken fern (*Pteridium aquilinum*) dominated the herb layer. Tick trefoil (*Desmodium* spp.), wild indigo (*Baptisia cinerea*) and trailing arbutus (*Epigaea repens*) were also noted in the herb layer of these communities during field surveys.

### Mesic Mixed Hardwood Forests: Coastal Plain Subtype

The Mixed Hardwood Forests identified within the expanded study corridor were found on a variety of acidic upland soils along low ridges, upland flats, and other dry-mesic upland areas. These communities were dominated by white oak (*Q. alba*), northern red oak (*Q. rubra*), black oak (*Q. velutina*), mockernut hickory (*C. alba*), red hickory (*C. ovalis*), and pignut hickory (*C. glabra*). Pines (*Pinus* spp.), sweetgum, red maple, and tulip poplar (*Liriodendron tulipifera*) were also common, particularly in disturbed areas. Understory species included red maple, flowering dogwood, sourwood (*Oxydendrum arboreum*), American holly (*Ilex opaca*), and black gum (*Nyssa sylvatica*). Shrubs included downy arrow wood (*Viburnum rafinesquianum*), deerberry, lowbush blueberry (*V. vacillans*), and American strawberrybush (*Euonymus americana*). Muscadine grape (*Vitis rotundifolia*) and poison ivy (*Toxicodendron radicans*) were often present in the vine layer. Herbs were fairly sparse, with heartleaf (*Hexastylis* spp.), downy rattlesnake orchid (*Goodyera pubescens*), pipsissewa (*Chimaphila maculata*), woodland tick-trefoil (*Desmodium nudiflorum*), and rattlesnake hawkweed (*Hieracium venosum*) common.

### Wet Pine Flatwoods

Wet pine flatwoods are rated S3 (habitat very rare or local in the state, or found only in a restricted area) by the NCNHP. This plant community is seasonally saturated to the surface and is generally found on flat coastal plain sediments. During field surveys, the upper canopy varied from relatively open to tightly closed and usually consisted of longleaf pine, loblolly pine, or pond pine (*Pinus serotina*). The understory, where present, contained hardwood saplings and shrub species including red maple, sweetgum, inkberry, blue huckleberry (*Gaylussacia frondosa*), dwarf huckleberry, Carolina kalmia (*Kalmia carolina*), red bay, and Piedmont staggerbush. In some areas creeping blueberry (*Vaccinium crassifolium*) formed dense mats, and giant cane occurred in dense patches. This community generally graded upslope to Mesic Pine Flatwoods and laterally to bottomland hardwood communities.

### Tidal Freshwater Marsh

This community is found along the margins of estuaries, or drowned rivers and creeks that are regularly or irregularly flooded with freshwater. These tidally influenced marshes have little or no salinity in the water (0.5 ppt or less). Within the expanded study corridor, this community was identified on the margins of the Cape Fear River. Freshwater species dominated these marshes with a minor brackish species component. Typical species included wild rice (*Zizania aquatica*), cattail, bulrush, pickerelweed, arrowhead, and other emergent aquatic species. Wax myrtle, titi (*Cyrilla racemiflora*), fetterbush (*Lyonia lucida*), and tag alder (*Alnus serrulata*) formed the shrub layer. The tidal freshwater marshes within the expanded study corridor graded shoreward to cypress gum swamps, bottomland hardwoods, and upland communities. Shrubs were typically scattered near the water's edge but became very dense through the gradient to the tidal Cypress Gum Swamp community.

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## Tidal Cypress Gum Swamp / Cypress Gum Swamp

This tidally influenced community is generally found on the margins of sounds and mouths of rivers with freshwater tides. In the expanded study corridor, this community type was observed most distinctly on the west bank and to the landward side of the Tidal Freshwater Marsh community on the east side of the Cape Fear River. Bald cypress (*Taxodium distichum*), swamp-tupelo (*Nyssa sylvatica* var. *biflora*), and water tupelo (*N. aquatica*) dominated the canopy layer. Occasionally loblolly pine and red maple were present in the canopy. Understory species included hardwood species such as Carolina ash (*Fraxinus caroliniana*), red maple, swamp-tupelo, and red bay. The shrub layer varied from open to rather dense with wax myrtle, titi, highbush blueberry (*Vaccinium corymbosum*). Dwarf palmetto (*Sabal minor*) and giant cane formed dense thickets on higher ground. The herb layer was usually sparse in these communities and predominantly composed of emergent aquatic plants.

The Cypress Gum Swamp community is found in the lower reaches of coastal rivers and grades into Tidal Cypress Gum Swamp communities. In the expanded study corridor, this community was most notable on the eastern side of the tidal Cypress Gum Swamp wetland communities bordering the Cape Fear River. The boundary between the two communities falls at the point where tidally-controlled flooding overrides river flooding or groundwater sources as the significant factor in the environment. The vegetative indicators of this boundary are not distinct, since floral composition was similar to the Tidal Cypress Gum Swamp communities. However, swamp-tupelo appeared to make up a larger portion of the canopy.

## Coastal Plain Bottomland Hardwoods

This community is usually located on or near abandoned or relict natural levee deposits, point bar ridges, and other parts of the floodplain adjacent to the channel. Within the expanded study corridor, the canopy of this community was dominated by laurel oak (*Q. laurifolia*), overcup oak (*Q. lyrata*), willow oak (*Q. phellos*), water oak (*Q. nigra*), red maple, loblolly pine, and sweet gum. The understory included saplings of canopy species, red bay, American holly, and sweetbay magnolia (*Magnolia virginiana*). The shrub layer was often very dense, and included wax myrtle, titi, sweet pepperbush (*Clethra alnifolia*), and Virginia sweetspire (*Itea virginica*). Giant cane was locally dominant in dense patches. The herb layer was fairly sparse, and was generally dominated by ferns, such as netted chain fern (*Woodwardia aerolata*) and sensitive fern (*Onclea sensibilis*).

## Coastal Plain Semi-permanent Impoundment

These ponded communities are impounded either through human or beaver activity and have naturalized forming vegetative assemblages suited to permanently inundated conditions. Herbaceous species identified in this community included cattail (*Typha* spp.), bulrush (*Scirpus* spp.), pickerelweed (*Pontederia cordata*), arrowhead (*Sagittaria lancifolia*), and other emergent aquatic species. Shrubby growth dominated the banks with wax myrtle (*Myrica cerifera*), tag alder (*Alnus serrulata*), and red maple comprising the dominant species.

## Small Stream Swamp

This community is found on floodplains of small streams that experience frequent flooding. Within the expanded study corridor, floristic differences between the Cypress Gum Swamp and small stream swamp communities were minimal. The primary distinguishing characteristics appeared to be the frequency and duration of inundation, and the topographic position where the small stream swamp community occupied a higher position in the landscape relative to the active channel. The canopy of this community was dominated by bald cypress, swamp-tupelo, red maple, and sweet gum. The understory contained saplings of the canopy species, red bay,

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Virginia sweetspire, wax myrtle, and titi. Dwarf palmetto or giant cane formed dense thickets on higher spots.

### Pocosin / Streamhead Pocosin

Pocosin communities identified within the expanded study corridor include Streamhead Pocosins and High Pocosins. The primary distinction between Low and High Pocosin communities, as described in Schafale and Weakley, is the height of the shrub canopy. In the Low Pocosin, the shrub height is described as less than 1.5 meters tall while the High Pocosin shrub canopy achieves a maximum height of between 1.5 and 3 meters. Schafale and Weakley describe similar floristic composition for both communities.<sup>147</sup> These communities were not distinguishable from one another in the field and for the purposes of this FEIS are combined under the designation Pocosin. The Pocosin communities observed in the field contained upper canopies consisting of scattered pond pines and loblolly bays (*Gordonia lasianthus*). The shrub layer was very dense throughout, and included doghobble (*Leucothoe racemosa*), inkberry, red bay, sweet pepperbush, and titi. Laurel-leaf catbrier was also present throughout these systems, and, in places formed impenetrable thickets.

Streamhead Pocosin communities were identified throughout the expanded study corridor. This community is found in headwaters of small streams in sandhill areas, on flat bottoms, and sometimes extending up adjacent seepage slopes. During the field surveys, this wetland community was generally found situated in ridge swales in saturated organic soils, and appeared to provide the primary hydrologic source water to the majority of the streams within the expanded study corridor. The canopy consisted primarily of loblolly pine, pond pine, loblolly bay, red maple, tulip poplar, sweet gum, black gum, and sweetbay magnolia. The shrub layer was very dense throughout, and included doghobble, inkberry, red bay, sweet pepperbush, and titi. Laurel-leaf catbrier was present throughout these systems in very dense stands. Two ferns, cinnamon fern (*Osmunda cinnamomea*) and Virginia chainfern (*Woodwardia areolata*), were common in the herb layer. This natural community type generally graded upslope to hardwood communities. The transition between this wetland community and the adjacent upland communities was fairly distinct. Although floristically very similar, Streamhead Pocosin communities have a more closed and higher canopy that Pocosin communities lack. Also, Streamhead Pocosin communities are positioned between slopes or in depressional areas such that surface water input is possible. High and Low Pocosin communities are positioned on high ground and receive surface or groundwater flow.<sup>148</sup>

### Open Water

This category includes all areas of surface water with no, or minimal, emerged vegetation. Water bodies that include floating and submerged aquatic plants are included in this category.

### *Altered Communities*

Three altered communities were identified within the expanded study corridor: Urban Land/Disturbed, Agricultural Land, and Utility Right-of-way. Figure 3-13 depicts the locations of the altered communities mapped within the expanded study corridor, and Table 3-18 presents the acreage of each the altered community types. Descriptions of the altered communities are provided below.

### Urban Land/Disturbed

This altered community type comprises areas of intensive use where much of the land is covered by impervious surfaces, including roads, residences, and commercial structures.

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Plants located within these areas are generally maintained cultivated grasses and ornamental plantings of shrubs or trees.

### Agricultural Land

Agricultural land may be broadly defined as land used primarily for production of farm commodities. It includes land that is used for row crops, grain and forage crops, pasture land, and idle fields in rotation to cultivated crops or pasture. Also included in this category are land and buildings used for the raising of livestock and poultry and other animal operations.

### Maintained Utility Right-of-Way

This altered community type describes the upland portions of utility corridors. The flora composition of this community included dog fennel (*Anthemis* sp.), common ragweed (*Ambrosia* sp.), lespedeza (*Lespedeza* sp.), little bluestem (*Scizachyrium scoparium*), wiregrass, giant cane, and other early successional herbaceous species which, tended to be dominant over woody plant growth. Shrub species present included eastern red cedar (*Juniperus virginiana*), sweetgum, red maple, and other species that are tolerant of frequent mowing and other disturbance.

### **Terrestrial Wildlife**

Within the expanded study corridor, wildlife species were identified during field surveys through both direct observation and secondary indicators such as tracks, scat, burrows, nests, and road kills. In addition, NCDOT biological staff consulted with representatives from USFWS, the North Carolina Wildlife Resources Commission (NCWRC), and the North Carolina Division of Marine Fisheries (DMF), concerning wildlife and habitat within the expanded study corridor. Local residents who hunt regularly also contributed information concerning wildlife species. Prior to field investigation an in addition to the above sources, wildlife species that could be found within and around the project area were identified through review of supporting literature.<sup>149</sup>

Contiguous tracts of forested natural plant communities punctuated by riparian zones occur in large blocks throughout the expanded study corridor. These non-fragmented areas provide habitat for wildlife species sensitive to human disturbance. Edge habitats are prevalent throughout the expanded study corridor due to the patchy nature of the land cover/land use patterns within the landscape. Edge habitats are often used by wildlife species as travel corridors. In addition, pocosins and riparian zones are particularly important to wildlife movement because they offer a combination of food and cover extending through more open or disturbed upland areas. Most wildlife observations were noted in these habitats during the field surveys.

Mammalian species observed during field surveys included black bear (*Ursus americanus*), bobcat (*Felis rufus*), gray fox (*Urocyon cinereoargenteus*), red fox (*Vulpes vulpes*), raccoon (*Procyon lotor*), beaver (*Castor canadensis*), whitetail deer (*Odocoileus virginianus*), and gray squirrel (*Sciurus carolinensis*). Local residents who regularly hunt lands within the expanded study corridor indicated that wild turkey (*Meleagris gallopavo*), bobwhite quail (*Colinus virginianus*), and fox squirrel (*Sciurus niger*) populations are present as well. Amphibian species observed included pickerel frog (*Rana palustris*), green frog (*R. clamitans*), southern chorus frog (*Pseudacris nigrita*), and slimy salamander (*Plethodon glutinosus*). Carolina anole (*Anole carolinensis*), eastern box turtle (*Terrapene carolina*), copperhead snake (*Agkistrodon contortrix*), cottonmouth snake (*A. piscivorous*), black rat snake (*Elaphe obsoleta*), were reptile species observed during field surveys. Common passerine bird species of the coastal plain of North Carolina were also observed, including northern cardinal (*Cardinalis cardinalis*), eastern phoebe (*Sayornis phoebe*), brown creeper (*Certhia americana*), Carolina wren (*Thryothorus*

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*ludovicianus*), song sparrow (*Melospiza melodia*), and eastern towhee (*Pipilo erythrophthalmus*). Several raptors, including barn owl (*Tyto alba*), fish crow (*Corvus ossifragus*), osprey (*Pandion haliaetus*) and red-tailed hawk (*Buteo jamaicensis*), were also observed.

### **3.4.2.2 Aquatic Communities and Wildlife**

Aquatic communities in the expanded study corridor include the Cape Fear River, several of its tributaries, and ponds. The Cape Fear River Basin provides habitat for a variety of fish species commonly found in large, warm water rivers and streams. With the exception of the Cape Fear River, surface waters in the expanded study corridor are of small size and are not considered significant recreational fishing waters.

Aquatic community data were developed for the expanded study corridor. Prior to field surveys, photographic interpretation of aerial photography depicting the expanded study corridor was conducted. In addition, multiple vector land cover data layers were reviewed, including Winnabow, Leland, and Castle Hayne USGS 7.5-minute topographic quadrangle maps, CGIA land cover data, NWI data, USDA NRCS Soil Survey mapping of Brunswick and New Hanover counties, and DCM wetlands data.<sup>150</sup>

Data pertaining to commercial, game, and non-game fish species occurring in New Hanover County and Brunswick County waters were obtained from the National Oceanic and Atmospheric Administration - National Marine Fisheries Service (NOAA NMFS), NCWRC, and NCDMF. In addition, identified aquatic and fish species were noted during field surveys. Local residents who fish regularly also contributed information concerning fish species. Pertinent scientific literature was also reviewed during this process.<sup>151</sup>

### **The Cape Fear River**

The expanded study corridor includes a segment of the lower Cape Fear River that is located approximately 25 miles upstream from its confluence with the Atlantic Ocean. Waters within this portion of the river are freshwater- tidally influenced. The river within the defined channel (not including the floodplain) is approximately 400 feet wide within the expanded study area. The expanded study corridor intersects the river at the apex of a meander bend and the floodplain to the inside of that bend is occupied by freshwater marsh habitat grading to Cypress Gum Swamps. The navigable channel depth of the Cape Fear River in the vicinity of the expanded study corridor is maintained by the USACE to be no less than 12 feet; however, the actual channel depth exceeds 12 feet in locations within the expanded study area. The Cape Fear River supports an active recreational fresh and salt-water fishery. Many of the target species of recreational fish are also targeted by commercial fishermen, including striped mullet (*Mugil cephalus*), channel catfish (*Ictalurus punctatus*), bullhead catfish (*Ameiurus nebulosus*), flounder (*Paralichthys spp.*), and striped bass (*Morone saxatilis*).

### **Stream Communities**

All of the streams identified within the expanded study corridor are tributaries to the Cape Fear River. During the field investigations conducted following the issuance of the DEIS, the streams were classified as perennial, intermittent, or ephemeral following NCDWQ Stream Classification.<sup>152</sup> Figure 3-14, A, B, and C, depict the locations of these waters identified within the expanded study corridor. Table 3-19 presents the NCDWQ stream classifications for each of these streams. In the DEIS, surface waters were described as draining into the Cape Fear River through the tributary systems of Town Creek, Hood Creek, Mill Creek, Indian Creek, and Toomers Creek. Revisions to the preferred alternative have shifted the alignment such that several tributaries to the Cape Fear listed in the DEIS as receiving surface flow from the project

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area are no longer predicted to fall within the impact area. The streams are Indian Creek, Mulberry Branch, Otter Branch, and Clabber Branch; and are not included in Table 3-19.

Energy inputs to stream communities are derived from allochthonous (produced outside of stream ecosystem) sources, in the form of terrestrial detritus. Rock, fallen debris (logs, sticks, etc.) and low velocity areas in the stream trap or retain detritus within the stream. The detritus is then decomposed by heterotrophic microorganisms, such as bacteria, and consumed by macroinvertebrates, such as aquatic insects and snails. Decomposers and primary consumers are, in turn, consumed by larger organisms. The amount of allochthonous energy input within a stream varies seasonally.

Aquatic invertebrates are a major component of stream ecosystems, as primary and secondary consumers, and as prey items for organisms higher in the food chain. Substrate elements (e.g. cobbles, leaves, sticks, etc.) were inspected for evidence of invertebrates. Craneflies (family Tipulidae), crayfish (family Cambaridae), and tadpoles were observed in many stream channels. Mosquitofish (*Gambusia* sp.) were noted in most streams during surveys. Individuals of a freshwater mussel species identified as an eastern elliptio (*Elliptio complanata*) were found in the main channels of Bishop Branch and an unnamed tributary (UT) to Morgan Branch. Dragonflies (order Odonata), mosquitoes (family Culicidae) and black flies (order Diptera), as well as snails (class Gastropoda), whirligig beetles (order Coleoptera), and water striders (order Hemiptera) were also common in the perennial waterbodies.

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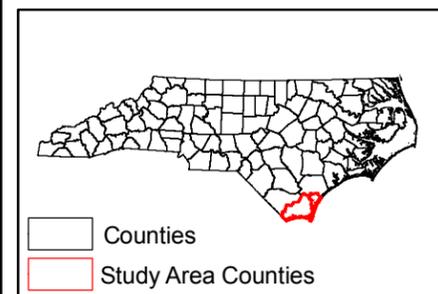
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TIP R-2633 A/B  
Wilmington Bypass

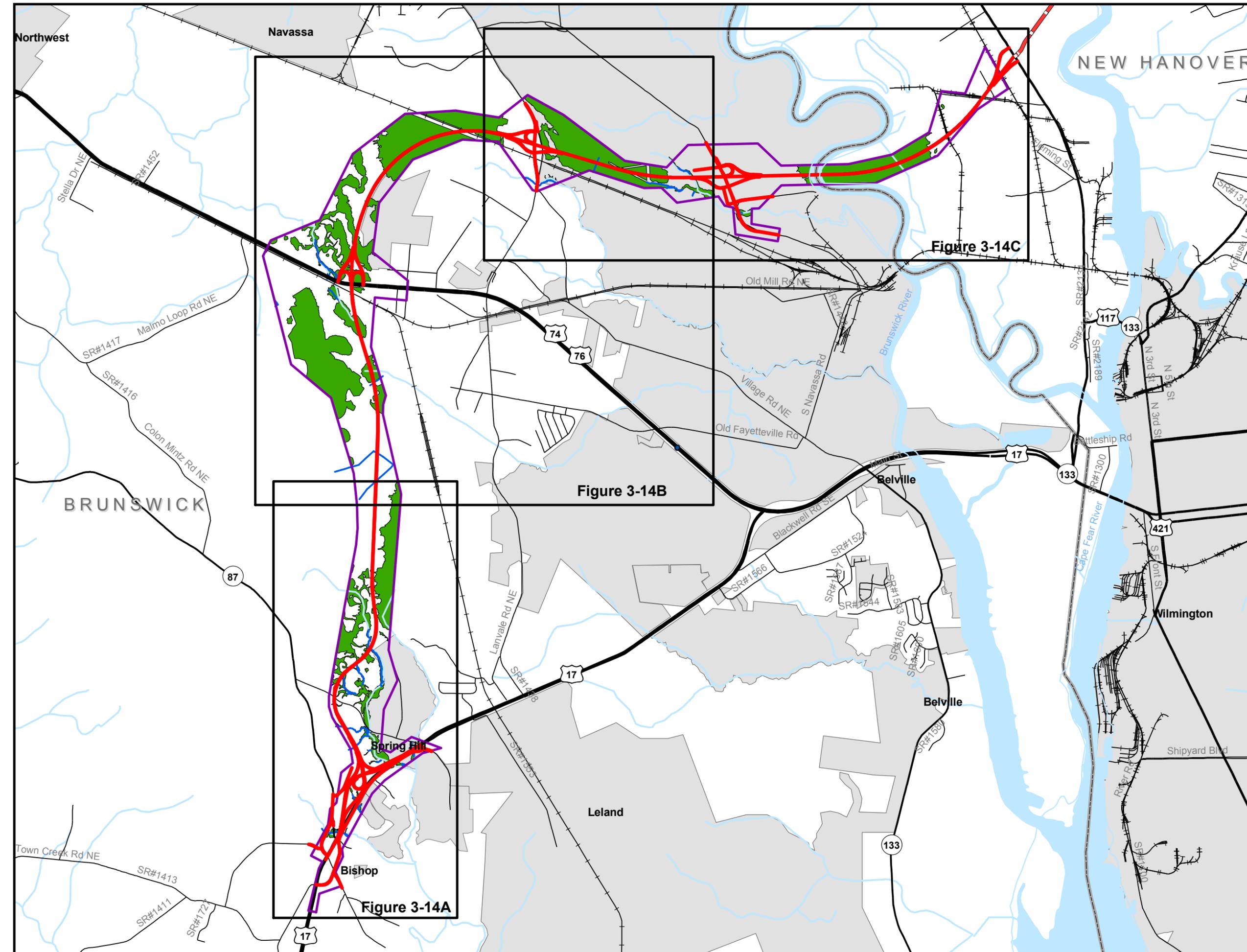
Figure 3-14  
Key Map for  
USACE Jurisdictional  
Streams and Wetlands

Legend

-  Expanded Study Corridor
-  R-2633 A/B Recommended Alignment
-  R-2633 C
-  Interstate Highways
-  US Highways
-  State Highways
-  State Routes
-  Railroads
-  Municipal Boundaries
-  Jurisdictional Delineated Streams
-  County Boundaries
-  Water
-  Streams (non-delineated)
-  Jurisdictional Delineated Wetlands



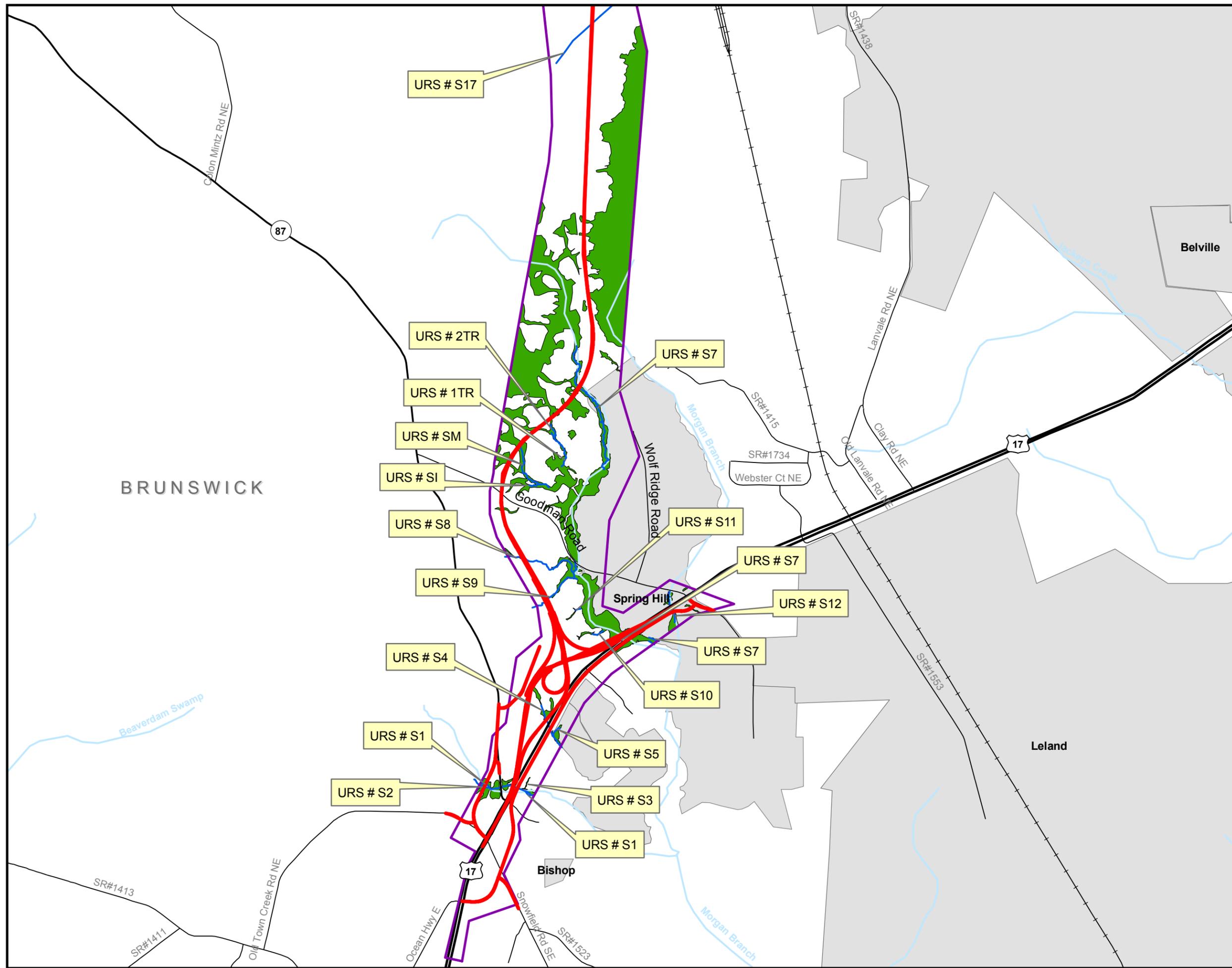
April 2007  
This map is for reference only.  
Sources: ESRI, NCDENR, NCDOT, USDOT, CGIA  
Brunswick County, New Hanover County, URS.





TIP R-2633 A/B  
Wilmington Bypass

Figure 3-14A  
USACE  
Jurisdictional Streams  
and Wetlands



**Legend**

- Expanded Study Corridor
- R-2633 A/B Recommended Alignment
- R-2633 C
- Interstate Highways
- US Highways
- State Highways
- State Routes
- Railroads
- Municipal Boundaries
- Streams (non-delineated)
- Jurisdictional Delineated Streams
- Jurisdictional Delineated Wetlands

North arrow pointing up with 'N' below it.

Scale bar: 2,000 1,000 0 2,000 Feet

Inset map of North Carolina counties with Brunswick and New Hanover counties highlighted in red.

- Counties
- Study Area Counties



April 2007  
This map is for reference only.  
Sources: ESRI, NCDENR, NCDOT, USDOT, CGIA  
Brunswick County, New Hanover County, URS.











**Table 3-19: Jurisdictional Streams Identified within the Expanded Study Corridor**

URS STREAM DESIGNATION	STREAM NAME AS INDICATED ON USGS QUAD	LINEAR FEET WITHIN EXPANDED STUDY CORRIDOR	NCDWQ STREAM CLASSIFICATION	NCDWQ STREAM SCORE
1TR	UT Morgan Branch	978	Perennial	32.5
2TR	UT Morgan Branch	382	Perennial	32.0
CART	Cartwheel Branch	375	Perennial	39.0
CART7A	UT Cartwheel Branch	66	Intermittent	21.0
S1	Bishop Branch	1,375	Perennial	59.0
S2	UT Bishop Branch	249	Perennial	44.5
S3	UT Bishop Branch	186	Perennial	42.0
S4	UT Morgan Branch	1,170	Intermittent	26.5
S5	UT Morgan Branch	230	Intermittent	20.5
S7	UT Morgan Branch	4,600	Perennial	53.0
S8	UT Morgan Branch	1,980	Perennial	39.5
S9	UT Morgan Branch	1,202	Perennial	40.0
S10	UT Morgan Branch	281	Perennial	34.0
S11	UT Morgan Branch	113	Intermittent	27.5
S12	Morgan Branch	838	Perennial	47.5
S13	UT Alligator Branch	3,216	Perennial	42.0
S13A	UT Alligator Branch	290	Intermittent	28.0
S14	Rowel Branch	1,929	Perennial	40.0
S15	UT Sturgeon Branch	405	Perennial	44.5
S16	UT Sturgeon Branch	2,668	Perennial	30.0
S17	UT Sturgeon Branch	2,395	Perennial	30.0
S18	UT to Mill Branch	757	Intermittent	27.0
S19	Cartwheel Branch	2,041	Perennial	43.5
S20	UT Cartwheel Branch	234	Perennial	32.0
S21	UT Cartwheel Branch	360	Perennial	32.5
S22	UT Cartwheel Branch	746	Perennial	36.0
SI	UT Morgan Branch	269	Intermittent	22.0
SM	UT Morgan Branch	1,474	Intermittent	25.0
SNO	UT Sturgeon Branch	651	Intermittent	25.0
<b>TOTAL</b>		<b>31,460</b>		

Source: NC Division of Water Quality 1999. Internal Guidance Manual, N.C. Division Of Water Quality Stream Classification Method, Version 2.0, North Carolina Department of Environment and Natural Resources, Division of Water Quality. Raleigh, NC.

### **Pond Communities**

Following the issuance of the DEIS, five pond communities (11.2 acres) were identified within the expanded study corridor and classified as Coastal Plain semi-permanent impoundments. Coastal Plain semi-permanent impoundments are impounded either through human or beaver activity and have naturalized forming vegetative assemblages suited to permanently inundated conditions. Herbaceous species identified in this community included cattail (*Typha spp.*), bulrush (*Scirpus spp.*), pickerelweed (*Pontederia cordata*), arrowhead (*Sagittaria lancifolia*), and

other emergent aquatic species. Shrubby growth dominated the banks with wax myrtle, titi, and red maple comprising the dominant species.

### 3.4.2.3 North Carolina Natural Heritage Program Identified Priority Areas (IPAs)

The NCNHP has identified select unique habitat areas throughout North Carolina as IPAs, also called Significant Natural Heritage Areas (SNHAs).<sup>153</sup> These areas are considered especially valuable because they contain special habitats, rare species, ecologically significant natural communities, and are considered reservoirs of biological diversity. IPA or SNHA designation does not confer legally mandated protections; however, this status does imply that these areas will be given special consideration during an environmental review process.

#### Methods

IPA GIS layer data for North Carolina were developed by the NCNHP.<sup>154</sup> Using GIS the locations of the IPAs in relation to the expanded study corridor were identified. IPAs were presented in detail in the DEIS and subsequent technical memoranda.<sup>155</sup> However, the GIS dataset used in that analysis was revised, updated, and re-issued by NCNHP as of November 2005. This report reflects acreage areas calculated using the most current NCNHP data.

#### IPAs Identified within the Expanded Study Corridor

In the DEIS, six IPAs were identified in the project area: Sturgeon Creek, US 421 Sandhill Ridge, Alligator Branch Sandhill and Flatwoods, Brunswick River and Cape Fear River Marshes, Battle Royal Bay, and Lower Cape Fear Aquatic Habitat. The NCNHP data indicated that four IPAs intersected the expanded study corridor: 421 Sand Ridge, Alligator Branch Sandhill and Flatwoods, Battle Royal Bay, and Brunswick and Cape Fear Rivers Marshes (Figure 3-15). Acreages for those portions of the IPAs that are located within the expanded study corridor are provided in Table 3-20. Descriptions of these IPAs are provided below.<sup>156</sup>

**Table 3-20: IPAs within the Expanded Study Corridor**

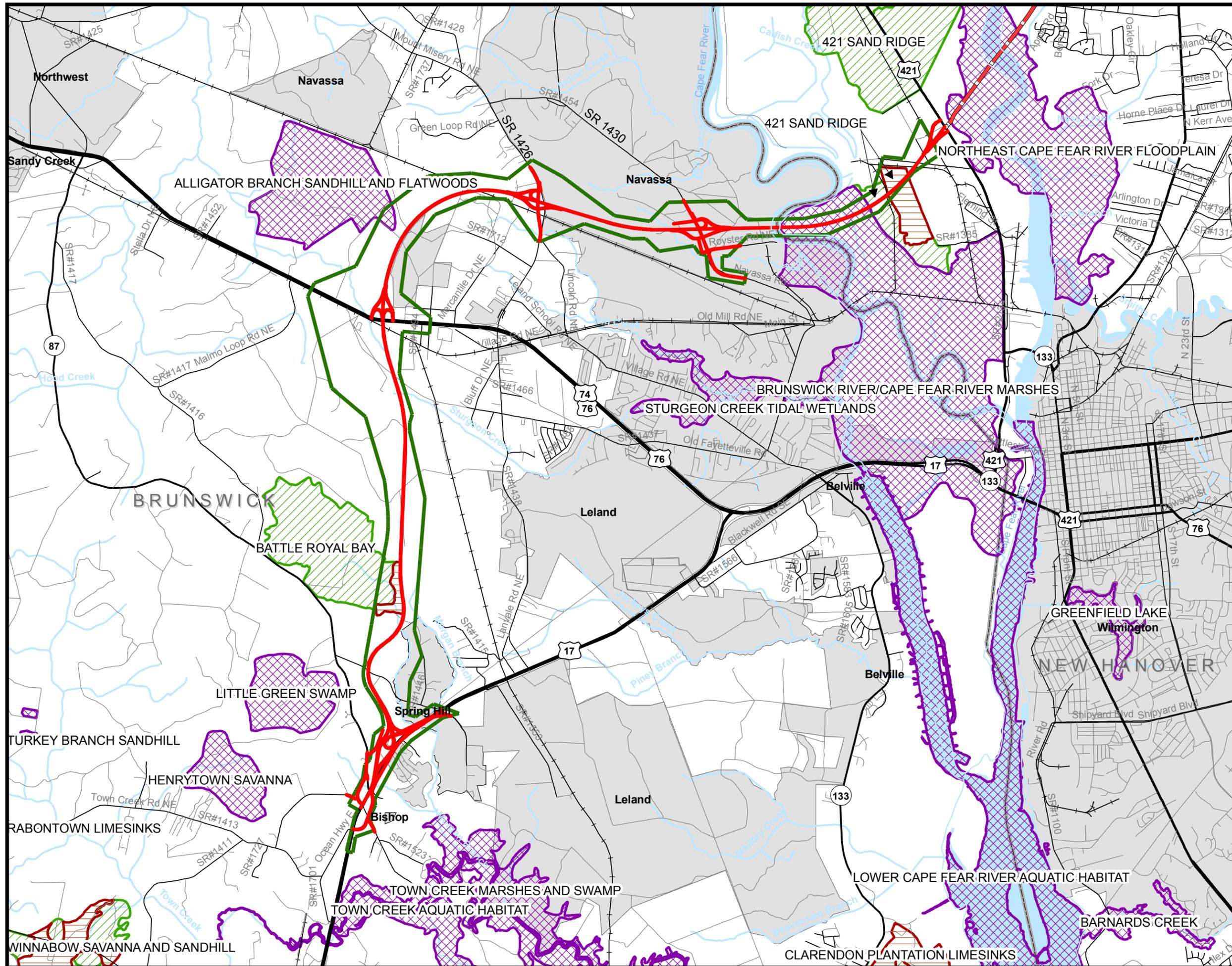
IDENTIFIED PRIORTIY AREA	AREA WITHIN EXPANDED STUDY CORRIDOR (ACRES)	
	Primary Area	Secondary Area
421 Sand Ridge	39.97	45.10
Alligator Branch Sandhill and Flatwoods	20.63	N/A
Brunswick and Cape Fear River Marshes	132.53	N/A
Battle Royal Bay	51.15	83.89

#### 421 Sand Ridge

This area is located between US Route 421 and the Cape Fear River, south of the CP&L power plant, and is approximately 352 acres in size. The 421 Sand Ridge IPA is a remnant dune field, containing wet and swampy forested areas, marshland, vernal pools and depression meadows. It supports coastal fringe sandhill and xeric sandhill scrub communities. To the west, this site slopes down to a Tidal Cypress Gum Swamp, and a large contiguous tract of freshwater marsh in good to excellent condition. The largest documented populations of Pickering's dawnflower (*Stylisma pickeringii*), a state-listed protected species, as well as many other sensitive species identified by NCNHP, are found in this IPA. The 421 Sand Ridge IPA has been divided into two distinct areas by significance by the NCNHP. An area of approximately 164 acres of the eastern portion of this IPA is classified as a "secondary" area, and is considered by the NCNHP to be of lesser quality than the remaining 188 "primary" acres.

TIP R-2633 A/B  
Wilmington Bypass

Figure 3-15  
NC Natural Heritage Program  
Identified Priority Areas



**Legend**

- Expanded Study Corridor
- R-2633 A/B Recommended Alignment
- R-2633 C
- Interstate Highways
- US Highways
- State Highways
- State Routes
- Local Roads
- Railroads
- Municipal Boundaries
- County Boundaries
- Water
- Streams (non-delineated)

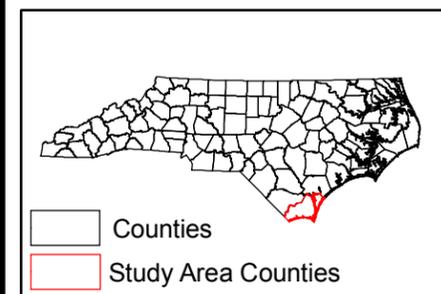
**NC NHP IPA**

**TYPE**

- PRIMARY
- SECONDARY
- TOTAL AREA



0 0.5 1 1.5  
Miles



April 2007  
This map is for reference only.  
Sources: ESRI, CGIA, NCDOT, Brunswick County,  
New Hanover County, NCDENR, USDOT, URS.



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### Alligator Branch Sandhill and Flatwoods

This site is located north of US 74, between the highway and railroad and is approximately 930 acres in size. This IPA contains what may be the largest extent of longleaf pine habitat in the region. Red cockaded woodpeckers (*Picoides borealis*) have been found here. This site is privately owned.

### Battle Royal Bay

This IPA is located approximately 2.5 miles northeast of the US 17/NC 87 junction, and is approximately 953 acres in size. The Battle Royal Bay site is comprised of two overlapping Carolina Bays, with low-profile sandy rims supporting wet pine flatwoods. The interior of this IPA supports pond pine woodlands. A large portion of the area was burned by a wildfire in the 1980's and regenerated in flatwoods and savanna communities. The site supports four candidate species for federal protection, and another five species on the NCNHP watch list. The Battle Royal Bay IPA has been divided into two distinct areas by significance by the NCNHP. An area of approximately 84 acres of the southeastern portion of this IPA is classified as a "secondary" area, and is considered by the NCNHP to be of lesser quality than the remaining 869 "primary" acres.

### Brunswick and Cape Fear River Marshes

This site is located along the Brunswick and Cape Fear Rivers, and is approximately 3,800 acres in size. This site is a regularly flooded freshwater tidal flat that is the largest high quality tidal freshwater variant in North Carolina. The area supports bishopweed (*Ptilimnium* spp.) a state-listed protected species, as well as the federally protected American alligator (*Alligator mississippiensis*), and a FSC, the rare skipper (*Problema bulenta*).<sup>157</sup>

## **3.4.3 WATER RESOURCES**

A Water Resources Technical Memorandum, an Addendum to the Water Resources Technical Memorandum, and a Revised Addendum to the Water Resources Technical Memorandum were prepared for the project and are incorporated by reference into this FEIS.<sup>158</sup> Existing water resources, hydrology, drainage and water quality are summarized in this section.

### **3.4.3.1 Groundwater**

#### **Physical Characteristics and Yield**

As described in Section 3.4.1.2, the principal aquifers in Brunswick and New Hanover counties are the Castle Hayne Limestone with an underlying Peedee Formation.<sup>159</sup> These confined aquifers are separated by a layer of silt and clay and slope down towards the coast. Borehole logs suggest that the Castle Hayne Limestone extends into only the easternmost portion of Brunswick County.<sup>160</sup> Wells tapping the Peedee Formation in the area near Leland and Navassa have low yields from the upper part of the formation. Wells deeper than 90 feet encounter brackish water.<sup>161</sup>

In the project area, reconnaissance boring typically encounters groundwater at depths of three to ten feet.<sup>162</sup> The groundwater is present under water table conditions in the surficial sands. None of the aquifers within the expanded study corridor have been designated by the USEPA as a "sole or principal drinking water source" under Section 1424(e) of the Safe Drinking Water Act, as amended.<sup>163</sup>

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Limited information is available on the attributes of the shallow, unconfined aquifer. Generally, the water yield from a shallow well is sufficient to supply a single-family residence on a 1/3-acre lot.<sup>164</sup> However, at the northeastern edge of the project area in the industrial corridor along US 421, the unconfined aquifer is thick and composed of coarse-grained sand, and a large well can produce 200-600 gallons per minute (gpm) on a 24-hour sustained yield. Due to its shallow depth and transmissive nature, this aquifer is extremely vulnerable to pollution.<sup>165</sup>

### **Groundwater Quality**

The shallowest aquifers generally are at the greatest risk of contamination. The natural quality of the near-surface, unconfined aquifer system within the expanded study corridor is extremely variable. Generally, it is characterized by the presence of iron, carbon dioxide, and sodium resulting in an acidic, soft, and slightly corrosive water quality. Iron content can range from none to high. The deep, confined aquifers (i.e., Castle Hayne Limestone and Peedee Formation) are characterized by the presence of calcium bicarbonate, resulting in a high pH value.<sup>166</sup>

The unconfined, shallow sand aquifer is recharged by rainfall. Since this aquifer is close to the surface, it is sensitive to surface contamination which can permeate to the underlying aquifer. Recharge of the confined Castle Hayne/Peedee aquifer system occurs through sinkholes and infiltration through the surficial sands and semi-permeable layers. In Brunswick County, sinkholes have been found in the vicinity of the towns of Boiling Spring Lakes, Supply, and Bolivia, which are all located outside of the project area.<sup>167</sup>

Specific information about recharge areas in Brunswick County is not available. Because potable groundwater supplies in Brunswick County are generally from the unconfined, shallow aquifer, most of Brunswick County is considered a potable groundwater recharge area sensitive to surface contamination.

### **3.4.3.2 Surface Waters**

#### **Streams**

The recommended alignment is located in the Cape Fear River Basin within the USGS 8-digit hydrologic units 03030005 and 03030007 and the North Carolina Department of Environment and Natural Resources (NCDENR) Division of Water Quality (DWQ) sub-basins 03-16-17 and 03-06-23. The Cape Fear River Basin is located entirely within the state's boundaries and flows southeast from the north central piedmont region near Greensboro to the Atlantic Ocean near Wilmington. The Cape Fear River is formed at the confluence of the Haw and Deep Rivers on the border of Chatham and Lee Counties, just below the B. Everett Jordan Reservoir Dam. From there, the river flows across the coastal plain past Fayetteville through three locks and dams to Wilmington before entering the ocean. The Cape Fear Basin drains 9,322 square miles and is the largest river basin in North Carolina. The headwaters of the Cape Fear River are at nearly 1,000 feet above sea level in Forsyth County and drain to sea level in Brunswick County before entering the Atlantic Ocean. The lower portion of the Cape Fear River Basin, where the project is located, is in the Lower Coastal Plain Physiographic Province.<sup>168</sup> Surface waters within the expanded study corridor drain into the Cape Fear River primarily through the tributary systems of Hood Creek, Indian Creek, Toomers Creek, Sturgeon Creek and Jackeys Creek. Figure 3-14 shows the locations of the rivers and streams in the project area.

During the field investigations in 2004, the centerlines of streams within the expanded study corridor were flagged in the field, and the locations of the flags were surveyed. The streams were classified as perennial, intermittent, or ephemeral following NCDWQ *Stream Classification Method*.<sup>169</sup> Following the field activities, the locations of the streams were mapped using

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computer assisted drafting software, and GIS. The location and classification of the stream were verified by the USACE in February 2004.

### **Navigable Waterways**

The portion of the Cape Fear River within the boundaries of the recommended alignment is a navigable waterway. According to the USACE, the shipping channel from the Cape Fear Estuary to Wilmington is maintained to a depth of 42 feet.<sup>170</sup> Navigation above the Port of Wilmington includes the Northeast Cape Fear River and the Cape Fear River.<sup>171</sup> Several bridges cross the Cape Fear River upstream and downstream of the expanded study corridor. The closest bridge downstream of the project is a North Carolina Seaboard Coast Line Railroad Bascule Bridge in Navassa (River Mile 34.0). The bridge has a horizontal clearance of 102 feet and vertical clearances of 9 feet during low water and 6 feet during high water. The closest fixed bridge downstream of the project is the US 421 Bridge in Wilmington (River Mile 30.0). This bridge has a horizontal clearance of 120 feet and a vertical clearance of 55 feet during mean high water.<sup>172</sup>

### **Water Quality**

Best Usage Classifications are assigned for each surface water body by the NCDENR, Environmental Management Commission (EMC) in accordance with *Procedures for Assignment of Water Quality Standards* (15A NCAC 2B .0100) and *Classifications and Water Quality Standards Applicable to the Surface Waters of North Carolina* (15A NCAC 2B .0200), as adopted by the NCDENR EMC. These classifications serve to protect water quality by governing the uses of the water resources. In accordance with 15A NCAC 2B .0311, NCDENR EMC has classified the state surface waters based on the “best usage” for which each water body should be protected. The classifications presented below are for surface waters occurring within the expanded study corridor and utilize a lettering system with definitions as follows:

Class WS-IV (water supply waters) - Class WS-IV waters are fresh waters protected as water supplies, which are generally in moderately to highly developed watersheds. Point source discharges of treated wastewater are permitted in Class WS-IV waters pursuant to 15A NCAC 2B .0104 and 2B.0211, and local programs to control nonpoint source and stormwater discharge of pollution are required. Class WS-IV waters are suitable for all aquatic life propagation and survival, fishing, wildlife, secondary recreation, and agriculture.

Class C Sw (fresh swamp waters) - Class C Sw waters are fresh swamp waters protected for aquatic life propagation and survival, fishing, wildlife, secondary recreation, and agriculture.

Class SC (tidal salt waters) - Class SC waters are tidal salt waters protected for aquatic life propagation and survival, fishing, wildlife, and secondary recreation.

Class SC Sw (tidal salt swamp waters) - Class SC Sw waters are tidal salt swamp waters protected for aquatic life propagation and survival, fishing, wildlife, and secondary recreation.<sup>173</sup>

The locations of the surface waters are shown in Figure 3-14 and the NCDENR EMC classifications for the major surface water bodies in the project area are listed in Table 3-21. The major tributaries of the Cape Fear River near the expanded study corridor, with the exception of Toomers Creek, Cartwheel Branch, and Brunswick River are classified as C Sw waters. The Cape Fear River is also classified as a C Sw water upstream of the upstream mouth of Toomers Creek. South of the upstream mouth of Toomers Creek, the Cape Fear River is classified as a SC water. The Brunswick River is also classified as a SC water. Cartwheel Branch is classified as a SC Sw water.<sup>174</sup> Toomers Creek is classified as WS-IV (water supply), which means that it could serve as an alternative drinking water source for

Wilmington, assuming that adequate treatment is provided.<sup>175</sup> South of the expanded study corridor Toomers Creek is classified as a Critical Area.

**Table 3-21: Stream Classifications**

STREAM	CLASSIFICATION*
CAPE FEAR RIVER (upstream of the upstream mouth of Toomers Creek)	C Sw
Hood Creek	C Sw
Alligator Branch	C Sw
Bay Branch	C Sw
Mill Branch	C Sw
Tributary to Mill Branch**	C Sw
CAPE FEAR RIVER** (downstream of the upstream mouth of Toomers Creek)	SC
Cartwheel Branch**	SC Sw
Tributary to Cartwheel Branch**	SC Sw
Toomers Creek** (from upstream mouth to a point 0.8 mile upstream of mouth)	WS-IV
Toomers Creek (from a point 0.8 mile upstream of mouth to mouth)	WS-IV CA
Brunswick River	SC
Sturgeon Creek	C Sw
Tributary to Sturgeon Creek**	C Sw
Mill Creek	C Sw
Rowel Branch**	C Sw
Town Creek	C Sw
Morgan Branch**	C Sw
Tributary to Morgan Branch**	C Sw
Bishop Branch**	C Sw
Tributary to Bishop Branch**	C Sw

\* According to 15A NCAC 2B .0311, the “best usage” for which the waters in each classification must be protected is as follows:

- Class C Sw Waters: Fresh swamp waters protected for aquatic life propagation and survival, fishing, wildlife, secondary recreation, and agriculture.
- Class SC Waters: Tidal salt waters protected for aquatic life propagation and survival, fishing, wildlife, and secondary recreation.
- Class SC Sw Waters: Tidal salt swamp waters protected for aquatic life propagation and survival, fishing, wildlife, and secondary recreation.
- Class WS-IV Waters: Fresh waters protected as water supplies which are generally in moderately to highly developed watersheds; point source discharges of treated wastewater are permitted pursuant to 15A NCAC 2B .0104 and .0211; local programs to control nonpoint source and stormwater discharge of pollution are required; suitable for all aquatic life propagation and survival, fishing, wildlife, secondary recreation, and agriculture.
- CA: Critical area.

\*\* Streams occurring within the project area.

According to 2003 benthos data, water quality within the Lower Cape Fear River near the project rates from good to fair-to-good. Water quality has generally stayed the same with a little improvement between 1998 and 2003.<sup>176</sup> Fish tissue samples analyzed from the Cape Fear River below Riegelwood in 1994 showed that the US Environmental Protection Agency (USEPA) and US Food and Drug Administration/North Carolina (USFDA/NC) mercury limit was exceeded in three bowfin samples out of 15 fish sampled.<sup>177</sup> It should also be noted that there are no 303(d) listed streams located within the expanded study corridor.<sup>178</sup>

### 3.4.4 JURISDICTIONAL ISSUES

#### 3.4.4.1 Wetlands

Jurisdictional waters of the United States, including wetlands, are protected under Section 404 of the Clean Water Act (CWA). The USACE and USEPA jointly define wetlands as those areas that are inundated or saturated by surface or groundwater at a frequency and duration sufficient

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to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions. Wetlands generally include swamps, marshes, bogs, and similar areas.<sup>179</sup> Section 404 jurisdictional wetlands are those areas satisfying the technical criteria contained in the USACE's Wetlands Delineation Manual.<sup>180</sup> The USACE's Wetlands Delineation Manual requires evidence of hydric soils, positive hydrological indicators, and a prevalence of hydrophytic vegetation for a determination that an area is a wetland. Section 404 jurisdictional waters other than wetlands include streams, rivers, and lakes.

Both federal and state programs regulate activities conducted in wetlands in order to minimize the continued reduction and degradation of these resources and strive to achieve a "no net loss" policy. The federal program is based on Section 404 of the CWA and the USACE's implementing regulations (33 CFR Parts 320-330).<sup>181</sup> The NCDWQ is tasked with administering Section 401 of the CWA.

### **Methods**

Wetland determinations were conducted concurrently with identification of vegetative communities prior to the publication of the DEIS. Approximate wetland locations were identified on black and white aerial photographs prior to field surveying. Approximate wetland boundaries were refined using infrared aerial photographs. Soil surveys, USGS 7.5-minute quadrangle maps, and USFWS NWI maps were also used in the identification process. Literature reviews were conducted to identify probable species composition of wetland communities potentially occurring within the project area.

Field surveys were conducted in several phases by qualified biologists. The first field investigation took place from July 11 through July 15, 1991. During this time, wetland locations and the biotic communities supported by those wetlands were identified. The corridors were inspected where access was available. Roadside surveys were performed for most areas. Site specific transects to identify vegetative species were conducted within twenty sites. The second field investigation was conducted from August 17 through August 24, 1993. This field survey included review of new areas within the proposed alignments occurring due to corridor shifts.

Wetlands were determined in accordance with the guidelines set forth in the USACE Wetlands Delineation Manual.<sup>182</sup> A detailed wetland boundary delineation was not conducted prior to the publication of the DEIS.

Estimates of wetland acreage were presented by dominant vegetative community type in the DEIS and are reproduced in Table 3-17. The estimated acreage of existing wetland communities within the 300-foot proposed right of way for each of the DEIS alternatives, as reported in the DEIS is listed in Table 3-22Table 3-17. Acreage was measured using the functional design drawings available at the writing of the DEIS and was prior to detailed wetland delineations. Jurisdictional delineations were conducted following selection of a preferred alternative.<sup>183</sup>

**Table 3-22: Wetlands Inventory Conducted for the DEIS Alternative Alignments**

SYSTEM TYPE	INVENTORY DESIGNATION	ACRES PER ALIGNMENT**			
		ALT. 2	ALT. 3	ALT. 8	ALT. 9
Natural Systems - Wetlands	Bottomland Hardwoods	44	35	14	14
	Wet Pine Flats	123	136	125	128
	Small Stream Swamps	15	19	16	20
	Swamp Forest	12	14	14	12
	Scrub/Shrub	20	24	24	20
	SUBTOTAL	214	228	193	194
	PERCENT OF TOTAL	37%	39%	33%	33%
	Open Water	3	4	4	3
	SUBTOTAL	3	4	4	3
	PERCENT OF TOTAL	0.5%	1%	1%	0.5%

Note: \*\*Based on a 300-foot wide proposed right-of-way.

\*Impact measures less than 1 acre. Value is not included in the subtotals or percentages.

Following the issuance of the DEIS, jurisdictional wetland data were developed for the expanded study corridor. Prior to field surveys, photographic interpretation of aerial photography depicting the expanded study corridor was conducted. In addition, multiple vector land cover data layers were reviewed, including the Winnabow, Leland, and Castle Hayne USGS 7.5-minute topographic quadrangle maps, CGIA land cover data, NWI data, USDA NRCS Soil Survey mapping of Brunswick and New Hanover counties, and DCM wetlands data.<sup>184</sup> Wetlands within the expanded study corridor were field-delineated in 1999, 2002, 2003, and 2004 in accordance with the USACE's Wetlands Delineation Manual.<sup>185</sup> The wetland/upland boundaries of each wetland area were flagged and their locations were surveyed. Each unique wetland area was characterized according to the USFWS *Classification of Wetlands and Deepwater Habitats of the United States*.<sup>186</sup> Following the field activities, the wetland boundaries were mapped using computer assisted drafting software, and GIS. Wetland boundaries in the expanded study corridor were re-verified and re-approved with additional wetlands delineated in subsequent periods. A jurisdictional determination by the USACE was granted on August 3, 2004.<sup>187</sup>

### **Jurisdictional Wetlands**

Approximately 1,421 acres of jurisdictional wetlands were identified within the expanded study corridor. Following guidelines in the USFWS document *Classification of Wetlands and Deepwater Habitats of the United States*, all of the wetlands within the expanded study corridor are considered palustrine wetlands (inland wetlands lacking flowing water and containing ocean derived salts in concentrations of less than .05%). Palustrine wetlands occurring within the expanded study corridor include Palustrine Forested (PFO) and Palustrine Emergent Marsh (PEM). The Cape Fear River is classified as a Riverine Tidal Unconsolidated Bottom (R1UB) wetland and comprises approximately 20 acres of the expanded study corridor. Often these different wetland types occur adjacent to each other and form large wetland complexes. Figure 3-14 depicts the locations of the jurisdictional wetlands mapped within the expanded study corridor. Table 3-23 presents the acreage of each of the wetland community types. It is important to note that the boundaries of the USACE jurisdictional wetlands are not identical to the natural plant communities described as wetlands, marsh, or swamp in Section 3.4.2.1. As such, the acreages associated with jurisdictional wetlands in Table 3-23 are not identical to the acreages associated with descriptive natural communities presented in Table 3-18.

**Table 3-23: Jurisdictional Wetlands within the Expanded Study Corridor**

WETLAND TYPE	JURISDICTIONAL WETLAND AREA WITHIN THE EXPANDED STUDY AREA (ACRES)
PALUSTRINE WETLANDS (total)	1,421
Palustrine Emergent (PEM)	125
Palustrine Forested (PFO)	1,291
RIVERINE WETLANDS (total)	20
Riverine Tidal Unconsolidated Bottom (R1UB)	20

Source: Section 404 Jurisdictional Area Assessment, Wilmington Bypass (R-2633 A/B); New Hanover and Brunswick County, North Carolina. EcoScience Corporation, Raleigh, NC, 1999.

URS Wetland Delineation Report (s) for 2002, 2003, 2004.

### **3.4.4.2 Buffer Areas**

Under the provisions of the CWA, the EMC has adopted permanent rules pertaining to maintaining vegetated buffer zones around riparian areas as part of the Nutrient Sensitive Waters Management Strategies for the select watersheds of North Carolina. The expanded study corridor is not within the affected watersheds.

#### **Methods**

NCDWQ was consulted to determine applicability of the riparian buffer regulations.

#### **Buffer Areas Identified within the Expanded Study Corridor**

No regulated buffer areas were identified within the expanded study corridor.

### **3.4.4.3 Protected Species**

Federally listed endangered and threatened species are legally protected under the provisions of Section 7 of the Endangered Species Act (ESA) of 1973, as amended, and any action likely to adversely affect a species afforded federal protection is subject to review by the USFWS and/or the National Marine Fisheries Service (NMFS). Species classified as Federal Species of Concern (FSC) are not protected under the provisions of Section 7 of the ESA, but are defined as species under consideration for listing as threatened or endangered. North Carolina provides limited protection to "at risk" species under the North Carolina Endangered Species Act and the North Carolina Plant Protection and Conservation Act of 1979. The NCWRC and the North Carolina Department of Agriculture (NCDA) are responsible for enforcing and administering species protection. The USFWS and the NCNHP maintain lists and location data of known occurrences of endangered, threatened, and rare species for North Carolina.

#### **Methods**

Online databases maintained by the USFWS and the NCNHP were reviewed for potential protected species found within Brunswick and New Hanover counties. NCDOT consulted with USFWS, WRC, NCNHP, USACE, NMFS, and DMF to determine which, if any, protected species had been previously identified or would potentially occur within the expanded study corridor and surrounding landscape. Species data obtained from these agencies were used to coordinate survey efforts. Initial surveys for protected floral and faunal species were conducted in 1992. Further research and field surveys to update and re-acquire data concerning federally and state listed species within the expanded study corridor were conducted pre-publication of the DEIS in early 1996, and following the publication of the DEIS in 1997, 2002, and 2003. The

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USFWS concurred with the biological conclusions for the federally protected species potentially occurring in Brunswick and New Hanover counties in a letter dated June 17, 2004 (Appendix A).

### *Protected Flora Surveys*

Floral species are largely dependant upon soil characteristics for the promotion of population health. Potential sites to survey for protected floral species were identified through the use of the New Hanover County and Brunswick County soil surveys and inspection of aerial photographs prior to field investigations. Vegetative cover types potentially containing suitable habitats for protected species were identified within the expanded study corridor and delineated through aerial photography interpretation and field verification prior to field studies. Areas were determined to be potentially suitable if the following criteria were observed in the field: appropriate soil type (based on samples taken in the field), common associate species present, appropriate vegetation cover type and density, and evidence of maintenance by fire. Field investigations were conducted by pedestrian surveys on transects at appropriate intervals through identified sites. Species listed as Federal Species of Concern (FSC) or designated by the state of North Carolina as threatened or endangered were noted during survey periods concurrent with federally protected species surveys.

### *Protected Fauna Surveys*

At the time of the issuance of the DEIS, it was thought that five species of birds listed federally or by the state as threatened or endangered may be found in Brunswick and/or New Hanover counties. Those species were: red-cockaded woodpecker (RCW), Arctic peregrine falcon, bald eagle, wood stork and piping plover. The Arctic peregrine falcon has since been delisted. Based on consultations with the USFWS, it was determined that RCW (*Picoides borealis*) had a potential to occur in the expanded study corridor. Field investigations for suitable RCW habitat areas are described further in this section.

Other federally protected fauna potentially occurring within the expanded study corridor were surveyed for in conjunction with other field survey efforts. These species included the American bald eagle (*Haliaeetus leucocephalus*), wood stork (*Mycteria americana*), and the American alligator (*Alligator mississippiensis*). No surveys for the federally protected West Indian manatee (*Trichechus manatus*) or shortnose sturgeon (*Acipenser brevirostrum*) were conducted, as this transient species occurs infrequently in North Carolina and NCNHP data show no known occurrences of this species in the expanded study corridor. Species listed as FSC or designated by the state of North Carolina as threatened or endangered were noted during survey periods concurrent with federally protected species surveys.

### **Federally Protected Species Identified within the Expanded Study Corridor**

As of March 2006, USFWS and NCNHP listed twelve federally protected species currently occurring and three federally protected species as having been known to occur historically in Brunswick and New Hanover counties (Table 3-24). Of these fifteen species, only two federally protected species were identified in the expanded study corridor during field surveys following the issuance of the DEIS: rough-leaved loosestrife (*Lysimachia asperulifolia*) and RCW. One other federally protected species, the shortnose sturgeon, has been documented within the Cape Fear River portion of the expanded study corridor with certainty, although this species was not surveyed for as part of this project. The three federally protected species documented within the expanded study corridor are described below. Descriptions of the other twelve federally protected species listed as occurring within Brunswick and/or New Hanover counties are presented in Table 3-24.

**Table 3-24: Federally Listed Endangered or Threatened Species in Brunswick and New Hanover Counties**

SCIENTIFIC NAME	COMMON NAME	FEDERAL STATUS	STATE STATUS	HABITAT PREFERENCE	HABITAT PRESENT
Plant					
<i>Amaranthus pumilus</i>	Seabeach Amaranth	T	T	ocean beaches and island-end flats	No
<i>Lysimachia asperulifolia</i>	Rough-leaved Loosestrife	E	E	pocosin/savanna ecotones, pocosins	Yes
<i>Thalictrum cooleyi</i>	Cooley's Meadowrue	E	E	wet savannas	Yes
Bird					
<i>Charadrius melodus</i>	Piping Plover	T	T	ocean beaches and island-end flats	No
<i>Haliaeetus leucocephalus</i>	Bald Eagle	T, PD	T	mature forests near large bodies of water (for nesting); lakes and sounds	Yes
<i>Mycteria americana</i>	Wood Stork	E	E	fresh or brackish ponds (for foraging)	Yes
<i>Picoides borealis</i>	Red-cockaded Woodpecker	E	E	mature open pine forests, mainly in longleaf pine	Yes
Mammal					
<i>Puma concolor cougar</i> <sup>a</sup>	Eastern Cougar	E	E	extensive forests, remote areas	Yes
<i>Trichechus manatus</i>	West Indian Manatee	E	E	warm waters of estuaries and river mouths	Yes
Fish					
<i>Acipenser brevirostrum</i>	Shortnose Sturgeon	E	E	brackish water of large rivers and estuaries; spawns in freshwater areas	Yes
Reptile					
<i>Alligator mississippiensis</i>	American Alligator	T(S/A)	T	fresh to slightly brackish lakes, ponds, rivers, and marshes	Yes
<i>Caretta caretta</i>	Loggerhead	T	T	nests on beaches; forages in ocean and sounds	No
<i>Chelonia mydas</i>	Green Turtle	T	T	nests on beaches; forages in ocean and sounds	No
<i>Dermochelys coriacea</i>	Leatherback	E	E	oceans, rarely in sounds	No
<i>Lepidochelys kempii</i>	Atlantic Ridley <sup>b</sup>	E	E	ocean and sounds	No

Sources: NC Natural Heritage Program, 2006

Status Notes:

Federal Status: E=Endangered

T=Threatened

T(S/A)=Threatened due to Similarity of Appearance

State Status: E=Endangered

T=Threatened

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### Rough-leaved Loosestrife

Rough-leaved loosestrife is federally and state listed as endangered. It prefers sandy, moist peat soils of seep bogs in sandhills or pine flatwoods savanna habitats. NCNHP data show no occurrences of this species in the expanded study corridor; however, during field surveys one population of the plant species was identified along the western edge of the expanded study corridor to the north of US Route 74/76.

### Red-Cockaded Woodpecker

The RCW is federally and state listed as endangered. The RCW breeds in mature, open pine communities and requires stands of pine and pine/hardwood at least 60 years old for foraging, and prefers stands with pine greater than 10 inches in diameter. This species will excavate cavities for roosting and nesting only in living pine trees. In longleaf pines the average age of trees with new cavity excavation is 95 years. RCW populations require foraging areas averaging 200 acres.

Suitable RCW habitat areas were identified through interpretation of aerial photography and field verification prior to field species surveys. Comprehensive field surveys for active RCW cavity trees in appropriate habitats within and extending 0.5 mile outside of the 1,000 foot study corridor boundaries of the DEIS alternatives were initiated in 1992. The search areas covered during this survey extended from US 17 in Brunswick County to I-40.

Three RCW clusters were identified during the field surveys in 1992. Cluster 1 was approximately 2.5 miles northeast of the junction of US 17 and NC 87 and on the western side of the corridor. Clusters 2 and 3 were near the Alligator Branch IPA to the north of US 74/76 and west of Leland Industrial Park. The three RCW clusters identified during the 1992 surveys were revisited during surveys in 1996, prior to the issuance of the DEIS and in 1997, after the issuance of the DEIS. No change was noted during the 1996 surveys. During the 1997 site visits all three clusters were found to be inactive. The geographic cluster centers of each cluster's cavity tree distributions found during the 1997 site visits were determined. Suitable habitat within a 0.5-mile radius of each cluster center was delineated as RCW foraging habitat. Foraging habitat analyses (FHA) were conducted for each of the three inactive RCW clusters.

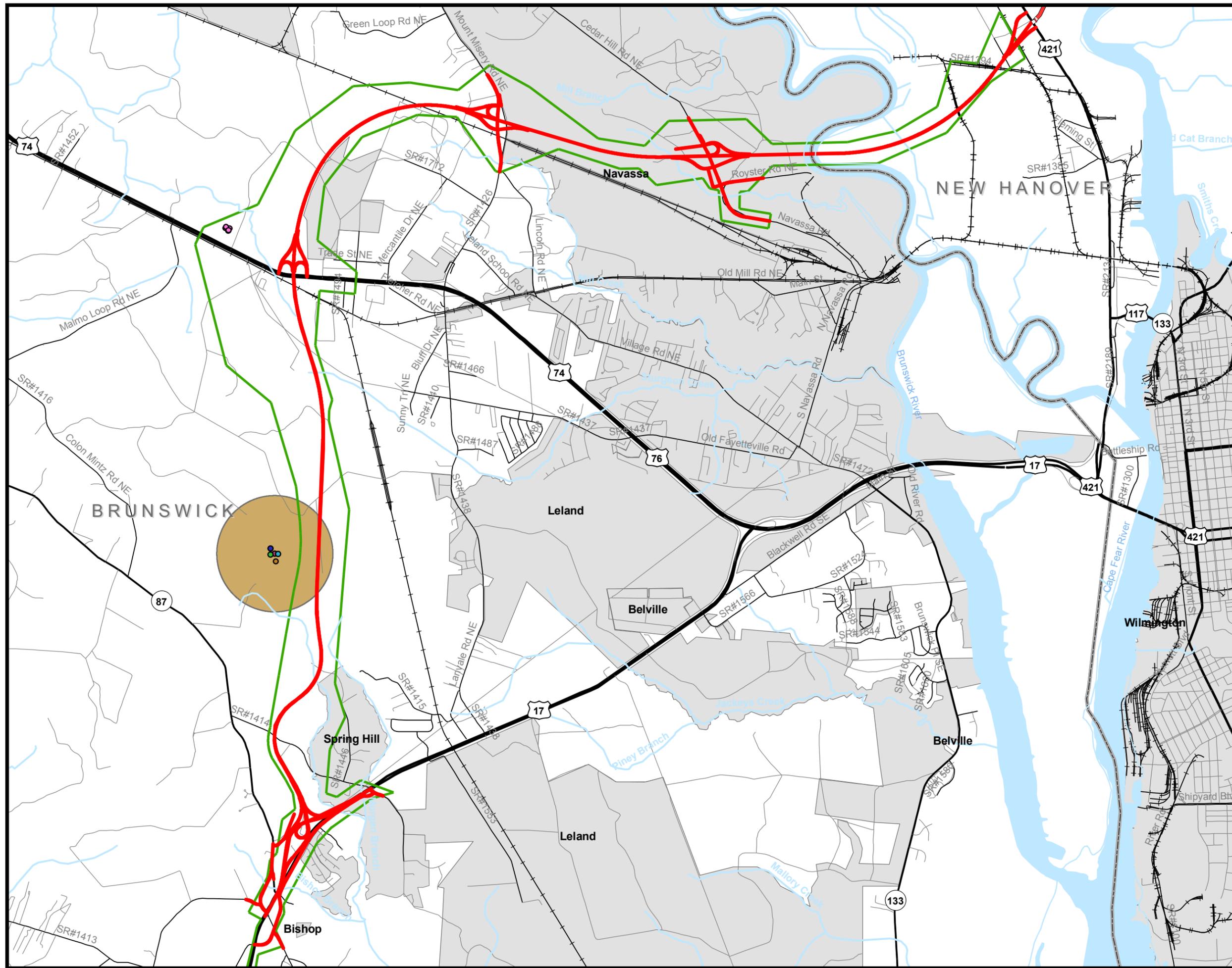
Revisions to the roadway alignment following the 1997 field surveys shifted the position of the preferred alternative (Alternative 9) to avoid directly affecting Clusters 2 and 3. The foraging radius for Cluster 1 remained partially within the boundaries of the preferred alternative. Survey data collected in 2002 indicated that the three colonies remained inactive and the cavity trees within Clusters 2 and 3 had been cut. Cluster 1 remained intact, but still inactive. The area of the remaining inactive cluster was resurveyed in 2003 following an agency request for a possible revision to the roadway alignment. Cluster 1 was found to be active during this resurvey (Figure 3-16).

### Shortnose Sturgeon

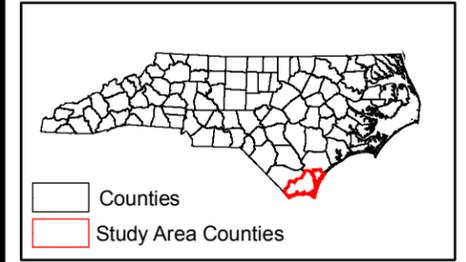
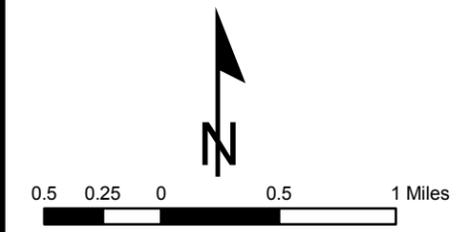
The Shortnose sturgeon is federally and state listed as endangered. This bottom-dwelling species is anadromous, meaning that it migrates up rivers from the ocean to spawn and is found primarily in riverine areas with a sand-silt bottom, at depths from six to 30 feet. The summer feeding area for the entire population is generally just upstream of the salt-freshwater interface in coastal rivers. In early spring (February-March), spawning adults move significant distances upstream to reproduce in deep, gravel-bottomed holes. Upon hatching, the young migrate downstream to join the remainder of the population. This species inhabits only the east coast of North America.

TIP R-2633 A/B  
Wilmington Bypass

Figure 3-16  
Active Red-Cockaded  
Woodpecker Cluster and  
Rough-leaved loosestrife  
Locations



- Legend**
- Expanded Study Area
  - R-2633 A/B Recommended Alignment
  - R-2633 C
  - Interstate Highways
  - US Highways
  - State Highways
  - State Routes
  - Local Roads
  - Railroads
  - Municipal Boundaries
  - County Boundaries
  - Water
  - Streams (non-delineated)
  - Rough-leaved loosestrife Locations
  - Foraging Area (Half Mile Radius)
  - RCW Cavity Tree Locations



April 2007  
This map is for reference only.  
Sources: ESRI, CGIA, USDOT, Brunswick County,  
New Hanover County, NCDOT, NCDENR, URS.



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Until recently, the shortnose sturgeon was thought to have disappeared from North Carolina waters. However, surveys by the USACE found three individuals of this species in the Cape Fear River. The distribution of the sturgeon population in the Cape Fear/Northeast Cape Fear river system is not fully known. Assumptions regarding the occurrence of the sturgeon in the Cape Fear/Northeast Cape Fear system are based on limited sightings and studies conducted in many East Coast river systems. In 1987 a shortnose sturgeon was collected in the Brunswick River in Brunswick County, and additional individuals have been observed in the same area since that time.<sup>188</sup> The Brunswick River joins the Cape Fear River approximately 1.7 river miles downstream from the proposed bridge crossing. Therefore, it is anticipated that the Cape Fear River drainage basin, including the expanded study corridor, contains a self-sustaining population of shortnose sturgeon.

### **Other Federally Protected Species Potentially Occurring within the Expanded Study Corridor**

In addition, to the three federally protected species identified within the expanded study corridor, three other federally protected species may potentially occur within the expanded study corridor: West Indian Manatee, Wood stork, and American alligator. Descriptions of these species are provided below.

#### **West Indian Manatee**

The West Indian manatee is federally and state listed as endangered. NCNHP data show no known occurrences of this species in the expanded study corridor. The species inhabits warm haline waters and is unlikely to travel as far upstream as the study area. However, it is believed that individuals may occasionally be found in the Cape Fear River.<sup>189</sup>

#### **Wood Stork**

The wood stork is federally and state listed as endangered. Storks are birds of freshwater and brackish wetlands, primarily nesting in cypress or mangrove swamps. They feed in freshwater marshes, narrow tidal creeks, or flooded tidal pools. Particularly attractive feeding sites are depressions in marshes or swamps where fish become concentrated during periods of falling water levels.<sup>190</sup> Potential roosting habitat exists in the project area for the wood stork. However, NCNHP data show no known occurrences of the wood stork in the expanded study corridor. The only known occurrence of nesting wood storks in North Carolina is a colony of birds that frequent Sunset Beach during early June through mid-September. This is the northernmost breeding range for this species.<sup>191</sup>

#### **American Alligator**

The American alligator is federally listed as a threatened species due to similarity in appearance (T S/A) and is state listed as threatened. The preferred habitat for this species is fresh to slightly brackish lakes, ponds, rivers, and marshes. NCNHP data does not indicate any known occurrences of this species in the expanded study corridor, and no observations of this species were noted during the field surveys. However, NCNHP data does indicate that the American alligator does occur in several streams in the vicinity of the expanded study corridor, including Ness Creek, Town Creek, and within the Cape Fear River south of the expanded study corridor. Because the American alligator is a mobile species there is a potential for it to occur within streams within the expanded study corridor. A species designated as T S/A is not granted the level of USFWS protection considerations afforded to threatened or endangered species during interagency consultations.<sup>192</sup>

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## **State Listed Endangered, Threatened, or Federal Species of Concern Identified within the Expanded Study Corridor**

According to the USFWS and NHP protected species database, 69 species are federally listed as a FSC, or listed by the State of North Carolina as endangered or threatened within Brunswick and New Hanover counties (Appendix G). Of these species, only three were identified during the course of protected species survey efforts: Savanna indigo bush (*Amorpha georgiana* var. *confusa*), Venus Flytrap (*Dionaea muscipula*), and Pickering's morning glory (*Stylisma pickeringii* var. *pickeringii*). Descriptions of these three species are provided below. Descriptions of the other 66 FSC and/or State protected species listed as occurring within Brunswick and/or New Hanover counties are presented in Appendix G.

### **Savanna Indigo-Bush**

Savanna indigo-bush is a FSC and is state listed as threatened. The preferred habitat for this species, wet savannas, was identified within the expanded study corridor. During a rare species survey conducted in 2002, populations of savanna indigo-bush were found within the expanded study corridor.

### **Venus Flytrap**

The Venus flytrap is listed as a Federal Species of Concern (FSC). The Venus flytrap is found in savannas, seepage bogs, and pocosin edges. Habitat for this species was identified within the expanded study corridor, and during a rare species survey conducted in 2002, populations of this species were found within the expanded study corridor.

### **Pickering's Morning-Glory**

Pickering's morning glory is a FSC and is state listed as threatened. The preferred habitat for this species, dry sandhills and sandy woods, was identified within the expanded study corridor. During a rare species survey conducted in 2002, populations of Pickering's morning glory were found within the expanded study corridor on the eastern side of the Cape Fear River in the Pine/Scrub Oak Sandhill community located to the south of the CP&L Sutton Steam Plant.

#### **3.4.4.4 Essential Fish Habitat**

The 1996 Congressional amendments to the Magnuson-Stevens Fishery Conservation and Management Act (MSFCMA) (PL 94-265) set forth requirements for the NMFS, Regional Fishery Management Councils (FMC), and other federal agencies to identify and protect important marine and anadromous fish habitat. These amendments established procedures for the identification of Essential Fish Habitat (EFH) and a requirement for interagency coordination to further the conservation of federally managed fisheries. EFH is defined as those waters and substrate necessary to fish for spawning, breeding, feeding, or growth to maturity (16 U.S.C. 1802(10)). EFH is separated into estuarine and marine components. The estuarine component is defined as all estuarine waters and substrates (mud, sand, shell, rock and associated biological communities), including sub-tidal vegetation (grasses and algae) and adjacent inter-tidal vegetation (marshes and mangroves). Within designated EFH, Habitat Areas of Particular Concern (HAPC) can be identified as priority areas for conservation and management. These habitats are identified based on their ecological importance, sensitivity, rarity and vulnerability.

### **Methods**

Following the issuance of the DEIS, the Final Habitat Plan for the South Atlantic Region was consulted to determine EFH and managed fish species within the expanded study corridor.<sup>193</sup>

## **Essential Fish Habitat Identified Within the Expanded Study Corridor**

The EFH is provided in Appendix G and is summarized in this section. Within the expanded study corridor, the Cape Fear River, and its associated tidal freshwater marsh, tidal cypress gum swamp, and cypress gum swamp communities have been designated as EFH for two fishery management plans (FMPs): the South Atlantic Fishery Management Council's (SAFMC) Shrimp, Red Drum, Snapper, and Grouper fishery management plan, and the SAFMC's Coastal Migratory Pelagics fishery management plan.<sup>194</sup> The marsh and swamp communities provide nursery and juvenile life stage habitat for 25 managed fish species and are therefore EFH (Table 3-25). There are no HAPCs identified within the expanded study corridor.

**Table 3-25: Managed Fish Species Potentially Found in the Expanded Study Corridor**

COMMON NAME	SCIENTIFIC NAME	LIFE STAGE <sup>A</sup>
Red drum	<i>Sciaenops ocellatus</i>	E L J A
Bluefish	<i>Pomatomus saltatrix</i>	E L J A
Summer flounder	<i>Paralichthys dentatus</i>	L J A
Gag grouper	<i>Mycteroperca microlepis</i>	J
Gray snapper	<i>Lutjanus griseus</i>	J
Cobia	<i>Rachycentron canadum</i>	E L J A
King mackerel	<i>Scomberomorus cavalla</i>	J A
Spanish mackerel	<i>Scomberomorus maculatus</i>	J A
Black sea bass	<i>Centropristis striata</i>	L J A
Spiny dogfish	<i>Squalus acanthias</i>	J A
Brown shrimp	<i>Penaeus aztecus</i>	E L J A
Pink shrimp	<i>Penaeus duorarum</i>	E L J A
White shrimp	<i>Penaeus setiferus</i>	E L J A
Scalloped hammerhead shark	<i>Sphyrna lewini</i>	J A
Big nose shark	<i>Carcharhinus altimus</i>	J A
Black tip shark	<i>Charcharhinus limbatus</i>	J A
Dusky shark	<i>Carcharhinus obscurus</i>	J A
Night shark	<i>Carcharhinus signatus</i>	J A
Sandbar shark	<i>Carcharhinus plumbeus</i>	J A
Silky shark	<i>Carcharhinus falciformis</i>	J A
Tiger shark	<i>Galeocerdo cuvier</i>	J A
Atlantic sharpnose shark	<i>Rhizoprionodon terraenovae</i>	J A
Longfin mako shark	<i>Isurus paucus</i>	J A
Whitetip shark	<i>Carcharhinus longimanus</i>	J A
Thrasher shark	<i>Alopias vulpinus</i>	J A

Source: NOAA, National Marine Fisheries Service, Habitat Conservation Division. 2000. Index by County of Waterbodies in which EFH Species are Found. Beaufort, NC.<sup>195</sup>

<sup>a</sup> E – Eggs, L – Larval, J – Juvenile, A - Adult

### **3.4.4.5 Areas of Environmental Concern**

Under the North Carolina Coastal Area Management Act of 1974 (CAMA), the North Carolina Coastal Resources Commission (CRC) controls development and land disturbing activities within coastal counties in locations designated as Areas of Environmental Concern (AECs). An AEC is loosely defined as an area of natural importance that may be easily destroyed by erosion or flooding, or have environmental, social, economic or aesthetic qualities valuable to the state. Areas designated as AEC include estuarine and ocean areas, ocean hazard areas,

public water supply areas, and natural or cultural resources. These areas may include coastal jurisdictional wetlands as well as portions of the uplands that border them. Development and land disturbing activities within AECs are regulated through a permitting process administered by the North Carolina Division of Coastal Management (NCDCM).<sup>196</sup>

**Methods**

Following the issuance of the DEIS, literature published by NCDCM was consulted to determine the presence or absence of AECs within the expanded study corridor.<sup>197</sup>

**AECs Identified within the Expanded Study Corridor**

Brunswick and New Hanover counties are within the jurisdiction of NCDCM as coastal counties. In areas of its jurisdiction, NCDCM defines Estuarine and Ocean System Public Trust Areas as "all navigable natural water bodies and the lands underneath, to the normal high watermark on shore."<sup>198</sup> The waters of the Cape Fear River and a back channel situated within the tidal freshwater marsh wetland system on the eastern side of the river were identified as Public Trust AEC areas totaling 14.6 acres. No other areas were identified as AECs within the expanded study corridor.

**3.4.4.6 Anadromous Fish Habitat**

The waters of the Cape Fear River system provide migration routes and spawning grounds for several species of anadromous fish (Table 3-26).<sup>199</sup> Anadromous species migrate from oceans into freshwater rivers to spawn. The segment of the Cape Fear River within the expanded study corridor is approximately 25 miles from the river’s outlet to the Atlantic Ocean and approximately 20 miles downstream from the USACE Cape Fear Lock and Dam Number 1. This structure presents the first obstruction to upstream fish migration. However, a fish ladder was installed by the USACE in May 1998 to accommodate the upstream movement of anadromous shad and river herring.

**Table 3-26: Anadromous Fish Species of the Cape Fear River**

COMMON NAME	SPECIES
American shad	<i>Alosa sapidissima</i>
Hickory shad	<i>Alosa mediocris</i>
Striped bass	<i>Morone saxatilis</i>
Atlantic sturgeon	<i>Acipenser oxyrinchus</i>
Shortnose sturgeon	<i>Acipenser brevirostrum</i>
Alewife	<i>Alosa pseudoharengus</i>
Blueback Herring	<i>Alosa aestivalis</i>

Source: University of Chapel Hill at Wilmington. "Anadromous Species of the Cape Fear River System." Wilmington, NC. 2005. Available: <http://www.uncwil.edu/cmsr/aquaticceology/lcfrp/Fisheries/anadromous.htm>. Accessed March 2006.

**Methods**

Following the issuance of the DEIS, scientific literature was consulted to identify anadromous fish species potentially occurring within the expanded study corridor.<sup>200</sup>

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### **Anadromous Fish Habitat Identified within the Expanded Study Corridor**

The portion of the Cape Fear River within the expanded study corridor was identified as habitat for anadromous fish species. Other waters of the expanded study corridor were not considered appropriate habitat.

#### **3.4.4.7 Submerged Aquatic Vegetation**

Submerged Aquatic Vegetation (SAV) habitat is dominated by one or more species of submerged rooted vascular plants or macroalgae. The NCDMF estimates that approximately 200,000 acres of North Carolina coastline support estuarine SAV.

#### **Methods**

Following the issuance of the DEIS, map data and literature published by NCDMF was consulted to determine the presence or absence of SAV within the expanded study corridor.<sup>201</sup>

#### **Submerged Aquatic Vegetation Identified within the Expanded Study Corridor**

According to the NCDMF map of the Distribution of SAV in Coastal North Carolina, no areas of SAV occur within the expanded study corridor.<sup>202</sup>



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**CHAPTER 4.  
ENVIRONMENTAL CONSEQUENCES**



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## **CHAPTER 4. EXISTING ENVIRONMENTS**

In this chapter of the FEIS, the probable environmental effects of implementing the original build alternatives presented in the DEIS and the recommended alignment within the expanded study corridor are described. All practicable efforts were taken to avoid and minimize impacts associated with the project. Since approval of the DEIS and selection of the DEIS Preferred Alternative, supplementary environmental studies supporting efforts to avoid and minimize impacts have been ongoing. Public and agency involvement efforts, as documented in Chapter 7 of this FEIS, have also been ongoing and were valuable in developing the recommended alignment, understanding potential project impacts, and developing mitigation measures. On November 17, 2005, the project NEPA/404 Merger Team concurred with the avoidance and minimization measures outlined on the *Section 404/NEPA Merger Project Team Meeting Agreement, Concurrence Point 4A – Avoidance and Minimization* (Appendix E) and described in certain sections of this chapter of the FEIS.

### **4.1 DIRECT IMPACTS**

Four build alternatives; alternatives 2, 3, 8, and 9; were evaluated in a DEIS issued in early 1997. Following the issuance of the DEIS, Alternative 9 was chosen as the Preferred Alternative. During the preliminary engineering of the Preferred Alternative, modifications were made to Alternative 9, as described in Section 2.3, to minimize and avoid environmental impacts. Due to the length of time between preparation of the DEIS and this FEIS and the modifications made to Alternative 9 (i.e., the recommended alignment), a reevaluation of the DEIS has been conducted. The reevaluation determined that the analyses included in the DEIS remain valid and that implementation of the recommended alignment would not result in substantial changes to the affected environment.<sup>203</sup>

The DEIS analysis is included in the following subsections titled DEIS Analysis. The text provided in the DEIS Analysis subsections was taken directly from the DEIS with minor modifications made for the purpose of providing clarity. In the DEIS sections, references to the study area refer to the original study area for the project, shown in Figure 1-2. Impacts associated with the recommended alignment are presented under the subsections titled FEIS Analysis. Since preparation of the DEIS, the assessment of expected effects of the project has been refined. Therefore, there is often more detail provided for effects associated with the recommended alignment than for the four build alternatives from the DEIS.

Comments made on the DEIS have been addressed in the FEIS analysis subsections. In some instances, the DEIS and FEIS analyses were similar. In order to avoid repetition, in those instances, the four build alternatives from the DEIS *and* the recommended alignment are addressed in a single section.

#### **4.1.1 HUMAN ENVIRONMENT**

##### **4.1.1.1 Community Facilities and Services**

###### **DEIS Analysis**

None of the build alternatives would adversely impact community facilities and services. There are no schools, parks, churches, or fire stations that would be displaced, nor would access to and from any of these facilities be impacted. One small cemetery located in the vicinity of the US 17 interchange would be isolated under all alternatives. Although SR 1414 and SR 2169 would be realigned under all of the proposed alternatives, newly aligned routes would not

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substantially affect fire station response time. The game lands, west of US 421, would not be encroached upon by any corridor.

### **FEIS Analysis**

The recommended alignment would not adversely impact community facilities and services. Additionally, the realignment of NC 87, SR 1552, and SR 2169 would not substantially affect the response times of emergency services providers. As part of the project, closure of SR 1414 (Goodman Road) to through traffic between US 17 and NC 87 is proposed, which may increase emergency response times to rural areas along NC 87. Closing Goodman Road will increase the travel distance for emergency response vehicles traveling to and from the Wilmington direction by approximately two miles. Fire protection in the unincorporated areas in the vicinity of Goodman Road and NC 87 is provided either by the Leland Fire Department or the Winnabow Fire Department through a cooperative agreement. The Winnabow Fire Department is located in Winnabow, approximately two and a half miles south of the NC 87/US 17 intersection.

The grade separation planned for SR 1426 over the railroad tracks may improve emergency response times. No schools, parks, churches, or fire stations would be displaced, nor would access to these facilities be impacted. The game lands, west of US 421, would not be encroached upon by the recommended alignment. However, one small cemetery located in the vicinity of the US 17 interchange would be isolated.

By improving the roadway network through increasing capacity and access, the project is expected to have an overall positive effect on community facilities and activity centers. According to 2000 Census data for Brunswick County, 65 percent of the residents of Census tracts in the project area commuted to work places outside of Brunswick County.<sup>204</sup> Many of these commuters presumably travel across the Cape Fear River toward employment in the Wilmington metropolitan statistical area. Throughout the 1990's, more employees commuted into New Hanover County from other areas than commuted out of the county. Only 8.6 percent of workers residing in New Hanover County commuted outside the county for work. For these reasons, improved access into and around the project area, particularly near the industries along US 421, the Leland Industrial Park, and the airport, could result in more efficient commuting times. The average commute time to work for residents of Brunswick County is 24.3 minutes.<sup>205</sup> The project would provide a more direct roadway link between the Port of Wilmington and the Leland Industrial Park, facilitating multi-modal transportation and rendering the industrial park more attractive for further industrial development. This link would also provide more efficient access to the New Hanover County Airport. Projected landside growth at the New Hanover County Airport's industrial park as well as potential airside expansion could result in employment opportunities.

A detailed assessment of the project's impact to community facilities and activity centers is presented in the *Wilmington Bypass US 17 to US 421 Brunswick and New Hanover Counties Indirect and Cumulative Effects Assessment*.<sup>206</sup>

#### **4.1.1.2 Relocations**

### **DEIS Analysis**

Table 4-1 shows the estimated number of relocations for the four build alternatives studied in the DEIS.

**Table 4-1: Estimated Number of Relocations (DEIS)**

<b>DISPLACEMENT TYPE</b>	<b>ALTERNATIVE 2</b>	<b>ALTERNATIVE 3</b>	<b>ALTERNATIVE 8</b>	<b>ALTERNATIVE 9</b>
Residential Owners	23	37	32	22
Residential Tenants	0	1	14	0
Estimated Number (Percent) of Minority Households	4 (17%)	5 (13%)	4 (9%)	4 (18%)
Total Residential	23	38	46	22
Small Businesses (< 8 employees)	8	9	8	7
Medium Businesses (8-12 employees)	1	1	1	1
Large Businesses (> 12 employees)	0	0	0	0
Total Businesses	9	10	9	8

Source: NCDOT, 1996i.

### Residential Relocations

The majority of residential relocations would occur in the vicinity of the US 17 and SR 1426 interchanges, with most of these displacements (18) required in the vicinity of the US 17 interchange. Alternative 2 would require 23 displacements and Alternative 9 would require 22 displacements. Based on NCDOT windshield surveys, four of these residences (17 and 18 percent for Alternatives 2 and 9, respectively) along both Alternatives are estimated to be minority. Alternatives 3 and 8 would displace substantially more residences. Alternative 3 would displace 38 residences of which five (13 percent) are estimated to be minority, and Alternative 8 would displace 46 residences of which four are estimated to be minority (9 percent).

According to relocation personnel, most displacements in the vicinity of the SR 1426 interchange would occur on the west side of SR 1426 under all four alternatives. For Alternatives 3 and 8, displacements would be concentrated in Census tract 201.98, block 824 (north of the King's Bluff aqueduct and west of SR 1426); for Alternatives 2 and 9, displacements would be concentrated in tract 201.98, block 825 (between the CSX Rail line and the King's Bluff aqueduct and west of SR 1426). Based on 1990 data, these Census blocks have low percentages of minority persons, 2.7 percent and 0.0 percent, respectively. Furthermore, the Census block group of which these Census blocks are part (tract 201.98, block group 8) has a lower percentage of persons having low-incomes (21.7 percent) than the study area (27.6 percent).

For all build alternatives, most displacements (18) are in the vicinity of the southern terminus of the project around the US 17 interchange. Within this vicinity, approximately half of the displacements (9) would occur on the east side of US 17 south of SR 1451. This area is comprised by Census tract 202, blocks 209 and 210. Although apparently more developed than when the 1990 Census was conducted, block 209 of Census tract 202 displays a small minority population of 10.8 percent (4 persons [1990 Census population]). Block 210 is located east of

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US 17 and north of Sloan Road. This Census block has a higher percentage of minority persons (56.0 percent or 119 persons) than the study area (27.6 percent). Additionally, the Census block group of which these Census blocks are part (Census tract 202, block group 2) has a higher percentage of persons having low-income (31.3 percent) than the study area (27.6 percent).

Another area of displacements would occur on the western side of US 17 in the vicinity of its interchange with the project. This area is generally comprised of Census tract 201.98, blocks 733 and 729. Blocks 729 and 733 span the west side of US 17 northward from the US 17/ NC 87 intersection to SR 1414. The racial minority percentage for block 729 is 100 percent (20 persons), and the racial minority percentage for block 733 is 18 percent (one person). The Census block group of which these Census blocks are part (Census tract 201.98, block group 7) has practically the same percentage of persons having low-incomes (27.2 percent) as the study area (27.6 percent).

Other displacements within the study area are scattered along the alternative corridors, which include several displacements located north of SR 1414 along the alternative corridor and several displacements in the vicinity of Cedar Hill Road.

### **Business Relocations**

Alternative 3 is projected to require approximately 10 business relocations. Alternatives 2 and 8 are projected to require approximately nine business relocations. Alternative 9 would require the displacement of approximately eight businesses. According to the relocation reports, none of the businesses identified are minority-owned. The relocation reports approved in December, 1996 list the businesses which are estimated to be displaced under each alternative (Appendix C). Review of these businesses suggests that no business that would be displaced represents a unique type of business in the area. Accordingly, temporary disruption in their services during relocation is not anticipated to create any severe hardships to patrons in the area.

### **FEIS Analysis**

In relocation studies conducted by the NCDOT, the number of residential and business relocations that would be necessary to implement the recommended alignment was estimated. The relocation reports, prepared in May 2006, for the recommended alignment are included as Appendix C of this document. The results of the relocation studies are shown in Table 4-2. Displacements would be mitigated through implementation of the relocation assistance programs described in the following subsection.

Since completion of the DEIS, reconnaissance of the project area has been conducted to identify development activity that has occurred since that time. Recent development activity has primarily occurred south of the proposed interchange at US 17, along US 17 and between the proposed interchange and the US 17/US 74/76 interchange. Sparse construction of individual homes has occurred elsewhere within the expanded study corridor. However, substantial changes in land use or the residential and commercial character of the expanded study corridor has not occurred. Nor have the demographic characteristics of the study corridor changed substantially. Thus, the relocation numbers and demographic data presented in this FEIS for the recommended alignment are consistent with those presented for the build alternatives studied in the DEIS. During preliminary engineering every effort was made to avoid relocations.

Seven businesses and 21 residences would be relocated as a result of implementing the recommended alignment.

The NCDOT will provide new access wherever economically justifiable to properties isolated by a project. All property access changes and proposed solutions identified in the service road study will be presented during the Design Public Hearing (see Section 4.4.2).

**Table 4-2: Estimated Number of Relocations**

DISPLACEMENT TYPE	*RECOMMENDED ALTERNATIVE
Residential Owners	14
Residential Tenants	7
Estimated Number of Minority Households	2
<b>TOTAL RESIDENTIAL</b>	21
Small Businesses (< 8 employees)	4
Medium Business (8-12 employees)	3
Large Businesses (>12 employees)	0
<b>TOTAL BUSINESSES</b>	7

Source: North Carolina Department of Transportation. Relocation Report for the Wilmington Bypass from US 421 to US 17. 2006.

\* Impacts based on proposed right of way limits of preliminary design.

### Residential Relocations

After completing preliminary design of the recommended alignment, NCDOT reevaluated the alignment for potential residential and business relocation impacts. The redesign of the US 17 interchange during preliminary engineering reduced the number of residential impacts south of US 17 by approximately eight residences. This reduction of impacts was offset somewhat by the relocation impacts in the vicinity of the proposed SR 1430 interchange, which was added after completion of the DEIS.

### Business Relocations

The relocation report included in Appendix C lists the businesses which are expected to be displaced. Review of these businesses suggests that no business that would be displaced represents a unique type of business in the area. Accordingly, temporary disruption in their services during relocation is not anticipated to create any severe hardships to patrons in the area.

### Relocation Assistance

The NCDOT has determined that there are comparable replacement housing and suitable business sites available within the project area for displaced homeowners, tenants, and businesses. The availability of residential and non-residential units for sale and rent was determined based on information obtained from realtors, newspapers, and real estate multiple listing services.

It is the policy of the NCDOT to ensure that comparable replacement housing for residents and suitable locations for displaced businesses would be available prior to construction of transportation projects. The North Carolina Board of Transportation (NCBOT) has three programs available to minimize the inconvenience of relocation: Relocation Assistance, Relocation Moving Payments, and Relocation Replacement Housing Payments or Rent Supplement.

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With the Relocation Assistance Program, experienced NCDOT staff would be available to provide displaced residents and businesses with information pertaining to financing and housing programs and the availability and prices of homes, apartments or businesses for sale and rent. The Relocation Moving Payments Program generally provides payment of actual moving expenses encountered during relocation. Where displacement would force an owner or tenant to purchase or rent property of higher cost or to lose a favorable financing arrangement (in cases of ownership), the Relocation Replacement Housing Payments and Rent Supplement Program will compensate up to \$22,500 to owners who are eligible and qualify, and up to \$5,250 to tenants who are eligible and qualify.

The relocation program established for the project will be conducted in accordance with the Federal Uniform Relocation Assistance and Real Property Acquisition Policies Act of 1970 (Public Law 91-646) and the North Carolina Relocation Assistance Act (GS 133-5 through 133-18). The program is designed to provide assistance to displaced persons in relocating to a replacement site in which to live or do business. At least one relocation officer is assigned to each highway project for this purpose.

The relocation officer determines the needs of displaced families, individuals, businesses, nonprofit organizations, and farm operations for advisory services without regard to race, color, religion, gender, or national origin. The NCDOT will schedule its work to allow ample time prior to displacement for negotiations and possession of replacement housing which meets decent, safe, and sanitary standards. Those who are displaced are given at least a 90-day written notice after NCDOT purchases the property. Rent and sales prices of replacement property offered will be within the financial means of the families and individuals displaced, and will be reasonably accessible to their places of employment. The relocation officer will assist owners of displaced residences, businesses, nonprofit organizations and farm operations in searching for and moving to replacement property.

All residential tenants and owner-occupants who may be displaced will receive an explanation regarding available options, such as: (1) purchase of replacement housing; (2) rental of replacement housing, either private or public; or (3) moving existing owner-occupant housing to another site (if possible). The relocation officer will also supply information concerning other state and federal programs offering assistance to displaced persons and will provide other advisory services as needed in order to minimize hardships to displaced persons in adjusting to a new location.

The Moving Expenses Payments Program is designed to compensate for the costs of moving personal property from homes, businesses, nonprofit organizations and farm operations acquired for a highway project. Under the Replacement Program for Owners, NCDOT will participate in reasonable incidental purchase payments for replacement dwellings such as attorneys' fees, surveys, appraisals, and other closing costs. If applicable, the NCDOT also makes a payment for any increased interest expenses for replacement housing payments, increased interest payments, and incidental purchase expenses. Reimbursement to owner-occupants for replacement housing payments, increase interest payments, and incidental expenses may not exceed a combined total of \$22,500, except under the Last Resort Housing Provision.

A displaced tenant may be eligible to receive a payment to rent a replacement dwelling or to make a down payment, including incidental expenses, on the purchase of a replacement dwelling. This payment will not exceed \$5,250. The down payment is based upon what the state determines is required when the rent supplement exceeds \$5,250.

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It is the state's policy that no person will be displaced by the NCDOT's federally-assisted construction projects unless and until comparable or adequate replacement housing has been offered or provided for each person displaced within a reasonable period of time prior to displacement. No relocation payment received will be considered as income for the purposes of the Internal Revenue Code of 1954 or for the purposes of determining eligibility or the extent of eligibility of any person for assistance under the Social Security Act or any other federal law.

Last Resort Housing is a program used when comparable replacement housing is not available or when it is unavailable within the displacee's financial means, and the replacement payment exceeds the federal and state legal limitations. This program allows broad latitude in methods of implementation by the state so that decent, safe, and sanitary replacement housing can be provided. Since opportunities for replacement housing appear adequate within the study area, it is not likely that the Last Resort Housing Program would be necessary for the proposed project. However, this program will still be considered as mandated by State law.

#### **4.1.1.3 Environmental Justice**

Title VI of the 1964 Civil Rights Act (Title VI) (42 USC §2000d) and related statutes provide that no person shall, on the grounds of race, color, age, religion, sex, national origin, or handicap/disability, be excluded from participation in, or be denied the benefits of, or be otherwise subject to discrimination under any program of the federal, state, or local government.

The US Environmental Protection Agency's (USEPA) Office of Environmental Justice defines environmental justice as:

The fair treatment and meaningful involvement of all people regardless of race, color, national origin, or income with respect to the development, implementation, and enforcement of environmental laws, regulation, and policies. Fair treatment means that no group of people, including racial, ethnic, or socio-economic group should bear a disproportionate share of the negative environmental consequences resulting from industrial, municipal, and commercial operations or the execution of federal, state, local, and tribal programs and policies. Meaningful involvement means that: (1) potentially affected community residents have an appropriate opportunity to participate in decisions about a proposed activity that will affect their environment and/or health; (2) the public's contribution can influence the regulatory agency's decision; (3) the concerns of all participants involved will be considered in the decision making process; and (4) the decision makers seek out and facilitate the involvement of those potentially affected.<sup>207</sup>

Executive Order (EO) 12898, which was signed by President Clinton in 1994, requires that "each Federal agency shall make achieving environmental justice part of its mission by identifying and addressing, as appropriate, disproportionately high and adverse human health or environmental effects of its programs, policies, and activities on minority populations and low-income populations."<sup>208</sup> The federal guidance for evaluating environmental justice issues is found in *Guidance for Federal Agencies on Key Terms in Executive Order 12898*, which was developed by the Interagency Working Group on Environmental Justice in August 1995.<sup>209</sup>

In response to the mandates of EO 12898, the United States Department of Transportation (USDOT) developed a Final Environmental Justice Strategy (60 FR 125: 33896) and a USDOT Order titled, *Actions to Address Environmental Justice in Minority Populations and Low-Income Populations* (USDOT Order 6640.23). In Order 6640.23 the USDOT provides clear definitions of the four minority groups addressed by EO 12898.<sup>210</sup> These groups are:

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- Black – a person having origins in any of the black racial groups of Africa;
  - Hispanic – a person of Mexican, Puerto Rican, Cuban, Central or South American, or other Spanish culture or origin, regardless of race;
  - Asian American – a person having origins in any of the original peoples of the Far East, Southeast Asia, the Indian subcontinent, or the Pacific Islands; and
  - American Indian and Alaskan Native – a person having origins in any of the original people of North America and who maintains cultural identification through tribal affiliation or community recognition.

When determining whether environmental effects are disproportionately high and adverse, agencies are to consider the following three factors to the extent practicable:

- Whether there will be an impact to the natural or physical environment that significantly and adversely affects a minority or low-income population. Such effects may include ecological, cultural, human health, economic, or social impacts on minority communities or low-income communities when those impacts are interrelated with impacts to the physical environment;
- Whether environmental effects are significant and are, or may be having an adverse impact on minority populations or low-income populations that appreciably exceed, or is likely to appreciably exceed those to the general population or other appropriate comparison group; and
- Whether the environmental effects occur or would occur in a minority population or low-income population affected by cumulative or multiple adverse exposures from environmental hazards.

### **DEIS Analysis**

Based on NCDOT windshield surveys conducted prior to the DEIS, the population that would be displaced and generally affected by the project under all four build alternatives evaluated in the DEIS is largely non-minority. Based upon project studies and review of the context and intensity of anticipated effects from the proposed alternatives, the preliminary evaluation suggests that none of the four build alternatives is likely to cause any net, disproportionately high or adverse effects on minority or low-income populations in the study area.

### **FEIS Analysis**

An assessment of environmental justice was conducted and documented in the report, *Environmental Justice Assessment, Wilmington Bypass* (EJ Assessment).<sup>211</sup>

Since the publication of the DEIS, developments in the preliminary design of project alignments have required expansion of the project study corridor for avoidance and minimization of project impacts. Through the course of preliminary design, it was determined that a minority community, Spring Hill, which was located outside of the DEIS Preferred Alternative corridor, would be affected by alignment modifications developed to reduce project impacts. After meeting with the community of Spring Hill, it was determined that members of the community had unintentionally not been included in the project development process. A NEPA/404 Merger Team meeting was held on June 10, 2004 to inform the Merger Team of the oversight in not

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providing the community with an opportunity for fair and full participation in the project development process, to convey the community's concerns, and to determine if the team would be receptive to re-opening Concurrence Point 4A, which is, Avoidance and Minimization of Impacts. The Merger Team agreed to reevaluate alternative alignments in the vicinity of Spring Hill that might avoid and minimize impacts to the natural, social, and physical environments. Subsequent work in the community suggested that Spring Hill was largely a minority community and that income levels were lower than county averages. The Merger Team agreed that additional studies should be undertaken to correctly identify the characteristics of this community and determine potential impacts of alignment selection and involve the community in the project development process.

Four NEPA/404 Merger Team meetings were held in the process of identifying the characteristics of the Spring Hill community and assessing potential impacts of alignment selection. At a meeting held in December of 2004, a committee of citizen representatives from the community was formed. In a meeting held in January of 2005, four alternative alignments in varying proximity to the Spring Hill community were presented and the FHWA determined that the project was not in compliance with EO 12898, as the Spring Hill community was unintentionally not "...provided opportunities for community input in the NEPA process..."<sup>212</sup> It was determined that additional documentation and citizen involvement was necessary.

The purpose of the EJ Assessment was to provide information on the minority and low-income populations within a specified study area of the project, and to provide an assessment of potential effects to those populations from construction and operation of the project. The effects evaluated in the EJ Assessment were the central issues that were articulated during the small group meetings held with citizens of the Spring Hill community in April and December 2004, and May and June 2005, and during the January 20, 2005 Merger Team meeting. These concerns were reviewed by the project team to determine the central issues that should be evaluated within the framework of environmental justice.

A brief synopsis of the EJ Assessment and the findings therein is provided in this FEIS.

### Identification of Protected Populations

For purposes of the EJ Assessment, low-income and/or minority populations were recognized as protected. In order to identify protected populations that might be affected by the project, a study area was delineated using a modified three-mile buffer around the expanded study corridor. The three-mile buffer was clipped on the east side of the expanded study corridor where the Cape Fear River acts as a natural boundary beyond US 421. Low-income and minority populations were identified at the block group and block levels, respectively, for the entire study area. According to *NCHRP Report 532*, "Evaluation units with protected population levels greater than the established threshold values are considered to have substantial protected populations and higher potential for distributive effects than other evaluation units."<sup>213</sup> The average of the percentages of both minority and low-income populations for Brunswick and New Hanover counties were used as threshold values. The aggregates of the percentage of protected populations at the block and block group levels were compared to the threshold values. It was determined that there is a substantial protected population present in the study area.

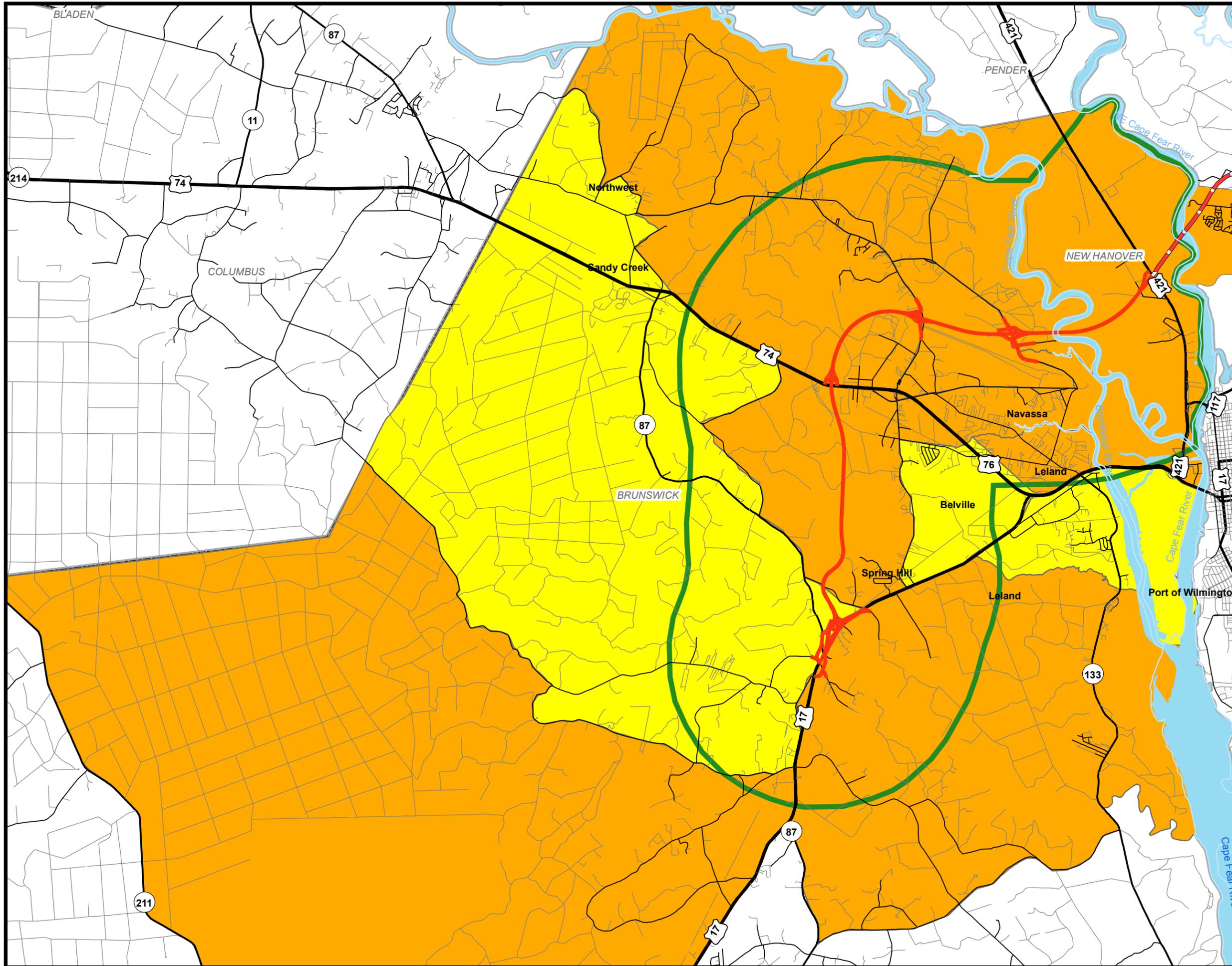
### Analysis and Findings

Maps were prepared showing the distribution of protected populations in the study area at the block and block group level in relation to the expanded study corridor. The maps were used

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throughout the environmental justice assessment to compare the distribution of protected populations to the predicted distribution of negative impacts in order to determine if the protected populations might suffer from negative impacts associated with the project. A preliminary evaluation of impacts to protected populations following *NCHRP Report 532* guidelines indicated that the project's effects on community cohesion would likely be inequitable among populations within the study area and a more detailed analysis of these potential effects was warranted.

A detailed analysis of community cohesion impacts was conducted to determine the potential effects of the alignment alternatives on communities comprised of protected populations. Based on an assessment of the presence of features that are characteristic of a cohesive community in the study area and an analysis of the potential negative impacts of the alternative alignments; the Spring Hill community was identified as a cohesive community whose low-income and minority populations could suffer from disproportionate adverse impacts depending on the relative proximity of the project to the community. Of the factors affecting community cohesion, displacements and relocations were expected to have the greatest impact and were the most disparate depending on the alignment of the project. During the avoidance and minimization process, it was found that the recommended alignment would best minimize adverse effects to the Spring Hill community while minimizing effects on some important natural and cultural resources in the expanded study corridor. Maps showing the recommended alignment in relation to the low-income and minority populations in the study area are included as Figure 4-1 and Figure 4-2, respectively. The recommended alignment of the project is not expected to have disproportionate adverse impacts to low-income and minority populations in the project study area..



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Figure 4-1  
Recommended Alignment and  
Low-Income Populations

Legend

- EJ Study Area
- Recommended Alignment
- R-2633C
- Interstate
- US Highway
- State Route
- Local Roads
- Railroad
- County
- Water

Percent Below Poverty  
by Census Block Groups

- 0% to 12.7% (below threshold)\*
- 12.8% to 49.9% (above threshold)\*
- 50% to 74.9%
- 75% to 100%

\* The threshold was determined to be 12.8% based on the aggregate average of percent of residents below poverty in Brunswick County (12.6%) and New Hanover County (13.1%).



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Miles



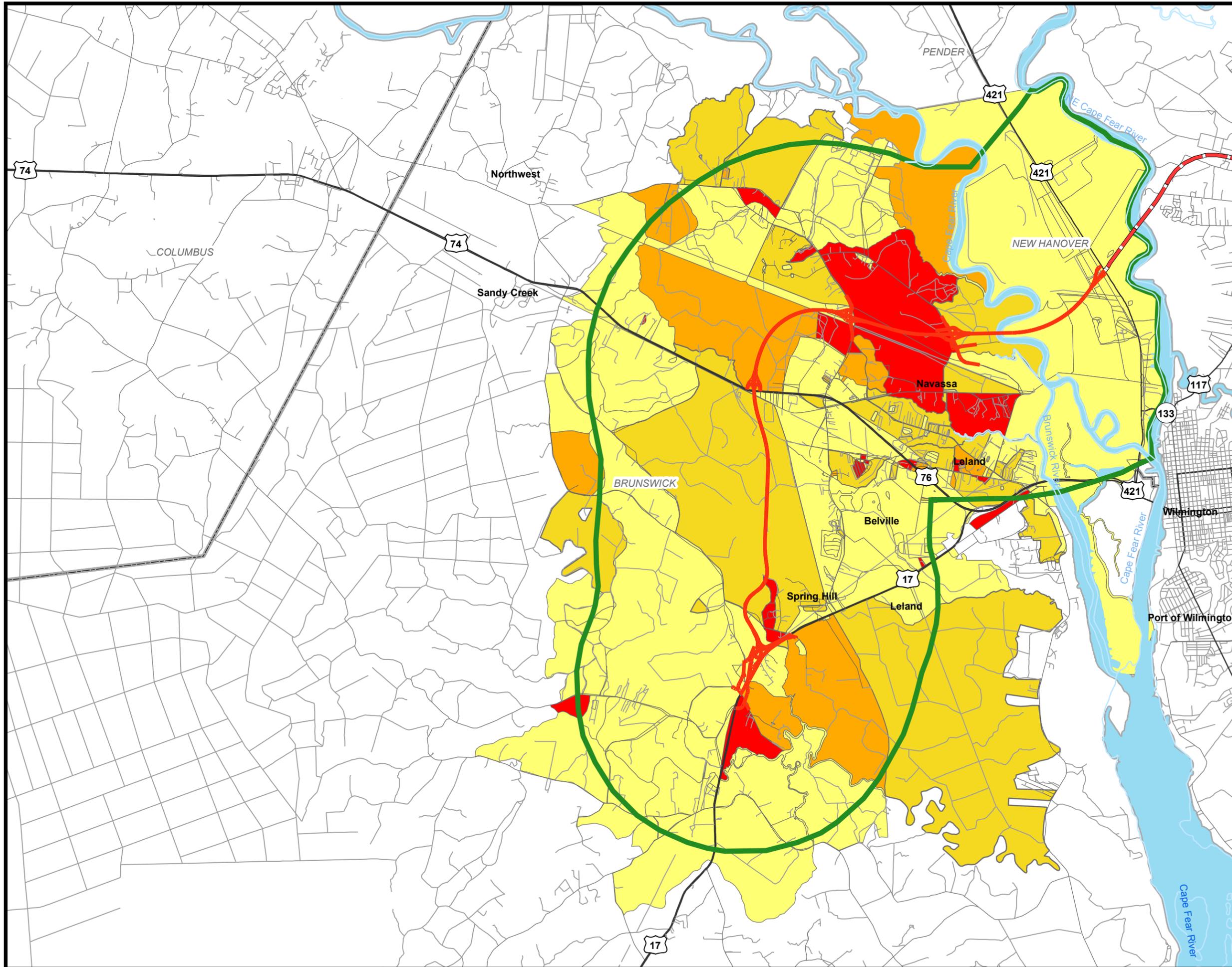
- Counties
- Study Area Counties





TIP R-2633A/B  
Wilmington Bypass

Figure 4-2  
Recommended Alignment and  
Minority Populations



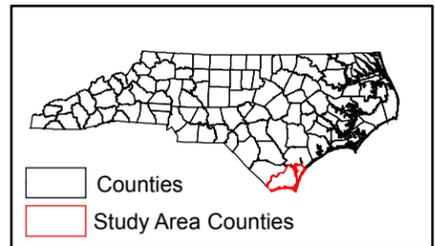
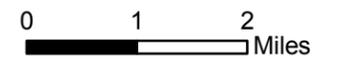
**Legend**

- EJ Study Area
- R-2633 A/B Recommended Alignment
- R-2633 C
- Interstate
- US Highway
- State Route
- Local Roads
- Railroad
- County
- Water

**Percent Minority by  
Census Blocks**

- 0% to 21.5% (below threshold)\*
- 21.6% to 49.9% (above threshold)\*
- 50% to 74.9%
- 75% to 100%

\* The threshold was determined to be 21.6% based on the aggregate average of percent of minority population in Brunswick County (20.4%) and New Hanover County (22.1%).





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#### **4.1.1.4 Economics**

##### **DEIS Analysis**

##### **Regional Impacts**

It is likely that the proposed project would have an overall beneficial economic impact on the region by providing facilitated access to major industries and trade centers in both Brunswick and New Hanover counties. There would be an increase in construction employment during the building phase of the project, as well as increased government revenues from transportation-related taxes. However, there would also be a loss of land from property tax roles.

Census data for Brunswick County suggests that approximately 63 percent of the residents of Census tract 201.98, which is in the vicinity of the project area, commuted outside of Brunswick County for work in 1990.<sup>214</sup> Many of these commuters presumably travel across the Cape Fear River toward employment in the Wilmington metropolitan statistical area. Additionally, because New Hanover County is relatively small in size, employees in the region may have jobs and residences in different counties. Throughout the 1980s, there have been more employees commuting into the County from other areas than there have been employees commuting out of the County.<sup>215</sup> For these reasons, improved access into and around the area, particularly near the industries along US 421, the Leland Industrial Park, and the airport's industrial park, could result in more efficient commuting times.

The proposed action would also provide improved access from I-40 to port facilities. "With planned capital investments and growth in cargo volume at the Morehead City and Wilmington facilities, the North Carolina ports should have an even greater impact on the economy of the state in the future".<sup>216</sup> In addition, the proposed action would provide a more direct roadway link between the Port and the Leland Industrial Park, facilitating multi-modal transportation and rendering the park more attractive for further industrial development. This link would also provide more efficient access to the New Hanover County Airport. Projected growth at the New Hanover County Airport's industrial park as well as aviation-related expansion potential could result in employment opportunities in the county.<sup>217</sup> Improved access to these facilities could help facilitate growth at the airport.

##### **Local Impacts**

Economic impacts to property near the proposed new roadway could be positive or negative. Some residential properties near the study area could experience increased noise levels and visual impacts. Other properties near the roadway and throughout the study area, especially non-residential property near the proposed interchanges, could become more accessible, making them more attractive for development.

Two thoroughfares would be realigned as part of the proposed action: SR 1414 and SR 2169. Cul-de-sacs at SR 1414 would be located at both sides of the project under all four alternatives. Service roads serving the residential areas in the vicinity of US 17/NC 87 would maintain access to these areas. Residential areas along Cole Court would be serviced by a northeast extending service road that would intersect with Hewett-Burton Road (SR 1414) on the east side of US 17. A second service road serving Stoney Creek Lane and areas south would extend to SR 1522, terminating near the intersection of SR 1522 and US 17 and south of the controlled-access limits. A third service road would be located west of NC 87 and serve residential areas from Oak View Drive NE, where the service road would parallel NC 87 to Old Town Road and

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intersect with US 17 just south of the controlled-access limits. With all four alternatives, SR 2169 in the vicinity of the US 421 interchange would be realigned on the north side of the project to connect with SR 1394 located west of this route. On the southern side of the project, SR 2169 would have a cul-de-sac at its new terminus. A service road study will be conducted during the preliminary engineering design phase. The North Carolina Department of Transportation (NCDOT) will provide new access wherever economically justifiable to properties isolated by a project. All property access changes and proposed solutions identified in the service road study would be presented during the Design Public Hearing.

## **FEIS Analysis**

### **Regional Impacts**

It is likely that the project would have an overall beneficial economic impact on the region by providing facilitated access to major industries and trade centers in both Brunswick and New Hanover counties. There would be an increase in construction employment during the construction phase of the project, as well as increased government revenues from transportation-related taxes. However, there would also be a loss of land from property tax roles. The loss of tax revenue is not anticipated to effect the counties' and local municipalities' abilities to provide public services. Loss of property tax revenues is expected to be temporary as other development in the project vicinity is likely to offset any losses. Indirect and cumulative economic effects are addressed in Section 4.2.1.3.

Positive economic effects can also have negative environmental effects as natural or undeveloped areas become developed. Potential negative environmental effects could include loss of wetlands and recharge areas, degradation of water quality from increased impervious surface, and habitat loss. Considering the past development trends and the continued favorable growth environment, impacts to these resources could also occur with the no-build scenario, though to a lesser degree. Indirect and cumulative effects on the natural environmental are addressed in Section 4.2.5.

### **Local Impacts**

Local economic impacts to property near the project could be positive or negative. Properties near the roadway and throughout the study area could become more accessible making them more attractive for development; however, noise and visual impacts could also be associated with the roadway which could make residential property adjacent to the project less desirable.

#### **4.1.1.5 Land Use**

##### **Existing Land Use**

Land uses in the study area can be divided into two basic categories: man-dominated systems and natural systems. Man-dominated systems are those lands which have been altered for residential and commercial development, agricultural purposes, or transportation and utility corridors. Natural systems are lands generally in an undisturbed condition and include second growth forests, planted pines, and wetlands.

Since the proposed project would be constructed on a new alignment, land use impacts would occur under all build alternatives. The No-Build Alternative would not create land use impacts.

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## DEIS Analysis

Table 4-3 lists the estimated number of acres of different land uses impacted by the Alternatives 2, 3, 8, and 9 within a 300-foot proposed right of way. All build alternatives would impact more natural system land than man-dominated land. It should be noted that the impacts to natural systems are based on the required right of way width and include the impacts associated with service roads. Actual impacts would be less since the construction limits would average less than 300 feet wide.

**Table 4-3: Estimated Land Use Impacts**

LAND USE	IMPACTED ACRES			
	ALT 2	ALT 3	ALT 8	ALT 9
Residential	7	9	9	7
Commercial/Industrial	36	44	52	52
Utilities	2	1	<1	2
Transportation	32	22	31	29
Agriculture	16	22	25	24
Cleared Land	1	1	<1	1
<b>SUBTOTAL</b>	<b>94</b>	<b>99</b>	<b>117</b>	<b>115</b>
Natural Systems (Upland)	277	261	267	268
Natural Systems (Wetland)	217	228	193	194
<b>SUBTOTAL</b>	<b>494</b>	<b>489</b>	<b>460</b>	<b>462</b>
<b>TOTAL</b>	<b>588</b>	<b>588</b>	<b>577</b>	<b>577</b>

A comparison of the alternatives shows that Alternatives 8 and 9 would impact more developed land than Alternatives 2 and 3. All four build alternatives would impact less than ten acres of residential land use.

## FEIS Analysis

Figure 3-5 shows the existing land use in relation to the recommended alignment. Approximately 972 acres of natural land use/land cover would be converted to transportation right of way by the project Section 4.1.3.3). This total is higher than that estimated for the build alternatives studied in the DEIS because changes that occurred since the DEIS. These include addition of the interchange at SR 1430 (Cedar Hill Road) and refinements in the US 17 interchange configuration that minimized residential relocations but increased right of way requirements. The direct effect of the project would not substantially change man-dominated land use. The project does have the potential to induce changes in land patterns and influence growth and development. The indirect and cumulative effects of the project are summarized in Section 4.2.

## Land Use Plans

Both the four build alternatives evaluated in the DEIS and the recommended alignment are consistent with the region's adopted land use plans. Since the preparation of the DEIS, an assessment of indirect and cumulative effects has been performed. A detailed assessment of the project's consistency with study area land use plans is presented in the *Wilmington Bypass US 17 to US 421 Brunswick and New Hanover Counties Indirect and Cumulative Effects Assessment*.<sup>218</sup> Additionally, CAMA establishes a cooperative program of coastal land management between local governments and the State of North Carolina for preparing,

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adopting and enforcing land use plans. As part of the permitting process, the project will be reviewed for consistency with state, federal, and local regulations and CAMA land use plans.<sup>219</sup>

The four build alternatives evaluated in the DEIS and the recommended alignment are consistent with the region's adopted transportation plans. The WMPO *2030 Long Range Transportation Plan* shows an outer loop bypassing the City of Wilmington. The general alignment shown for this outer loop is similar to the project alignment.<sup>220</sup> A detailed assessment of the project's consistency with study area transportation plans is presented in the *Wilmington Bypass US 17 to US 421 Brunswick and New Hanover Counties Indirect and Cumulative Effects Assessment*.<sup>221</sup>

#### **4.1.1.6 Cultural Resources**

##### **Historic Architectural Resources**

###### **DEIS Analysis**

Historic architectural resources which appear to be 50 years or older were identified in a multi-phase historic architectural survey of the project corridors (described in Section 3.1.5). Only the Goodman House and Doctor's Office, located near the southern terminus of the proposed alternatives (north side of SR 1414, 0.8 miles west of NC 17) was determined to be eligible for listing in the NRHP, under Criteria A and C, through concurrence between FHWA and the SHPO (Appendix E). The NRHP boundaries of this property, which dates between the 1830s and the early-twentieth century, encompass an approximately 9.5-acre tract which does not extend into the proposed alternatives to the east of the property.

Given that the boundaries of the Goodman House and Doctor's Office property do not extend into the common corridor of Alternatives 2, 3, 8, and 9 (at their southern terminus), and that lands between the proposed corridor and the edge of the property are heavily wooded and separated by a stream and associated wetland, the proposed corridor will have an effect but have no adverse effect on this NRHP-eligible property (Appendix A). The proposed corridor does not alter the property's location, setting, or use nor does it affect those characteristics that qualify the property for inclusion in the NRHP.

###### **FEIS Analysis**

Since the publication of the DEIS, the project study corridor was expanded and the alignment was refined in order to avoid and minimize project impacts. Specifically, on November 17, 2005, the NEPA/404 Merger Team, of which HPO is a member, concurred that the recommended alignment best avoids and minimizes environmental impacts to a minority community and a stream system. HPO concurrence was conditional upon the use of a memorandum of understanding or environmental commitments to address any effect of the recommended alignment on the Goodman House and Doctor's Office.

The recommended alignment right of way will be approximately 120 feet away from the property and will be separated by a forested area between the right of way and the property. The project necessitates the termination of Goodman Road in a cul-de-sac near the western end of the NRHP-eligible boundary. The FHWA, NCDOT, and HPO determined (concurrence letter of February 2006, Appendix A) that the recommended alignment would have no adverse effect upon the Goodman House and Doctor's Office provided that:

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- NCDOT shall use best planning practices for tree removal to reduce impacts to the woods adjacent to the Goodman House and Doctor's Office; and
  - NCDOT shall plant the edge of the right of way between stations 34+50 and 36+00 with native evergreens to further screen the new facility from the Goodman House and Doctor's Office.

Per FHWA, NCDOT, and HPO concurrence, native evergreen vegetation will be planted at the edge of the project right-of-way from station 34 + 50 to station 36 + 00 on the preliminary design plans between the roadway and the Goodman House and Doctor's Office. Best planning practices will be used for tree removal to reduce impacts to the woods adjacent to the Goodman House and Doctor's Office.

### **Archaeological Resources**

In the DEIS it was concluded that the common corridor of Alternatives 2, 3, 8 and 9 in New Hanover County cross site 31NH39\*\*. It was noted that, if the site fell within the preferred alternative, the site would be evaluated in terms of eligibility for the NRHP. It was also noted that, if the site was determined eligible to be listed in the NRHP, then FHWA and NCDOT, in consultation with HPO would evaluate the effect of the selected alternative on the resource and identify appropriate treatment measures. Since the issuance of the DEIS, site 31NH39\*\* was determined eligible for listing in the NRHP.

In addition to the previously recorded site, Site 31NH39\*\*, another historic site, Site 31BW604\*\* was identified as requiring further consideration following the DEIS. Site 31NH39\*\* is a nineteenth century historic site and 31BW604\*\* is a historic cemetery.

As currently designed, the proposed project would not directly impact sites 31NH39\*\* and 31BW604\*\*. However, because these sites are close to the edge of the proposed highway corridor, temporary protective fencing will be installed during construction to ensure that no inadvertent impacts to the sites occur. If the final highway design changes such that avoidance is not possible and if the effect of the recommended alignment on these sites is adverse pursuant to 36CFR800.5, then appropriate treatment measures to address these adverse effects will need to be developed. Procedures for treatment would be developed by FHWA and NCDOT, in consultation with the HPO, and, if appropriate, the Advisory Council on Historic Preservation, pursuant to 36CFR800.5(e). Since Site 31NH39\*\* is eligible for the listing in the NRHP per Criterion D, it would not require preservation in place. Since Site 31BW604\*\* is not eligible for the NRHP, it does not require further consideration under Federal Section 106 guidelines. However, if the recommended alignment is changed such that construction activities will be required on this site, then the NCDOT will comply with North Carolina State laws governing treatment of cemeteries (NC General Statutes, Chapter 65, Article 5).

## **4.1.2 PHYSICAL ENVIRONMENT**

### **4.1.2.1 Noise**

#### **DEIS Analysis**

A preliminary noise analysis was conducted for the proposed project in order to determine existing noise levels, evaluate future noise levels, determine impacted areas, and examine the feasibility of noise mitigation measures in impacted areas.<sup>222</sup>

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Potentially impacted noise sensitive sites identified in a preliminary analysis were further subjected to a refined analysis using FHWA's STAMINA 2.0 computer model. Existing, 2016 No-Build, and 2016 Build conditions were evaluated. All identified noise sensitive areas fall under Activity Category B in the FHWA Noise Abatement Criteria.

The noise impact evaluation conducted for the DEIS indicated that one residence along Alternatives 2 and 9 would experience a substantial increase in noise levels, and one residence along Alternatives 3 and 8 would experience noise levels that approach the FHWA abatement criteria.

For the No-Build Alternative, some sites would experience increases in traffic noise levels due to increases in traffic volumes on currently existing roadways. These results showed that one residence is predicted to experience noise levels that approach the abatement criteria in the vicinity of the US 17, and one residence is predicted to experience noise levels that approach the abatement criteria in the vicinity of the SR 1426 interchange.

### **FEIS Analysis**

The FHWA implemented a new noise model, *Traffic Noise Model* (TNM) in March 1998, following the issuance of the DEIS. The analysis of noise impacts was updated using the latest model (Version 2.1) and the preliminary design of the recommended alignment.

In March 2004 a potential impact to the minority community of Spring Hill was identified. Following coordination with the community and the NEPA/404 Merger Team, alternatives were developed to potentially avoid or minimize the impacts to the minority community. Five alignments were developed for consideration by the Merger Team, known as Red (Alternative 9), Green, Orange, Blue and Pink. Three alignments (Red, Green and Pink) which represent the range of alternatives were chosen for detailed study of the noise effects. A *Supplemental Noise Technical Memorandum* was prepared in September 2005.<sup>223</sup> The study utilized the updated NCDOT Traffic Noise Abatement Policy, and determined that the Pink alignment, which is now the recommended alignment, would have fewer noise impacts due to its location being further from the community of Spring Hill. The Merger Team attained Concurrence Point 4A, Avoidance and Minimization, for the recommended alignment at a meeting on November 17, 2005. The *Noise Technical Memorandum* for the recommended alignment was updated in March 2006.

### **Noise Abatement Criteria**

To determine if highway noise levels are compatible with various land uses, the FHWA has developed noise abatement criteria and procedures to be used in the planning and design of highways. Since completion of the DEIS these criteria and procedure have been amended and are in accordance with Title 23 Code of Federal Regulations (CFR), Part 772, US Department of Transportation, FHWA, Procedures for Abatement of Highway Traffic Noise and Construction Noise. A summary of the FHWA Noise Abatement Criteria (NAC) for various land uses is presented in Table 4-4. Sound pressure levels in this report are referred to as Leq(h). The hourly Leq, or equivalent sound level, is the level of constant sound that, over an hour time interval, would contain the same acoustic energy as the time-varying sound. In other words, the fluctuating sound levels of traffic noise are represented in terms of a steady noise level with the same energy content.

**Table 4-4: Noise Abatement Criteria**

CRITERIA FOR EACH FHWA ACTIVITY CATEGORY		
Activity Category	Leq(h)	Description of Activity Category
A	57 (Exterior)	Lands on which serenity and quiet are of extraordinary significance and serve an important public need and where the preservation of those qualities are essential if the area is to continue to serve its intended purpose.
B	67 (Exterior)	Picnic areas, recreation areas, playgrounds, active sports areas, parks, residences, motels, hotels, schools, churches, libraries, and hospitals.
C	72 (Exterior)	Developed lands, properties, or activities not included in Categories A or B above.
D	--	Undeveloped lands.
E	52 (Interior)	Residences, motels, hotels, public meeting rooms, schools, churches, libraries, hospitals, and auditoriums.

Source: Title 23 of the Code of Federal Regulations (CFR) Part 772, U.S. Department of Transportation, Federal Highway Administration

Noise mitigation measures must be considered when future noise levels either approach or exceed the criteria levels, or if there are substantial increases over the ambient noise levels. The NCDOT Traffic Noise Abatement Policy uses an “approach value” of 1 dBA less than those shown in Table 4-4. Additionally the value used for “substantial increase” is shown in Table 4-5 and is based on the existing noise level. Title 23 CFR, Section 772.11(a) states, "In determining and abating traffic noise impacts, primary consideration is to be given to exterior areas. Abatement will usually be necessary only where frequent human use occurs and a lowered noise level would be of benefit." For this project, the majority of the identified receptors were residential. Commercial receptors were located at the proposed interchanges with US 74/76 and US 421.

**Table 4-5: Criteria for Substantial Increase in Noise**

HOURLY A-WEIGHTED SOUND LEVEL - DECIBELS	
Existing Noise Level in Leq(h)	Increase in dBA from Existing Noise Levels to Future Noise Levels
50 or less dBA	15 or more dBA
51 dBA	14 or more dBA
52 dBA	13 or more dBA
53 dBA	12 or more dBA
54 dBA	11 or more dBA
55 or more dBA	10 or more dBA

Source: North Carolina Department of Transportation Noise Abatement Policy

Analysis Methodology

The TNM uses the number and type of vehicles on the planned roadway, their speeds, the physical characteristics of the road (curves, hills, depressed, elevated, etc.), receptor location and height, and, if applicable, barrier type, barrier ground elevation, and barrier top elevation.

The noise predictions made are highway-related noise predictions for the traffic conditions during the year being analyzed. Peak hour design and level-of-service (LOS) C volumes were compared, and the volumes resulting in the noisiest conditions were used with the proposed posted speed limits. Hence, during all other time periods, the noise levels will be no greater than those indicated. The TNM computer model was utilized in order to determine the number of land uses (by type) that would be impacted during the peak hour of the design year 2025. A land use is considered impacted when exposed to noise levels approaching or exceeding the FHWA noise abatement criteria and/or predicted to sustain a substantial noise level increase.

### Noise Analysis Results

The analysis of 242 receivers was modeled to determine the predicted noise level for the 2025 build scenario. The receivers are grouped into five Noise Sensitive Areas (NSA) that were presented in Section 3.3.1 and shown on Figure 3-7. The results indicate (Table 4-6) the predicted noise levels for the recommended alignment would result in 54 impacted receivers. Twenty (20) of these receptors would experience a substantial increase over the Noise Abatement Criteria (NAC). For detailed results of all receivers analyzed please refer to the updated *Noise Technical Memorandum*.<sup>224</sup>

As presented in Table 4-6, the noise impact analysis conducted during preparation of the FEIS for the recommended alternative indicates a greater number of impacts to noise receivers than what was determined in the DEIS. The reasons for this difference are apparent in the design changes made since completion of the DEIS (e.g. addition of the interchange at SR 1430 Cedar Hill Road) and changes in analysis procures and impact criteria combined with slightly higher ambient noise levels.

**Table 4-6: Noise Impacts by Noise Sensitive Area**

NOISE SENSITIVE AREA	DESCRIPTION	TOTAL NO. OF IMPACTED RECEIVERS	NO. OF RECEIVERS IMPACTED BASED ON APPROACH OR EXCEED NOISE ABATEMENT CRITERIA	NO. OF RECEIVERS IMPACTED BASED ON SUBSTANTIAL NOISE LEVEL INCREASE
1	US 17 Interchange Area	21	21	0
2	US 74/76 Interchange Area	1	1	0
3	SR 1426 Interchange Area	7	7	0
4	SR 1430 Interchange Area	16	12	16
5	US 421 Interchange Area	9	5	4
Total		54	46	20

Source: North Carolina Department of Transportation. *Supplemental Noise Impact Technical Memorandum* for the Wilmington Bypass Project, TIP No. R-2633A/B. September 2005.

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## Noise Abatement Measures

When traffic noise impacts are predicted, examination and evaluation of alternative noise abatement measures for reducing or eliminating the noise impacts must be considered. Consideration for noise abatement measures must be given to all impacted receptors. Noise abatement measures that were investigated for this project are presented in the following sections.

### *Highway Alignment*

Highway alignment selection involves the horizontal or vertical orientation of the proposed improvements in such a way as to minimize impacts and costs. The selection of alternative alignments for noise abatement purposes must consider the balance between noise impacts and other engineering and environmental parameters. For noise abatement, horizontal alignment selection is primarily a matter of siting the roadway at a sufficient distance from NSAs. Changing the highway alignment is not a viable alternative for noise abatement due to engineering and environmental constraints.

### *Traffic System Management Measures*

Traffic management measures that limit vehicle type, speed, volume and time of operation are often effective noise abatement measures. For this project, traffic management measures are not considered appropriate for noise abatement due to their effect on the capacity and level of service on the proposed roadway.

### *Noise Barriers*

Physical measures to abate anticipated traffic noise levels could often be incorporated with a measurable degree of success by the application of solid mass attenuable measures to effectively diffract, absorb, and reflect highway traffic noise emissions. Solid mass attenuable measures may include earth berms or artificial abatement walls. A noise barrier evaluation was conducted for the recommended alignment. The evaluation was accomplished in two steps. First, a qualitative barrier evaluation was performed for each impacted receptor that considered each receptor's FHWA NAC activity category, source-receptor relationships, impacted site densities, and the ability to have continuous barriers. The qualitative evaluation resulted in the selection of two potential noise barrier study locations, referred to as Study Area A and B (Figure 4-3).

The first potential barrier, (Study Area A), is located on the east side of the US 17/US 17 Bypass interchange between SR 1552 (Sloan Road) and Stoney Creek Lane. The optimized design of a concrete noise wall that would provide the necessary reduction was 1,660 feet (506 meters) long and exposed height ranged from 9.0 to 15.0 feet (2.7 to 4.5 meters) high. The barrier would benefit four receptors at a total cost of \$293,000 (\$73,250 per benefited receptor). Based on NCDOT Noise Abatement Policy, the noise wall is not cost-effective, and therefore, not recommended for construction.

The second potential barrier, (Study Area B), is located along SR 1430 (Cedar Hill Road) within the controlled access right-of-way adjacent to the southwest quadrant of the proposed interchange. The preliminary design of an optimized concrete noise wall was approximately 1,180 feet (360 meters) long with an exposed height ranging from 10.0 to 14.0 feet (3.0 to 4.2 meters). The barrier would benefit six receptors at a total cost of \$209,300 (\$34,900 per benefited receptor). Based on NCDOT Noise Abatement Policy, this noise wall is considered feasible, reasonable and cost-effective. Hence, this noise wall is recommended for

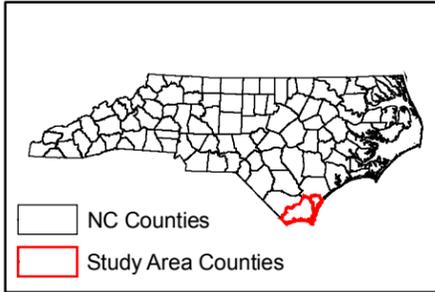
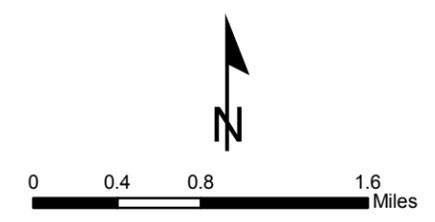
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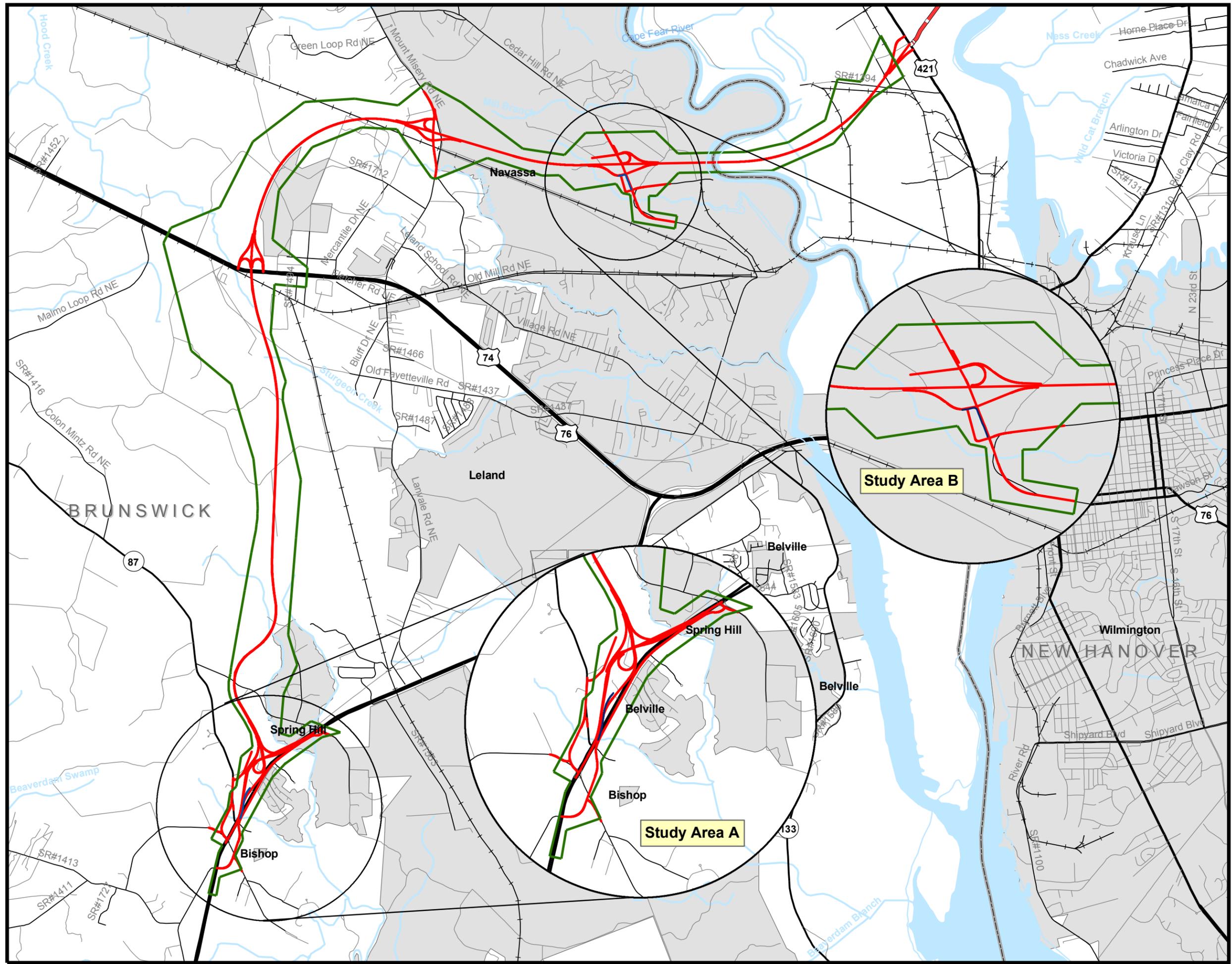
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Figure 4-3  
Noise Barrier Study Locations

- Legend**
- Expanded Study Corridor
  - R-2633 A/B Recommended Alignment
  - R-2633 C
  - Interstate Highways
  - US Highways
  - State Highways
  - State Routes
  - Local Roads
  - Railroads
  - Municipal Boundaries
  - County Boundaries
  - Water
  - Streams (non-delineated)
  - Noise Barrier Study Area



April 2007  
This map is for reference only.  
Sources: ESRI Inc. US Census, NCDOT, Brunswick County, New Hanover County, CGIA, USDOT, and URS.





construction, contingent on completion of the project final design and the public involvement process. If, during final design, these conditions change, the abatement measures may not be provided. A final decision on the installation of abatement measures will be made upon completion of the project design and the public involvement process.

*Land Use Controls*

One of the most effective noise abatement measures is proper land use planning to minimize future impacts. Noise abatement is only considered for those receivers present at the date of public knowledge for the project, which in this case will be the signing of the Record of Decision (ROD).

Local jurisdictions with zoning control should develop policies to limit the location of noise-sensitive land uses adjacent to the roadway. Furthermore, land use controls can be used to establish buffer zones between the roadway and future noise-sensitive areas.

**4.1.2.2 Air Quality**

**DEIS Analysis**

**Consistency with the State Implementation Plan**

Since the proposed project is located in an attainment area, the provisions of the Transportation Regulations (40 CFR Parts 51 and 93) are not currently applicable. This project is not anticipated to create any adverse effect on the air quality of this attainment area.

**Microscale Analysis**

In accordance with NCDOT requirements, a microscale analysis was performed to assess the local impact of a new roadway on future-year air quality conditions.<sup>225</sup> Table 4-7 summarizes the results of the microscale analysis. Predicted CO concentrations are lower for the year 2000 than for the year 2016 due to projected traffic volume increases. No exceedances of the one- or eight-hour average NAAQS were modeled for interchange and free-flow segment west of the interchange in any scenario (build or no-build) or model year (2000 or 2016).<sup>226</sup> Therefore, no adverse impacts to air quality are anticipated from any of the build alternatives.

**Table 4-7: Estimated Carbon Monoxide Concentrations**

LOCATION	AVERAGING TIME	YEAR 2000 CO CONCENTRATION (PPM)	YEAR 2016 CO CONCENTRATION (PPM)
US 421 Interchange - Build Condition	1-Hour	4.2	4.1
	8-Hour	2.6	2.5
US 421 Interchange - No-Build Condition	1-Hour	3.1	3.3
	8-Hour	1.9	2.0

Notes: Receptors numbers one through four represented free-flow conditions along the project in Brunswick County. Projected one-hour and estimated eight-hour average concentrations were lower for these receptors than along the receptors in the vicinity of the interchange. Higher concentrations under the build scenario are largely the result of higher projected traffic volumes than the no-build condition. National Ambient Air Quality Standards for CO are 35 ppm (1-hour) and 9 ppm (8-hour).

**FEIS Analysis**

The project is located in Brunswick and New Hanover Counties, which has been determined to comply with the National Ambient Air Quality Standards. The proposed project is located in an

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attainment area; therefore, 40 CFR Parts 51 and 93 are not applicable. This project is not anticipated to create any adverse effects on the air quality of this attainment area.

As anticipated, no exceedances of the one-hour average NAAQS for carbon monoxide were projected with the CAL3QHC model for any scenario or model year. Likewise, no exceedances of the eight-hour average NAAQS for carbon monoxide were estimated for any scenario or model year. Accordingly, no adverse effects on the air quality of this attainment area are anticipated with the project. Results of the interchange and free-flow analysis are presented in the *Air Quality Technical Memorandum Final Addendum*.<sup>227</sup>

Based on the evaluation of air quality impacts associated with the US 421/Wilmington Bypass interchange as described in the *Air Quality Technical Memorandum*, there would be no exceedances of the NAAQS or substantial adverse impacts to air quality associated with this project.

### Mobile Source Air Toxics (MSAT)

#### **Unavailable Information for Project Specific MSAT Impact Analysis**

This EIS includes a basic analysis of the likely MSAT emission impacts of this project. However, available technical tools do not enable us to predict the project-specific health impacts of the emission changes associated with the alternatives in this EIS. Due to these limitations, the following discussion is included in accordance with CEQ regulations (40 CFR 1502.22(b)) regarding incomplete or unavailable information:

**Information that is Unavailable or Incomplete.** Evaluating the environmental and health impacts from MSATs on a proposed highway project would involve several key elements, including emissions modeling, dispersion modeling in order to estimate ambient concentrations resulting from the estimated emissions, exposure modeling in order to estimate human exposure to the estimated concentrations, and then final determination of health impacts based on the estimated exposure. Each of these steps is encumbered by technical shortcomings or uncertain science that prevents a more complete determination of the MSAT health impacts of this project.

- **Emissions:** The EPA tools to estimate MSAT emissions from motor vehicles are not sensitive to key variables determining emissions of MSATs in the context of highway projects. While MOBILE 6.2 is used to predict emissions at a regional level, it has limited applicability at the project level. MOBILE 6.2 is a trip-based model--emission factors are projected based on a typical trip of 7.5 miles, and on average speeds for this typical trip. This means that MOBILE 6.2 does not have the ability to predict emission factors for a specific vehicle operating condition at a specific location at a specific time. Because of this limitation, MOBILE 6.2 can only approximate the operating speeds and levels of congestion likely to be present on the largest-scale projects, and cannot adequately capture emissions effects of smaller projects. For particulate matter, the model results are not sensitive to average trip speed, although the other MSAT emission rates do change with changes in trip speed. Also, the emissions rates used in MOBILE 6.2 for both particulate matter and MSATs are based on a limited number of tests of mostly older-technology vehicles. Lastly, in its discussions of PM under the conformity rule, EPA has identified problems with MOBILE6.2 as an obstacle to quantitative analysis.

These deficiencies compromise the capability of MOBILE 6.2 to estimate MSAT emissions. MOBILE6.2 is an adequate tool for projecting emissions trends, and performing relative analyses between alternatives for very large projects, but it is not

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sensitive enough to capture the effects of travel changes tied to smaller projects or to predict emissions near specific roadside locations.

- **Dispersion.** The tools to predict how MSATs disperse are also limited. The EPA's current regulatory models, CALINE3 and CAL3QHC, were developed and validated more than a decade ago for the purpose of predicting episodic concentrations of carbon monoxide to determine compliance with the NAAQS. The performance of dispersion models is more accurate for predicting maximum concentrations that can occur at some time at some location within a geographic area. This limitation makes it difficult to predict accurate exposure patterns at specific times at specific highway project locations across an urban area to assess potential health risk. The NCHRP is conducting research on best practices in applying models and other technical methods in the analysis of MSATs. This work also will focus on identifying appropriate methods of documenting and communicating MSAT impacts in the NEPA process and to the general public. Along with these general limitations of dispersion models, FHWA is also faced with a lack of monitoring data in most areas for use in establishing project-specific MSAT background concentrations.
- **Exposure Levels and Health Effects.** Finally, even if emission levels and concentrations of MSATs could be accurately predicted, shortcomings in current techniques for exposure assessment and risk analysis preclude us from reaching meaningful conclusions about project-specific health impacts. Exposure assessments are difficult because it is difficult to accurately calculate annual concentrations of MSATs near roadways, and to determine the portion of a year that people are actually exposed to those concentrations at a specific location. These difficulties are magnified for 70-year cancer assessments, particularly because unsupportable assumptions would have to be made regarding changes in travel patterns and vehicle technology (which affects emissions rates) over a 70-year period. There are also considerable uncertainties associated with the existing estimates of toxicity of the various MSATs, because of factors such as low-dose extrapolation and translation of occupational exposure data to the general population. Because of these shortcomings, any calculated difference in health impacts between alternatives is likely to be much smaller than the uncertainties associated with calculating the impacts. Consequently, the results of such assessments would not be useful to decision makers, who would need to weigh this information against other project impacts that are better suited for quantitative analysis.

***Summary of Existing Credible Scientific Evidence Relevant to Evaluating the Impacts of MSATs.*** Research into the health impacts of MSATs is ongoing. For different emission types, there are a variety of studies that show that some either are statistically associated with adverse health outcomes through epidemiological studies (frequently based on emissions levels found in occupational settings) or that animals demonstrate adverse health outcomes when exposed to large doses.

Exposure to toxics has been a focus of a number of EPA efforts. Most notably, the agency conducted the National Air Toxics Assessment (NATA) in 1996 to evaluate modeled estimates of human exposure applicable to the county level. While not intended for use as a measure of or benchmark for local exposure, the modeled estimates in the NATA database best illustrate the levels of various toxics when aggregated to a national or State level.

The EPA is in the process of assessing the risks of various kinds of exposures to these pollutants. The EPA Integrated Risk Information System (IRIS) is a database of human health effects that may result from exposure to various substances found in the environment. The IRIS database is located at <http://www.epa.gov/iris>. The following toxicity information for the six

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prioritized MSATs was taken from the IRIS database *Weight of Evidence Characterization* summaries. This information is taken verbatim from EPA's IRIS database and represents the Agency's most current evaluations of the potential hazards and toxicology of these chemicals or mixtures.

- **Benzene** is characterized as a known human carcinogen.
- The potential carcinogenicity of **acrolein** cannot be determined because the existing data are inadequate for an assessment of human carcinogenic potential for either the oral or inhalation route of exposure.
- **Formaldehyde** is a probable human carcinogen, based on limited evidence in humans, and sufficient evidence in animals.
- **1,3-butadiene** is characterized as carcinogenic to humans by inhalation.
- **Acetaldehyde** is a probable human carcinogen based on increased incidence of nasal tumors in male and female rats and laryngeal tumors in male and female hamsters after inhalation exposure.
- **Diesel exhaust** (DE) is likely to be carcinogenic to humans by inhalation from environmental exposures. Diesel exhaust as reviewed in this document is the combination of diesel particulate matter and diesel exhaust organic gases.
- **Diesel exhaust** also represents chronic respiratory effects, possibly the primary noncancer hazard from MSATs. Prolonged exposures may impair pulmonary function and could produce symptoms, such as cough, phlegm, and chronic bronchitis. Exposure relationships have not been developed from these studies.

There have been other studies that address MSAT health impacts in proximity to roadways. The Health Effects Institute, a non-profit organization funded by EPA, FHWA, and industry, has undertaken a major series of studies to research near-roadway MSAT hot spots, the health implications of the entire mix of mobile source pollutants, and other topics. The final summary of the series is not expected for several years.

Some recent studies have reported that proximity to roadways is related to adverse health outcomes -- particularly respiratory problems.<sup>228</sup> Much of this research is not specific to MSATs, instead surveying the full spectrum of both criteria and other pollutants. The FHWA cannot evaluate the validity of these studies, but more importantly, they do not provide information that would be useful to alleviate the uncertainties listed above and enable us to perform a more comprehensive evaluation of the health impacts specific to this project.

***Relevance of Unavailable or Incomplete Information to Evaluating Reasonably Foreseeable Significant Adverse Impacts on the Environment, and Evaluation of impacts based upon theoretical approaches or research methods generally accepted in the scientific community.*** Because of the uncertainties outlined above, a quantitative assessment of the effects of air toxic emissions impacts on human health cannot be made at the project level. While available tools do allow us to reasonably predict relative emissions changes between alternatives for larger projects, the amount of MSAT emissions from each of the project alternatives and MSAT concentrations or exposures created by each of the project alternatives cannot be predicted with enough accuracy to be useful in estimating health impacts. (As noted above, the current emissions model is not capable of serving as a meaningful emissions analysis tool for smaller projects.) Therefore, the relevance of the unavailable or incomplete

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information is that it is not possible to make a determination of whether any of the alternatives would have "significant adverse impacts on the human environment."

In this document, FHWA has provided a qualitative analysis of MSAT emissions relative to the various alternatives, and has acknowledged that all project alternatives may result in increased exposure to MSAT emissions in certain locations, although the concentrations and duration of exposures are uncertain, and because of this uncertainty, the health effects from these emissions cannot be estimated.

For each alternative in this EIS, the amount of MSATs emitted would be proportional to the vehicle miles traveled, or VMT, assuming that other variables such as fleet mix are the same for each alternative. Under the No-Build Alternative, however, the decrease in level of service on critical links (level of service in E in future years) and increase in congestion on existing routes would result in higher levels of regional MSATs. In addition, because the estimated VMT under each of the build alternatives are nearly the same, varying by less than one percent, it is expected there would be no appreciable difference in overall MSAT emissions among the various alternatives. Also, regardless of the alternative chosen, emissions will likely be lower than present levels in the design year as a result of EPA's national control programs that are projected to reduce MSAT emissions by 57 to 87 percent from 2000 to 2020. Local conditions may differ from these national projections in terms of fleet mix and turnover, VMT growth rates, and local control measures. However, the magnitude of the EPA-projected reductions is so great (even after accounting for VMT growth) that MSAT emissions in the study area are likely to be lower in the future in virtually all locations.

Because of the specific characteristics of the project alternatives (i.e. interchange locations), under each alternative there may be localized areas where VMT would increase, and other areas where VMT would decrease. Therefore it is possible that localized increases and decreases in MSAT emissions may occur. The localized increases in MSAT emissions would likely be most pronounced at interchanges that would be built at US 17, US 74/76, SR 1430, and SR 1426, under each build alternative. However, even if these increases do occur, they too will be substantially reduced in the future due to implementation of EPA's vehicle and fuel regulations.

In sum, under all build alternatives in the design year it is expected there would be reduced MSAT emissions in the immediate area of the project, relative to the No Build Alternative, due to the reduced VMT associated with more direct routing, and due to EPA's MSAT reduction programs. In comparing various project alternatives, MSAT levels could be higher in some locations than others, but current tools and science are not adequate to quantify them. However, on a regional basis, EPA's vehicle and fuel regulations, coupled with fleet turnover, will over time cause substantial reductions that, in almost all cases, will cause region-wide MSAT levels to be significantly lower than today.

#### **4.1.2.3 Farmland**

In accordance with the FPPA and state Executive Order Number (EO) 96, the impact of the project on prime, unique, and statewide important farmlands was assessed. The FPPA requires completion of Farmland Conversion Impact Rating Forms (US Department of Agriculture [USDA] Form AD-1006) for federally-funded projects.

In order to determine the level of significance given to farmland impacts, the Natural Resources Conservation Service (NRCS) assigns ratings to the impacts. The relative value of the farmland to be converted is determined by the NRCS on a scale from 0 to 100. Site assessment points, from 0-160, were also determined using a worksheet. A total high rating of 260 points is

possible. The FPPA states that sites receiving a total score of less than 160 should be given a minimal level of consideration for protection. Sites receiving a total score of 160 or more should be given increasingly higher levels of consideration for protection (7 CFR Part 658.4).

### **DEIS Analysis**

All of the build alternatives would impact prime, unique, and statewide important farmlands. Since the proposed action would impact important farmlands, a Farmland Conversion Impact Rating Form was completed for the alternatives in coordination with the NRCS. These forms are included in Appendix D. Table 4-8 summarizes the estimated potential prime and unique farmland impacts which would occur under each build alternative. Only the No-Build Alternative would avoid impacting farmlands.

**Table 4-8: Farmland Conversion Impacts**

<b>FARMLAND IMPACTED</b>	<b>ALT. 2</b>	<b>ALT. 3</b>	<b>ALT. 8</b>	<b>ALT. 9</b>
Prime and Unique Farmland (total acres)	79.25	92.55	55.04	66.45
Statewide Important (total acres)	43.50	97.20	132.80	78.60
Total Acres Indirectly Converted	0	0	0	0
Total Acres in Alternative	508	508	493	493
Percent of Farmland in County to be Converted	4%	7%	7%	5%
Total Impact Rating (0-260 - nearest point)*	45.75	49.83	57.91	52.21

Source: USDA Natural Resources Conservation Service Form AD-1006

\* Determined from USDA Natural Resources Conservation Service Farmland Evaluation Forms (Form AD-1006).

Alternative 2 impacts approximately 122.75 acres, Alternative 3 impacts about 189.75 acres, Alternative 8 impacts about 187.84 acres, and Alternative 9 impacts about 145.05 acres.

The build alternatives were scored a total rating score with a range of 45.75 for Alternative 2, to a score of 57.91 for Alternative 8 on the Farmland Conversion Impact Rating Forms. Since the total ratings for all alternatives were less than 160, the build alternatives would be in compliance with the FPPA.

### **FEIS Analysis**

The recommended alignment would impact prime, unique, and statewide important farmlands. A revised Farmland Conversion Impact Rating Form (Form AD-1006) was completed for the recommended alignment and submitted to NRCS. The completed form is included in Appendix D. The form shows a total rating of 66 for the recommended alignment which is substantially lower than the threshold of 160. Thus, the recommended alignment is in compliance with the FPPA and does not require farmland protection.

#### **4.1.2.4 Utilities**

### **DEIS Analysis**

#### **Electric Power Transmission and Natural Gas Lines**

All of the alternatives would cross seven electric transmission lines. Alternatives 2 and 9 would also cross two natural gas lines, and Alternatives 3 and 8 would cross three natural gas lines. Electrical substations would not be impacted. In addition to the major transmission lines, there are numerous lower voltage lines which carry power to individual sites. Where these lines cross the roadway, they would also have to be relocated or reconfigured.

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## Sewer Facilities

Most development within the study area uses septic systems or private sanitary sewer facilities. None of the build alternatives would impact the Leland or Belville wastewater treatment plants or the private treatment facilities within the study area.

## Water Service

The Brunswick portion of the study area receives potable water from ground water wells, and the Northwest Water Treatment Plant in Brunswick County, which services the Leland Sanitary District and areas south to Calabash. Water is piped into Leland Sanitary District into two (2) metered vault locations at the SR 1426 and SR 1455 intersection and approximately one half mile north of US 17 and SR 1415. The proposed build alternatives are not expected to have any direct impacts on water service to the study area. The terminus of the project corridor at US 421 could impact water supply mains for New Hanover County and the City of Wilmington. In addition, major water lines between the US Lock and Dam #1 and the City of Wilmington Treatment Plant would also be crossed. These lines may require relocation or reconfiguration in order accommodate the project construction. Although the alignment of all four alternatives crosses Toomers Creek (Class WS-IV waters), the location of this crossing is approximately 1.4 miles from its confluence with the Cape Fear River, over one half of a mile outside of the area of protection for this water supply. Moreover, due to its lack of use, Toomers Creek is scheduled to be discontinued as an emergency water supply in 1997.<sup>229</sup> Most development within the New Hanover portion of the study area obtains water from private well systems or tanks. The build alternatives would not impact private water tanks or extensive well systems within the study area. Wells within the proposed highway's right of way would be surveyed prior to project construction. NCDOT would purchase these wells and cap and abandon them in accordance with North Carolina well construction standards. Any subsurface contamination would be reported to the Wilmington Regional Office of the NC Department of Environment, Health, and Natural Resources (DEHNR). During the final design phase of the project, NCDOT would also identify wells adjacent to the project right of way which could be impacted by roadway construction. Mitigation for these wells could be provided through land purchase, compensation for damages, or the provision of new wells.

## FEIS Analysis

### Electric Power Transmission and Natural Gas Lines

The major electric transmission lines and substations, the Lake Sutton Power Plant, and major natural gas transmission and distribution lines in the proximity of the recommended alignment are shown in Figure 3-8 and discussed in Section 3.3.4.1.

The Lake Sutton Power Plant is outside of the expanded study corridor and would not be affected by construction of the recommended alignment. It is expected that the recommended alignment would cross seven electric transmission lines and seven natural gas lines (see Figure 3-8). Electric substations are not expected to be impacted. Electric and natural gas transmission lines located in the project area are mainly concentrated just east of US 421, parallel to and east of SR 1426 (Mt. Misery Road), and parallel to the CSX railroad. In addition to the major transmission lines, there are numerous lower voltage lines which carry power to individual sites. Where these lines cross the roadway, they would have to be relocated or reconfigured.

NCDOT will coordinate with Progress Energy, Brunswick Electric Membership Corporation and Piedmont Natural Gas for any necessary relocation or reconfiguration of electrical transmission lines or natural gas lines.

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## Sewer Facilities

Public and private sewer and water facilities within the project area are shown in Figure 3-9 and discussed in Section 3.3.4.2.

As stated in Section 3.3.4.2, much of the development within the project area uses septic systems or private sanitary sewer facilities. The recommended alignment is not expected to impact the Northwest Water Treatment Plant, Northeast Brunswick Regional Wastewater Treatment Plant or the Belville Wastewater Treatment Plant.

The recommended alignment is expected to cross the Town of Leland's sewer main just west of the Cape Fear River and north of the town. In addition, the recommended alignment will cross both Brunswick County water lines just north of Leland, and near SR 1426 and New Hanover County water lines near US 421.

## Water Service

Wells within the right of way of the recommended alignment would be surveyed prior to project construction. NCDOT would purchase these wells and cap and abandon them in accordance with North Carolina well construction standards. Any subsurface contamination would be reported to the Wilmington Regional Office of the North Carolina Department of Environment and Natural Resources (DENR). During the final design phase of the project, NCDOT would also identify wells adjacent to the project right of way which could be impacted by roadway construction. Mitigation for these wells could be provided through land purchase, compensation for damages, or the provision of new wells. NCDOT would also work with water and sewer authorities in the area to minimize any impacts to water and sewer lines and to coordinate their relocation, as necessary.

### **4.1.2.5 Visual**

Visual impacts of the project are similar among the four build alternatives evaluated in the DEIS and the recommended alignment.

Construction of the proposed project would have a visual impact on adjacent areas. The project would be designed and constructed as a four-lane, divided, controlled-access freeway, which would be similar in appearance to I-40 through New Hanover County. One of the problems inherent in designing a controlled-access freeway involves providing sufficient right of way to comply with design criteria while minimizing disruption to the surrounding area.

Although the project corridor shows some relief in the terrain towards the southern terminus at US 17, the project area is generally flat. Because of the flat terrain and near sea level elevations; the design of the project's mainline, interchanges, and crossings of roadways, railways, and waterways, precludes depressed or below grade construction. As a result of elevated grade separations, the project would be seen as a subtle undulation of road surface rising and falling across the relatively flat landscape. There would be interchanges at US 17, US 74/76, SR 1426, SR 1430, and US 421. Each of the interchanges would require grade separation for overpasses. Grade separation would also be required at the railroad crossings west of SR 1426. A high-level fixed-span bridge would be constructed over the Cape Fear River. At grade separations and bridges, the roadway would be highly visible to people in areas off of the roadway, which would be an adverse impact. Conversely, numerous opportunities for views across agricultural fields, forested areas and waterways from the tops of overpasses and bridges would exist for motorists using the new roadway. The highest point along the roadway would be the bridge crossing over the Cape Fear River. This bridge would be highly visible from vessels traveling along the river.

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In general, visual quality is enhanced or improved for those using the facility and degraded for those viewing the freeway from off the road.

Future highway oriented development which may be constructed adjacent to the proposed roadway could be designed to reduce the visual impacts of the freeway. The inclusion of treatments such as coloring of structural elements, buffer areas, and screening landscaping into a new development's design can lessen the impacts of the freeway. Additionally, it is the policy of the NCDOT to include aesthetic features in its roadway designs. The NCDOT will consider incorporating the following principals in the roadway design in order to create an aesthetically acceptable and functional roadway and to minimize visual impacts:

- Integrate landscaping into the project design to promote visual continuity of the highway and to blend it into the natural landscape as much as possible.
- Minimize the loss of vegetation, especially during construction when equipment and material access, storage, and staging are required.
- Design noise attenuation features, if reasonable and feasible, to be compatible with surrounding natural features and development.

#### **4.1.2.6 Hazardous Materials**

##### **DEIS Analysis**

In November 1996 a survey was conducted to identify known and potential hazardous waste sites within the project study area.<sup>230</sup> Using the information collected during the survey, each identified site was assessed in terms of its potential to impact the four alternative corridors. The site assessments were based upon the following evaluation criteria: on-site observations, storage of hazardous materials or generation of hazardous waste, reported contamination or regulatory activity, and distance to the proposed right of way for each alternative alignment. For the purposes of this preliminary analysis, it was assumed that all sites within one mile of the corridor warranted further investigation in its respective database record or an on-site investigation, where appropriate.

The findings of the survey are based on preliminary information only and are not intended to replace more detailed studies such as subsurface soil or groundwater investigations. This survey serves as a guide for identifying potential hazardous materials and waste sites within the project study area.

Approximately 70 sites were identified inside the one-mile screening (buffer) corridor. Appendix F lists the sites' names, addresses, and characteristics. Table 4-9 lists the relevant sites including hazard type and location related to each alternative. Approximately four sites occurring within the 1,000-foot corridors of the four alternatives are known to have petroleum contamination resulting from a leaking underground storage tank (UST). Two sites within the 1,000-foot corridor have registered USTs and one site is an automobile sales, service, and salvage facility. There may be other potential hazardous materials and waste sites within the study area which were not identified due to limited historical and regulatory data, illegal dumping practices, and lack of compliance with North Carolina stationary tank registration and hazardous waste generator programs.

**Table 4-9: Hazardous Materials and Waste Sites**

<b>ERIIS ID#/ MAP ID#</b>	<b>HAZARD TYPE</b>	<b>ALTERNATIVE IMPACT</b>	<b>COMMENT</b>
37005003419/ 3419	Leaking UST	1 km South of Alternatives 2&9	Infinger Transportation Co.
37005001207/ 1207	Leaking UST	1 km Northwest of Alternatives 2,3,8,&9	Chemical Leaman Tank Lines
37039000263/ 263	No Further Remedial Action Planned Site	1 km Northwest of Alternatives 2,3,8,&9	Chemical Leaman Tank Lines
37010026526/ 6526	Registered UST	1 km Southeast of Alternatives 2,3,8,&9	Hertz Corporation
37005001592/ 1592	Leaking UST	1 km Southeast of Alternatives 2,3,8,&9	CP&L Sutton Plant
37005001693/ 1693	Leaking UST	1 km South of Alternatives 2&9	CSX-Davis Yard
37005001698/ 1698	Leaking UST	1 km South of Alternatives 2&9	CSX Transportation Fuel Spill
37005001702/ 1702	Leaking UST	1km Southeast of Alternatives 2&9	CSX-Davis Yard Diesel Spill
37002000392/ 392	Emergency Response Notification System	<1km Southeast of Alternatives 2,3,8&9	801 Sutton Steam Plant Road
37005003784/ 1729	Leaking UST	1km Southeast of Alternatives 2,3,8&9	D&L Trucking-UST
37005003784/ 3784*	Leaking UST	Alternatives 2,3,8,&9	Kenan Transport Co.
37005006102/ 6102*	Leaking UST	Alternatives 2,3,8,&9	South Atlantic Services, Inc.
37005005783/ 5783*	Leaking UST	Alternatives 2,3,8,&9	S.A.S., Inc.
37010019085/ 9085	Registered UST	1 km Southeast of Alternatives 2,3,8,&9	Ryder Truck Rental
37010027974/ 7974	Registered UST	1 km North of Alternatives 2,3,8,&9	Atlantic Mack Sales
37010027009/ 7009	Registered UST	1 km North of Alternatives 2,3,8,&9	Waste Industries
37005004792/ 4792	Leaking UST	1 km Southeast of Alternatives 2,3,8,&9	Nitrex Surface Spills
37005004617/ 4617*	Leaking UST	Alternatives 2,3,8,&9	National Starch & Chemical Corp.
37005003415/ 3415	Leaking UST	1 km East of Alternatives 2,3,8,&9	Industrial Electrical Sales & Service
37005004628/ 4628	Leaking UST	<1 km East of Alternatives 2,3,8,&9	National Starch & Chemical Co.
37005005325/ 5325	Leaking UST	1 km Northwest of Alternatives 3&8	Presant Industrial Supply Co.
37005000979/ 979	Leaking UST	South of Alternatives 2&9	Carolina Creosoting-Pole Storage

ERIIS ID#/ MAP ID#	HAZARD TYPE	ALTERNATIVE IMPACT	COMMENT
37005000976/ 976	Leaking UST	South of Alternatives 2&9	Carolina Creosoting-Lagoon
37005000977/ 977	Leaking UST	South of Alternatives 2&9	Carolina Creosoting-landfarm
37005000978/ 978	Leaking UST	South of Alternatives 2&9	Carolina Creosoting-tank area
37005004814/ 4814	Leaking UST	<1 km South of Alternatives 2&9	North-Carolina Equipment Co.
3700100075/ Unplottable	CERCLIS	South of Alternatives 2&9	Carolina Creosoting Corp.
37001000154/ Unplottable	CERCLIS	<1 km East of Alternatives 2,3,8,&9	General Wood Preserving Co. Inc.
37018000042/ Unplottable	Solid Waste Facility	1 km East of Alternatives 8&9	Brunswick County Transfer
37001000152/ Unplottable	CERCLIS	adjacent to Alternatives 2,3,8,&9	National Starch & Chemical Co.
26	Registered UST	1 km Northwest of Alternatives 2,3,8,&9	Sneeden's Trading Post/Union
27	Leaking UST	<1 km Northwest of Alternatives 2,3,8,&9	South Atlantic Services
28	Registered UST	North of Alternatives 2,3,8,&9	Wilmington Grading & Paving
29	Registered UST	Southeast of Alternatives 2,3,8,&9	MCO Transport, Inc.
30	Leaking UST	<1 km Southeast of Alternatives 2,3,8,&9	Kenan Transport Co.
31*	Registered UST	Alternatives 2,3,8,&9	Fredrickson Transport
32	Registered UST	Southeast of Alternatives 2,3,8,&9	Tidewater Transit Terminal
33	Leaking UST	Northwest of Alternatives 2,3,8,&9	Carolina Power & Light
34	Acids, solvents, metal sludges	1 km Southeast of Alternatives 2,3,8,&9	Queensboro Steel Plant
35	Scrap metal recycling	<1 km Southeast of Alternatives 2,3,8,&9	Southern Metal Recyclers
36	Registered UST	<1 km Southeast of Alternatives 2,3,8,&9	Parrish Wrecker Service
37	Wastewater & Ashes	<1 km Southeast of Alternatives 2,3,8,&9	Refuse Fired Steam Plant
38	Registered UST	<1 km Southeast of Alternatives 2,3,8,&9	W.R. Grace
43	Solid Waste Landfill	Southeast of Alternatives 2,3,8,&9	Fleming Landfill (closed)
44	engine fluid & fuels	Southeast of Alternatives 2,3,8,&9	Unidentified Scrap Yard
89	Auto repair & salvage	North of Alternatives 2&9	Gurganus Garage & Salvage
95	Leaking UST	East of Alternatives 2,3,8,&9	National Starch & Chemical
97	Organics, metals,	Northeast of Alternatives 8&9	General Wood Preserving

ERIIS ID#/ MAP ID#	HAZARD TYPE	ALTERNATIVE IMPACT	COMMENT
	& PCP		Co.
103*	Automobile sales, service, salvage	Alternatives 2,3,8,&9	Frank's Auto Sale
104	Registered UST	South of Alternatives 2,3,8,&9	Exxon Station
109*	Registered UST	Alternatives 2,3,8,&9	Smith Douglas Div. of Borden Chemical
110	Registered USTs/lagoons	South of Alternatives 2&9	Carolina Creosoting

NOTE: \*Facilities with hazards which occur within the 1,000 foot corridor of the four alternatives.

Source: Environmental Risk Information & Imaging Services (ERIIS). Property Record Reports for Northeast, Central, and Southeast search areas for the Wilmington Bypass in Brunswick and New Hanover, N.C., Herndon, Va. November 1996.

### **FEIS Analysis**

Potential sites of soil contamination, groundwater contamination, or hazardous substances near the project corridor were identified in Section 3.3.6. In this section, the expected types and severities of impacts associated with these sites are summarized.

### **Method**

In Section 3.3.6.1, the method used to identify potential sites of contamination and gather information pertaining to the sites was described. Information gathered during that process was used to determine the expected degree of impact associated with those sites.

As described in Section 3.3.6.1, a Phase I Site Assessment was conducted in 2005 for the project prior to modification of the alignment to include the recommended alignment. As a result of the avoidance and minimization process, the corridor of the recommended alignment differs slightly from the alignment studied in the Phase I Site Assessment, in that it is shifted to the west in the vicinity of the southern terminus near NC 87 and US 17. Only one site was identified in this area as part of the limited Phase I Site Assessment. Due to the rural nature and current land uses in the vicinity of the southern terminus of the project, it is not expected that any additional sites with potential environmental impact to the project would be identified in an assessment of the shifted alignment. However, additional investigations should be conducted prior to and throughout project construction.

It should also be emphasized that there may be other contaminated sites present within the project study area that have not registered with or reported to a state or federal agency or were not observed during field studies. In addition, the sites discussed in this section may or may not have the same impact on the corridor for the recommended alignment compared to the alignment studied in the Limited Phase I Site Assessment, depending on the status of the site and/or its location relative to the proposed right of way of the recommended alignment. Actual impacts to the project cannot be determined without collection and analysis of soil and/or groundwater samples.

### **Impacts**

Potential impacts relative to contaminated sites can occur in different forms. First, the costs and schedule of the transportation improvement project can be affected. Second, construction of the project could result in the disturbance or release of contaminated or hazardous materials during construction activities, or long-term impacts on or near these sites.

Twelve sites were identified as having the possibility for UST involvement and/or contamination issues. A map showing the approximate location of the identified sites relative to the corridor of the Preferred Alternative from the DEIS and the corridor of the recommended alignment was presented as Figure 3-10. NCDOT memorandums summarizing the findings of the Limited Phase I Site Assessment and references to the technical reports are included in Appendix F. Potential types of impacts associated with these sites and their expected severities are summarized in Table 4-10.

**Table 4-10: Summary of Expected Degree of Impact**

SITE NO.	PROPERTY NAME	EXPECTED IMPACT	SEVERITY
1	Formerly D&J Exxon	Possible petroleum soil and groundwater contamination	Low
2	Carolina Pole (formerly General Wood Preserving)	Possible hydraulic oil and wood preserving chemical soil and/or groundwater contamination	Low-Moderate
3	C.T. Specialties (formerly National Starch Company)	Possible chlorinate and non-chlorinated organic compound soil and/or groundwater contamination	Moderate
4	Formerly Carolina Creosote	Possible soil and groundwater contamination	Low
5	Brunswick County Waste Water Treatment Plant	None	Low
6	P&W Oil Company, Inc.	Possible soil and/or groundwater contamination	Low
7	High Rise Service Company, Inc.	Possible soil and/or groundwater contamination	Low-Moderate
8	Old Dominion Freight Line (formerly Fredrickson Motor Express)	Possible soil and/or groundwater contamination from removed UST and current oil-water separator	Low
9	Tidewater Transit Company, Inc.	Possible soil and/or groundwater contamination from historical release and oil-water separator	Moderate-High
10	Zambesi Equipment	Soil contamination and possible groundwater impact	Low
11	Precision Cams	None	Low
12	Tidewater Holding	Possible soil and or groundwater contamination	Low

Sources: CATLIN Engineers and Scientists. "Limited Phase I Site Assessment US 17 (Wilmington Bypass) from NC 87 south of Bishop to US 74-76 east of Malmo, Brunswick County, TIP# R-2633A." 15 December 2005.

CATLIN Engineers and Scientists. "Limited Phase I Site Assessment WBS Element: 34491.1.2 (TIP #: R-2633B) US 17 (Wilmington Bypass) from US 74/76 east of Malmo in Brunswick County to US 421 north of Wilmington in New Hanover County." 3 November 2005.

### Avoidance

For all sites identified within the corridor ranked low for severity of potential impact, the data accumulated will be revisited prior to project right of way acquisition and construction and an updated review of agency files and public records will be conducted to determine if there has been any substantial change in the status since the report was prepared. For those sites ranked with a moderate to high expected severity of impact, a further review of records will be conducted to determine the status of any contamination assessments or remedial actions taking

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place at those sites. A Phase II Site Assessment, including, at a minimum, soil and water sampling, will be conducted.

#### **4.1.2.7 Mineral Resources**

Neither the four build alternatives studied in the DEIS nor the recommended alignment would directly impact existing active mines or quarries in the project area. Each alignment would pass approximately 1,500 feet south of an existing sandpit on US 421.

The project may enhance the mineral resource potential of the area by improving access and, as discussed in Section 4.2.2.1, facilitating growth. Because the project is close to existing sandpits and quarries, the new roadway may allow more efficient transport of construction materials. New development in the counties may increase the demand for local sand and crushed stone. Construction of the roadway may also temporarily increase demand for local mineral resources.

#### **4.1.2.8 Floodplain/Floodway**

##### **DEIS Analysis**

The proposed roadway would encroach on the floodplain fringe around the bridge crossing areas. The total linear length of floodplain encroachment, by alternative, is approximately 18,000 feet for Alternatives 2 and 3 and about 11,000 feet for Alternatives 8 and 9. However, the build alternatives are not expected to adversely affect floodplain elevations within their corridors. Since the primary flooding elevations in the study area are dominated by coastal surge, the freshwater flow from the upstream drainage basins has a negligible effect on river stages in New Hanover County.

##### **FEIS Analysis**

The project would encroach on the floodplain fringe around the bridge crossing areas. However, the recommended alignment is not expected to adversely affect floodplain elevations. Since the primary flooding elevations in the project area are dominated by coastal surge, the freshwater flow from the upstream drainage basins has a negligible effect on river stages in New Hanover and Brunswick counties. The area of 100-year floodplain encroachment by the recommended alignment will be approximately 31.1 acres (7,335 linear feet) within the slope stake limits. The substantial differences in impacts calculated for the build alternatives studied in the DEIS and the recommended alternative is because right of way limits, not slope stake limits, were used to calculate the impacts. Another reason is that the recommend alignment has been further developed through preliminary design to minimize floodplain impacts. Figure 3-11 shows the encroachments for the recommended alignment.

A floodplain evaluation was conducted in accordance with Executive Order 11988 "Floodplain Management" and 23 CFR 650, Subpart A "Location and Hydraulic Design of Encroachments on Floodplains."<sup>231</sup> The recommended alignment was determined to be within the floodplain fringe of the Cape Fear River. The Cape Fear River has no regulatory floodway; therefore, no encroachments or modifications to such a floodway would occur. Encroachments of the recommended alignment on the Cape Fear River floodplain include minor transverse encroachments into the 100-year frequency floodplain along the Cape Fear River. Impacts associated with these encroachments have been preliminarily evaluated and determined to be minimal.

Coordination with local officials and FEMA will occur during the final design phase of the project and will continue through completion of all construction phases.

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#### **4.1.2.9 Protected Lands**

Federal or state protected lands such as wild and scenic rivers, state/national forest, and game lands and preservation areas are not found within the study area of the DEIS or the expanded corridor. No direct impacts would occur to these resources from construction of the project.

#### **4.1.3 NATURAL ENVIRONMENT**

##### **4.1.3.1 Geology**

Because no cuts are required for any of the build alternatives studied in the DEIS or the recommended alignment, blasting and associated impacts are not anticipated.

##### **4.1.3.2 Soils**

The properties of the soils within the corridors of the four build alternatives studied in the DEIS and the recommended alignment can affect the final engineering design. Soil limitations for the recommended alignment include erosion hazard, shrink/swell potential, differential settlement, low strength, corrosivity, and flood hazard. The erosion hazard of all the soils within the expanded study corridor is slight.<sup>232</sup> Flood hazards are discussed in Section 4.1.2.8.

##### **4.1.3.3 Biotic Communities and Wildlife**

#### **DEIS Analysis**

Preliminary information concerning biotic communities and wildlife was presented in detail in the DEIS and subsequent technical memoranda, and is summarized in this FEIS.<sup>233</sup> Methods employed to identify existing natural system conditions within the DEIS study corridors and the expanded study corridor are described in Section 3.4.2.

#### **Terrestrial Communities**

Loss of habitat is the primary issue which needs to be considered when assessing the adverse impacts to biotic communities in the study area. Alternative 2 would impact 494 acres of natural systems (277 acres of upland and 217 acres of wetland), Alternative 3 would impact 489 acres (261 acres of upland and 232 acres of wetland), Alternative 8 would impact 460 acres (267 acres of upland and 197 acres of wetlands), and Alternative 9 would impact 462 acres (268 acres of upland and 197 acres of wetland). These impact acreages are based on a 300-foot-wide right of way.

Natural upland habitats within Alternatives 2 and 3 consist primarily of mesic pine forest, planted pine, and mixed hardwoods. Alternatives 8 and 9 are made up of mesic pine forest, mixed hardwood, and sandhill.

Each build alternative would impact approximately 100 acres (range 94 to 117) of man-dominated land. Commercial/industrial development comprises the largest man-dominated land use within the alternative corridors.

#### **Terrestrial Wildlife**

##### *Impacts*

Further fragmentation of wildlife habitat would occur as a result of any of the build alternatives. All four of the build alternatives are generally within similar types of habitat. Thus, impacts to wildlife corridors are similar. Overall, loss of natural habitat and additional habitat fragmentation

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would impact wildlife in the area. Terrestrial resource impacts, specifically wetland and upland community types, will result in initial disruption of terrestrial species migration and an increase in animal fatalities. Wildlife particularly sensitive to terrestrial habitat fragmentation includes large mammals such as black bear and white-tailed deer. Impacts of upland fringe habitats will decrease due to reduced cultivated field impacts.

Selection criteria for placement of the four alternatives adjacent to the railroad allowed for minimization of wetland impacts and habitat fragmentation. Compatible land use techniques also allowed for a larger parcel size with greater habitat value. Wetlands, comprised of heterogeneous vegetation types and dense understory, offer greater habitat value for wildlife than much of the pine plantations within the study area. Much of the surrounding area is owned by Leland Industrial Company which allows paper companies to harvest timber. In addition, the area is zoned for potential future development. Specific ecological consequences of terrestrial or aquatic habitat fragmentation are not likely to result in genetic isolation of species, community structure, or habitat islands.

### *Mitigation*

Concern for water quality will be present in areas where the roadway is built on fill within the wetlands. Roadway built on fill will act as a dam to the tidal flows of the swamp marshes in the area. In order to maintain the vegetation, which also benefits wildlife associated with this type of biotic community, a daily water exchange must take place. Construction of a roadway through this type of community may require culverts to allow water to pass through the filled area. There are no set standards available for pipe sizing with regard to this type of water exchange, however, a standard pipe sizing used for a fifty year storm should be sufficient to allow for adequate water exchange. This however does not necessarily address wildlife migration and how it pertains to habitat fragmentation, genetic isolation, and wildlife mortality.

Pipe sizing can be made larger than hydrologic specifications in order to allow larger species to move more freely within the fragmented community, however, larger species may still choose to cross the roadway, which would increase mortality rates of these species. The use of bridging over wetland areas greatly reduces the impacts to wetlands and avoids these wildlife and community issues to a great extent.

### **FEIS Analysis**

Predicted impacts to biotic communities and wildlife systems identified within the recommended alignment are described in this section of the FEIS. Following the publication of the DEIS, terrestrial community data presented in the DEIS were revised to reflect more detailed data collection methods and survey data. Where applicable, vegetative community designations described in the DEIS were modified to reflect variations within the expanded study corridor. Methods used to identify natural communities within the expanded study corridor are described in Section 3.4.2.

### **Terrestrial Communities**

Approximately 497 acres of terrestrial communities are located within the recommended alignment slope stake, or fill limits, and approximately 672 acres are within the recommended alignment right of way. Table 4-11 summarizes the potential impacts to terrestrial communities by type.

**Table 4-11: Terrestrial Community Impacts**

COMMUNITY TYPE	QUANTITY WITHIN RIGHT OF WAY (ACRES)	QUANTITY WITHIN SLOPE STAKES (FILL LIMITS) (ACRES)
<b>NATURAL COMMUNITIES (total)</b>	<b>522</b>	<b>377</b>
Mesic Pine Flatwoods	154	124
Pine/Scrub Oak Sandhills	96	77
Mesic Mixed Hardwood Forests	65	52
Wet Pine Flatwoods	84	67
Tidal Freshwater Marsh	33	0
Tidal Cypress Gum Swamp/Cypress Gum Swamp	7	0
Coastal Plain Bottomland Hardwoods	13	11
Coastal Plain Semi-permanent Impoundment	< 1	< 1
Small Stream Swamp	5	4
Pocosin/Streamhead Pocosin	54	42
Open Water	4	0
<b>ALTERED COMMUNITIES (total)</b>	<b>150</b>	<b>120</b>
Urban/Disturbed	94	75
Agricultural Land	44	36
Maintained Utility Right of Way	12	9
<b>TOTAL COMMUNITIES</b>	<b>672</b>	<b>497</b>

## Terrestrial Wildlife

### *Impacts*

The primary impact to wildlife populations will stem from the effects of habitat loss and habitat fragmentation. Wildlife populations will be displaced or otherwise impacted through loss of habitat. In addition, the projects paved roadways may be barriers to wildlife movement. Species that require large tracts of contiguous habitat that were identified within the expanded study corridor included black bear, bobcat, whitetail deer, and wild turkey. These species utilize diurnal and seasonal movements over large areas to access foraging, mating, and refuge habitats. In addition, the proposed project will bisect many of the edge habitat areas used as wildlife travel corridors. Wildlife populations currently occupying these habitats may be negatively impacted. Amphibian and reptile species also travel seasonally to and from breeding areas, though these movements tend to be more local. Loss and isolation of reproductive habitats (e.g., wetlands and communities supporting vernal or ephemeral pools) may also negatively impact amphibian species.

Other impacts to wildlife include traffic noise and disturbed edge habitat that may increase invasive and alien species to within, and surrounding the recommended alignment. The diversity of constituent wildlife species currently occurring in the immediate vicinity of the recommended alignment should be expected to decrease in complexity and change toward more edge specialist species as the overall area of edge vegetation increases through the expansion of roadside habitats and floral diversity decreases. Following construction of the highway, direct mortality of individuals from collisions with vehicles is likely.

### *Mitigation*

Wildlife passages are proposed to mitigate for the barrier effect of the project on wildlife movement. Bridges planned for crossing over riparian areas have been extended to allow for wildlife passage on upland areas. Two independent bridge structures and a box culvert would be designed to allow for wildlife movement across the roadway via underpasses. The passage

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locations were selected by a team consisting of NCDOT, NCWRC and USFWS representatives. The independent bridge structures were located at select upland areas bordered by wetland systems because these edges, or transitional areas, serve as natural wildlife corridors. The box culvert was located within a pocosin wetland area north of US 74/76 and will be designed to serve as a small animal crossing. The locations of the wildlife crossings are shown on Figure 4-4.

Bridge structures and fill slopes will be placed such that sufficient ground to structure clearance and dry passage is provided for large-bodied wildlife. The crossing areas under the bridge structures will provide a minimum of eight feet of vertical clearance and will be made as wide as possible to encourage wildlife usage.<sup>234</sup> Whitetail deer, bobcats, black bear, small mammals, reptiles, and amphibians were identified in these areas and these structures will allow diurnal and seasonal movements while minimizing mortality of individual animals from vehicle collisions.

Fencing will be installed for a distance of 2,500 feet on either side of any of the proposed crossings and will be of sufficient height to guide wildlife into the passageways.<sup>235</sup> The height of fencing will be determined through coordination between NCDOT, NCWRC and USFWS during final design.

#### **4.1.3.4 Aquatic Communities and Wildlife**

##### **DEIS Analysis**

Impacts to aquatic communities are directly related to stream crossings and water quality changes. Direct impacts will result from actual destruction of stream bottom habitat during the construction of bridges and culverts. Benthic macro invertebrates inhabit bottom substrates in streams and rivers. In general, these organisms are very slow moving, therefore, actual organism loss is probable regardless of the alternative selected. Macroinvertebrate communities are extremely sensitive to water quality or physical changes. With the construction of any of the alternatives, macroinvertebrate populations will probably experience a temporary decrease in diversity and the number of families representing pollution sensitive orders, such as *Ephemeroptera*, *Plecoptera* and *Tricoptera*. These impacts may result from increased turbidity and sedimentation during construction in the immediate vicinity of the stream crossing and possibly downstream. These impacts should be temporary and the benthic communities should reestablish themselves soon after project completion.

Impacts to fisheries resources resulting from a no-build scenario would be relative to the long-term degradation of water quality due to continued growth and travel and their effects to storm water runoff.

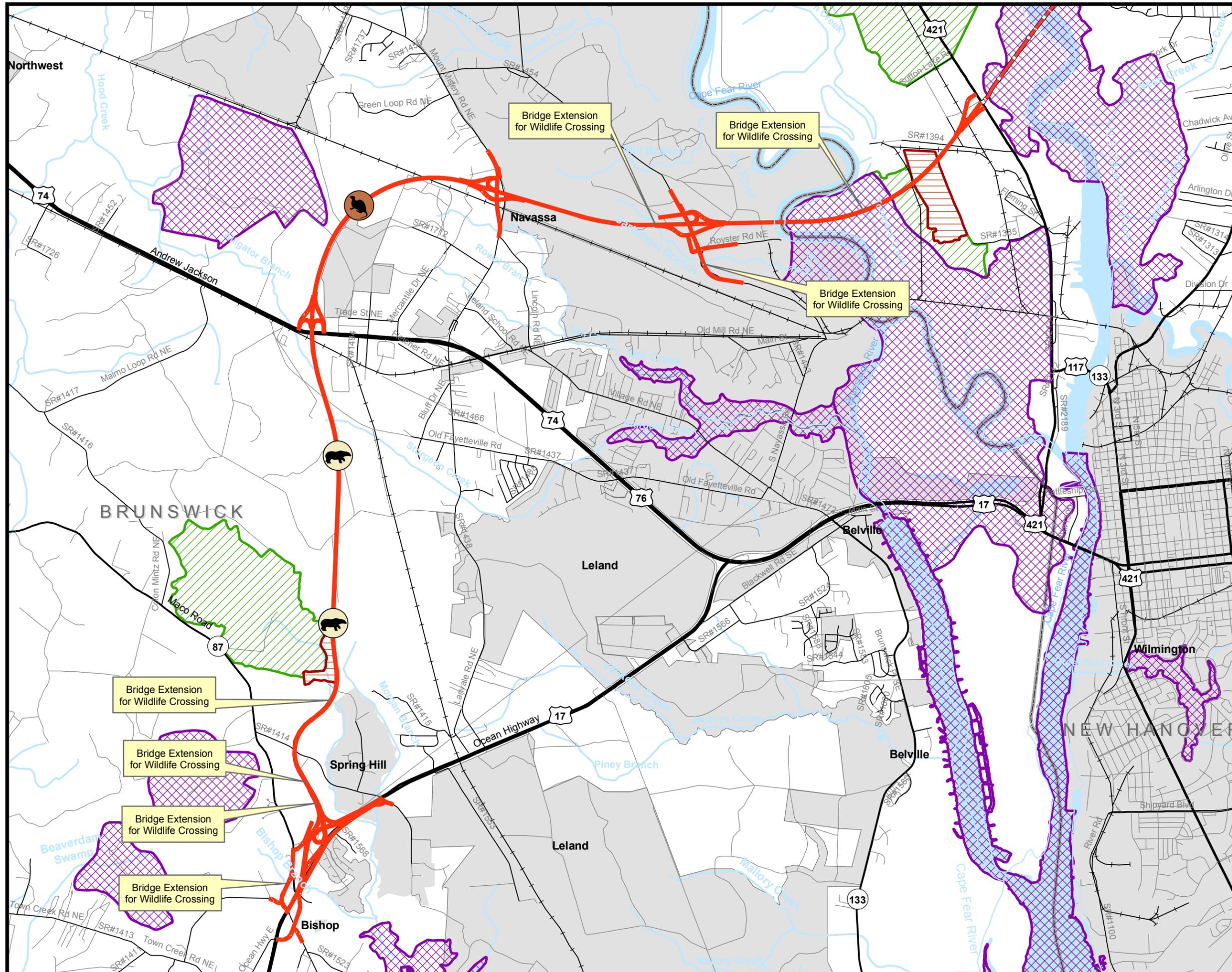
Considerations to anadromous fish species include restricting fish movement or passage and spawning periods.

##### **River and Stream Crossings**

The proposed build alternatives would cross one major waterway, the Cape Fear River, and several minor creeks and their tributaries.

Table 4-12 lists the types and preliminary design sizes of the structures proposed for each crossing. Additional stream crossings requiring conveyances less than 72 inches are likely under the build alternatives. These minor drainage structures will be identified during the final engineering design phase of the project.

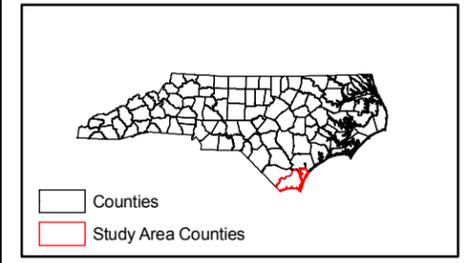
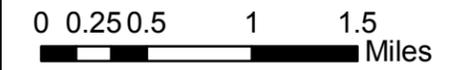
Figure 4-4  
Location of Wildlife Crossings



**Legend**

- Large Animal Wildlife Crossings
- Small Animal Wildlife Crossings
- R-2633 A/B Recommended Alignment
- R-2633 C
- Interstate Highways
- US Highways
- State Highways
- State Routes
- Local Roads
- Railroad
- Municipal Boundaries
- County Boundaries
- Water
- Streams (Non-delineated)

- NC NHP IPA**
- TYPE**
- PRIMARY
  - SECONDARY
  - TOTAL AREA





Alternatives 2, 3, 8, and 9 each would require two bridge crossings, three new culverts larger than 72 inches and three extensions of existing box culverts. Bridges would span the Cape Fear River and Toomers Creek, the culvert extensions are for Bishop Branch and Morgan Branch, and the new crossings are for Morgan Branch and Alligator Branch. The preliminary sizing of all culvert crossings was designed for inlet control under a 50-year storm.

**Table 4-12: Preliminary Hydrologic Crossings**

ALT.	CROSSING NUMBER	STRUCTURE TYPE	LOCATION	STRUCTURE DESCRIPTION
2,3,8,9	B1	Culvert	Morgan Branch	2 @ 7 ft x 6 ft box culvert
2,3,8,9	B2	Culvert	Morgan Branch	2 @ 6 ft x 6 ft box culvert
2,3	B3	Culvert	Alligator Branch	6 ft x 9 ft box culvert
8,9	B4	Culvert	Alligator Branch	7.5 ft x 6 ft box culvert
2,9	B5	Bridge	Cape Fear River	2,950ft length, 55 ft vertical clearance, 90 ft horizontal clearance (minimum)
3,8	B5	Bridge	Cape Fear River	2,950ft length, 55 ft vertical clearance, 90 ft horizontal clearance (minimum)
2,3,8,9	B6	Bridge	Toomers Creek	220 ft length

## **FEIS Analysis**

### **Cape Fear River**

The segment of the Cape Fear River and the adjoining marsh wetlands within the expanded study corridor will be spanned by bridging. Work conducted to install shafts and piles may temporarily impact aquatic habitat by removal of vegetation and increased turbidity and siltation within the adjacent water column. Temporary work bridges would reduce bottom habitat due to the addition of temporary foundations. Temporary loss of habitat would have minimal effects on fishery populations that utilize these areas during feeding, spawning, or as nursery grounds for juveniles. Removal of these piles after construction should allow the area to return to pre-construction conditions. Aquatic communities in the vicinity of the proposed bridge crossing may be directly impacted by sedimentation and reduced water quality resulting from project construction. Benthic non-mobile organisms, such as filter and deposit feeders, and macro and micro algae, are particularly sensitive to construction activities such as dredging, filling, and slope stabilization. These construction activities physically disturb substrate, resulting in the loss of sessile benthic organisms. Populations of photosynthetic species, the primary producers in the food chain, can also be greatly affected by siltation. The increased amount of suspended particles in the water column reduces the photosynthetic ability by absorbing available light. Mobile aquatic organisms may escape some of the effects of siltation, however gills of fish, crustaceans and larval amphibian and insect forms can become clogged and dysfunctional as a result of sedimentation. Spawning habitats for these species may become filled with sediment, diminishing reproductive success and eventually reducing populations. Permanent impacts will stem from fill and loss of substrate habitat to structure placement. Impact quantities will be calculated during the final design process. Measures discussed under Section 4.1.3.7 to reduce impacts to the state- and federally-endangered shortnose sturgeon would also reduce impacts to other resident and anadromous fish species.

### **Streams**

Since the publication of the DEIS, potential impacts to jurisdictional streams associated with the project have been assessed. Approximately 4,402 linear feet of streams are within the recommended alignment right of way. Table 4-13 lists stream lengths within the right of way for

each stream segment. Crossing of streams is unavoidable for the project. However, all practicable efforts have been taken during preliminary design of the recommended alignment to minimize impacts to streams. The recommended alignment will cross 14 perennial stream channels, in addition to the Cape Fear River, and six intermittent stream channels, resulting in an impact of 1,003 linear feet. Six of the perennial stream crossings will be made by bridges at new crossing locations. Two perennial and three intermittent streams will be crossed utilizing new culverts, while two perennial and one intermittent stream will be impacted by extending existing culverts. The remaining four perennial and two intermittent streams will either utilize existing culverts or are located outside of the proposed slope stake limits and will not be impacted by the project. Stream crossing locations are shown on Figure 3-14 and impacts to streams are presented in Table 4-13.

**Table 4-13: Impacts to Streams within the Expanded Study Corridor**

<b>URS Stream ID</b>	<b>Stream Name as Indicated on USGS Quad</b>	<b>NCDWQ Stream Classification</b>	<b>NCDWQ Stream Score</b>	<b>Linear Feet w/in Right-of-Way</b>	<b>Linear Feet of Impact</b>	<b>Crossing Type</b>
1TR	UT Morgan Branch	Perennial	<b>32.5</b>	0	0	<b>N/A</b>
2TR	UT Morgan Branch	Perennial	<b>32.0</b>	35	0	<b>Outside slope stakes</b>
CART	Cartwheel Branch	Perennial	<b>39.0</b>	214	0	<b>Bridge</b>
CART7A	UT Cartwheel Branch	Intermittent	<b>21.0</b>	20	0	<b>Outside slope stakes</b>
S1	Bishop Branch	Perennial	<b>59.0</b>	70/236	0/62	<b>Bridge, Extend Culvert</b>
S2	UT Bishop Branch	Perennial	<b>44.5</b>	66	0	<b>Bridge</b>
S3	UT Bishop Branch	Perennial	<b>42.0</b>	0	0	<b>N/A</b>
S4	UT Morgan Branch	Intermittent	<b>26.5</b>	414	72	<b>Extend Culvert</b>
S5	UT Morgan Branch	Intermittent	<b>20.5</b>	0	0	<b>N/A</b>
S7	UT Morgan Branch	Perennial	<b>53.0</b>	162/323	0	<b>Bridge, Existing Culvert</b>
S8	UT Morgan Branch	Perennial	<b>39.5</b>	437	0	<b>Bridge</b>
S9	UT Morgan Branch	Perennial	<b>40.0</b>	348	0	<b>Bridge</b>
S10	UT Morgan Branch	Perennial	<b>34.0</b>	0	0	<b>N/A</b>
S11	UT Morgan Branch	Intermittent	<b>27.5</b>	0	0	<b>N/A</b>
S12	Morgan Branch	Perennial	<b>47.5</b>	288	49	<b>Extend Culvert</b>
S13	UT Alligator Branch	Perennial	<b>42.0</b>	8	0	<b>Existing Culvert</b>
S13A	UT Alligator Branch	Intermittent	<b>28.0</b>	164	0	<b>Existing Culvert</b>

URS Stream ID	Stream Name as Indicated on USGS Quad	NCDWQ Stream Classification	NCDWQ Stream Score	Linear Feet w/in Right-of-Way	Linear Feet of Impact	Crossing Type
S14	Rowel Branch	Perennial	40.0	99	0	Existing Culvert
S15	UT Sturgeon Branch	Perennial	44.5	0	0	N/A
S16	UT Sturgeon Branch	Perennial	30.0	334	165	Culvert
S17	UT Sturgeon Branch	Perennial	30.0	412	236	Culvert
S18	Mill Branch	Intermittent	27.0	296	172	Culvert
S19	Cartwheel Branch	Perennial	43.5	0	0	N/A
S20	UT Cartwheel Branch	Perennial	32.0	0	0	N/A
S21	UT Cartwheel Branch	Perennial	32.5	0	0	N/A
S22	UT Cartwheel Branch	Perennial	36.0	0	0	N/A
SI	UT Morgan Branch	Intermittent	22.0	0	0	N/A
SM	UT Morgan Branch	Intermittent	25.0	153	79	Culvert
SNO	UT Sturgeon Branch	Intermittent	25.0	323	168	Culvert
TOTAL				4,402	1,003	

N/A denotes streams that are not crossed by the recommended alignment.

Temporary work bridges will be required to construct bridges over some streams and will impart temporary stream impacts at these bridge construction locations. Construction methods over open water and wetlands are presented in Section 4.1.4.8. It is anticipated that both single and dual work bridges will be utilized. Finger bridges will be constructed at bent locations. Temporary foundation installation for the work bridges would reduce substrate habitat and result in the temporary loss of habitat for aquatic populations that utilize these areas during feeding, spawning, or as nursery grounds for juveniles. Removal of these piles after construction should allow the area to return to pre-construction conditions.

### Ponds

Since the publication of the DEIS, potential impacts to ponds associated with the project have been assessed.

Approximately 0.5 acres of pond communities are located within the recommended alignment slope stake limits. The affected natural communities are naturalized man-made impoundments and provide limited aquatic and wildlife value. These areas were identified and classified as Coastal Plain semi-permanent impoundments (Table 4-11). Impacts to jurisdictional wetlands at these locations have been included in the total impact calculated for PEM wetlands (Table 4-15).

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#### 4.1.3.5 Natural Heritage Program Identified Priority Areas (IPAs)

##### DEIS Analysis

Among the different community types there are five unique communities impacted that are listed by the Natural Heritage Program as Identified Priority Areas (IPA). They are: US 421 Sandhill Ridge, Alligator Branch Sandhill and Flatwoods, Brunswick River/Cape Fear River Marshes, Battle Royal Bay, and Lower Cape Fear River Aquatic Habitat.

##### FEIS Analysis

Changes in the corridor since preparation of the DEIS resulted in four IPAs within the expanded corridor of the recommended alignment. The Lower Cape Fear Aquatic Habitat is not within the corridor of the recommended alignment. Portions of three of the four IPAs identified within the expanded study corridor are traversed by the recommended alignment: 421 Sand Ridge, Brunswick and Cape Fear River Marshes, and Battle Royal Bay. Approximately 18 acres of the IPAs are located within the recommended alignment slope stake limits, and 82 acres are within the recommended alignment right of way. Table 4-14 summarizes the potential impacts to IPAs by individual IPA and by their habitat value (primary and secondary) ranking. IPA crossing locations are shown on Figure 3-15. IPAs are not statutorily protected; therefore, mitigation of effects to IPAs is not required; however, efforts were taken to minimize effects to IPAs during preliminary design of the recommended alignment.

**Table 4-14: Impacts to Identified Priority Areas**

IPA Name	ACRES WITHIN RIGHT OF WAY		ACRES WITHIN SLOPE STAKES (FILL LIMITS)		TOTAL
	Primary	Secondary	Primary	Secondary	
421 Sand Ridge	11	14	7	11	43
Battle Royal Bay	0.0	19	0.0	0.0	19
Brunswick and Cape Fear River Marshes	38	N/A	0.0	N/A	38
<b>TOTAL</b>	<b>49</b>	<b>33</b>	<b>7</b>	<b>11</b>	<b>99</b>

#### 4.1.3.6 Water Resources

##### Groundwater

Expected effects of the project on groundwater are similar among the DEIS alternatives and the recommended alignment. Wells within the project's right of way would be surveyed prior to project construction. NCDOT would purchase these wells and cap and abandon them in accordance with North Carolina Well Construction Standards. Any subsurface contamination would be reported to the Wilmington Regional Office of the NCDENR. During the final design phase of the project, NCDOT would also identify wells adjacent to the project right-of-way, which could be impacted by roadway construction. Mitigation for these wells could be provided through land purchase, compensation for damages, or the provision of new wells.

A roadway alignment is in a cut section if the elevation of the roadway is less than the original ground elevation. Well drawdown (reduced yield) usually occurs around areas of cut sections. However, reduced yields for shallow wells are not likely in the project area since there are no large cut sections (deeper than 1-3 feet) anticipated for the project. Also, no blasting in the

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study area would occur due to road construction. Impacts to public water supply wells are presented in Section 4.1.2.4. See Section 4.1.2.4 for information regarding impacts to groundwater wells.

Construction of the project would contribute to a cumulative decrease in available recharge area for the Castle Hayne and Peedee aquifers. However, due to the wide availability of undeveloped recharge areas in the vicinity, the proposed project is not expected to substantially impact aquifer recharge volumes.

Pollutants associated with highway construction and use could potentially affect aquifer ground water quality in localized areas. As discussed under Section 4.1.4.7, possible pollutants include pesticides, herbicides, fertilizers, petrochemicals, oil, grease, heavy metals, and hazardous materials. No sole or principal drinking water aquifers are present in the project area.<sup>236</sup>

To minimize short-term groundwater quality impacts due to construction, NCDOT contract specifications require the contractor to implement a plan to minimize and control construction-related contaminant spills. Pollutants associated with highway construction and use would be minimized by the BMPs discussed in Section 4.1.4.7.

In flat areas, such as the project site, drainage is typically provided through grass swales parallel to the roadway. Since the area is relatively flat, the swales would drain slowly, providing an opportunity for water to seep into the ground. This type of drainage would help minimize long-term impacts to aquifer recharge areas due to an increase in impervious surfaces.

### **Surface Water**

Expected effects of the project on surface water are similar among the DEIS alternatives and the recommended alignment. Stormwater runoff rates would increase slightly due to the increase in impervious roadway surface area. This is an unavoidable, long-term impact resulting from construction of any build alternative.

Pollutants that may be contained in the stormwater runoff include:

- Sediment eroded during construction activity;
- Pesticides, herbicides, and fertilizers used to plant and maintain highway landscaping;
- Petrochemicals, oil, grease, and heavy metals associated with operation of vehicles;
- Trash and debris discarded by highway users; and,
- Chemicals and hazardous materials accidentally spilled during transport.

The project has the potential to temporarily degrade the quality of water in the surrounding streams by means of soil erosion during construction. Construction impacts are presented in Section 4.1.4.

Other impacts may include alteration of water levels and flows due to interruptions and additions to surface and groundwater flow from construction; increased nutrient loading. The only water supply water body within the vicinity of the project is Toomers Creek (Class WS-IV). Although the recommended alignment crosses Toomers Creek, the location of this crossing is outside the critical area of protection for this water supply. Moreover, Toomers Creek has not been used to supplement the Cape Fear River as a source of drinking water in emergency situations for

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several years since better sources are available in the area. Due to its lack of use and availability of better water supply sources, the Toomers Creek facility was deactivated.<sup>237</sup>

The NCDOT will incorporate measures to control non-point source water quality impacts as described in NCDOT's "Best Management Practices for Protection of Surface Waters". The goal of these best management practices (BMPs) is "to prevent degradation of the state's waters through the location, construction, or operation of the highway system".<sup>238</sup> These measures will be incorporated into the final engineering design of the project and will be detailed in an erosion and sedimentation control plan. This plan will be prepared in accordance with the guidelines and requirements of the North Carolina Sedimentation Pollution Control Act (15A NCAC 4B.0101-0130).

During construction, BMPs for in-water and over-water construction will be implemented, which will incorporate monitoring and enforcement of operational standards. A list of BMPs and NCDOT standards are included in Section 4.1.4.

BMPs to control stormwater runoff include directing sheet flow over grassed shoulder slopes and shallow flat slope ditches, using stone lined ditches in lieu of rigid concrete pavement, and using storage where necessary and practicable to reduce discharge of roadway runoff into sensitive receiving waters.<sup>239</sup> In flat areas, such as the project site, long-term stormwater drainage is typically provided through grass swales parallel to the roadway. Vegetated swales will reduce water quality impacts to surface water by catching oil, grease, and other pollutants and preventing them from draining to the area streams and rivers.

Stormwater runoff from the project will be contained as part of the project. NCDOT has no jurisdiction to impose land use and development controls. However, local government has the ability to control development through zoning, issuance of permits, and water quality objectives. Brunswick County, the towns of Leland and Navassa, and New Hanover County have land use plans as required by the Coastal Area Management Act (CAMA). These plans identify sensitive areas and development and environmental potential and constraints.

State stormwater certification (Regulation 15A NCAC 2H.1000) would be required. Requirements for this certification vary by the classifications of waters to which the project would drain.

Emergency oil and chemical spill response plans are in effect for Brunswick County. Typically, local law enforcement and/or fire department officials are the first to respond to accidental spills. These officials then notify the County Emergency Management Coordinators, located in the Town of Bolivia. If the spill threatens navigable waters, the Emergency Management Coordinator then notifies the US Coast Guard in Wilmington. In these instances, the Coast Guard will determine the appropriate response and coordinate cleanup activities.

The project will impact stream systems for which permitting will be required. Permits required for impacts to streams are discussed in Section 4.4.1.

#### **4.1.3.7 Jurisdictional Issues**

##### **DEIS Analysis**

##### **Wetlands**

Using the survey methods described in 3.4.4.1 prior to detailed field delineations, it was determined that the natural systems land within the alternative corridors is comprised of

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approximately 35 percent wetland communities. The project area contains bottomland hardwoods, wet pine flats, small stream swamps, swamp forest, and scrub/shrub. Alternative 2 would impact 214 acres of wetlands (37 percent of total acreage); Alternative 3 would impact 228 acres of wetlands (39 percent of total acreage); Alternative 8 would impact 193 acres of wetland (33 percent of total acreage); and Alternative 9 would impact 194 acres of wetland (33 percent of total acreage). These impacts are based on removing wetlands within the entire 300-foot wide right-of-way with consideration given for service roads as needed, and right-of-way widening at interchanges.

In most cases, the actual construction footprint will be less than 300 feet, and will vary with the height of the fill slope. For example, with the currently proposed 46-foot median, the construction footprint would be 148 feet (median, lanes and shoulders) plus the lengths covered by the fill slopes on either side. At a maximum slope rate of 2 to 1, any fill slopes less than 38 feet in height would result in a total construction footprint less than 300 feet wide.

### Buffer Areas

There was no analysis of buffer areas reported in the DEIS, however, there are no buffer rules in effect for the Cape Fear River Basin. No effects to buffer areas associated with the DEIS alternatives are anticipated.

### Protected Species

#### *Plants*

Due to the presence of suitable habitat for the federally-endangered rough-leaved loosestrife (*Lysimachia asperulaefolia*) and Cooley's meadowrue (*Thalictrum cooleyi*), additional field surveys will be conducted after an alternative has been selected to determine if they are present in the project area. This area remains unresolved and will require further investigation.

#### Birds

**Red-cockaded Woodpecker** -The impacts described in this section are based on the results of surveys conducted in 1992, 1993, and 1996, as described in Section 3.4.4.3.<sup>240</sup> Since the issuance of the DEIS, Cluster #2 and Cluster #3 were resurveyed and found to be destroyed. For this reason, only impacts reported in the DEIS relevant to Cluster #1 are presented in this section.

The foraging area of Cluster #1 consists of slash pine plantation (37 percent), pocosin (24 percent), long leaf pine (18 percent), and pond pine bay (15 percent). The remaining 6 percent is slash pine sapling.

Alternatives 2 and 3 (1,000-foot wide corridor) traverse about 109 acres of foraging area, which is about 60 percent pocosin, 20 percent pond pine bay, and 20 percent long leaf pine. The proposed right-of-way would impact about 35 acres of the foraging area, most of which is pocosin (58 percent) with the remaining 42 percent impacting long leaf pine and pond pine bay.

Alternatives 8 and 9 (1,000-foot wide corridor) traverse about 23 acres of foraging area which is all slash pine plantation. The proposed right-of-way would impact about 11 acres of slash pine plantation.

The information regarding the arctic peregrine falcon in the NHP database has been reviewed. The species is not expected to be found in the study area due to lack of documented individual siting; therefore the biological conclusion is **no effect** for this species.

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**Bald Eagle** - The information regarding the bald eagle in the NHP database has been reviewed. While habitat for this species is present in the study area, the bald eagle is not expected to be found in the study area due to the lack of identified nests and no sightings of this species; therefore, the biological conclusion is may affect, **not likely to adversely effect** for this species.

**Wood Stork** - The information regarding the wood stork in the NHP database has been reviewed. The wood stork is not expected to found in the study area. Habitat is not available within the study area; therefore the biological conclusion is **no effect** for this species.

**Piping Plover** - The information regarding the piping plover in the NHP database has been reviewed. The piping plover prefers habitat found along the coast; therefore, this species is not expected to occur within the study area. The biological conclusion is **no effect** for this species.

### *Mammals*

**Eastern Cougar** - The information regarding the eastern cougar in the NHP database has been reviewed. Because this species is considered to be extirpated from the state of North Carolina, the biological conclusion is **no effect** for this species.

**West Indian Manatee** - The information regarding the West Indian manatee in the NHP database has been reviewed. The manatee is not expected to travel into the study area. However, construction in aquatic areas should follow best management practices as recommended by the National Marine Fisheries Services.

Dredge and fill activities in the Cape Fear River may temporarily impact the habitat available to the manatee. Any direct or indirect impacts are anticipated to be minor. Best Management Practices would reduce and/or eliminate any potential impacts to this species. Furthermore, based on previous communications, the USFWS prefers that in-water construction be accomplished during the seven month period, November through May, so that potential encounters during the manatee's annual migration through North Carolina waters from June through October will be avoided or minimized. The following USFWS precautions should be implemented throughout the construction period to minimize the potential for adverse manatee encounters:

1. Construction personnel should be trained to identify manatees, their habitat, and their seasonal migration patterns; the need to avoid harm to manatees; and the general responsibility of all construction personnel for observing water-related activities for manatees.
2. Construction personnel should be informed that there are civil and criminal penalties for harming, harassing, or killing manatees, which are protected by the Marine Mammal Protection Act of 1972 and the Endangered Species Act;
3. All moving equipment should be shut down immediately if a manatee comes within 50 feet of the operational area of the equipment, with activities suspended until the manatee departs project area on its own volition. Other appropriate precautions should also be taken if a manatee be sited within 100 yards of the active construction/dredging operation or vessel movement.
4. Any collision with and/or injury to a manatee should be reported immediately to the USFWS manatee coordinator in Jacksonville, Florida, the Raleigh Office and the North Carolina Wildlife Resources Commission.

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5. All watercraft associated with the project should have posted placards with a USFWS approved statement of caution regarding the potential for manatee encounters.

6. The construction contractor will maintain a log of sightings, collisions, or injuries to manatees during the project construction, which will be summarized in a report and submitted to the USFWS Raleigh Office and the NCWRC at project end.

Other measures that must be taken during the manatees' seasonal migration through North Carolina waters between June and October include:

1. All vessels associated with the project are to follow deep water routes where possible and should be operated at "no wake/idle" speeds at all times where draft of vessel provides less than a four-foot clearance from the bottom.

2. Where necessary, siltation barriers must be made of a material in which manatees cannot become entangled and secured in a manner that they cannot break free and entangle manatees. These barriers should be regularly monitored to ensure that manatees have not become entangled. Furthermore, barriers will be placed in a manner to allow manatees entry to or exit from essential habitat.

Given the location of the project (located in the extreme northern range of the manatee), and adherence to the aforementioned recommendations, the proposed project is **not likely to adversely effect** the manatee.

#### *Reptiles, Amphibians, and Invertebrates*

Four of the reptilian species that are federally-listed in Brunswick County as threatened or endangered are not anticipated to be found in the project area. These include Kemp's Ridley sea turtle (*Lepidochelys kempi*), loggerhead sea turtle (*Caretta caretta*), the green sea turtle (*Chelonia mydas*), and the leatherback sea turtle (*Dermochelys coriacea*). Two of the reptilian species federally-listed as threatened in New Hanover County include green sea turtle (*Chelonia mydas*) and loggerhead sea turtle.

The information regarding the above referenced turtle species in the NHP database has been reviewed. These species are found in coastal habitats and are not anticipated to travel upstream in the Cape Fear River to the project vicinity. Therefore, the biological conclusion is **no effect** for these turtle species.

The information regarding the American alligator in the NHP database has been reviewed. Because the use of Best Management Practices is recommended for any construction adjacent to water, the biological conclusion is **no effect** for this species.

#### *Fish*

**Shortnose Sturgeon** - The shortnose sturgeon (*Acipenser brevirostrum*) is a federal- and state-listed endangered species which is likely to occur in the Northeast Cape Fear River in the study area. Pursuant to Section 7 of the Endangered Species Act, an informal consultation meeting was held on April 22, 1996, to discuss potential impacts to the shortnose sturgeon. Discussion ensued regarding construction methods, Best Management Practices, and time of year restrictions for in-water construction activities. Both the NC Division of Marine Fisheries and Dr. Mary Moser, University of North Carolina - Wilmington, recommend a moratorium from February 1 through May 31 on in-water construction activities during the construction of the bridge over the Cape Fear River.<sup>241</sup> The moratorium would be in effect during the spawning and breeding time for the endangered short-nosed sturgeon and other anadromous fish.

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Long-term impacts to fisheries resources may include water quality degradation due to storm water runoff and hydrocarbon pollution. "Construction on piles, rather than fill, and diversion of bridge run-off would help to reduce these chronic effects."<sup>242</sup>

## **FEIS Analysis**

### **Wetlands**

#### *Impacts*

Methods used to calculate impacts to jurisdictional wetlands are explained in detail in Section 3.4.4.1. The proposed project would result in unavoidable impacts to jurisdictional wetlands. Project impacts to jurisdictional waters would require a Section 404 Dredge and Fill Permit from the USACE to discharge fill into waters of the United States in accordance with the Clean Water Act of 1977. A Section 401 Water Quality Certification Permit from the NCDWQ would also be required for activities resulting in discharge to waters of the United States in accordance with the NC General Statutes Chapter 143 Article 21, Part 1.

Approximately 78.8 acres of the jurisdictional wetlands are located within the recommended alignment slope stake limits and 185.7 acres are within the recommended alignment right of way. Wetland impact locations are shown on Figure 4-5, A, B and C. Table 4-15 summarizes the potential impacts to wetland communities by wetland type. These estimations are based on detailed field delineations conducted following the issuance of the DEIS and are reflective of efforts made to avoid and minimize impacts to wetlands.

**Table 4-15: Impacts to USACE Jurisdictional Wetlands**

WETLAND TYPE	QUANTITY WITHIN RIGHT OF WAY (ACRES)	QUANTITY WITHIN SLOPE STAKES (FILL LIMITS) ACRES
Palustrine Forested (PFO)	149.6	78.1
Palustrine Emergent (PEM)	36.1	0.7
<b>PALUSTRINE WETLANDS (Total)</b>	<b>185.7</b>	<b>78.8</b>

Impacts to wetlands by the recommended alignment are unavoidable. However, all practicable efforts have been taken during preliminary design of the recommended alignment to minimize impacts to wetlands. Temporary work bridges will be required to construct bridges over wetland areas and will impart temporary wetland impacts at each of the bridge construction locations. Construction methods over open waters and wetlands are presented in Section 4.1.4.8. The project's unavoidable wetland impacts will require permits from the USACE and NCDWQ. Permits required for the impacts are discussed in Section 4.4.

#### *Mitigation*

Mitigation for the proposed impacts to jurisdictional waters, including wetlands, will be arranged through the Ecosystem Enhancement Program (EEP) under the 2002 Memorandum of Agreement (MOA) between the USACE, NCDOT, and NCDENR. The MOA established the procedures for providing compensatory mitigation through the EEP to offset impacts to waters and wetlands due to activities authorized by Clean Water Act permits. Opportunities exist for on-site mitigation at various locations along the recommended alignment. These opportunities will be assessed by NCDOT during the final design phase of the project.

### **Buffer Areas**

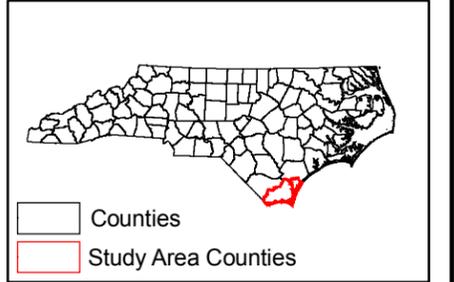
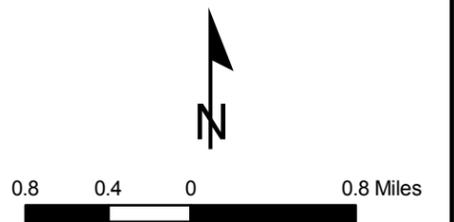
There are no buffer rules in effect for the Cape Fear River Basin; therefore, no impacts to buffer areas are anticipated.

TIP R-2633 A/B  
Wilmington Bypass

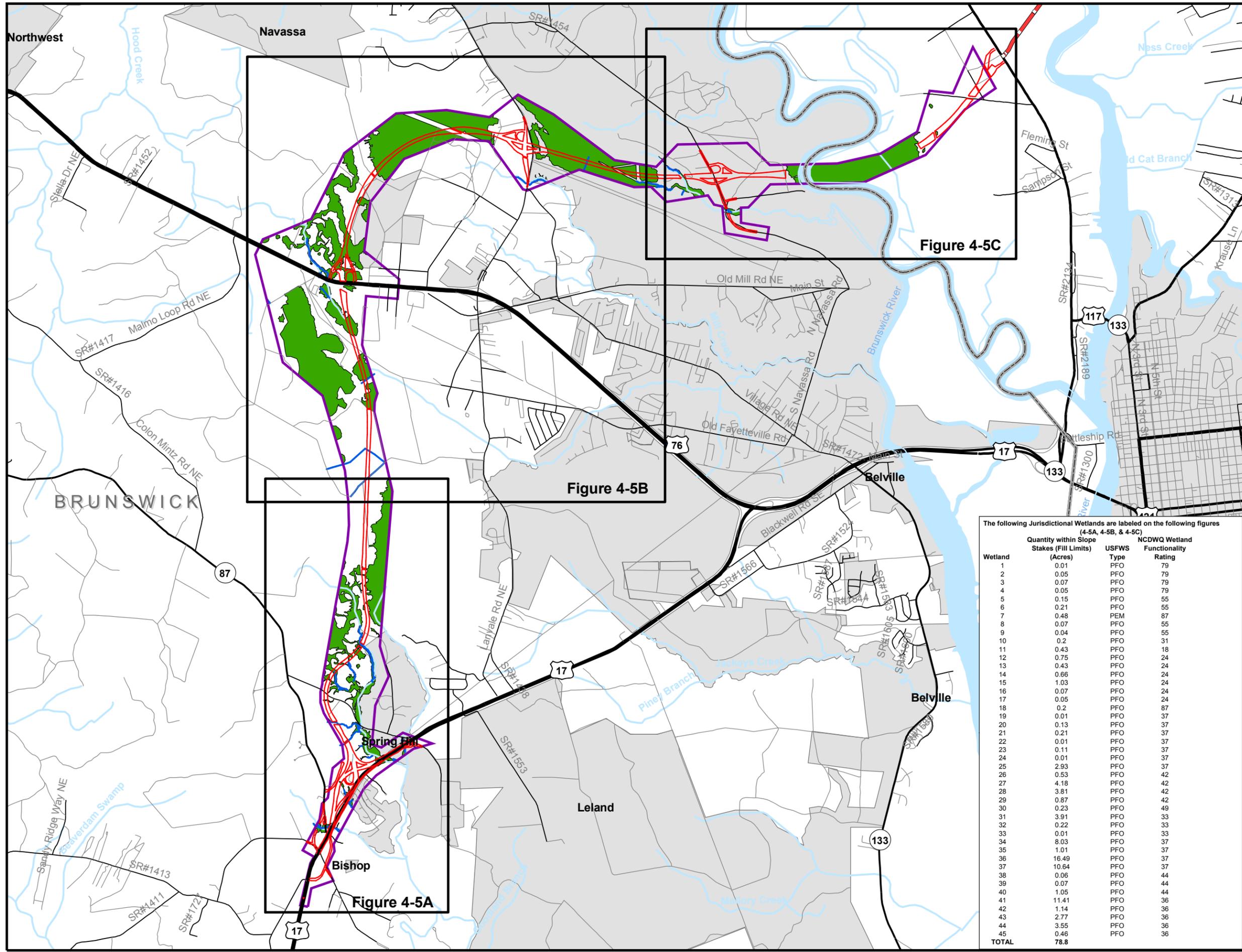
Figure 4-5  
Key Map for USACE  
Jurisdictional  
Wetlands Impact Locations

Legend

-  Expanded Study Corridor
-  R-2633A/B Slope Stake Limits
-  R-2633 C
-  Interstate Highways
-  US Highways
-  State Highways
-  State Routes
-  Local Roads
-  Railroads
-  Municipal Boundaries
-  County Boundaries
-  Water
-  Jurisdictional Delineated Streams
-  Jurisdictional Delineated Wetlands
-  Streams (non-delineated)



April 2007  
This map is for reference only.  
Sources: ESRI, NCDENR, Brunswick County,  
New Hanover County, NCDOT, USDOT, CGIA,  
URS.



The following Jurisdictional Wetlands are labeled on the following figures (4-5A, 4-5B, & 4-5C)

Wetland	Quantity within Slope Stakes (Fill Limits) (Acres)	USFWS Type	NCDWQ Wetland Functionality Rating
1	0.01	PFO	79
2	0.05	PFO	79
3	0.07	PFO	79
4	0.05	PFO	79
5	0.15	PFO	55
6	0.21	PFO	55
7	0.48	PEM	87
8	0.07	PFO	55
9	0.04	PFO	55
10	0.2	PFO	31
11	0.43	PFO	18
12	0.75	PFO	24
13	0.43	PFO	24
14	0.66	PFO	24
15	1.03	PFO	24
16	0.07	PFO	24
17	0.05	PFO	24
18	0.2	PFO	87
19	0.01	PFO	37
20	0.13	PFO	37
21	0.21	PFO	37
22	0.01	PFO	37
23	0.11	PFO	37
24	0.01	PFO	37
25	2.93	PFO	37
26	0.53	PFO	42
27	4.18	PFO	42
28	3.81	PFO	42
29	0.87	PFO	42
30	0.23	PFO	49
31	3.91	PFO	33
32	0.22	PFO	33
33	0.01	PFO	33
34	8.03	PFO	37
35	1.01	PFO	37
36	16.49	PFO	37
37	10.64	PFO	37
38	0.06	PFO	44
39	0.07	PFO	44
40	1.05	PFO	44
41	11.41	PFO	36
42	1.14	PFO	36
43	2.77	PFO	36
44	3.55	PFO	36
45	0.46	PFO	36
<b>TOTAL</b>	<b>78.8</b>		















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## **Protected Species**

Federally listed endangered and threatened species are legally protected under the provisions of Section 7 of the Endangered Species Act (ESA) of 1973, as amended, and any action likely to adversely affect a species afforded federal protection is subject to review by the USFWS and/or the NMFS. Species classified as Federal Species of Concern (FSC) are not protected under the provisions of Section 7 of the ESA, but are defined as species under consideration for listing as threatened or endangered. North Carolina provides limited protection to "at risk" species under the North Carolina Endangered Species Act and the North Carolina Plant Protection and Conservation Act of 1979. The NCWRC and the North Carolina Department of Agriculture (NCDA) are responsible for enforcing and administering species protection.

### *Biological Conclusions for Federally Protected Species*

This section presents the biological conclusions for the four federally protected species (rough-leaved loosestrife, red-cockaded woodpecker, and shortnose sturgeon) documented in the expanded study corridor, and three federally protected species (West Indian manatee, wood stork, bald eagle, and American alligator) that potentially may occur within the expanded study corridor. Biological conclusions for the remaining ten federally listed species listed by NCNHP as occurring within either Brunswick or New Hanover counties, but not identified within the expanded study corridor, are presented in the 2004 *Addendum to the Natural Systems Technical Memorandum*.<sup>243</sup> The USFWS concurred with the biological conclusions in a letter dated June 17, 2004 (Appendix A).

#### Rough-leaved Loosestrife

During field surveys one population of this plant species was identified along the western edge of the expanded study corridor to the north of US 74/76. However, this population does not occur within either the recommended alignment slope stake limits or the recommended alignment right of way.

**Biological Conclusion: May affect, not likely to adversely affect.** Although the population was identified within the expanded study corridor, it is not within either the recommended alignment slope stake limits or the recommended alignment right of way. The population may be indirectly impacted by future development around the proposed interchange with US 74/76.

#### Red-Cockaded Woodpecker

Surveys for RCWs were conducted at various points throughout the history of the project. Results of the surveys are summarized in Section 3.4.4.3 of this FEIS. One RCW population (Cluster #1) has been identified as utilizing habitat that overlaps the recommended alignment's slope stake limits and right of way. Based on the USFWS foraging habitat analysis (FHA) method, approximately 0.07 acres of foraging habitat for the RCW cluster would be impacted by the proposed project. A reduction of 0.07 acres of foraging habitat would not reduce available habitat below critical levels.<sup>244</sup>

**Biological Conclusion: May affect, not likely to adversely affect.** The results of the FHA indicated that the removal of RCW foraging habitat from Cluster 1 due to construction of the proposed project would not reduce available habitat below critical levels. However, because the proposed project would potentially reduce available foraging habitat by 0.07 acres, a potential effect is noted.

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## Shortnose Sturgeon

Impacts to shortnose sturgeon related to bridge construction over the Cape Fear River have been addressed in Informal Section 7 Consultations, both prior to and following issuance of the DEIS, with NMFS, USFWS, NCDMF, NCWRC and other regulatory agencies.<sup>245</sup> There is the potential for interference with shortnose sturgeon migration due to vibrations in the water column stemming from construction activities. Comprehensive data concerning the effects of vibration on migrating shortnose sturgeon were not available during these consultations; however, NCDOT has collected vibration readings from the Northeast Cape Fear River bridge construction site (TIP R-2633 C). Results of these studies have been discussed during Informal Section 7 Consultations and, based on these and species life history data, a moratorium on construction work was set for the period between February 1 and June 15 that will apply to the open river channel from the defined edge of the bank plus 115 feet to either side. The restriction states: "No in-water work in the Cape Fear River and Toomers Creek between February 1 and June 15 of any year. For the purposes of this moratorium, in-water is defined as the main channel where the vegetation lines meets open water and extending 35 meters into adjacent wetlands on both sides of the channel. This applies to either vibratory or impact pile driving. The 35 meter buffer from where the vegetation line meets the open water includes wetlands only and not upland areas."<sup>246</sup> To effectively minimize the potential for impacting the Cape Fear River population of the shortnose sturgeon, NCDOT will not conduct in-water construction activities within the moratorium zone during the agreed upon time period.

**Biological Conclusion:** May affect, not likely to adversely affect. Official concurrence from NMFS was received in a letter dated August 24, 2006 Appendix A.

## West Indian Manatee

Impacts to the West Indian manatee related to bridge construction over the Cape Fear River have been addressed in Informal Section 7 Consultations. Although this species is unlikely to occur within the recommended alignment, there is the potential for interference with this species. To effectively minimize the potential for impacting the West Indian manatee, the USFWS *Precautionary Guidelines for General Construction in Areas Which May Be Used by the West Indian Manatee in North Carolina* should be adhered to during bridge construction.<sup>247</sup> These mitigation guidelines are presented in Appendix G.

**Biological Conclusion:** May affect, not likely to adversely affect. NCNHP data show no known occurrences of this species in the expanded study corridor and it is unlikely that the manatee would travel upstream into the vicinity of the recommended alignment. This determination is given with the understanding that the proposed project will adhere to the USFWS *Precautionary Guidelines for General Construction in Areas Which May Be Used by the West Indian Manatee in North Carolina* (Appendix G).

## Wood Stork

Even though potential roosting habitat for the wood stork exists in the project area, the only known occurrence of nesting wood storks in North Carolina is a colony of birds ranging from 15-100 individuals that frequent Sunset Beach during early June through mid-September. This is the northernmost breeding range for this species. In addition, NCNHP data show no known occurrences of this species in the expanded study corridor.

**Biological Conclusion:** May affect, not likely to adversely affect. Due to the limited and localized nesting activity of the wood stork in North Carolina, the USFWS concurs with the biological conclusion that the project may affect, but is not likely to adversely affect the wood stork.

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## Bald Eagle

Potential nesting habitat is present within the project study area. However, NCNHP data does not identify existing nest location within or immediately adjacent to the project study area. No sightings of this species or nesting sites were reported from terrestrial or flight surveys were conducted along the project corridor and one-half mile beyond with no nesting sites found.

**Biological Conclusion: May affect, not likely to adversely affect.** Considering the existence of potential habitat and the lack of identified nests and no sightings of this species or nesting sites during field surveys, the USFWS concurs with the biological conclusion that the project may affect, but is not likely to adversely affect the bald eagle.

## American Alligator

NCNHP data does not indicate any known occurrences of this species in the expanded study corridor, and no observations of this species were noted during the field surveys. However, NCNHP data does indicate that the American alligator does occur in several streams in the vicinity of the project study area, including Ness Creek, Town Creek, and within the Cape Fear River south of the expanded study corridor. Because the American alligator is a mobile species there is a potential for it to occur within streams within the recommended alignment. A species designated as threatened due to similar appearance is not granted the level of USFWS protection considerations afforded to threatened or endangered species during interagency consultations.

### *Impacts to State Listed Endangered, State Listed Threatened, or Federal Species of Concern*

This section presents the potential impacts to the three species that are federally listed as a FSC, or listed by the State of North Carolina as endangered or threatened, and were identified during the course of protected species survey efforts, as presented in Section 3.4.4.3 of this FEIS: Savanna indigo bush, Venus flytrap, and Pickering's morning glory.

## Savanna Indigo Bush

During a rare species survey conducted in 2002, populations of savanna indigo-bush were found within the expanded study corridor. However, these identified populations are not located within the recommended alignment's slope stake limits or right of way. As such, no direct impacts to this species are anticipated.

## Venus Flytrap

During a rare species survey conducted in 2002, populations of this species were found within the expanded study corridor. These identified populations are located within the recommended alignment's slope stake limits. As such, unavoidable impacts to these populations would result from the construction of this project.

## Pickering's Morning-glory/Dawnflower

During a rare species survey conducted in 2002, populations of Pickering's dawnflower were found within the expanded study corridor on the eastern side of the Cape Fear River in the Pine/Scrub Oak Sandhill community located to the south of the CP&L Sutton Steam Plant. These identified populations are located within the recommended alignment's slope stake limits. As such, unavoidable impacts to these populations would result from the construction of this project.

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## Essential Fish Habitat

An Essential Fish Habitat (EFH) analysis was conducted for the project (Appendix G). While the analysis took place following the issuance of the DEIS, it is expected that effects of the project on EFH would be similar among the DEIS alternatives and the recommended alignment.

### *Impacts*

The proposed project would cross estuarine systems in the Cape Fear River that are designated EFH for the South Atlantic Fishery Management Council's Shrimp, Red Drum, Snapper and Grouper, and Coastal Migratory Pelagics Fishery Management Plans. Construction activities may include the installation of temporary bridges, pier structures, pier protection, and pier shafts. Bridge construction would temporarily impact aquatic habitat by increasing turbidity and siltation associated with using barges and/or temporary work bridges during construction (Table 4-16). Permanent disturbance of waterway bottom sediment would be limited to the installation of in-water piles.

**Table 4-16: Impacts to Fisheries Management Plan Managed Species**

PROJECT ACTIVITY	IMPACT ASSESSMENT
Work Bridge Installation	Potential temporary impacts to some FMP species in immediate construction area; temporary loss of relatively small areas of habitat from placement of temporary fill (removable pier structures)
Pier Structure Installation	Temporary impact on FMP species; avoidance of immediate construction area and potential interruption of species movement patterns
Vibratory Hammer/Drilled Shafts/Pile Driving	Potential sedimentation and turbidity and potential interruption of species movement patterns
Fill (pier structures)	Permanent loss of relatively small area of habitat for some FMP species
Work Bridge Installation	Potential temporary impacts to some FMP species in immediate construction area; temporary loss of relatively small areas of habitat from placement of temporary fill (removable pier structures)

Source: North Carolina Department of Transportation. Wilmington Bypass US 17 to US 421 (R-2633A/B) Essential Fish Habitat Assessment. March 2006.

Increases in turbidity as a result of construction operations may have a short term impact to local fishery resources. Turbidity produces a silt layer that may cause an impact to benthic populations and ultimately reduce species diversity. Fish and invertebrate gills may become clogged with excessive suspended silt in the water column. Larvae and juveniles may also be suffocated by silt in nursery areas.

Installation of temporary bridging would also result in the temporary loss of bottom habitat due to the placement of temporary shafts and sheet piles. The amount of temporary habitat would be relatively minor with respect to available habitat affected adjacent to the project area. This temporary loss of habitat would have a minimal affect on fisheries populations that utilize these areas during feeding, spawning, or as nursery grounds for juveniles. Removal of these piles after construction should allow the area to return to pre-construction conditions.

Based upon the project design, the minimal short-term impacts associated with temporary bridges, installation of bridge structures, and the proposed mitigation, potential impacts to EFH will not be substantial. Further information concerning EFH affected by the proposed project is summarized in the EFH Assessment included in Appendix G.

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### *Mitigation*

A construction moratorium has been developed for the project that states: “In order to protect shortnose sturgeon and other anadromous fish, there shall be no in-water work in the Cape Fear River and Toomers Creek between February 1 and June 15 of any year. For the purposes of this moratorium, in-water is defined as the main channel where the vegetation line meets open water and extending 35 meters (115 feet) into adjacent wetlands on both sides of the channel.”<sup>248</sup>

This condition was developed specifically for this project in coordination with NCDOT, the NCDMF, and the NCWRC. The 115-foot buffer from where the vegetation line meets the open water includes wetlands only and not upland areas. Construction equipment will be allowed to traverse the temporary work bridges during the moratorium period.<sup>249</sup>

Impacts to water quality associated with installation of bridge piers are considered temporary and would be minimized through implementation of requirements associated with established 401/404 Water Quality Certifications.

### Areas of Environmental Concern

The waters of the Cape Fear River and Toomers Creek were identified as Public Trust AEC areas. Approximately 3.7 acres of this AEC are located within the within the recommended alignment right of way. However, the entire area will be crossed by bridging. Impacts to this area will be limited and similar to those described for EFH. Impacts to AECs associated with the DEIS alternatives were not assessed.

### Anadromous Fish Habitat

Anadromous fish habitat identified within the project right of way was limited to the waters of the Cape Fear River and Toomers Creek. However, the entire area will be crossed by bridging. Impacts to this area will be limited and similar to those described for EFH. Effects of the project on anadromous fish habitat are expected to be similar for the four DEIS alternatives and the recommended alignment.

### Submerged Aquatic Vegetation

No Submerged Aquatic Vegetation (SAV) habitat is mapped within the expanded study corridor; therefore no impacts to SAVs are anticipated for the four DEIS alternatives or the recommended alignment.

#### **4.1.4 CONSTRUCTION IMPACTS**

The construction activities associated with building a new roadway will create environmental impacts. These impacts, generally short-term in nature, can be controlled, minimized, or mitigated through conformance with Best Management Practices (BMPs) and standard NCDOT procedures. The general categories of BMPs from the NCDOT are listed below.

- Erosion Control
- Flow Diversion
- Impervious Dikes
- Dewatering

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- Temporary Stream Crossings
  - Ground Stabilization
  - Maintaining Normal Flow

For detailed information concerning the BMPs, refer to the NCDOT guide, “Best Management Practices for Construction and Maintenance Activities.”<sup>250</sup> Potential construction impacts of the project are similar among the four build alternatives evaluated in the DEIS and the recommended alignment. These impacts are discussed in the following subsections.

#### **4.1.4.1 Energy**

Construction of the project is expected to result in less total energy utilization than the No-Build Alternative. Construction of the facility would initially require the consumption of energy and resources that would not be used if the project were not built. Operation of the facility, however, would compensate for the energy lost during construction by increasing the efficiency of the region's roadway system.

Increased energy efficiency on the new freeway would be attributed to its controlled access features and would result in the following:

- Decreased vehicle delays,
- More efficient vehicle operating speeds, and
- Diversion of traffic away from less convenient and less efficient roadways.
- The project is considered consistent with the Federal Energy Policy Act of 2005.

#### **4.1.4.2 Visual**

Short term visual impacts are expected to occur due to construction activities and equipment. To reduce the potential for visual impacts, construction activities would be contained within as minimal an area as practical. Construction easements on parcels outside the alignment, where required, would be managed to minimize potential visual impact. Following construction, ground cover, landscaping, or related materials may be utilized to restore or enhance areas to preconstruction conditions or better.

#### **4.1.4.3 Noise**

Construction of the project will result in temporary increases in noise levels within the vicinity of the project. Noise would be generated primarily from heavy equipment used to transport materials and constructing the roadway. Sensitive receivers located close to the construction activities may temporarily experience increased noise levels. The four build alternatives addressed in the DEIS and the recommended alignment traverse relatively sparsely populated, rural terrain, where few sensitive receivers are located. However, temporary construction noise associated with the project would likely affect areas in the vicinity of the southern terminus (around the convergence of US 17 and NC 87) and along SR 1426 (Mount Misery Road) more than in other areas.

Construction noise can be controlled by regulating the hours of construction and equipping machinery with noise reduction devices. Certain construction activities could also be limited during the evening, weekends, and holidays. Storage and staging areas would be located as

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far from noise sensitive areas as practicable. NCDOT specifications require the contractor to limit noise levels to 80 dBA Leq in noise-sensitive areas adjacent to the project. The NCDOT also reserves the right to monitor construction noise and to require noise abatement where limits are exceeded. The NCDOT can also limit work that produces objectionable noise during normal sleeping hours.

#### **4.1.4.4 Biotic Communities**

Construction, staging and stockpiling operations would result in the disruption of the resident wildlife population. The clearing of habitats, human activity, and noise from construction operations would result in the displacement of mobile wildlife species. Non-mobile species would be lost as habitat is converted to construction areas.

Maximum disruption of wildlife communities would occur when project construction begins as displaced animals are forced to compete for space with other nearby resident wildlife populations. These impacts would be minimized as much as possible by restricting land clearing and construction operations to within the project right of way. Off-site staging and stockpiling areas would be located to impact the least amount of natural habitat as possible. Stockpiling and staging areas would be re-vegetated after construction, which could provide replacement habitat for some species.

#### **4.1.4.5 Air**

Construction activities could have a short-term impact on air quality, primarily during site preparation. Particulate matter (dust) is the pollutant of primary concern during the construction period. Dust would be generated during earth moving activities, handling of cement, asphalt, or aggregate, and equipment travel over unpaved haul roads. Wind erosion of exposed areas and material stockpiles would also generate particulate matter.

The amount of dust generated would vary, depending on the construction activity and local weather conditions. Where excess dust is anticipated to be a problem, effective dust control measures would be implemented in accordance with standard NCDOT procedures. Dust control would be the responsibility of the contractor and could include:

- Minimizing exposed earth surface.
- Temporary and permanent seeding and mulching.
- Watering working and haul areas during dry periods.
- Covering, shielding, or stabilizing material stockpiles.
- Using covered haul trucks.

Emissions from construction equipment are regulated by federal standards. Any burning of cleared materials would be conducted in accordance with applicable state and local laws, regulations, and ordinances. Specifically, a Burning Permit from the North Carolina Division of Forest Resources must be obtained for burning within woodlands or 500 feet of woodlands under the protection of the Division of Forest Resources.

#### **4.1.4.6 Utilities**

Construction of the project will require some adjustment, relocation, or modification to existing public utilities such as natural gas pipelines, power transmission/distribution lines, water and

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sewer lines, and telephone and cable television lines. The impacts to these utilities are described in Section 4.1.2.4. Any disruptions to utility service during construction would be minimized by phased adjustments to the utility lines.

It is anticipated that the construction techniques to be used in the relocation of buried utilities would include a combination of trenching and boring. Utility relocation impacts will be more succinctly defined and minimized at Concurrence Points 4B and 4C of the Section 404/NEPA Merger Process as a result of utility relocation design in the final design phase of the project. All modifications, adjustments, or relocations would be coordinated with the affected utility companies.

#### **4.1.4.7 Water Quality and Drainage**

Runoff from the project construction site could impact water quality by the transport of sediment, nutrients, or hazardous materials. In accordance with the North Carolina Sedimentation and Pollution Control Act (15A NCAC 4B.0001.0027), an erosion and sedimentation control plan must be prepared for land-disturbing activities that cover one or more acres to protect against runoff from a ten year storm. Thus, prior to the start of project construction activities, an erosion and sedimentation control plan will be prepared in accordance with the NCDENR publication *Erosion and Sediment Control Planning and Design*, and the NCDOT guidelines *Best Management Practices for Protection of Surface Waters*. The best management practices (BMPs) to minimize sedimentation and erosion impacts during construction include, but are not limited to:

- Scheduling construction activities to minimize exposed area and duration of exposure;
- Clearing only minimal distances ahead of grading;
- Temporary seeding, sodding, and/or mulching of disturbed areas;
- Use of gravel or straw on exposed surfaces prior to re-vegetation;
- Re-vegetating as soon as possible after construction;
- Use of energy dissipaters at outfalls;
- Construction of temporary sediment traps;
- Use of silt fences;
- Covering stockpiled materials; and,
- Wetting exposed areas during windy conditions.

Additionally, NCDOT's standard practices will be adhered to during construction of the project. The standard practices require the proper use and handling of construction materials. Every precaution should be taken by the contractor to avoid erosion and discharge of waste water, bitumens, or hazardous materials, including fuel, lubricants, solvents or other chemicals, to ground or surface waters.

#### **4.1.4.8 Construction Methods over Open Water and Wetlands**

The project will require several piers to be constructed in the wetlands surrounding the Cape Fear River, and require main span piers in the Cape Fear River. Bridge foundations would most

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likely be waterline footings. To construct waterline footings, piles or drilled shafts would be installed into the bottom of the waterway. A cast-in-place concrete footing would be constructed on top of the piles or drilled shafts at an elevation near the waterline. Pier columns would be constructed on top of the waterline footings. These pier columns would support the bridge superstructure, including the bridge deck.

The new bridge or construction activity will not disrupt commerce on the Cape Fear River or hinder it in any way. The horizontal and vertical clearances (per the US Coast Guard) will accommodate all vessels that currently use the section of the river upstream of the project area. A notice to mariners will be issued prior to and during construction on the river.

### Construction in Open Water

Construction in open water could impact environmental resources such as the shortnose sturgeon, West Indian manatee, and water quality. This section describes the possible impacts and protection measures for these resources. These provisions have been determined through informal Section 7 Consultations since the preparation of the DEIS.

#### *Shortnose Sturgeon*

NCDOT has committed to complying with a construction moratorium from February 1 to June 15 over the Cape Fear River. The following is a summation of the commitments made by NCDOT to minimize impacts to the shortnose sturgeon:

“In order to protect shortnose sturgeon and other anadromous fish, there shall be no in-water work in the Cape Fear River and Toomers Creek between February 1 and June 15 of any year. For the purposes of this moratorium, in-water is defined as the main channel where the vegetation line meets open water and extending 35 meters (115 feet) into adjacent wetlands on both sides of the channel. This condition was developed specifically for this project in coordination with the NC Division of Marine Fisheries and the NC Wildlife Resources Commission and applies to either vibratory or impact pile driving. The 35-meter (115-foot) buffer from where the vegetation line meets the open water includes wetlands only and not upland areas.”<sup>251</sup>

Also, NCDOT’s BMPs for the protection of surface waters will be used along with turbidity curtains to reduce impacts to fish species and water quality. Sediment and erosion control measures shall adhere to the NCDOT Erosion and Sediment Control/Stormwater Certification and the Erosion and Sediment Control plan to be developed for this project during final design.<sup>252</sup>

#### *West Indian Manatee*

The USFWS prefers that in–water construction be accomplished during the seven-month period from November through May so that potential encounters with manatee will be avoided or minimized. Construction activities may continue through the time in which manatees may be in the area; however, the USFWS 2003 *Precautionary Guidelines for General Construction in Areas Which May Be Used by the West Indian Manatee* in North Carolina (Appendix G) should be adhered to during these times.

#### *Other Provisions*

For construction of the proposed bridge within the channel of the Cape Fear River, the most likely practicable construction method would be the use of floating barge construction method. For this method of construction, the waterway depths allow the barges near the proposed bridge location to float without the need for dredging. This method would be most applicable within the

Cape Fear River, where depths would typically not necessitate dredging. At least two barges would be utilized for construction of the proposed bridge, one to deliver materials and the other to serve as a platform for construction equipment. The barges would likely be placed with a towboat and anchored into position with driven piles or cables. After construction of each set of piers is complete, the anchored barges would be repositioned for the next pier construction site.

### Construction in Wetlands

There are two viable options for construction of bridges in the vicinity of wetlands and very shallow open water; temporary haul roads and temporary work bridges. Of these two options, the preferred is the temporary work bridge.

#### *Temporary Haul Road*

A temporary haul road would entail resting a layer of geotextile fabric in the wetland area adjacent to the construction site on which select embankment material would be placed in accordance with NCDOT specifications. This temporary haul road would provide both a road and work platform for conventional land-based construction equipment. After the construction is complete, the temporary haul road and underlying geotextile layer would be removed with the use of construction equipment.

#### *Temporary Work Bridges*

Temporary work bridges would be used for the Cape Fear River outside the navigable channel and for other stream and wetland crossings. For this method, a temporary work bridge to support construction equipment would be built adjacent to the location of the permanent bridge being constructed. The temporary work bridge would be expanded between pier construction sites with bridge extensions called “fingers”. It is anticipated that both single and dual work bridges would be constructed for this project. The work bridge would be removed upon completion of the permanent bridge. Impacts to the wetlands and waterway bottoms under this construction method would be temporary and considered minimal due to the temporary piles. Proposed locations and types of temporary work bridges described in Table 4-17.

**Table 4-17: Proposed Locations and Types of Temporary Work Bridges**

LOCATION	TEMPORARY WORK BRIDGE TYPE
NC 87 Relocated Over Bishop Branch	Singe 50-ft.-wide work bridge.
Project Mainline Over Secondary Tributary to Morgan Branch	Dual 50-ft.-wide work bridges with 25-ft.-wide finger bridges at each bent.
Project Mainline Over Secondary Tributary to Morgan Branch	Dual 50-ft.-wide work bridges with 25-ft.-wide finger bridges at each bent.
Project Mainline Over Tributary to Morgan Branch	Dual 50-ft.-wide work bridges with 25-ft.-wide finger bridges at each bent.
Project Mainline Over Cartwheel Branch	Dual 50-ft.-wide work bridges with 25-ft.-wide finger bridges at each bent.
SR 1430 (Cedar Hill Road) Over Cartwheel Branch	Singe 50-ft.-wide work bridge.
Project Mainline Over Cape Fear River	Dual 50-ft.-wide work bridges with 25-ft.-wide finger bridges at each bent.

Final selection of the construction techniques will be accomplished during final design and evaluated formally through the Section 404 and Section 10 permitting processes.

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#### **4.1.4.9 Erosion Control**

In accordance with the North Carolina Sedimentation and Pollution Control Act (15A NCAC 4B.0001.0027), and erosion and sedimentation control plan must be prepared for land-disturbing activities that cover one or more acres to protect against runoff from a ten year storm. Thus, prior to the start of project construction activities, an erosion and sedimentation control plan will be prepared in accordance with the NCDENR publication *North Carolina Erosion and Sediment Control Planning And Design Manual* and the NCDOT sediment and erosion control program.<sup>253</sup> The plan will identify BMPs to be used to reduce erosion and sedimentation. Best management practices would include but are not limited to:

- Minimizing exposed earth surface.
- Installation of silt fencing.
- Temporary and permanent seeding and mulching.
- Watering working and haul areas during dry periods.
- Covering, shielding, or stabilizing material stockpiles.

#### **4.1.4.10 Borrow and Disposal Sites**

All construction waste material generated during clearing, grubbing, and other construction phases would be removed from the project site and burned or disposed of by the contractor in accordance with state and local regulations. Litter and other general trash would be collected and disposed of at local landfill locations. Construction waste and borrow with regard to wetlands will not be allowed unless properly permitted by USACE. Specific locations of borrow and disposal sites will be determined during the final design phase of the project.

#### **4.1.4.11 Traffic Maintenance & Detour Accessibility**

Changes to the alignment since the DEIS was prepared, as described in Section 2.3, result in a change of traffic maintenance and detour accessibility construction-related impacts associated with the project. For this reason, construction-related impacts of this type for those alternatives evaluated in the DEIS are presented separately.

Temporary detours for construction activities would not be required for the project; however, traffic flow along these routes would be temporarily impeded from controlled-traffic conditions during construction along existing thoroughfares. An increase in truck traffic in the project area would occur during construction. Access to construction staging areas and the construction sites may require temporary access roadways. The traffic control plan developed during the final engineering design phase would define designated truck routes and parking areas for construction vehicles.

### **DEIS Analysis**

Two thoroughfares would be realigned as part of the proposed action: SR 1414 and SR 2169.

Cul-de-sacs at SR 1414 would be located at both sides of the project under all four alternatives.

Service roads serving the residential areas in the vicinity of US 17/NC 87 would maintain access to these areas.

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Residential areas along Cole Court would be serviced by a northeast extending service road that would intersect with Hewett-Burton Road (SR 1414) on the east side of US 17.

A second service road serving Stoney Creek Lane and areas south would extend to SR 1522, terminating near the intersection of SR 1522 and US 17 and south of the controlled-access limits.

A third service road would be located west of NC 87 and serve residential areas from Oak View Drive NE, where the service road would parallel NC 87 to Old Town Road and intersect with US 17 just south of the controlled-access limits.

With all four alternatives, SR 2169 in the vicinity of the US 421 interchange would be realigned on the north side of the project to connect with SR 1394 located west of this route.

On the southern side of the project, SR 2169 would have a cul-de-sac at its new terminus.

A service road study will be conducted during the final engineering design phase.

The NCDOT will provide new access wherever economically justifiable to properties isolated by a project.

All property access changes and proposed solutions identified in the service road study would be presented during the Design Public Hearing.

A detailed traffic plan would be developed as part of the final engineering design to coordinate traffic flows with each construction phase.

### **FEIS Analysis**

The project will result in changes in access due to road closings and realignments. The following is a list of the changes to the local roadway network.

- Several realignments and new construction will take place near the southern terminus of the project in the vicinity of US 17/NC 87.
- Cul-de-sacs at SR 1414 (Goodman Road) would be located at both sides of the project.
- In order to maintain access to residential areas and to minimize relocations in the vicinity of US 17/NC 87, these roads have been partially realigned. US 17 has been realigned from just south of Hewett-Burton Road (SR 1414) to the existing intersection with NC 87. A service road to the south of the realignment of US 17 will run from Hewett-Burton Road south to a location opposite Zion Church Road (SR 1727). The portion from approximately a quarter mile south of Hewett-Burton Road and Sloan Road will be along the existing US 17 (which will be narrowed down to 2-lanes from the present 4-lanes).
- NC 87 will be realigned to connect into US 17 at the existing Old Town Road (SR 1412) intersection. The new alignment will parallel existing US 17. Old Town Road will intersect NC 87 just north of US 17.
- North of the realigned NC 87, a service road will be constructed to provide access to the area to the west of the US 17 interchange.
- At the Mt. Misery Road (SR 1426) interchange, the roadway will be realigned just to the west of the existing Mt. Misery Road and bridged over the bypass. The existing Mt.

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Misery Road will remain in place and be used as a service road and cul-de-sacs will be placed on both sides of the project.

- In the vicinity of the interchange with Cedar Hill Road (SR 1430), service roads will be constructed to provide access to residential areas and realignments will take place to improve the traffic operations.
- Northeast of the interchange, a cul-de-sac will be constructed off of Cedar Hill Road to provide access to properties adjacent to the interchange.
- Davis Way, an existing dirt road that is located to the west of Cedar Hill Road and north of the recommended alignment will be upgraded to a paved road and become a service road for the adjacent properties.
- To the south of the recommended alignment, Royster Road (located to the east of Cedar Hill Road) will be realigned to intersect Cedar Hill Road approximately 300 feet north of the existing intersection. It will then be extended beyond Cedar Hill Road and turn and run north to provide access along the rear side of properties that currently use Cedar Hill Road for access.
- South of Royster Road, just as Cedar Hill Road turns to head east, Cedar Hill Road will be realigned so that the curve will have a higher design speed. The current configuration has been problematic. Additionally, a portion located in a marsh area, has been subject to flooding and will be bridged over this section.

#### **4.1.5 IRRETRIEVABLE & IRREVERSIBLE COMMITMENT OF RESOURCES**

As with any new roadway project, construction of the project would require certain irreversible and irretrievable commitments of natural resources, manpower, materials, and fiscal resources. Lands within the right of way would be converted from their present use to transportation use. Use of these lands is considered an irreversible commitment during the time period that the land is used for a highway facility. However, if a greater need arises for use of the land, or if the highway facility is no longer needed, the land can be converted to another use. At present, there is no reason to believe such a conversion would ever be necessary or desirable.

Considerable amounts of fossil fuels, labor, and highway construction materials such as cement, aggregate, and bituminous material would be expended to complete the project. Additionally, large amounts of labor and natural resources would be used in the fabrication and preparation of construction materials. These materials are generally not retrievable. However, while demand has increased they are not in short supply and their use would not have an adverse effect on the availability of these resources. Any construction would also require a substantial one-time expenditure of state and federal funds that are not retrievable.

Construction of the project would, however, add a critical link to the long-range transportation system for the region. The project is consistent with the long-range transportation goals and objectives of the NCDOT TIP and the Greater Wilmington Urban Area LRTP. It is anticipated that the roadway would enhance long-term access opportunities around and through the Wilmington area, and would support local and regional commitments to transportation improvement and economic viability. Benefits of the project would include improved roadway safety through the eastern portion of Brunswick County; reduced travel times; reductions in fuel consumption; and an additional crossing of the Cape Fear River, which would alleviate some of the traffic crossing the existing lift-span bridge.

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In summary, the anticipated beneficial effects would balance the irretrievable commitment of resources caused by the project. The project is consistent with state and local goals of improving transportation service in the region and strengthening the area's economic base.

#### **4.1.6 RELATIONSHIP BETWEEN LONG TERM & SHORT TERM USES/BENEFITS**

The most disruptive local short-term impacts associated with the project would occur during project construction. Existing homes, farms, and businesses within the project right of way would be displaced. However, adequate replacement housing, land, and space are available for homeowners, tenants, and business owners within the project area. Improved mobility and access to and from the study area could stimulate economic and business growth and viability as well as long-term residential interest.

Construction activities would create short-term air quality, noise, and visual impacts for nearby residents and businesses. Normal traffic patterns would also be disrupted. Implementation of Best Management Practices and NCDOT standard construction procedures would help minimize these impacts.

Increased turbidity levels in creeks and streams adjacent to construction activities could temporarily affect localized water quality. Best Management Practices, as described in Section 4.1.4, would minimize potential water quality impacts. In addition, the NCDOT will consult with the USACE in order to determine measures that will minimize impacts to waterways and wetlands.

The local, short-term impacts and use of resources by the proposed action would be consistent with the maintenance and enhancement of long-term productivity. Completion of the project would, over the long-term, be consistent with local, county, regional, and state transportation plans. The project will improve access to and from northeast Brunswick County, including Leland Industrial Park. This improved access will facilitate economic development throughout northeast Brunswick County in the form of new industrial and commercial development and to a lesser extent new residential and institutional development.

Coupled with the I-40 Connector (R-2405) and R-2633C, the project will serve as a principle link to beach areas of North Carolina. Access would be improved for vehicles traveling from the north and south along I-95 heading to Brunswick County beaches, South Carolina beaches and resorts, as well as areas north of Wilmington. Additionally, when combined with the US 17 corridor, the project has economic development importance as a connector to the state port at Wilmington.

#### **4.2 INDIRECT AND CUMULATIVE EFFECTS**

An assessment of indirect and cumulative effects associated with the project and other past and reasonably foreseeable future actions has been conducted since the issuance of the DEIS. The purpose of this section is to provide an overview of the indirect effects of the project and the combined or cumulative effects of the project and other past, present, and reasonably foreseeable future development activities. Please refer to the Wilmington Bypass Indirect and Cumulative Effects Assessment for the complete analysis.<sup>254</sup>

An indirect and cumulative effects study area was developed to serve as a basis from which to gather specific demographic, socioeconomic, land use, and environmental data for identification of potential indirect and cumulative effects of the project. The methods used to identify the study area included consideration of the project's purpose and need, the service area of the proposed transportation improvement, regional and local travel patterns, county and municipal boundaries, drainage basins, water supply watershed/ subwatershed boundaries, and project

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impacts to the surrounding physical, social, and natural resources. Interviews conducted with local agency officials were also helpful in defining the study area. This process resulted in a primary indirect and cumulative effects study area for parcel-specific land use analysis (referred to as the study area) and a supplemental study area for a travelshed analysis (referred to as the travelshed). The study area is shown in Figure 4-6 and consists of a three-mile buffer of the R-2633 alignment, with particular focus on the R-2633A/B portion of the alignment. The project's geographic location and travelshed is shown in Figure 4-6. Other projects and development activities considered

## **4.2.1 HUMAN ENVIRONMENT EFFECTS**

### **4.2.1.1 Community Cohesion**

The presence of a new, limited-access freeway can have both positive and negative indirect effects on community cohesion. In general, positive effects can include shorter travel times and more convenient access between homes, stores, and businesses. However, a new roadway can also create a barrier between residential areas and their shopping centers, recreational sites, and schools. At a neighborhood level, a new freeway can create a barrier between individual homes previously connected by a local street system. Considered cumulatively, these indirect effects can affect the cohesion of a community.

As described in Section 3.1.4, the Spring Hill community, was found to exhibit qualities and characteristics that identify it as a distinctive and uniquely cohesive community and, since the commencement of the environmental and planning studies for the Cape Fear Skyway project; additional communities have demonstrated characteristics of some social interaction and networking. These communities include Snee Farms, Planters Walk and Stoney Creek, and are located south of Spring Hill on the east side of US 17.

Like many of the effects assessed in this document, a change in community cohesiveness is not an isolated effect of the project, but is related to other effects such as noise increases and alteration of travel patterns. Some of these effects are direct in nature, such as the relocation or displacement of community members. Other effects are indirect, such as increases in noise levels and changes in views. Effects of the project including relocations, social isolation, induced development and land use change, changes in physical boundaries of communities, changes in transportation and neighborhood access, changes in noise levels, disturbance to quality of life and visual effects can be considered cumulatively to determine whether community cohesion might be affected. The direct and indirect effects of the DEIS alternatives and the recommended alignment that might cumulatively affect community cohesion are summarized in Table 4-18 for Spring Hill and Table 4-19 for Snee Farms, Stoney Creek, and Planters Walk.

**Table 4-18: Project-Related Effects Associated with the Cohesion of Spring Hill**

Type	DEIS Alternatives	Recommended Alignment
Division/ Barrier Effects	No effect.	No effect.
Relocations/ Displacements	According to the DEIS, each alternative would result in 18 relocations in the vicinity of the southern terminus. It is likely that some of these relocations would affect the Spring Hill community.	No effect.
Isolation	Effects to isolation are related to the cumulative effect of US 17 and the Wilmington Bypass and are a function of the proximity of the project to the community. An alignment further west within the DEIS alternative corridors would have less of an effect than an alignment shifted further east, closer to Spring Hill.	Isolation of Spring Hill is related to the cumulative effect of US 17 and the Wilmington Bypass and is a function of the proximity of the project to the community. With the recommended alignment, the project is further removed from the community and there would not be a change in the physical boundary of the community. The recommended alignment would not isolate the community.
Induced Development and Land Use Change	Similar effects are expected among all alternatives. Induced development and redevelopment pressure could disrupt the social network of the community.	
Transportation and Neighborhood Access	Similar effects are expected among all alternatives. The project would have both negative and positive effects on transportation and neighborhood access. Direct access to NC 87 on Goodman Road would be eliminated, requiring that residents access NC 87 via US 17. The project would marginally increase impedance between the northern and southern sections of Spring Hill.	
Noise Levels	Effects to noise levels are expected to be related to the proximity of the project to the community. An alignment further west within the DEIS alternative corridors would have less of an affect than an alignment shifted further east, closer to Spring Hill. Any alignment within the DEIS alternative corridors is expected to have more of a noise impact on Spring Hill than the recommended alignment.	Changes in noise levels are not expected to affect households in Spring Hill.
Visual Changes	An alignment located further east within the DEIS alternative corridors would have a greater visual effect to Spring Hill than one located further west. The introduction of a new transportation feature that would be visible from vantages throughout the community would be out of context with existing visual elements.	The US 17 interchange would be visible in the distance.

**Table 4-19: Summary of Effects Associated with the Community Cohesion of Snee Farms, Stoney Creek and Planters Walk**

Type	DEIS Alternatives	Recommended Alignment
Division/Barrier Effects	The need for increased right-of-way along US 17 to accommodate an interchange with the project would not divide or introduce a new barrier to these communities.	
Relocations/Displacements	In the DEIS, it was reported that each DEIS alternative would result in 18 relocations in the vicinity of the southern terminus, approximately half of which would occur on the east side of US 17. These relocations would likely affect Spring Hill, Snee Farms, Stoney Creek and Planters Walk.	The redesign of the US 17 interchange during preliminary engineering substantially reduced the number of residential relocations east of US 17 in the proximity of the Snee Farms, Stoney Creek and Planters Walk communities. There would be no relocations associated with the project in these communities.
Isolation	New structures in the vicinity of these communities associated with each alternative would take place along existing US 17 and would not create a new boundary or hem in these communities.	
Induced Development and Land Use Change	Each alternative is expected to facilitate the trend of development in this area. Additional commercial land uses are expected to be induced. These communities are a reflection of the development trend – increased development is not likely to affect the cohesion of these communities.	
Transportation and Neighborhood Access	The communities would no longer have direct access to US 17. Service roads would be provided. While this could cause some inconvenience, accessing US 17 would be safer.	
Noise Levels	The FHWA’s noise model has been updated since the assessment performed for the DEIS alternatives. A revised assessment conducted for the recommended alignment indicated that noise levels would increase for some receptors and decrease for others. Similar effects can be expected for the DEIS alternatives.	
Visual Changes	In the vicinity of these communities, changing views will consist of additional road structure associated with the interchange of the project and US 17. This is not inconsistent with the visual context as US 17 is an existing visible structure. An adverse effect is not expected.	

In Spring Hill, the potential effect of the project on community cohesion seems to be a function of the proximity of the project to the community. While the effects related to the recommended alignment would not cumulatively affect cohesion in Spring Hill, effects associated with an alignment located east within the DEIS corridor could affect cohesion. In Snee Farms, Stoney Creek and Planters Walk, displacements associated with the DEIS alternatives would be expected to have a negative direct effect on the communities, but, considered cumulatively with other effects on community cohesion; none of the alternatives are expected to affect the cohesion of these communities.

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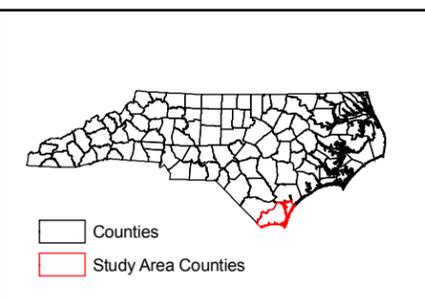
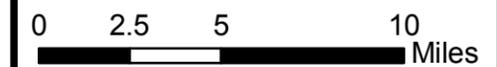
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TIP R-2633 A/B  
Wilmington Bypass

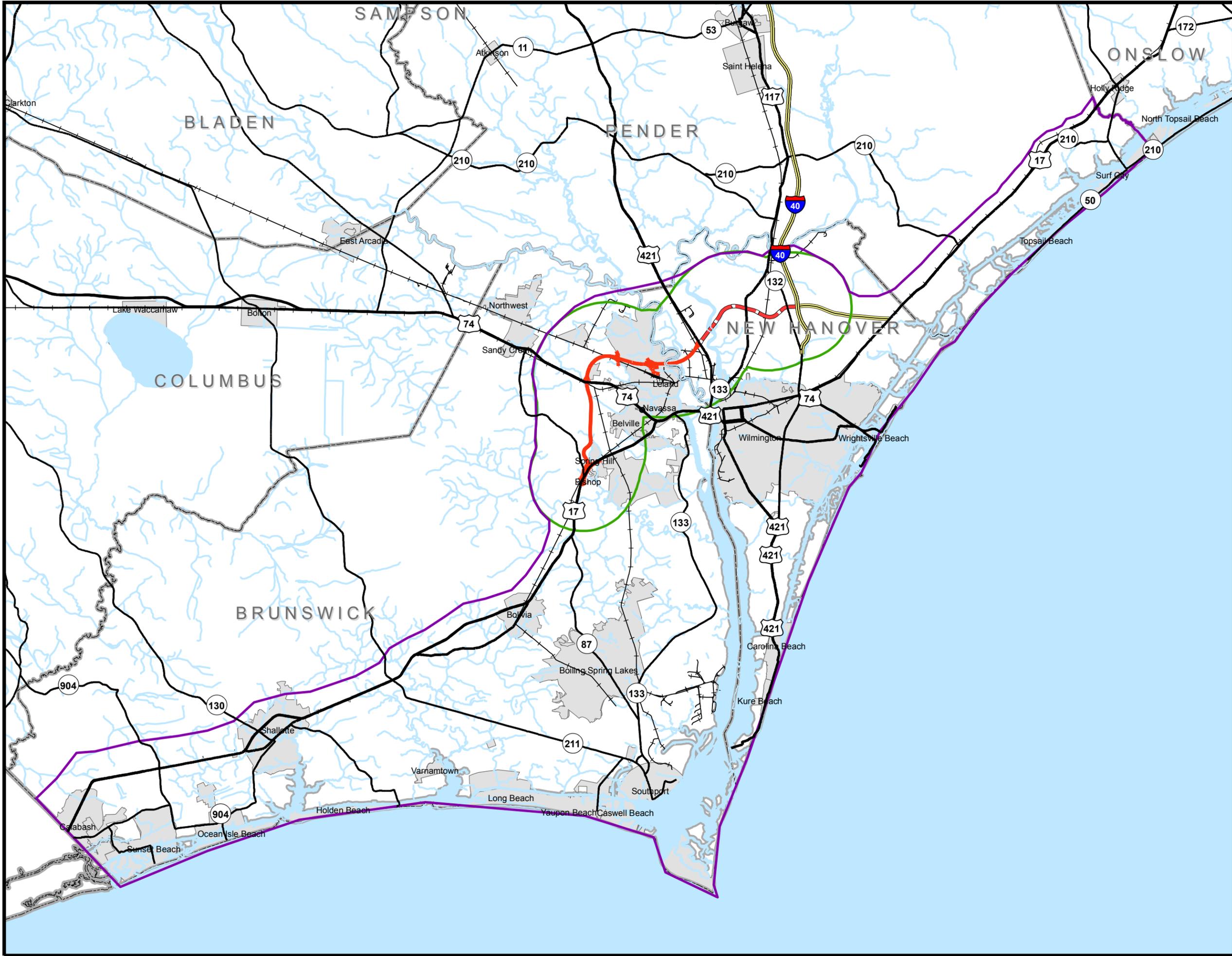
Figure 4-6  
ICE Study Area  
and Travelshed

Legend

-  Travelshed
-  Study Area
-  R-2633 A/B Recommended Alignment
-  R-2633 C
-  Interstate Highways
-  US Highways
-  State Highways
-  Railroads
-  Municipal Boundaries
-  County Boundaries
-  Water
-  Streams (Non-delineated)



April 2007  
This map is for reference only.  
Sources: ESRI, CGIA, Brunswick County,  
New Hanover County, USDOT, NCDOT, URS.





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#### **4.2.1.2 Traveler Proclivity**

Due to its regional effect, it is important to consider indirect and cumulative effects of the project on traveler proclivity on a larger scale than the study area. A travelshed was identified (Figure 4-6) for which indirect and cumulative effects of the project on traveler proclivity were assessed. The North and South Carolina coastlines are a major destination for regional beachgoers and tourists arriving via the Interstate Highway System from throughout the eastern United States. Upon completion, the Wilmington Bypass will take these long-distance travelers from I-40 and US 17 around Wilmington at freeway speeds. It will be especially useful for I-40 travelers destined for the Brunswick County beaches and coastal areas of South Carolina. Time savings and increased connectivity provided by the project will increase development pressure within this travelshed. Specifically, the project induces development by enhancing/providing access to both inexpensive rural land and valued coastal property, therefore increasing the overall attractiveness of the travelshed for development. By serving as part of an evacuation route in the case of an emergency, the project could help address Brunswick County's stated need for an improved transportation network to evacuate people from the coastal areas because of the threat of hurricanes, floods and the presence of a military ocean terminal that handles large amounts of munitions among other risk factors.

#### **4.2.1.3 Economic Effects**

The project is expected to indirectly affect both businesses and employment in the study area. While the area north of the project in the vicinity of US 117 may experience some negative economic effects because of the diversion of traffic (and customers passing-by) from this area, overall the project is expected to have a positive effect in the study area. Project-induced growth in the form of highway-oriented retail and industrial businesses in the vicinity of interchanges will contribute to the positive economic effects of the project. In addition, the project could facilitate economic growth by improving mechanisms for distribution of goods and materials to and from the travelshed. In New Hanover County's "Comprehensive Plan" it is noted that, to remain competitive, the county's inland highway access needs to be improved. Under the no-build scenario, this need may be left unfulfilled.

Considered cumulatively with other infrastructure projects, such as water and sewer expansion and projects to increase the capacity of the port, the project is expected to positively affect an already favorable economic outlook in the area.

Positive economic effects can also have negative environmental effects as natural or undeveloped areas become developed. Potential negative environmental effects could include loss of wetlands and recharge areas, degradation of water quality from increased impervious surface, and habitat loss. Considering the past development trends and the continued favorable growth environment, impacts to these resources could also occur with the no-build scenario, though to a lesser degree.

#### **4.2.1.4 Summary of Human Environment Effects**

Due to the growth trends already apparent in the study area without the project and since the project does not provide direct access to major employment centers; the project is not anticipated to substantially affect the urban spatial structure of greater Wilmington. The main effects of the project are expected within interchange catchment areas. These effects include influencing location decisions for future development, accelerating the pace of industrial expansion, and inducing commercial growth. To a lesser extent, the project may induce some residential development by providing new access to low cost, undeveloped, rural land.

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The project is generally expected to intensify and concentrate development trends already apparent in the study area. For example, study area land use shifts from rural to suburban will occur under both the build and no-build scenarios but are expected to be concentrated and intensified around project interchanges under the build scenario. The overall economic outlook in the study area is positive with or without the project; however, but the project is expected to facilitate industrial expansion, associated employment opportunities, and the distribution of goods and services; thus potentially improving an already positive trend.

Effects related to encroachment and alteration are particular to the build scenario. These include an expected positive effect on traveler proclivity and an expected negative effect on study area aesthetics.

Effects related to induced development are likely to impact wetlands and threatened and endangered species and degradation to water quality. Considering the past development trends and the continued favorable growth environment, impacts to these resources are also expected with the no-build scenario, though to a lesser degree.

## **4.2.2 LAND USE AND TRANSPORTATION PLANNING EFFECTS**

### **4.2.2.1 Land Use Effects**

In determining project-related effects on future land use; study area trends in population and development, which influence land use, were first assessed. An inventory of these trends provides a baseline to aid in determining which expected changes can be attributed to the project and which are not attributable to the project and would likely occur under the no-build scenario.

Current land use is shown in Figure 4-7. While much of the study area can be characterized as rural, through the analysis of study area trends it was found that substantial growth has already been occurring. For example, between 1990 and 2000 the Greater Wilmington Metropolitan Urban Area was the 14<sup>th</sup> fastest growing metropolitan urban area in the United States according to the US Census. This growth was accompanied by an increase in the construction of residential and industrial properties in the study area. Conditions within the study area were found to be particularly conducive to industrial growth, as the area is uniquely positioned to capitalize on an extensive multimodal transportation system that includes the Port of Wilmington and the Cape Fear River, CSX railroads, and direct interstate access via the Wilmington Bypass and I-40. Examples of recent and planned development in the study area include the Leland Industrial Park (near US 74/76) and Brunswick Forest, a large mixed-use development just east of the NC 87/US 17 intersection.<sup>255</sup> Some of the drivers of growth in the study area include the opening of the easternmost segment of I-40 in 1990, the attraction of nearby beaches, an influx of retirees to New Hanover County, and a multi-million dollar sewer project in Brunswick County.<sup>256</sup>

Due to the growth trends already apparent in the study area without the project and since the project does not provide direct access to major employment centers and will be a controlled access facility; the project is not anticipated to substantially affect the urban spatial structure of greater Wilmington. Using Geographic Information System (GIS) tools, future land use under the build and no-build scenarios can be compared to existing uses. In general, a comparison of existing and future land use indicates a shift from a rural pattern dominated by forestland and other natural areas to a more urban setting with commercial, residential, and industrial land uses. This overall shift was evident in both the future build and no-build scenarios. The main effects the project is expected to have on future land use within the study area include influencing location decisions for future development, accelerating the pace of industrial

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expansion, and inducing commercial growth within interchange catchment areas. While the project will not provide direct access to Wilmington's CBD, segments of the project may be used by residents in the northern portion of the study area as part of their route to the CBD. The project will also reduce congestion on other roads that do directly access the CBD by removing through-traffic from these routes. Considered cumulatively with increased employment opportunities associated with more intense industrial and commercial growth and increased access to affordable undeveloped land, it is expected that the project will induce minimal residential growth in the study area. Expectations of future land use in the study area both with and without the project are shown in Figure 4-8 and Figure 4-9, respectively. Land use is shown in relation to the recommended alignment only, rather than for the recommended alignment and the four DEIS alternatives. It is expected that the project will mainly influence land use shifts around interchange catchment areas. If the interchange locations are shifted from those shown in the figures, such as with one of the DEIS alternatives, the associated land use change would shift similarly.

Likely study area land use shifts within interchange catchment areas<sup>3</sup> are described as follows:

- US 421/Wilmington Bypass – Current land use in this proposed interchange area is a mix of commercial, industrial, and forested/wetland uses. The New Hanover County Board of Commissioners Task Force for Planning and Development of the US Highway 17 Bypass (I-140) has identified this interchange as a top priority for future water and sewer expansion and targeted industrial development.
- Future land use with the project is likely to include a change to commercial and industrial development in various adjacent land parcels. Due to improved access to the highway system, increased commercial development is also likely in the corridor between this interchange and the Central Business District (CBD) of Wilmington.
- Due to the expansion of water and sewer to this area and the building of R-2633C, development is expected even without the project. However, with the project the extent and pace of new development would be greater.
- Cedar Hill Road/Wilmington Bypass – Current land use in this proposed interchange area is a mix of forested/wetlands and low density residential uses.
- Future land use with an interchange at Cedar Hill Road, as proposed with the recommended alignment, is likely to include a change to commercial and industrial development in various adjacent land parcels. Improved access and job creation may also moderately induce residential development within the surrounding rural areas.
- Future land use without the project, or with the project but without an interchange at Cedar Hill Road, is not expected to be substantially different than the future land use with project scenario; the primary difference will include a less intensely developed interchange catchment area. Specifically, new highway oriented commercial and industrial development will be less likely to locate in this area.

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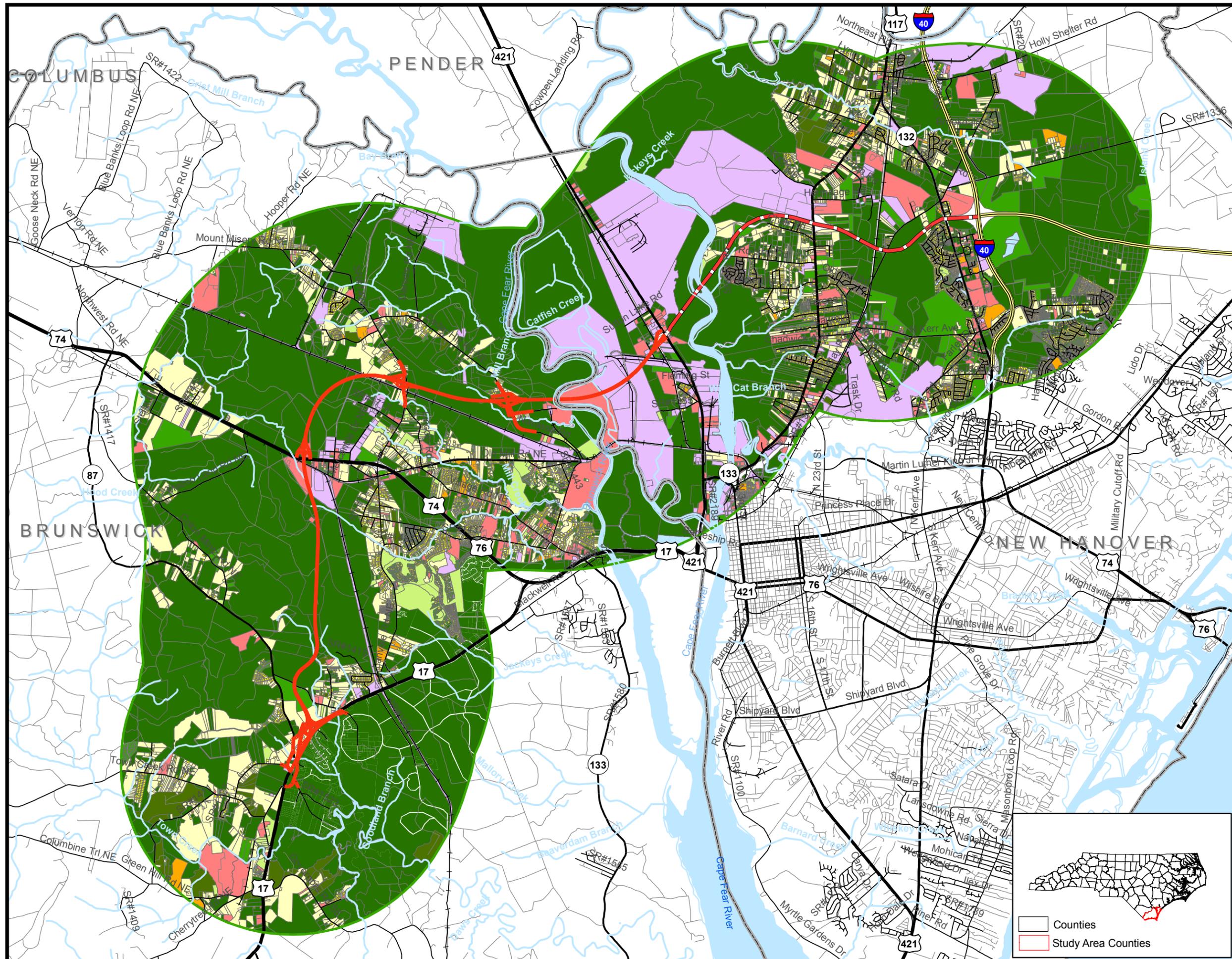
<sup>3</sup> The term interchange “catchment area,” much like the use of the hydrological term to describe the area of land from which water drains into a particular body, is used to describe the land area surrounding an interchange that is in close enough proximity to the roadway that it will draw a customer base from roadway travelers. The size of a catchment area will vary dependant on various factors such as land use, access, and density, but generally encompassed the area within two miles of interchanges.

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TIP R-2633A/B  
Wilmington Bypass

Figure 4-7  
Current Land Use Within  
the Study Area

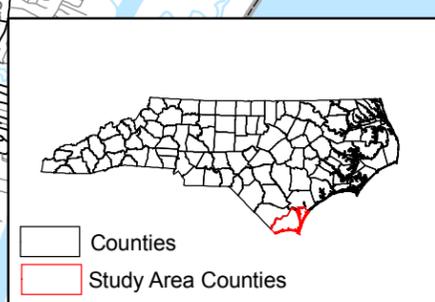
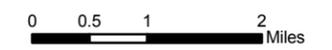


**Legend**

- ICE Study Area
- R-2633A/B Recommended Alignment
- R-2633 C
- Interstate Highways
- US Highways
- State Highways
- State Routes
- Local Roads
- Railroads
- County Boundaries
- Streams (Non-delineated)

**Current Land Use Within Study Area**

- Commercial
- Industrial
- Public/Institutional/School
- Cropland
- Golf Course/Pasture/Grass
- Woods/Grassland
- Woodland/Forest
- Housing, Low
- Housing, Low/Medium
- Housing, Medium
- Housing, Medium/High
- Housing, High



- Counties
- Study Area Counties

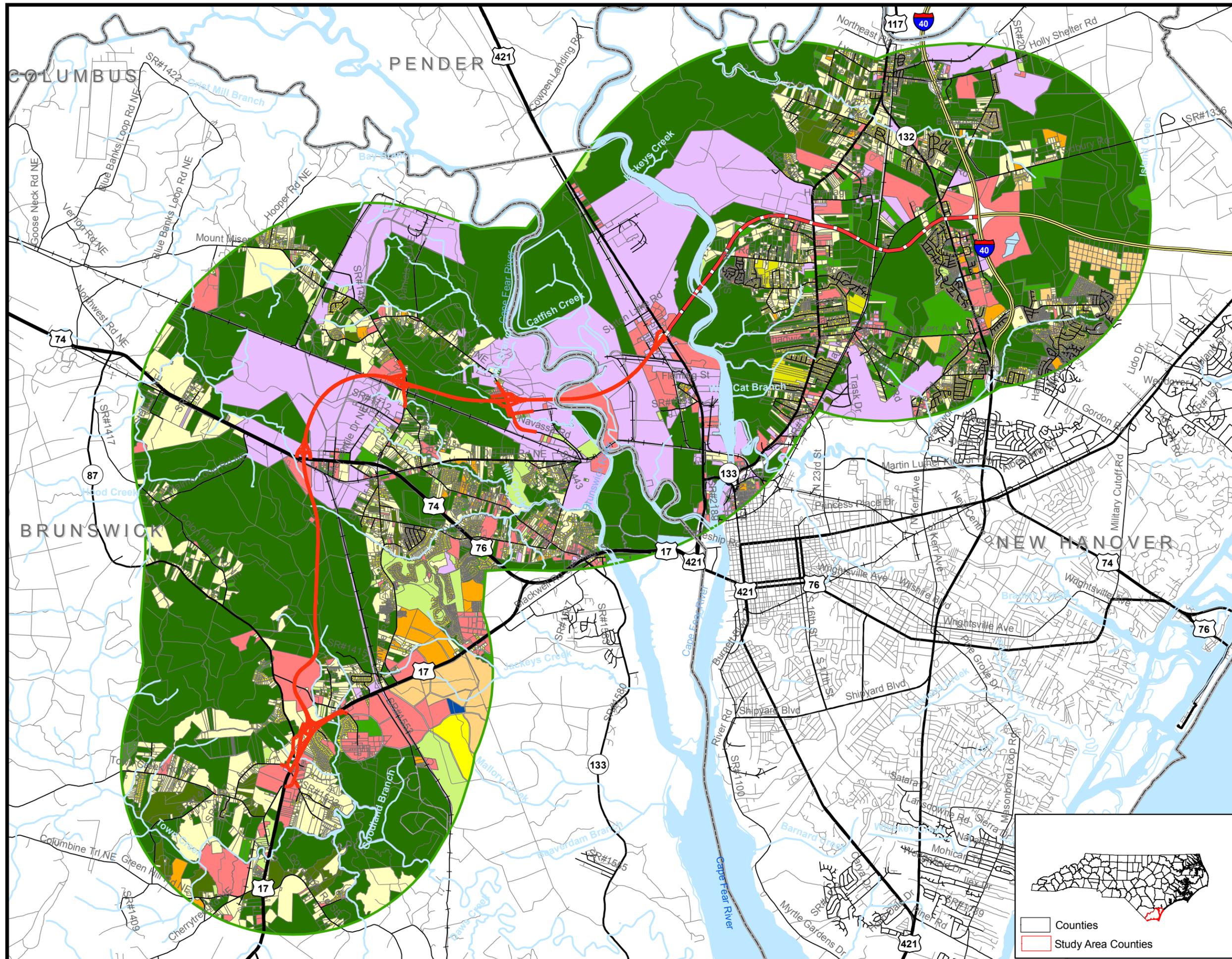


April 2007  
This map is for reference only.  
Sources: ESRI, CGIA, NCDOT, Brunswick County,  
New Hanover County, USDOT, US Census, URS.

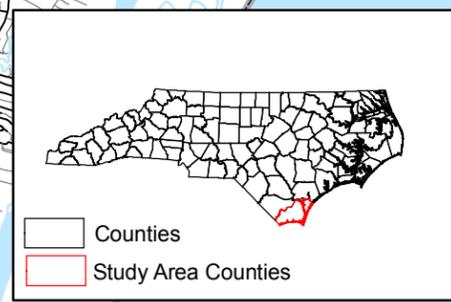
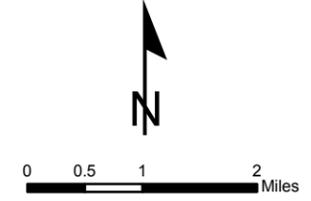


TIP R-2633A/B  
Wilmington Bypass

Figure 4-8  
Future Land Use  
With Project



- Legend**
- ICE Study Area
  - R-2633 A/B Recommended Alignment
  - R-2633 C
  - Interstate Highways
  - US Highways
  - State Highways
  - State Routes
  - Local Roads
  - Railroads
  - County Boundaries
  - Water
  - Streams (Non-delineated)
- Future Land Use With Project**
- Commercial
  - Industrial
  - Public/Institutional/School
  - Cropland
  - Golf Course/Pasture/Grass
  - Woods/Grassland
  - Woodland/Forest
  - Housing, Low
  - Housing, Low/Medium
  - Housing, Medium
  - Housing, Medium/High
  - Housing, High
  - Water

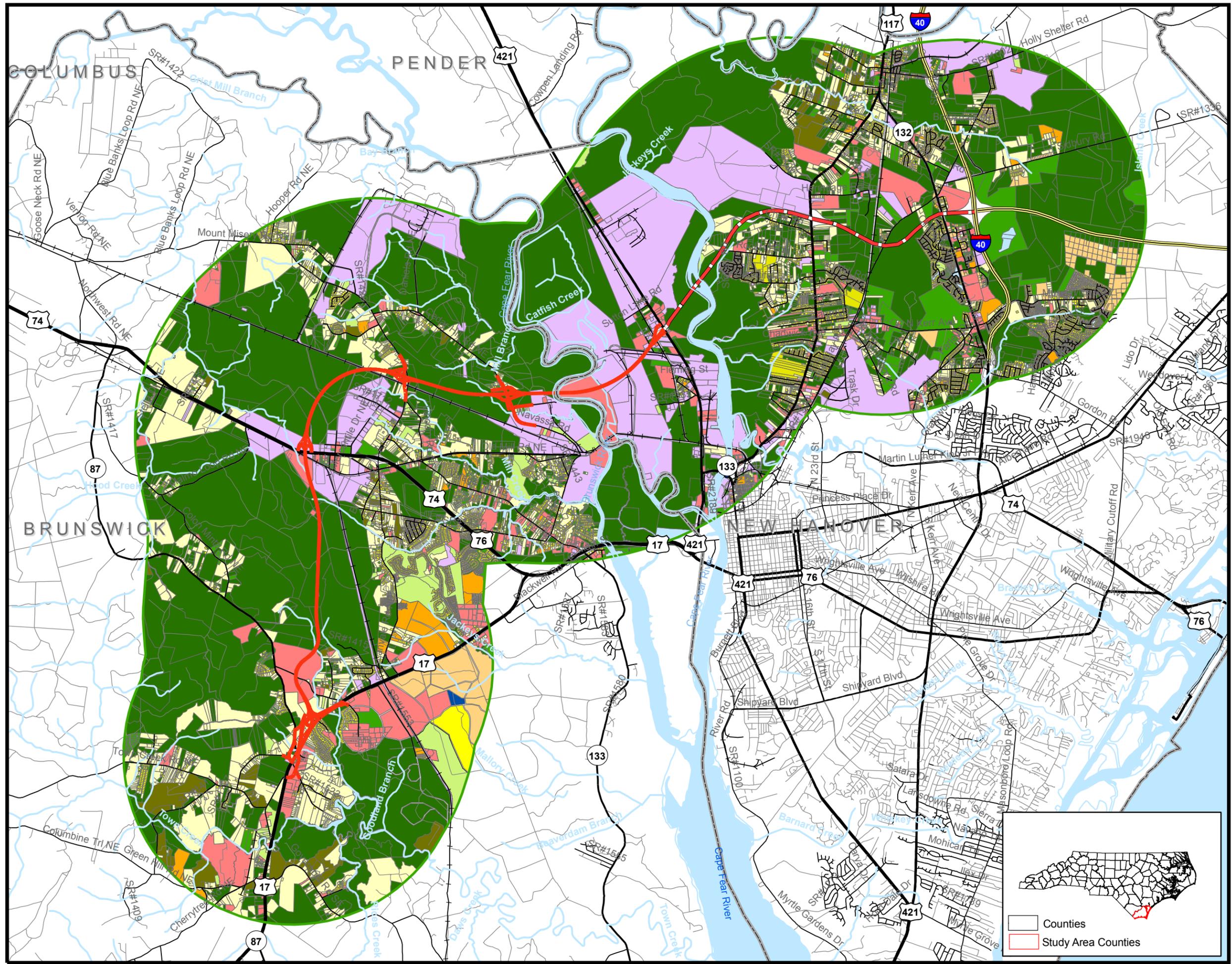


April 2007  
This map is for reference only.  
Sources: ESRI, CGIA, NCDOT, Brunswick County, New Hanover County, CGIA, USDOT, URS.

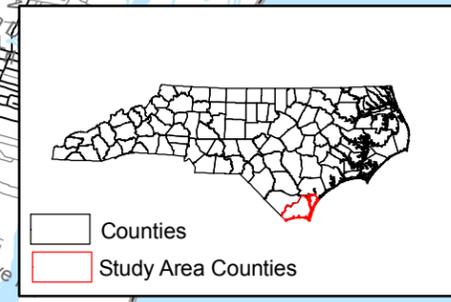
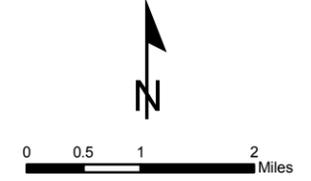


TIP R-2633A/B  
Wilmington Bypass

Figure 4-9  
Future Land Use  
Without Project



- Legend**
- ICE Study Area
  - R-2633 A/B Recommended Alignment
  - R-2633 C
  - Interstate Highways
  - US Highways
  - State Highways
  - State Routes
  - Local Roads
  - Railroads
  - County Boundaries
  - Water
  - Streams (Non-delineated)
- Future Land Use Without Bypass**
- Commercial
  - Industrial
  - Public/Institutional/School
  - Cropland
  - Golf Course/Pasture/Grass
  - Woods/Grassland
  - Woodland/Forest
  - Housing, Low
  - Housing, Low/Medium
  - Housing, Medium
  - Housing, Medium/High
  - Housing, High
  - Water



April 2007  
This map is for reference only.  
Sources: ESRI, CGIA, Brunswick County, New Hanover County, USDOT, NCDOT, URS.



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- Mt. Misery Road/Wilmington Bypass - Current land use in this proposed interchange area is a mix of forested/wetlands and low density residential uses.
  - Future land use with the project is likely to include a change to commercial development in various adjacent land parcels and industrial development to the south. Improved access may also moderately induce residential development within the surrounding rural areas.
  - Future land use without the project is likely to include new development but to a much lesser extent than under the build scenario. Specifically, without the project there will be little incentive for highway oriented commercial development in this area. Additionally, industrial and residential development will be less likely without immediate highway access.
  - US 74/76/Wilmington Bypass - Current land use in this proposed interchange area is a mix of commercial, industrial and forested/wetland uses.
  - Future land use with the project is likely to include substantial expansion of industrial development and moderate commercial development in various adjacent land parcels. Improved access may also moderately induce residential development within the surrounding rural areas.
  - Future land use without the project is likely to include new development, but to a much lesser extent than under the build scenario. Specifically, while industrial expansion in the Leland Industrial Park is still likely to occur, it will be less rapid than with the project. Immediate highway access will substantially influence demand for space in Leland Industrial Park.
  - US 17/Wilmington Bypass - Current land use in this proposed interchange area is primarily low density residential mixed with forested/wetlands, agricultural, and underutilized or abandoned commercial.
  - Future land use with the project is likely to include additional commercial and residential development replacing forested areas. Brunswick Forest, a mixed use development containing approximately 10,000 single and multifamily housing units, 600 acres of golf course property and a network of streets, shops, schools and other infrastructure is currently being constructed just east of the US 17/Wilmington Bypass interchange on former timber company land.<sup>257</sup>
  - Future land use without the project is likely to be represented by the same mix of new development, including the Brunswick Forest development and other projects currently underway. However, the extent of other development may be decreased. Most notably, the demand for highway oriented retail will decrease in this particular location.

Recently completed, the easternmost segment of the Wilmington Bypass (R-2633C) connects US 421 to I-40 and is located in north New Hanover County. Also recently completed R-2405 (from I-40 to US 17 to the east in New Hanover County) connects to R-2633C with an interchange at I-40. By 2020-30 the northern part of New Hanover is expected to emerge as the fastest-growing area in the county, driven in part by the immigration of baby-boomer retirees.<sup>258</sup> This growth will bring a mix of land use changes, including new residential, industrial, and commercial development throughout, with substantial commercial development at the I-40/Wilmington Bypass interchange. Most of this growth will replace existing forested and grassland areas. In addition, some project-induced commercial development is likely in the

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Wilmington Bypass/US 117 interchange area. This interchange may also moderately induce residential development to the north as the project will provide an alternative route via US 421 for some commuters to reach the Wilmington CBD.

#### **4.2.2.2 Compatibility with Transportation Plans**

The project is expected to be compatible with area transportation plans. The WMPO 2030 *Long Range Transportation Plan* shows an outer loop bypassing the City of Wilmington. The general alignment shown for this outer loop is similar to the project alignment.<sup>259</sup> Considered cumulatively, R-2633A/B and C and other reasonably foreseeable project area TIP projects, are expected to decrease travel time for out-of-town and local travelers and increase mobility in and around Wilmington. Decreasing travel times and increasing mobility is compatible with the goals of project area transportation plans.

A detailed assessment of the project's consistency with study area transportation plans is presented in the *Wilmington Bypass US 17 to US 421 Brunswick and New Hanover Counties Indirect and Cumulative Effects Assessment*.<sup>260</sup>

### **4.2.3 PHYSICAL ENVIRONMENT**

#### **4.2.3.1 Noise Effects**

The noise evaluation reported in the DEIS indicated that one residence along Alternatives 2 and 9 would experience a substantial increase in noise levels, and one residence along Alternatives 3 and 8 would experience noise levels that approach the FHWA abatement criteria of 67 dBA. For the no-build alternative, some sites would experience increases in traffic noise levels due to increases in traffic volumes on currently existing roadways. These results show that one residence is predicted to experience noise levels that approach the abatement criteria in the vicinity of the US 17 interchange and one residence is predicted to experience noise levels that approach the abatement criteria in the vicinity of the SR 1426 interchange.

An updated noise assessment was conducted for the recommended alignment using FHWA's Traffic Noise Model software Version 2.1. Based on the noise analysis conducted for the recommended alignment, noise levels would increase for 207 receptors. Of these 207 receptors, 54 receptors would be affected by noise for the recommended alignment. A receptor is considered affected when the predicted noise level exceeds the criteria for substantial increase and/or exceeds the threshold set for the Noise Abatement Criteria (NAC). Noise abatement measures were considered for three locations within the study area and determined not to be reasonable and feasible. Cumulative effects associated with other transportation projects or developments planned in the study area may further contribute to increased noise levels.

### **4.2.4 CULTURAL RESOURCES EFFECTS**

#### **4.2.4.1 Historic Architecture Resources Effects**

Historic architectural resources identified in Section 3.1.5.1 may be affected by project induced development. However, specific locations of project induced development and magnitude of the impacts on historic architectural resources are not known at this time. No adverse affects to historic resources would occur as a result of the project; therefore, no cumulative effects have been identified.

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#### **4.2.4.2 Archaeological Resources Effects**

Archaeological resources identified in Section 3.1.5.2 may be affected by project induced development. However, specific locations of project induced development and magnitude of the effects on archaeological resources are not known at this time. Project induced development is most likely in project interchange areas; therefore, indirect and cumulative effects to undiscovered archaeological resources would most likely occur in these locations.

#### **4.2.5 NATURAL ENVIRONMENTAL EFFECTS**

##### **4.2.5.1 Biotic Community and Wildlife Impacts**

Impacts described in this section are noted as having high potential to occur and may occur throughout the study area, but the severity is likely to vary by locale. Impacts determined through field research pertain specifically to the survey area, or the expanded study corridor (and a one half-mile buffer area surrounding the project corridor for red-cockaded woodpeckers) in which surveys were conducted, but may be applicable to the study area as a whole.

#### **Vegetative Communities**

##### **Indirect Effects**

The most likely effect to vegetative communities is the removal of vegetation for development induced or facilitated by the project. This effect is expected to be similar among each of the project alternatives. The removal of vegetation for purposes of development is an indirect effect of the project. It is expected that the project will induce limited development, such as commercial uses around project interchanges, and will likely accelerate other development such as build-out of industrial areas and, to a lesser extent, expansion of existing residential development near interchanges in the vicinity of Mt. Misery Road and Cedar Hill Road. The Alligator Branch Sandhill and Flatwoods IPA is located near the proposed interchange of the project with US 74/US 76. Induced industrial development in this area is expected with each alternative. This induced land use change would indirectly affect the Alligator Branch Sandhill and Flatwoods IPA, however, its likelihood and extent are uncertain. The project, as proposed, is a controlled access freeway and is not expected to induce land use changes outside of interchange areas, and would likely not affect other vegetative communities within the IPAs described in Section 3.4.2.3. As described in Section 4.2.2, signs of increased development are already apparent in the study area. Under the no-build scenario, vegetative communities are also likely to be affected by ongoing development over time.

##### **Cumulative Effects**

The project will directly affect vegetative communities. Of particular importance are the IPAs described in Section 4.1.3.5. The recommended alignment would result in direct effects to the 421 Sandridge, Brunswick River/Cape Fear River Marshes, and Battle Royal Bay IPAs. Selection of another alignment within the common corridor of the four DEIS alternatives could result in additional direct effects to the Alligator Branch Sandhill and Flatwoods. These direct effects combined with the effects of other past and reasonably foreseeable future projects or developments will cumulatively affect vegetative communities within the study area. Past development activities include development along US 421 within the boundaries of the US 421 Sand Ridge IPA. The Battle Royal Bay and Brunswick River/Cape Fear River Marshes IPAs have remained generally undisturbed. If built, TIP project R-4063 (Table 1-2 and Figure 1-8), a widening project, would result in additional effects to the Sturgeon Creek Tidal Wetlands, an IPA in the study area. At the writing of this document, there are no other known impact-causing activities that would affect these vegetative communities.

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## **Habitat and Wildlife**

### **Indirect Effects**

Both effects associated with induced or facilitated development and encroachment-alteration effects can result in the loss and/or reduction of quality of habitat and wildlife within the study area. Habitat and wildlife loss is an indirect effect associated with induced and facilitated development and is expected to occur under both the build scenario for each alternative and the no-build scenario. Under the build scenario, it is expected that the project will induce limited development, such as commercial uses around project interchanges, and will likely accelerate other development such as build-out of industrial areas and, to a lesser extent, expansion of existing residential development near interchanges in the vicinity of Mt. Misery Road and Cedar Hill Road. This limited project-induced development is anticipated to have indirect effects to habitat and wildlife found in the vicinity of the US 17 interchange, Leland Industrial Park and the US 74/76 interchange, and the Mt. Misery Road and Cedar Hill Road interchanges. The project, as proposed, is a controlled access freeway and is not expected to induce land use changes that would substantially affect habitat and wildlife outside of interchange catchment areas.

As described in Section 4.2.2, signs of increased development are already apparent in the study area. Under the no-build scenario, habitat and wildlife are likely to be affected by ongoing development over time regardless of the project.

Indirect effects attributable to project induced development and encroachment include loss of natural habitat, habitat fragmentation, displacement of wildlife species, and disruption of wildlife foraging habits and movement patterns.

### **Cumulative Effects**

A direct effect to habitat that should be taken into consideration for cumulative effects to habitat and wildlife is the reduction or removal of some types of habitat. Direct, indirect and cumulative effects described under the headings of “vegetative communities,” “wetlands,” and “streams” should also be considered effects to habitat and wildlife as these ecosystems serve as habitat and effects to them also affect dependent wildlife. Where vegetative communities are affected some wildlife populations will be displaced or otherwise affected through loss of habitat and forage species. Habitat fragmentation and isolation lead, over the long term and cumulatively, to local reduction in species abundance and diversity. Additionally, where movement patterns are blocked or disrupted due to development activities, the genetic isolation can reduce species’ ability to rebound from disruptive events.

## **4.2.6 JURISDICTIONAL ISSUES**

### **4.2.6.1 Water Resources**

The study area falls within subbasins 03-06-17 and 03-06-23 in the Cape Fear River Basin. Currently, many of the surface waters in the study area have an impaired status for fish consumption use. While there are important resource waters within subbasin 03-06-17; there are no surface waters in the study area designated as trout waters, high quality waters, or outstanding resource waters. There is one water supply watershed in the study area. Sources of pollution include National Pollutant Discharge Elimination System (NPDES) dischargers and horse and swine operations. Basinwide, water quality stressors include habitat degradation, arsenic, chlorophyll a, low dissolved oxygen, pH, turbidity, fecal coliform bacteria and enterococcus, and mercury in fish tissue.

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Impervious surfaces can block or redirect recharge and affect the amount of surface runoff in rivers and streams. Considered with the removal of vegetative cover adjacent to stream channels and at road crossings, effects may include sediment and nutrient loading and increased water temperature. In the long term, as the stream channels go through a re-shaping process to accommodate the increased flow, stream banks are likely to become eroded and incised, leading to further sediment loading downstream.

The project is expected to facilitate some additional residential, commercial, and industrial development in some locations. Thus, indirectly the project will contribute to the amount of land area covered by impervious surfaces and, depending on the type of industry that arrives, potential sources of pollution. If the project is not built, it is likely that the study area will still experience increased development and its associated effects on water quality, but the development may be less extensive and the pace slower.

#### **4.2.6.2 Wetlands**

##### **Indirect Effects**

Wetland loss is an indirect effect associated with induced and facilitated development and is expected to occur under both the build and no-build scenarios for each alternative. Under the build scenario, it is expected that the project will induce limited development, such as commercial uses around project interchanges, and will likely accelerate other development such as build-out of industrial areas and, to a lesser extent, expansion of existing residential development near interchanges in the vicinity of Mt. Misery Road and Cedar Hill Road. This limited project-induced development is anticipated to have indirect effects to wetlands found in the vicinity of the US 17 interchange, Leland Industrial Park and the US 74/76 interchange, and the Mt. Misery Road and Cedar Hill Road interchanges. The project, as proposed, is a controlled access freeway and is not expected to induce land use changes that would substantially affect wetlands outside of interchange catchment areas.

As described in Section 4.2.2, signs of increased development are already apparent in the study area. Under the no-build scenario, wetlands are also likely to be affected by ongoing development over time.

##### **Cumulative Effects**

In consideration of the cumulative effects on wetlands in the study area it is important to include direct effects. Adherence to avoidance and minimization measures as well as Best Management Practices (BMPs) on a project-by-project basis should reduce cumulative effects on wetlands; however, total avoidance of effects to wetlands will not be feasible. The construction of the roadway will require placement of some amount of fill within jurisdictional wetlands, although mitigation for the effects to these systems is expected. Bridging, as opposed to filling, culverting, or ditching and draining wetland systems will minimize damage to these fragile ecosystems. If the recommended alignment is constructed, bridges will be constructed over six riverine areas to minimize effects to aquatic and wetland systems. Calculations indicate that the recommended alignment would traverse 106.1 acres. Permanent effects, based on slope stake limits, total 78.8 acres for the recommended alignment.<sup>261</sup> Preliminary calculations of wetland effects for the four DEIS alternatives were reported as follows in the DEIS: Alternative 2, 214 acres; Alternative 3, 228 acres; Alternative 8, 193 acres; and Alternative 9, 194 acres. It is important to note that these acreages are not comparable to the effects to wetlands reported for the recommended alignment because they were calculated assuming all wetlands within a 300 foot wide right-of-way would be affected and they were calculated prior to detailed wetland delineations.

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Further effects to wetlands are expected from other infrastructure projects in the study area. For example, TIP R-2405A (I-40 Connector) is expected to affect 98 acres of wetlands and TIP U-0092 (Smith Creek Parkway) is expected to affect 6.9 acres of wetlands.<sup>262</sup> R-2633C is expected to affect 96 acres of wetlands. Other TIP and development projects in the study area are also expected to affect wetlands, however, the extent of their effect is not known.

The cumulative loss of wetlands will decrease surface water storage (flood control), aquifer recharge area, and sediment removal and nutrient cycling (water quality protection).<sup>263</sup> Additionally, the cumulative loss of wetlands will hinder the production of trees and peaty soils. And since wetlands support aquatic productivity (fishing, shell fishing, and waterfowl hunting) and the provision for plant and wildlife habitat (hunting, trapping, plant/wildlife/nature photography, nature observation, and aesthetics); these human activities their associated industries will be negatively impacted.

Cumulative effects associated with other infrastructure projects and development will also occur under the no-build scenario. However, more extensive cumulative effects are expected under the build scenario compared to the no-build scenario.

#### **4.2.6.3 Threatened and Endangered Species**

##### **Indirect Effects**

The effects described for habitat and wildlife are also applicable to threatened and endangered species. Under both the build and no-build scenarios project-induced development patterns may eventually affect the rough-leaved loosestrife population found in the vicinity of the US 74/76 interchange. Project induced development is not likely to affect the red-cockaded woodpecker or its foraging habitat since the project, as proposed, is a controlled access freeway and is not expected to induce land use changes in the vicinity of the active red-cockaded woodpecker cluster.<sup>264</sup> Indirect effects to shortnose sturgeon populations could result from water quality degradation associated with increased impervious surfaces.

As described in Section 4.2.2, signs of increased development are already apparent in the study area. Under the no-build scenario, threatened and endangered species could also be affected from habitat loss and degradation from ongoing development over time.

##### **Cumulative Effects**

Effects to threatened and endangered species are addressed through the Section 7 Consultation process on a project by project basis. Issues related to effects to threatened and endangered species on this project have been addressed in two Informal Section 7 Consultations with NMFS, USFWS, NCDMF, NCWRC, NCDOT, and other regulatory agencies. Through this process NCDOT has agreed to restrict construction activities within the aquatic areas utilized by the fish during their seasonal movement periods such that disturbance of this species will be avoided and minimized to the greatest extent possible. No other transportation or development projects were identified within the study area for which effects to Threatened and Endangered species could be considered cumulatively with the project.

#### **4.2.7 OTHER CONSIDERATIONS**

There is inherent uncertainty in estimating indirect and cumulative effects, and therefore a risk that the actual outcome will differ from that forecasted. Analysis of cumulative effects requires estimating impacts from past, present and reasonably foreseeable future actions. At this point in time, there are three projects within the study area that are listed in the 2006-2012 TIP as programmed for planning and environmental study but are unfunded and unscheduled for right

of way acquisition and construction. These projects are described in Table 4-20. At this point, no environmental documentation has been completed for these projects, no preferred alternatives have been selected, it is uncertain whether and where these projects might be built, and the projects are not considered to be reasonably foreseeable. However, in the interests of full disclosure, the potential cumulative effects of these three projects with the subject project and other TIP projects in the study area that are funded (listed in **Table 1-2**) are addressed in this section.

**Table 4-20: Candidate TIP Projects in the Study Area**

Project No.	Project Name	Proposed Improvement
R-3300	Hampstead Bypass, US 17 south of NC 87 to I-40	Multi-lane facility on new location
U-4436	SR 1318 (Blue Clay Rd) and Wilmington Bypass	Construct an interchange
U-4738	US 17 to Independence Boulevard – Carolina Beach Road intersection	New facility with structure over the Cape Fear River

Source: North Carolina Department of Transportation. Transportation Improvement Program, 2006-2012. Available: <http://www.ncdot.org/planning/development/TIP/TIP/>

The first project, R-3300, together with projects R-4732, R-2633A/B and C, and R-2405, would provide a continuous bypass for through-travelers around the most developed coastal communities of the Wilmington region. R-3300, which may be a project on new location, would of course have its own direct impacts to the environment; however, it is not possible to estimate those at this time. One cumulative effect of these projects together will be the removal of many through-travelers from the local street network. The shift in travel patterns is also expected to induce development which could negatively affect natural resources such as wetlands, and threatened and endangered species, and contribute to the degradation of water quality. Given the uncertainties regarding Project R-3300, such as its location and what its direct impacts would be, it is not possible to quantify the cumulative impact it will have together with this project and others in the region. Considering the past development trends in the region and the continued favorable growth environment, impacts to these resources are also expected without the construction of R-3300, though to a lesser degree.

The second candidate project, U-4436, would introduce an additional interchange on the already completed portion of the Wilmington Bypass (R-2633C) just west of I-40. Generally, induced commercial growth is expected around interchange catchment areas. In this case, some increases in commercial and industrial land uses are already expected in the area of the interchange. Candidate project U-4436 would likely increase the pace and intensity at which this development occurs. This candidate project is not expected to have a substantial cumulative effect when considered with R-2633A/B (the project) and R-2633C.

TIP project U-4738 is described in the 2006-2012 TIP as a new facility from US 17 to Independence Boulevard-Carolina Beach Road with structure over the Cape Fear River and is unfunded for right of way acquisition and construction. The project is also known as the Cape Fear Skyway. In 2003, the NCDOT prepared a feasibility study for the potential project. Feasibility studies are preliminary in nature. These studies are a precursor study to the NEPA project development and environmental analysis process and are intended to estimate project costs and evaluate functional feasibility. While the feasibility study evaluated a route connecting to the Wilmington Bypass at US 17, it is possible that project U-4738 could connect elsewhere along US 17. According to the feasibility study, if the Cape Fear Skyway is built, it would serve commuter and tourist traffic, provide an unimpeded gateway to the City of Wilmington through a fixed-span bridge, serve emergency vehicles, provide a safer and quicker evacuation route from

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New Hanover County, and provide access to port facilities and the Military Ocean Terminal at Sunny Point.

Subsequent to the feasibility study, the North Carolina Turnpike Authority (NCTA) selected the Cape Fear Skyway as a candidate project for environmental study only. At this time in the toll road development process, there is considerable uncertainty associated with the viability of the project, and the NCTA has not yet made a determination to move forward with building the project. The 2003 feasibility study did not evaluate the feasibility of building the Cape Fear Skyway as a toll project. The NCTA is gathering information about the traffic and revenue the project is expected to generate, as well as its financial feasibility. If the NCTA continues to study the project, it is estimated that a draft environmental impact statement for the Cape Fear Skyway may be completed in July 2008.

#### **4.2.7.1 Travel Patterns**

Considered alone, the Wilmington Bypass does not provide direct access to the City of Wilmington. Considered with the Cape Fear Skyway, a direct route from the southern portion of the study area in Brunswick County to the major employment and activity center of the City of Wilmington would be provided. This positive cumulative effect on travel patterns would likely occur regardless of whether the Cape Fear Skyway terminates at the Wilmington Bypass or at some other nearby location along existing US 17. The Cape Fear Skyway would also provide an additional crossing of the Cape Fear River. Considered with the crossing provided by the Wilmington Bypass, the cumulative effect would be a relief of congestion on the existing Cape Fear Memorial Bridge.

#### **4.2.7.2 Community Cohesion**

As described in Section 3.1.4, cohesive communities in the study area were identified near the southern terminus of the project. The Spring Hill community is located east of the project interchange with existing US 17. It was determined that an eastern alignment of the project in this area could affect the cohesion of this community while a western alignment would minimize adverse effects. Three communities exhibiting characteristics indicative of potential cohesiveness; Snee Farms, Stoney Creek and Planters Walk; were identified south of existing US 17 near the proposed terminus of the project. The cohesiveness of these communities was not found to be indirectly or cumulatively affected by the project. Considered cumulatively with the Cape Fear Skyway, these expected effects could change.

If the Cape Fear Skyway terminates at the Wilmington Bypass, additional direct effects, such as relocations, and indirect effects, such as increased noise levels could result. Considered cumulatively, these effects could affect the community cohesion of Spring Hill, Snee Farms, Stoney Creek, and Planters Walk. According to the feasibility study conducted for the Cape Fear Skyway, 30 residences and four businesses may be displaced by the Cape Fear Skyway, and most of these relocations would be in the vicinity of the proposed interchange with the Wilmington Bypass and at the eastern end of the proposed bridge.

There is uncertainty as to how many relocations would affect these communities. There is also uncertainty as to other indirect effects and whether the Cape Fear Skyway would terminate at the Wilmington Bypass or at some other location. In addition, while Snee Farms, Stoney Creek and Planters Walk have exhibited some characteristics typical of a cohesive community, a determination of their cohesiveness has not been made. While, cumulatively, the project and the Cape Fear Skyway may affect the community cohesion of neighborhoods near the southern terminus of the project, additional information about the Cape Fear Skyway and the communities south of existing US 17 would be necessary to make a conclusive determination.

### 4.2.7.3 Other Cumulative Effects

In the feasibility study for the Cape Fear Skyway, it is noted that additional assessments of wetland and stream effects, socioeconomic effects, hazardous materials, protected species, biotic communities and historic and archaeological resources are necessary. While there is not yet enough information about the effects to these resources from the Cape Fear Skyway, it can be assumed that the effects of the projects considered together would result in increased cumulative effects to at least some of these resources.

At this point in the project development process for the Cape Fear Skyway, it is difficult to assess the potential cumulative effect of the project and the Cape Fear Skyway on induced growth. The Cape Fear Skyway is currently proposed as a toll road, but the cost of the toll has not yet been determined and would likely influence the amount of induced growth in Brunswick County. While the Cape Fear Skyway would make parts of Brunswick County more accessible to the employment center in the City of Wilmington and more attractive to development, an expensive toll could discourage daily commuters into the City of Wilmington from locating in Brunswick County.

## 4.3 SUMMARY OF ENVIRONMENTAL CONSEQUENCES

### 4.3.1 DEIS ANALYSIS

Estimated environmental impacts and costs associated with the four build alternative are summarized in Table 4-21.

Some of the projected effects of the project could not be quantified with a single number for inclusion in Table 4-21. These issues included: community cohesion, economic effects, regional planning consistency, community cohesion, visual impacts, water quality, soils, and mineral resources.

**Table 4-21: Summary of Project Impacts from the DEIS**

Factors	Alt. 2	Alt. 3	Alt. 8	Alt. 9
<b>Project Features</b>				
Length (miles)	13.1	13.2	13.3	13.3
Number of Interchanges	4	4	4	4
Number of railroad crossings	4	4	4	4
Construction Costs	\$ 122,100,000	\$ 121,590,000	\$ 118,500,000	\$123,400,000
Right-of-Way Costs	\$ 13,275,000	\$14,725,000	\$14,725,000	\$13,250,000
Total Costs	\$135,375,000	\$ 136,315,000	\$ 133,225,000	\$ 136,650,000
<b>Socioeconomic Features</b>				
Residential Relocations	23	38	46	22
Business Relocations	9	10	9	8
Schools Impacted	0	0	0	0
Parks Impacted	0	0	0	0
Churches Impacted	0	0	0	0
Cemeteries Impacted	1	1	1	1
<b>Physical Factors</b>				
Electric Power Lines Crossed	7	7	7	7
Gas Lines Crossed	2	3	3	2

Factors	Alt. 2	Alt. 3	Alt. 8	Alt. 9
Water Lines Crossed	3	3	3	3
Receptors Impacted by Noise	1	1	1	1
Leaking Underground Storage Tanks	7	7	7	7
Prime and Unique Farmland (AD-1006 ratings)	45.75	49.83	57.91	52.21
Agricultural Land (estimated acres)	16	22	25	24
Number of Exceedances of Carbon Monoxide Ambient Standards	0	0	0	0
<b>Cultural Resources</b>				
Prehistoric Sites Impacted	0	0	0	0
Recorded Archaeological Sites	1	1	1	1
Recorded Historical Sites	0	0	0	0
National Register Districts Impacted	0	0	0	0
<b>Natural Resources</b>				
Stream Crossings	6	6	6	6
Navigable Waterway Crossings	1	1	1	1
Urban/Disturbed	87	95	108	104
Red-Cockaded Woodpecker Colony Sites Impacted	0	0	0	0
Red-Cockaded Woodpecker Foraging Habitat (acres)*	129 [35]*	129 [35]*	23 [11]*	23 [11]*
NHP - Identified Priority Areas	5	5	4	4
Floodplains (linear feet)	18,000	18,000	11,000	11,000
TOTAL UPLANDS (acres)	277	261	267	268
Mesic Pine Forest	115	136	97	90
Mixed Hardwood	72	69	78	74
Pine/Scrub Oak Sandhill	21	21	39	39
Pine Plantation	69	35	29	42
Pine Sapling	0	0	24	23
TOTAL WETLANDS (acres)	217	228	193	194
Bottomland Hardwoods	38	35	14	14
Wet Pine Flats	77	85	57	112
Tidal Marsh Scrub-Shrub	13	15	8	11
Tidal Freshwater Marsh	12	14	14	12
Tidal Cypress--Gum Swamp	20	24	24	20
Pocosin	57	55	76	25

\*Note: Acreage estimates noted within [brackets] represent corridor acreage within the presently established right of way, by alternative.

## 4.3.2 FEIS ANALYSIS

### 4.3.2.1 Direct Impacts

Estimated environmental impacts associated with the recommended alignment are summarized in Table 4-22. The Summary section, beginning on page S-1 also provides a synopsis of the environmental effects of the project.

Some of the projected effects of the project can only be presented qualitatively and therefore could not be quantified for inclusion in Table 4-22. These issues include: community cohesion,

economic effects, regional planning consistency, visual impacts, water quality, soils, and mineral resources. These impacts are briefly summarized below.

**Table 4-22: Summary of Environmental Impacts**

FACTORS	RECOMMENDED ALIGNMENT
Project Features	
Length (miles)	14.2
Number of Interchanges	5
Number of railroad crossings	6
Construction Costs	\$273,700,000
Right of way Costs	\$6,989,000
Total Costs	\$280,689,000
Socioeconomic Features	
Residential Relocations	16
Business Relocations	9
Schools Impacted	0
Parks Impacted	0
Churches Impacted	0
Cemeteries Impacted	0
Physical Factors	
Electric Power Lines Crossed	7
Gas Lines Crossed	2
Water Lines Crossed	3
Receptors Impacted by Noise	54
Moderate and High Ranked Haz. Mat. Sites	2 High, 2 Low-Moderate
Prime and Unique Farmland (AD-1006 rating)	66
Number of Exceedances of Carbon Monoxide Ambient Standards	0
Cultural Resources	
Previously Recorded Archaeological Sites Impacted	0
Previously Recorded Archaeological Sites	1
Recorded Historical Sites	0
National Register Historic Districts Impacted	0
Natural Resources	
Stream Crossings	20
Navigable Waterway Crossings	1
Stream Crossings Bridged	6
Stream Impacts (linear feet)	1,003
Red Cockaded Woodpecker Colony Sites Impacted	0
Red Cockaded Woodpecker Foraging Habitat (acres)	0.07
NCHP Identified Priority Areas (IPAs) (total acres)	18
Primary (acres)	7
Secondary (acres)	11
Floodplains (linear feet)	7,335
Floodplains (acres)	31.1
Natural Communities (total acres)	377
Mesic Pine Flatwoods (acres)	124
Pine/Scrub Oak Sandhills (acres)	77

FACTORS	RECOMMENDED ALIGNMENT
Mesic Mixed Hardwood Forests (acres)	52
Wet Pine Flatwoods (acres)	67
Tidal Freshwater Marsh	0
Tidal Cypress Gum Swamp/Gum Swamp (acres)	0
Coastal Plain Bottomland Hardwoods (acres)	11
Coastal Plain Semi-permanent Impoundments (acres)	<1
Small Stream Swamp (acres)	4
Pocosin/Streamhead Pocosin (acres)	42
Open Water (acres)	0
Altered Communities (total acres)	120
Urban/Disturbed (acres)	75
Agricultural Land (acres)	36
Maintained Utility Right of Way (acres)	9
<b>Wetlands</b>	
Palustrine (total acres)	78.8
Palustrine Emergent (PEM) (acres)	0.7
Palustrine Forested (PFO) (acres)	78.1
Riverine (total acres)	0

#### **4.3.3 COMMUNITY COHESION (SECTION 4.1.1.1)**

The presence of a new, limited-access freeway can have both positive and negative impacts to the cohesion of a community or neighborhood; however, these impacts are difficult to quantify. In general, positive effects can include shorter travel times and more convenient access between homes, stores, and businesses. Alternatively, a new roadway can also create a wall or barrier between individual homes previously connected by a local street system or residential areas and their shopping centers, recreation, and schools. Because of the rural, sparsely developed nature of the study area, displaced households along the project are not anticipated to cause substantial disruptions in developed communities. Most displacements would occur in two concentrated areas around the proposed interchanges of SR 1426, SR 1430, and US 17. The project includes service roads that maintain access residences so no residences would be isolated by the project.

#### **4.3.4 ECONOMIC EFFECTS (SECTION 4.1.1.4)**

It is likely that the project would have an overall beneficial economic impact on the region by providing facilitated access to major industries and trade centers in both Brunswick and New Hanover counties. Project-induced growth in the form of highway-oriented retail and industrial businesses in the vicinity of interchanges would also contribute to the positive economic effects of the project. In addition, there would be an increase in construction employment during the construction phase of the project, as well as increased government revenues from transportation-related taxes. However, there would also be a loss of land from property tax roles. Loss of property tax revenues is expected to be temporary as other development in the project vicinity is likely to offset any losses.

Local economic impacts to property near the project could be positive or negative. Properties near the roadway and throughout the study area could become more accessible making them more attractive for development; however, noise and visual impacts could also be associated with the roadway which could make residential property adjacent to the project less desirable.

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Positive economic effects can also have negative environmental effects as natural or undeveloped areas become developed. Potential negative environmental effects could include loss of wetlands and recharge areas, degradation of water quality from increased impervious surface, and habitat loss. Considering the past development trends and the continued favorable growth environment, impacts to these resources could also occur with the no-build scenario, though to a lesser degree. Indirect and cumulative effects on the natural environment are addressed in Section 4.2.5.

#### **4.3.5 REGIONAL PLANNING (SECTION 3.2)**

The project is consistent with the Wilmington Urban Area LRTP, the Brunswick County Thoroughfare Plan and the region's land use plan.

#### **4.3.6 VISUAL IMPACTS (SECTION 4.1.2.5)**

The project will introduce a new visual element into the context of the landscape thereby adversely impacting views of natural areas that will be converted to transportation uses. However, the terrain in the project area is generally flat and expansive and scenic vistas are uncommon. The project corridor will generally be screened from view by existing vegetation, except in the vicinity of interchanges and grade separations.

Construction of the project would have a visual impact on adjacent areas. The project would be designed and constructed as a four-lane, divided, controlled-access freeway, which would be similar in appearance to I-40 through New Hanover County. One of the problems inherent in designing a controlled-access freeway involves providing sufficient right of way to comply with design criteria while minimizing disruption to the surrounding area.

Although the project corridor shows some relief in the terrain towards the southern terminus at US 17, the project area is generally flat. Because of the flat terrain and near sea level elevations, the design of the project's mainline, interchanges, and crossings of roadways, railways, and waterways, precludes depressed or below grade construction. As a result of elevated grade separations, the project would be seen as a subtle undulation of road surface rising and falling across the relatively flat landscape. Each of the interchanges would require grade separation for overpasses. Grade separation would also be required at the railroad crossings west of SR 1426. A high-level fixed-span bridge would be constructed over the Cape Fear River. At grade separations and bridges, the roadway would be highly visible to people in areas off of the roadway, which would be an adverse impact. Conversely, numerous opportunities for views across agricultural fields, forested areas and study area waterways from the tops of overpasses and bridges would exist for motorists using the new roadway, which would be a positive effect. The highest point along the roadway would be the bridge crossing over the Cape Fear River. This bridge would be highly visible from vessels traveling along the river.

#### **4.3.7 WATER QUALITY (SECTION 4.1.3.6)**

Stormwater runoff rates would increase slightly due to the increase in impervious roadway surface area. This is an unavoidable, long-term impact resulting from construction of the project. The proposed build alternative also has the potential to temporarily degrade the quality of water in the surrounding streams as a result of soil erosion during construction. Best management practices will be employed during construction to minimize water quality degradation.

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#### **4.3.8 SOILS/TOPOGRAPHICAL/GEOLOGICAL IMPACTS (SECTION 4.1.3)**

The properties of the soils within the expanded study corridor could affect the engineering design of the project. Soil limitations for the build alternative include erosion hazard, shrink/swell potential, differential settlement, low strength, corrosivity, and flood hazard.

Due to the proximity of the project to existing construction material sites, more efficient transport of these construction materials may result. New development in the county may increase the demand for local sand and crushed stone. Construction of the roadway may also temporarily increase demand for local mineral resources.

##### **4.3.8.1 Indirect and Cumulative Effects**

Due to the growth trends already apparent in the study area without the project and since the project does not provide direct access to major employment centers; the project is not anticipated to substantially affect the urban spatial structure of greater Wilmington. The main effects of the project are expected within interchange catchment areas. These effects include influencing location decisions for future development, accelerating the pace of industrial expansion, and inducing commercial growth. To a lesser extent, the project may induce some residential development by providing new access to low cost, undeveloped, rural land.

The project is generally expected to intensify and concentrate development trends already apparent in the study area. For example, study area land use shifts from rural to suburban will occur under both the build and no-build scenarios but are expected to be concentrated and intensified around project interchanges under the build scenario. The overall economic outlook in the study area is positive with or without the project; however, but the project is expected to facilitate industrial expansion, associated employment opportunities, and the distribution of goods and services; thus potentially improving an already positive trend.

Effects related to encroachment and alterations are particular to the build scenario. These include an expected positive effect on traveler proclivity and an expected negative effect on study area aesthetics.

Effects related to induced development are likely to impact wetlands and threatened and endangered species and degradation to water quality. Considering the past development trends and the continued favorable growth environment, impacts to these resources are also expected with the no-build scenario, thought to a lesser degree.

#### **4.4 REQUIRED PERMITS AND ACTIONS**

Construction of the project would result in several activities requiring environmental regulatory permits from state and federal agencies. A list of these permits, organized by issuing agency, is provided below. The NCDOT will obtain all necessary permits prior to construction.

Many of the environmental issues and mitigation measures discussed in this FEIS will be further quantified and evaluated as final roadway designs are completed. The actions that would occur after completion of the FEIS are described below. The Summary of this FEIS and specific sections of Chapter 4 of this document provide more detailed discussions of environmental commitments and recommendations.

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#### **4.4.1 PERMITS**

##### **4.4.1.1 North Carolina Division of Coastal Management**

Coastal Area Management Act (CAMA) Major Development Permit. CAMA requires permits for major land disturbing activities within designated AECs, which include: marshlands, tidelands, estuaries, and fragile natural and cultural resource areas.

Authority. North Carolina General Statute 113A, Article 7, Subsection 118. Regulations promulgated in 15A NCAC 7.

State Dredge and Fill Permit. A permit is required for any project involving excavation and/or filling activities in estuarine waters, tidelands, or marshlands. A joint application may be filed if the project also requires a CAMA Major Development Permit, USACE Section 10 and 404 Permits, or a Section 401 Water Quality Certification.

Authority. North Carolina General Statute 113-229. Regulations promulgated in 15A NCAC 7J permit procedures.

##### **4.4.1.2 North Carolina Division of Water Quality**

Section 401 Certification. Any activity which may result in discharge to navigable waters and which requires a federal permit must obtain a certification that such discharge will be in compliance with applicable state water quality standards.

Authority. North Carolina General Statute 143, Article 21, Part 1. Regulations promulgated in 15A NCAC 2H and 2B.

Authority. North Carolina General Statute 143, Article 21, Part 1. Regulations promulgated in 15A NCAC 2H.0100.

Stormwater Certification. Development in a coastal county that requires a CAMA major permit or a sedimentation and erosion control plan requires stormwater certification. Requirements vary and are affected by the classifications of the water to which the project would drain. The DEM Regional Office provides site-specific requirements.

Authority. North Carolina General Statute 143, Article 21, Part 1. Regulations promulgated in 15A NCAC 2H.1000 and 2B.0200.

##### **4.4.1.3 North Carolina Division of Forest Resources**

Burning Permit. A permit is required to start a fire in woodlands or within 500 feet of woodlands under the protection of the Division of Forest Resources. Thirty-day permits can be issued for highway construction.

Authority. North Carolina General Statute 113, Article 4C, Subsection 60.21-60.31. Regulations promulgated in 14 NCAC 9C.0200-.0203.

##### **4.4.1.4 United States Army Corps of Engineers**

Section 404 Permit. A permit from the USACE is required for any activity in water or wetlands that would discharge dredged or fill materials into Waters of the United States and adjacent wetlands. To obtain permit approval, impacts to wetlands must be mitigated through avoidance, minimization, and compensation measures in accordance with the "Memorandum of Agreement (MOA) between the Environmental Protection Agency and the Department of the Army

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Concerning the Determination of Mitigation Under the Clean Water Act Section 404(b)(1) Guidelines" (February, 1990).

Authority. Federal Water Pollution Control Act Amendments of 1972 and Section 404 of the Clean Water Act of 1977. Regulations promulgated in 33 CFR Part 323.

Section 10 Permit. A permit is required for construction of structures such as piers and jetties and excavation and placement of fill material in or affecting navigable waterways, including the Cape Fear River.

Authority. River and Harbor Act of 1899, Section 10.

#### **4.4.1.5 United States Coast Guard**

Section 9 Permit. A permit must be obtained for any new bridge over navigable waterways, including the Cape Fear River. Bridge clearances are reviewed under this permit.

Authority. River and Harbor Act of 1899, Section 9.

#### **4.4.1.6 United States Fish and Wildlife Service**

Section 404 and Section 10 Permit Review. The USFWS' responsibilities include review of Section 404 and Section 10 Permits to determine a project's impact on public fish and wildlife resources. The USFWS provides recommendations to the USACE on how the proposed project could avoid or minimize impacts to existing fish and wildlife resources and their habitats, including wetlands.

Authority. Fish and Wildlife Coordination Act, as amended.

Section 7 Consultation. Consultation with the USFWS is required for any project that may impact endangered or threatened plants and animals and their Designated Critical Habitat. Informal Section 7 Consultation regarding Red cockaded woodpecker foraging and shortnose sturgeon was undertaken during the FEIS phase of the project and is documented in Section Chapter 7 of this FEIS.

Authority. Endangered Species Act of 1973, Section 7.

### **4.4.2 SUBSEQUENT ACTIONS**

Following the issuance of the DEIS, NCDOT, in consultation with FHWA, selected Alternative 9 as the Preferred Alternative for implementation. The following studies were prepared so that a roadway design could be developed that avoids and minimizes environmental impacts:

- Additional **wetland delineation studies** (detailed determination of wetland locations and classifications in accordance with USACE procedures) were conducted to account for conditions with the expanded study corridor. Supplemental assessment of water resources was conducted to reevaluate information in the DEIS and to study shifts in the project alignment.
- Additional **archaeological surveys** were conducted near the Cape Fear River floodplain and major tributaries, including a survey and documentation for underwater sites in the Cape Fear River.

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- **Historic architecture studies** and **106 effects consultations** on the Goodman House and Doctor's Office Property were conducted.
  - **Hazardous materials investigations** were performed to further review sites that could potentially impact the selected alternative.
  - Additional **threatened and endangered species surveys** were conducted to account for conditions within the expanded study corridor and to reevaluate data in the DEIS.
  - **Informal Section 7 consultations** were conducted with the USFWS and the NMFS.
  - An **environmental justice assessment** was conducted to reevaluate information in the DEIS and to evaluate potential shifts in the alignment.
  - An **indirect and cumulative effects assessment** was conducted to reevaluate information presented in the DEIS and to provide a more in depth analysis of indirect and cumulative effects associated with the project.
  - **Supplemental noise analyses** were conducted to update the previous analysis with the new noise model and to study effects of alignment shifts.
  - A **supplemental air quality analysis** was conducted to update the previous analysis.

As part of the preliminary engineering design phase, the following studies have also been conducted:

- a **design study** was conducted to determine which roadway segments should bridge wetlands, which should be constructed on fill, and the feasibility and practicability of each method;
- a **traffic capacity analysis** was prepared to design ramps, lane and turning movement configurations, traffic storage requirements, etc.;
- **drainage and hydrological studies** were performed for preliminary design of major drainage structures;
- a **service road study** was conducted to determine if access can be provided to residences and businesses whose access would be restricted due to construction of the selected alternative;
- **preliminary right of way limits** were defined on the preliminary plans; and
- **preliminary geotechnical investigations** were performed to identify geology and soil types and limitations.
- A **reevaluation** was conducted to determine whether there have been changes in the project, its surroundings, or other new information that would require a supplement to the DEIS.

After the FEIS is completed, the project implementation process will remain incomplete. The following is a description of the actions that would be taken, events that would occur, and studies that would be completed prior to project construction. Coordination with resource agencies would be maintained throughout the entire process. The FEIS has been prepared

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based on the results of the studies listed above and the preliminary roadway design plans. The FEIS will be circulated for public and agency review. After approval of the Record of Decision (ROD), a Design Public Hearing will be held to receive public comments on the preliminary plans.

The final roadway design plans would be developed, taking into consideration all public comments received on the preliminary design plans and this FEIS. The following studies may be prepared as part of the final design:

- **drainage and hydrological studies** to identify and design minor drainage structures;
- a study for **bridge type** for crossing the Cape Fear River;
- a **scour analysis** for the Cape Fear River Bridge;
- design of a **traffic control plan** to provide access during the construction phase;
- a **survey for wells** within and adjacent to proposed right of way limits;
- a **noise analysis** based on updated traffic and detailed design plans to evaluate whether potential noise barriers are feasible and reasonable, and if so, to determine their locations. Additionally, public involvement related to the construction of noise abatement will be conducted;
- a **geotechnical investigation** to recommend techniques and materials to overcome any soil limitations along the selected alternative identified during the investigation; and
- **right of way limits** will be finalized.

Other actions that must be completed prior to the start of project construction include, but are not limited to:

- preparation of an erosion control plan that incorporates BMPs;
- coordination with utilities for relocation/reconfiguration of systems;
- implementation of the Relocation Assistance Program; and
- approval of all required permits and certifications.

During project construction, the NCDOT would implement BMPs and will comply with all permit conditions. Any additional measures that would minimize environmental impacts that have been agreed upon during the ongoing consultations with resource agencies would also be implemented.

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**CHAPTER 5.  
LIST OF PREPARERS**



## CHAPTER 5. LIST OF PREPARERS

This environmental document was prepared by URS Corporation – North Carolina, consulting engineers, in cooperation with the North Carolina Department of Transportation and the Federal Highway Administration. The following personnel were instrumental in the preparation of this document:

NAME	POSITION	CREDENTIALS
<b>Federal Highway Administration</b>		
Clarence Coleman, PE	Operations Engineer	BS in Civil Engineering responsible for federal-aid projects in North Carolina. 14 years of experience.
Ron Lucas, PE	Area Engineer	Area Engineer responsible for federal-aid projects in Divisions 1-4, 10, and 12, which include Brunswick and New Hanover counties. 15 years of experience.
<b>North Carolina Department of Transportation</b>		
L. Gail Grimes, PE	Assistant Manager, Project Development and Environmental Analysis Branch <i>(No longer with NCDOT)</i>	Engineer responsible for highway planning and environmental impact analyses for NCDOT with 30 years of experience.
Vincent J. Rhea, PE	Project Manager, Project Development and Environmental Analysis Branch	Registered civil engineer responsible for highway planning and environmental impact analysis for NCDOT with 37 years of experience.
Drew Joyner, PE	Former Project Manager, Project Development and Environmental Analysis Branch	BS in Civil Engineering and 11 years of experience in planning projects.
James A. Speer, PE	Roadway Project Engineer, Roadway Design Unit	BS in Civil Engineering with 26 years of total transportation engineering experience. Engineer responsible for review of roadway design criteria and plans for NCDOT.
Danny Gardner	Project Design Engineer, Roadway Design Unit	AAS in Civil Engineering. Engineer responsible for review of roadway design plans for NCDOT with 18 years of experience.
Kimberly Drew Hinton	Senior Public Involvement Officer	BS in Civil Engineering with 16 years of total transportation engineering experience.
<b>URS Corporation – North Carolina</b>		
Tim H. Keener, PE	Principal in Charge	BS in Civil Engineering and 20 years of experience as the Principal in Charge, Project Manager, and Project Engineer for various civil/transportation engineering projects
David A. Griffin, CEP	Principal Project Advisor (Former Project Manager)	CEP, specializing in environmental and NEPA documentation, BS in Biology, and 30 years of experience

NAME	POSITION	CREDENTIALS
		in environmental assessment impact analysis.
Jeff C. Weisner, AICP	Project Manager	AICP, specializing in environmental documentation, BS in Biology, and 11 years of experience in environmental assessments and preparation of environmental documents.
Peter N. Trencansky, PE	Project Engineer	MCE in Civil Engineering with nine years of experience in transportation design and planning projects including noise analysis and traffic.
James J. Barcomb, PE	Structural Engineer	MS in Civil Engineering with 14 years of experience in the field of hydrologic and hydraulic engineering.
Raymond C. Bode	Environmental Scientist	MS in Fish and Wildlife Sciences with six years of experience in the evaluation of terrestrial and aquatic resources.
Marvin A. Brown	Architectural Historian	MA in American Civilization and 23 years of experience in historic architectural investigations.
Daniel F. Cassidy, PhD, RPA	Archaeologist	PhD in Anthropology with 20 years of experience in archaeological investigations.
Shannon M. Cox	Environmental Planner	MEM with focus in Resource Economics and Policy with four years of experience in planning and NEPA documentation.
Brenda K. Crumpler	Public Involvement Specialist/Technical Editor	Diploma in business administration with 42 years of experience with responsibilities for coordination of public involvement activities and technical editing.
Satrajit Das, PhD, PE	Structural Engineer	PhD in Structural Engineering with 15 years of experience in bridge design and rehabilitation and design and construction of residential, commercial, and industrial buildings.
Ed G. Edens, PE	Roadway Design Engineer	BS in Civil Engineering with 17 years of experience in planning, design, management, and construction inspection.
Scott L. Hoffeld, CEP	Environmental Planner	CEP, specializing in environmental and NEPA documentation, MS in Resource Management and Administration with 14 years of experience in environmental and socioeconomic analysis. Responsible for Socioeconomic

NAME	POSITION	CREDENTIALS
		Analysis, Air Quality Analysis, and document preparation.
Ernest H. Jamison	Design Technician	AA in Architectural Technology with 20 years of drafting experience in AutoCAD and Microstation.
Matthew W. Jorgenson, RPA	Archaeologist	MA in Anthropology with 12 years of experience in archaeological investigations.
Kimberly S. Leight, AICP	Environmental Planner	AICP, specializing in environmental documentation, MS in Environmental Engineering, 10 years of experience in the coordination of environmental assessments and the preparation of environmental documents.
Michael Lindgren	Roadway Design Engineer	BS in Civil Engineering, 13 years of experience associated with the development of roadway plans in accordance with NCDOT and AASHTO guidelines.
Steven C. Lund	Environmental Scientist/Air Quality Analyst	BS in Meteorology, 15 years of experience in air quality, and dispersion modeling evaluations.
Vickie M. Miller	Environmental Scientist ( <i>No longer with URS</i> )	MS in Environmental Science and Ecology with six years of experience conducting investigations to evaluate terrestrial and aquatic resources.
Tina L. Randazzo	Environmental Scientist	BS in Environmental Science with six years of experience in the evaluation of terrestrial and aquatic resources.
Susan Shelingoski, CPESC, PWIT	Environmental Scientist	MS in Botany with seven year of experience conducting investigations to evaluate terrestrial and aquatic resources.
Duane R. Verner, AICP	Transportation Planner	AICP, specializing in transportation planning. MA in Urban Planning with seven years of experience in preparing NEPA environmental documents.
Kory A. Wilmot	Environmental Planner	MA in Public Administration with five years of experience in planning and NEPA documentation.
Kathryn A. Wolfe, PWS	Environmental Scientist ( <i>No longer with URS</i> )	MS in Water Resources with nine years of experience in environmental documentation.
<b>Dr. Jay Carter &amp; Associates</b>		
Janice Goodson	Biologist	BS in Fisheries and Wildlife Science and 15 years experience surveying, monitoring, and managing red cockaded woodpeckers in the Southeastern

NAME	POSITION	CREDENTIALS
		United States as well as over 10 years experience preparing environmental documents including biological and environmental assessments.
Tracy Rush	Biologist/Botanist	MS in Forest Resources and BS in Biology / Botany and over 11 years experience preparing environmental documents and surveying for protected species in the Southeastern United States.
Lisa DeMatteo	Biologist	BS in Biology and seven years experience monitoring protected bird populations included red cockaded woodpeckers and two years experience preparing environmental documents.
Alicia Jackson	Biologist	BS in Fisheries and Wildlife Science and over seven years experience preparing environmental documents and surveying for protected species in the Southeastern United States.
<b>EcoScience Corporation</b>		
Jerry McCrain, PhD	President/Principal in Charge	PhD in Resource Management and 31 years of experience in the environmental field.
A. P. (Sandy) Smith	Vice President/Senior Project Manager	MS in Marine Biology with 17 years of experience in natural systems studies and protected species assessments.
Matt Cusack	Senior Scientist	BS in Marine Biology with 7 years of experience in wetland delineations and wetlands functional assessments.
<b>Mid-Atlantic Technology and Environmental Research, Inc.</b>		
Wes Hall, MA	Underwater Archaeologist	14 years experience in underwater archaeology.

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**CHAPTER 6.**  
**LIST OF AGENCIES TO WHOM DEIS WAS SENT**



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## **CHAPTER 6. LIST OF AGENCIES TO WHOM DEIS WAS SENT**

### **6.1 FEDERAL AGENCIES**

Department of Health and Human Services, Office of Environmental Affairs  
Department of the Interior  
Department of Commerce  
Department of Agriculture  
Department of Energy  
Environmental Protection Agency  
Federal Railroad Administration  
Federal Emergency Management Agency  
National Marine Fisheries Service  
Office of Management and Budget

### **6.2 REGIONAL OFFICES**

Department of Housing and Urban Development  
Federal Emergency Management Agency  
General Services Administration  
US Fish and Wildlife Service  
US Army Corps of Engineers  
US Coast Guard  
Urban Mass Transit Administration

### **6.3 STATE AGENCIES**

North Carolina Department of Environment and Natural Resources  
North Carolina Department of Cultural Resources  
North Carolina Department of Public Instruction  
North Carolina Wildlife Resources Commission  
North Carolina Department of Economic and Community Development  
North Carolina State Ports Authority  
State Clearinghouse

### **6.4 LOCAL GOVERNMENTS**

Brunswick County Manager  
Cape Fear Council of Governments  
Chairman, Brunswick County Commissioners  
Chairman, New Hanover County Commissioners  
Mayor of Leland  
Mayor of Wilmington  
Mayor of Navassa  
New Hanover County Manager  
Wilmington Transportation Advisory Committee

### **6.5 LOCAL AGENCIES**

Brunswick County Planning Department  
City of Wilmington Planning Department  
New Hanover County Planning Department

### **6.6 LIBRARIES**

Brunswick County Public Library



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**CHAPTER 7.  
COMMENTS AND COORDINATION**



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## CHAPTER 7. COMMENTS AND COORDINATION

### 7.1 AGENCY COORDINATION

During the study, agency coordination took place through communication with a Steering Committee and a Merger Team, as well as through communication with federal, state and local agencies in general. General coordination with agencies took place during the initial stages of the project when the scoping letter and Notice of Intent (NOI) were issued. The Steering Committee was formed at the outset of the project and was consulted throughout the NEPA process to ensure compliance with local, state and federal policies. Coordination with the Merger Team took place after 1997 following the development of the merger process. Coordination with the Merger Team followed the Section 404/NEPA Merger 01 Process and took place at specific points in the study, called Concurrence Points (CPs). The agencies forming each of these groups and the timing and context of agency coordination meetings are summarized in this section.

#### 7.1.1 HISTORY OF AGENCY COORDINATION

##### 7.1.1.1 Formation of Steering Committee

In order to provide cooperation and coordination during the study process, a Steering Committee was established at the outset of the project under the leadership of the NCDOT. Committee members provided information and review of the project process to ensure compatibility with local, state and federal planning projects and policies. Steering Committee members met regularly throughout the study process and represented the following agencies:

- FHWA
- USACE
- NCDOT
- NCDENR
- NCDOT
- Brunswick County
- New Hanover County
- City of Wilmington

##### 7.1.1.2 Issuance of Scoping Letter under SEPA

At the outset of the environmental studies for the Wilmington Bypass, the proposed roadway extended from US 17 in Brunswick County east to I-40 in New Hanover County and was identified as TIP number R-2633.

When the environmental studies for R-2633 were initiated, there were no federal funds involved. Therefore, the studies were being conducted in accordance with the SEPA. Under the SEPA process, a scoping letter soliciting comments on the proposed SEPA EIS was sent on February 15, 1991 to the following local, state, and federal agencies:

- FAA
- FEMA
- USACE
- U.S. Coast Guard (5<sup>th</sup> District)
- USDA
- USDOD
- USEPA
- USFWS
- USGS
- NMFS
- USCS
- North Carolina State Clearinghouse
- North Carolina State Ports Authority
- New Hanover County Board of Commissioners
- Brunswick County Board of Commissioners
- Mayor, Town of Leland
- North Carolina Department of Human Resources
- Mayor, City of Wilmington
- Mayor, Town of Navassa
- North Carolina Department of Public Instruction

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- NCDENR
  - NCDOT
    - Hydrographic Unit
    - Landscape Unit
    - Geotechnical Unit
    - Location & Survey Unit
    - Right-of-Way Branch
    - Board of Transportation Member
  - NCDCCR
    - Traffic Engineering Branch
    - Statewide Planning
    - Bicycle Coordinator
    - Director of Aeronautics
    - Third Highway Division Engineer

The scoping letter and agency comments received in response to the scoping letter are provided in Appendix E. The agency comments are also summarized in Section 7.1.2.3

### 7.1.1.3 Issuance of Notice of Intent under NEPA

In June 1992, the Wilmington Bypass project became a federal-aid project, subject to the requirements of NEPA. The FHWA became the lead agency. In accordance with NEPA, a NOI to prepare a NEPA EIS was published in the Federal Register on August 27, 1992. No comments were received from agencies following the issuance of the NOI. The NOI is included in Appendix B.

### 7.1.1.4 Notice of Intent to Conduct Separate Environmental Studies

In 1994, the eastern segment of R-2633, from US 421 to I-40, was placed on an accelerated schedule and renumbered as TIP No. R-2633C in the 1995-2001 TIP. At that time, a second NOI to prepare a NEPA EIS for the R-2633A/B segment from US 17 in Brunswick County to US 421 in New Hanover County was published in the Federal Register on December 20, 1995. This NOI is included in Appendix B.

As the study progressed, other agencies and organizations were contacted to inform them of the study and request information. Agencies and organizations contacted were:

- NCDENR
  - Division of Parks and Recreation
  - NCNHP
  - Division of Forest Resources
- The North Carolina Nature Conservancy
- North Carolina State Ports Authority – Wilmington, North Carolina
- NCDMF, Wilmington, North Carolina
- Brunswick County
  - Emergency Management
  - Engineering Department
  - Library
  - Planning Department
  - Brunswick County Schools
- New Hanover County Ministerial Association
- Brunswick County Electric Membership Corporation
- USDOJ, Geological Survey, Water Resources Division
- New Hanover County
  - Board of Commissioners
  - Engineering Department
  - Fire Department
  - Library
  - Planning Department
  - Schools
- New Hanover International Airport – Takeda Chemical Products USA, Inc.
- Resources Development Commission for Brunswick County
- United States Marine Corps
- North Carolina Department of Agriculture
- NPS
- Military Ocean Terminal, Sunnypoint
- NCDCCR, Underwater Archaeology Unit
- Leland Sanitary District
- Lower Cape Fear Water and Sewer Authority

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- Town of Leland
  - Town of Navassa
  - Cape Industries
  - Carolina Power & Light Company
  - CSX Rail Transportation
  - E.I. DuPont, Cape Fear Plant
  - General Electric Company
  - NC Horticulture Crop Research Station
  - North Carolina Natural Gas Corporation
  - City of Wilmington
    - Engineering Department
    - Fire Department
    - Planning Department
    - Transit Authority
    - Utility Services
  - North Carolina State University, Department of Zoology – Raleigh, North Carolina

### 7.1.1.5 Section 404/NEPA Merger Process

The USACE, FHWA, and NCDOT signed an Interagency Agreement integrating Section 404 and NEPA in 1997. The agreement requires the establishment of a project team at the beginning of each transportation project and outlines the coordination process with a series of concurrence points (CPs). The CPs are as follows:

- CP-1: Purpose and Need
- CP-2: Detailed Study Alternatives
- CP-2A: Bridge Locations and Lengths
- CP-3: Least Environmentally Damaging Practicable Alternative (LEDPA or Preferred Alternative)
- CP-4A: Avoidance and Minimization of Impacts
- CP-4B: 30% Hydraulic Design
- CP-4C: 100% Hydraulic Design and Permit Drawings

The following agencies are part of the Merger Team:

- |         |         |         |         |
|---------|---------|---------|---------|
| ▪ NCDWQ | ▪ FHWA  | ▪ USEPA | ▪ HPO   |
| ▪ NCDCM | ▪ NCWRC | ▪ NMFS  | ▪ USFWS |
| ▪ USACE | ▪ NCDMF | ▪ NCDOT |         |

The Merger Team reviews and provides written concurrence at each CP before initiating the next step. The signed concurrence forms for the CPs related to this project are located in Appendix E.

## 7.1.2 AGENCY COORDINATION MEETINGS

### 7.1.2.1 Timeline Summarizing Agency Coordination Activities

A timeline of agency coordination activities is provided in Table 7-1.

**Table 7-1: Timeline of Agency Coordination Activities**

DATE	DESCRIPTION
02/15/1991	Scoping letter issued soliciting comments on scope of SEPA EIS
08/27/1992	NOI to prepare a NEPA EIS published in <i>Federal Register</i>
12/20/1995	NOI to prepare a separate NEPA EIS for R-2633A/B and R-2633C published in <i>Federal Register</i>
03/19/1996	Joint Steering Committee/ Agency meeting
10/07/1996	Joint Steering Committee/ Agency meeting
11/04/1996	Agency meeting
12/1996	DEIS submitted for agency and public review
11/21/1997	Post-public hearing meeting
12/09/1997	Joint Steering Committee/Agency meeting
03/16/1998	USACE concurred by letter that Alternative 9 is the Preferred Alternative
09/20/2000	Merger Team/ Agency meeting
01/28/2002	Merger Team field meeting
09/12/2002	Merger Team meeting
04/08/2003	Informal Section 7 consultation meeting
09/17/2003	Merger Team/ Agency meeting
12/10/2003	Informal Section 7 consultation meeting
02/12/2004	Merger Team/ Agency field meeting
06/10/2004	Merger Team/ Agency meeting
08/12/2004	Merger Team/ Agency meeting
01/11/2005	Merger Team/ Agency field meeting
01/20/2005	Merger Team/ Agency meeting
04/21/2005	Merger Team/ Agency meeting
10/20/2005	Merger Team/ Agency meeting
11/17/2005	Merger Team/ Agency meeting
11/29/2005	Informal Section 7 consultation meeting

### **7.1.2.2 Summary of Meeting Proceedings**

A brief summary of meetings held for the purpose of agency coordination is provided in this section. Detailed meeting minutes from agency coordination meetings are provided in Appendix E.

#### **March 19, 1996 – Agency Meeting**

An initial agency coordination meeting was held on March 19, 1996. The purpose of this meeting was to bring together both the Steering Committee (described in Section 7.1.1.1) and other agency representatives (listed in Section 7.1.1.2 and Section 7.1.1.4) to discuss both R-2633A/B and R-2633C. In addition, the meeting was held to obtain agency comments on the study. More specifically, agency input was sought on the process for developing preliminary alternatives, the process for selection of the reasonable and feasible alternatives, the scope of the project, forms of acceptable mitigation, and any additional concerns not yet identified.

#### **October 7, 1996 – Joint Steering Committee/ Agency Meeting**

The purpose of this meeting was to discuss the Preliminary Alternatives. Preliminary Alternatives included four alternatives on new location and one alternative to improve the

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existing roadway. In addition, the discussion focused on the possible elimination of the Northern Alternative for both R-2633C as well as R-2633A/B.

### **November 4, 1996**

An agency coordination meeting was held among the FHWA, HPO, and NCDOT. The agency representatives discussed the finding of “Conditional No Adverse Effect” to the Tinga property, and the finding of “No Adverse Effect” to the Goodman property.

### **November 21, 1997 – Post Hearing Meeting**

The purpose of the meeting was to discuss comments received from the public and agencies during the public hearing held for the DEIS regarding R-2633A/B. An overview of the impacts associated with the four existing alternatives was presented along with eight new alternatives designed to avoid an asphalt plant proposed at US 74/76 by the Martin Marietta Company. Several questions were raised and are documented in the record of meeting included in Appendix H, but generally included whether a Supplemental EIS and additional public involvement would be required if new alternatives were to be considered. Other issues that arose after the preparation of the DEIS were also discussed and generally included issues with property west of the Cape Fear River, the potential historical significance of Georgetown Road, results of a red cockaded woodpecker analysis, access to the Robert Quinn property at US 421, requests for specific interchanges and support for a Preferred Alternative. It was determined that recommendations for a Preferred Alternative could not be made until a decision was made as to whether a shift in the alignment to avoid the proposed Martin Marietta plant could take place at this stage in the process.

### **December 9, 1997 – Joint Steering Committee/ Agency Meeting**

After a summary of progress to date, including new developments since the submittal of the DEIS, the Steering Committee/agencies discussed habitat for endangered species, Section 7 consultation, stream crossings, wetland impacts, and their general preferences among Alternatives 2, 3, 8 and 9.

### **September 20, 2000 – Merger Team Meeting**

The purpose of the meeting was to review the status of R-2633A/B and determine how the NCDOT should proceed in consideration of the NEPA/404 Merger 01 Process. After discussion, the Merger Team agreed that CPs 1, 2, and 3 would be formalized prior to continuing work on CP-4; a study would be conducted to determine whether shifting the southern portion of Alternative 9 would minimize impacts to wetlands and a tributary to Morgan Branch; and that a matrix quantifying impacts with the new alignment compared to Alternative 9 would be provided. Other comments concerned the need for an assessment of essential fish habitat, whether the NEPA/404 Merger process was being followed and the possibility of expanding the study area surrounding the southern terminus of Alternative 9.

### **January 28, 2002 – Merger Team Field Meeting**

The purposes of the meeting were to review project stream crossings, the placement of bridge ends, discuss wildlife crossings, and familiarize Merger Team members with the project setting.

### **September 12, 2002 – Merger Team Meeting**

The purpose of the meeting was to update the Merger Team on project progress, receive comment on design layout of the Preferred Alternative (Alternative 9) with respect to avoidance and minimization of environmental impacts and preface future discussion of CP-2A and CP-4A.

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The design layout of the Preferred Alternative and potential associated environmental impacts were presented. Investigation of a shift of the alignment further west to avoid wetlands was requested. Questions regarding the assessment of secondary and cumulative effects were asked. It was determined that, after design layout issues are addressed, areas to be bridged identified, and an agency field meeting between USACE, NCDOT and DWQ held; a Merger Team meeting for CP-2A and CP-4A would be held. Requests were made for discussions of construction impacts and moratoriums to address impacts to shortnose sturgeon.

#### **April 8, 2003 – Informal Section 7 Consultation Meeting**

The purpose of the meeting was to discuss protected species issues in relation to R-2633A/B. A background of the project was provided, as well as information on potential impacts to protected species including red cockaded woodpecker, roughleaf loosestrife and shortnose sturgeon. Specifically in relation to shortnose sturgeon, participants discussed details of a construction moratorium period.

#### **September 17, 2003 – Merger Team Meeting**

The purpose of the meeting was to review design layouts and obtain concurrence on CP-2A and CP-4A. The Merger Team agreed with the selection of the eastern alternative as the Preferred Alternative and dropped the western alignment. The Merger Team agreed with the selection of Option 3 as the preferred alignment in the vicinity of the Cedar Hill Road interchange. It was noted that all coastal wetlands would be bridged. It was also noted that USFWS supports a determination of “not likely to adversely effect” the red cockaded woodpecker and NCDOT needed to submit a concurrence request to USFWS. It was noted that data pertaining to impacts to shortnose sturgeon from construction of R-2633C would likely not be available for another year and that all construction activities would be kept outside of the moratorium on R-2633A/B. The need for information on service road locations and impacts, utility relocations and impacts, construction techniques and temporary roads for CP-2A and CP4A was discussed. The types and locations of wildlife crossings were discussed. The Merger Team signed CP-2A. It was noted that Section 7 consultation would likely need to be completed prior to signing CP 4A.

#### **December 10, 2003 – Informal Section 7 Consultation Meeting**

The purpose of the meeting was to discuss potential impacts to the shortnose sturgeon from construction of the bridge over the Cape Fear River and to define the details of the construction moratorium period. Data collected at the Northeast Cape Fear River bridge construction site was presented and discussed.

#### **February 12, 2004 – Merger Team/Agency Meeting**

The purposes of the meeting were to discuss outstanding issues from the September 17, 2003 Merger Meeting and achieve concurrence on CP-4A. Positive and negative impacts of shifting the alignment were presented and discussed. The location and type of wildlife crossings that had been determined with coordination between USFWS and WRC were presented and discussed. Impacts to streams and wetlands from service roads were discussed. It was noted that temporary work bridges are consistent with those proposed for R-2633C and that work bridge plans and pile construction information would be necessary before CP-4B and CP-4C. Wetland impacts associated with utility relocations were discussed. Proceedings from an informal Section 7 Consultation were summarized. CP-4A was signed with stipulations regarding avoidance and minimization efforts and that additional information pertaining to work bridge design and construction techniques and refined utility impacts would be provided at CP-4B.

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### **June 10, 2004 – Merger Team/Agency Meeting**

The purposes of the meeting were to discuss potential impacts of the project on the Spring Hill community and determine if the Merger Team would be receptive to re-opening CP-4A and evaluating alternative alignments that would further avoid and minimize impacts to the community. It was determined that if NCDOT wanted to reopen CP-4A, the Merger Team would consider possible alternatives and that additional information would be necessary for the consideration of alternatives.

### **August 12, 2004 – Merger Team/Agency Meeting**

The purpose of the meeting was to discuss alternative alignments proposed to avoid and minimize impacts to the Spring Hill community. Several alternative alignments were presented and differences among the impacts were discussed. Agency representatives supported the alignment previously selected as CP-4A and agreed that some agency representatives should attend a meeting with the Spring Hill community to explain and discuss the decision.

### **January 11, 2005 – Merger Team/ Agency Field Meeting**

The purposes of the meeting were to visit the Spring Hill community, review potential project impacts to the community, review wetlands along proposed alternative alignments and consider possible bridge locations. It was determined that the CP 4A alternative was no longer preferred by NCDOT, the decision to revisit CP 4A was justified because impacts to the Spring Hill community were not previously considered. It was also decided that a revised impact table would be prepared and a desktop review of environmental resources associated within an area located to the east of the existing project terminus would be conducted. It was also requested that a new alignment based on modifications to the Blue alignment be developed and documentation of potential impacts to Spring Hill be provided to the Merger Team.

### **January 20, 2005 – Merger Team/ Agency Meeting**

The purpose of the meeting was to discuss alternative alignments in the vicinity of the Spring Hill community and associated impacts. Representatives of Spring Hill were invited to participate in the meeting. Since the Merger Team meeting held in August, the Merger team had met with the Spring Hill community, had a field meeting, and developed the Pink alignment as another alternative. It was determined that further documentation of the reasoning behind rescinding CP-4A, documentation of possible mitigation measures and a public workshop were necessary.

### **April 21, 2005 – Merger Team/ Agency Meeting**

The purpose of the meeting was to continue discussing CP-4A and the alternative alignments in the vicinity of the Spring Hill community. The Merger Team generally agreed to rescind the Red alignment as the CP-4A alignment and readdress selection of the Preferred Alternative. Further information identified as necessary to proceed included an assessment of environmental justice, indirect and cumulative effects, noise analysis and wetland information.

### **October 20, 2005 – Merger Team/ Agency Meeting**

The purposes of the meeting were to discuss new information presented to the Merger Team and determine if any additional information was required before proceeding with formally adopting CP-3, rescinding CP-4A and achieving new concurrence on CP-4A. Discussion during the meeting included details of the indirect and cumulative effects assessment and the environmental justice assessment and an agreement to briefly assess the impacts of an alternative southern terminus.

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### **November 17, 2005 – Merger Team/ Agency Meeting**

The purposes of the meeting were to review and discuss information provided to the Merger Team showing the potential impacts of an alternative southern terminus, review and adopt the proposed Preferred Alternative, rescind the Red Alignment as CP-4A, and discuss and concur on the new CP-4A alignment. The Merger Team formally concurred on CP-3 and rescinded the Red Alignment as CP-4A. The Merger Team did not achieve concurrence on a new CP-4A alignment during the meeting, but, subsequent to the meeting, 4A concurrence on the Pink alignment was achieved.

### **November 29, 2005 – Informal Section 7 Consultation Meeting**

Details of the construction moratorium for the shortnose sturgeon were discussed. Specifically, the definition of “in water”, the period of the moratorium, and applicability to tributaries were informally agreed upon. Monitoring options were also discussed.

### 7.1.2.3 Comments and Responses to the Study

Agency comments received through the coordination process are summarized in Table 7-2 along with responses. The full text of the comments is included in Appendix A.

**Table 7-2: Wilmington Bypass R-2633A/B – Agency Comments**

#	AGENCY COMMENT	RESPONSE
<b>U.S. Department of Transportation, Federal Transit Authority December 26, 1996</b>		
1	The environmental document contains a comprehensive discussion and analysis of transportation alternatives. We therefore concur with your assessment that the environmental study process for this project substantially meets the requirements of a major investment study.	Comment noted.
<b>N.C. Department of Administration January 23, 1997</b>		
1	This project has been assigned State Application number 97-E-4220-0462. Please use this number with all inquiries or correspondence with this office.	Comment noted.
<b>N.C. Department of Environment, Health and Natural Resources, Division of Forest Resources January 30, 1997</b>		
1	We still continue to favor the Southern Bypass Alternative over all other possible alternatives. The Southern Alternative will present less problems to forestry.	Comment noted.
2	We hope the ROW contractor would attempt to salvage all forest wood products during construction.	Although contractor's option, NCDOT will encourage the contractor to salvage forest products for productive purposes.
3	We hope that adjacent woodland would be protected from adverse construction activities.	NCDOT will minimize the impacts to the natural environment to the extent practicable.
<b>N.C. Department of Environment, Health, and Natural Resources, Division of Forest Resources February 13, 1997</b>		
1	As we had expected, all four build alternatives will have a high impact to woodland, ranging from 261 to 277 acres of upland types and 193 to 228 acres of wetland types.	Comment noted.
2	However, the four build alternatives (2, 3, 8, and 9) will have less impact to woodland than if the extreme northern alternatives were selected.	Comment noted.
3	Based on Table 3.12, we tend to favor Alternative 8 which impacts a total of 460 acres of upland and wetland woodland combined. This is slightly less than the other three and also impacts less- a. Pine forest, b. Pine plantations, c. Bottomland hardwoods.	Comment noted.

#	AGENCY COMMENT	RESPONSE
4	We would hope that the final alignment design would be able to reduce the above acreage figures whenever possible.	NCDOT will minimize the impacts to the natural environment to the extent practicable.
5	We would hope that the proposed USACE Conservation Area (involving 2,800 acres) for mitigation would permit some limited recommended BMP Forestry Practices. We would not be in favor of just using this area for preservation purposes.	Comment noted. Permissible uses of preservation land will be coordinated with the USACE.
6	We would hope that the ROW construction would initiate all efforts possible to salvage all forest wood products for pulpwood chips, poles and saw timber during construction operations.	Although contractor's option, NCDOT will encourage the contractor to salvage forest products for productive purposes.
7	The document appears to address our other forestry concerns.	Comment noted.
<b>N.C. Department of Cultural Resources February 21, 1997</b>		
1	Surveys for historic architectural resources were conducted in several phases. They covered a large study area and multiple alternates that were subsequently eliminated. Because only four build alternates are studied in the DEIS, the section on historic architectural resources identify historic properties with the area of potential effect for only those four alternates. Hence, the survey reports, correspondence, and concurrence forms referenced in the DEIS contain information about many more resources that the DEIS identifies. For the purpose of clarity, we recommend that the FEIS contain an explanation of this discrepancy.	Comment noted. Section 3.1.5 and Section 4.1.1 of this FEIS include clarification on this discrepancy and provide relevant information on historic resources within the area of potential effect.
2	We concur with the recommendations for terrestrial and underwater surveys of the preferred corridor as stated in Section 4.1.4.1. We are available for consultation when you are developing a scope of work for archaeological survey and site assessments of the preferred corridor.	Comment noted. NCDOT coordinated with the HPO regarding the scope and findings of these surveys. Relevant information regarding this issue can be found in Section 3.1.5 and Section 4.1.1 of the FEIS.
<b>N.C. Department of Environment, Health and Natural Resources, Division of Water Quality February 24, 1997</b>		
1	The DWQ is responsible for issuance of the Section 401 Water Quality Certification for activities which impact water of the state including wetlands. The Wilmington Bypass will impact up to 357 acres of jurisdictional wetland. DWQ commends NCDOT for providing extensive documentation of the study corridors for the proposed 22-mile long project. Although DWQ would have preferred to see the entire project included within one planning document, we thank NCDOT for providing the Draft EIS documents concurrently for the two major segments.	Comment noted.
2	DWQ should be able to agree to an alignment which demonstrates avoidance of wetland and stream impacts to the maximum extent practical.	The Final EIS has expanded discussion on bridge construction techniques and associated impacts in Section 4.1.4.8. The issues presented here

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	<p>NCDOT has committed providing specific descriptions of wetland impact minimization techniques which will be utilized during the detailed design and construction phases. These topics should include, but are not limited to: median widths, particularly through extensive wetland area; a cost-benefit analysis of impacts associated with filling versus bridging through extensive wetland areas, particularly those contiguous to the Cape Fear and Northeast Cape Fear River, for example, determination of bridge lengths, particularly over High Quality Waters, should consider long-term economic impacts to fisheries resources, not only immediate construction costs and hydraulic design constraints; control access throughout the highway corridor and its associated secondary impacts; specific interchange designs, and; design features which may be incorporated to protect water quality, such as grass swales. The requested information would be helpful in our review, and thus help to meet NCDOT's accelerated schedule for the I-40 to US 421 segment of the Wilmington Bypass.</p>	<p>were coordinated and resolved through the Merger 01 process. Bridge lengths were agreed upon through signing of Concurrence Point 2A and Avoidance and Minimization were achieved through Concurrence Point 4A.</p> <p>NCDOT commits to continued coordination with the Merger Team with agencies as design details are developed.</p>
3	<p>The two subject documents include cursory discussions of wetland mitigation needs for the Wilmington Bypass project. NCDOT has been investigating numerous potential sites throughout the planning process, although no sites are named or discussed in detail. NCDOT is reminded that the new DWQ Wetland Rules (15A NCAC 2H0506 h 2) include specific requirements for mitigation plans and ratios based upon the distance of impact areas from surface waters. A complete mitigation proposal, addressing a specific property (ies). Suggested site plans including earthwork, stream/hydraulic manipulations, and planting schemes, plus monitoring and remediation methodologies, should be included in the Final EIS documents. NCDOT should note that issuance of the 401 Certification will be contingent upon review and final approval of the mitigation plan. This should be considered in planning of the accelerated schedule for the I-40 to US 421 segment of the project.</p>	<p>Mitigation for the proposed impacts to wetlands will be arranged and through the NCDENR Ecosystem Enhancement Program (EEP) under the Memorandum of Agreement (MOA) between the USACE, NCDOT, and NCDENR of 2002. Mitigation planning will take into account requirements set forward by NCDWQ.</p>
4	<p>Both of the referenced documents list stream crossings requiring culverts equal to or exceeding 72 inches diameter. DWQ cannot determine if any other perennial stream impacts will be involved. NCDOT is reminded that stream mitigation may be required for this project in accordance with current DWQ Wetland Rules (15A NCAC 2H.0506 b 6) which were not in effect at the time the DEIS document were prepared. NCDOT is advised to re-examine the stream impacts to be involved with this project, and include a revised discussion in the FEIS documents. This should include all perennial streams, along with the types of structures necessary, and estimated linear feet of stream relocations. This information will be required</p>	<p>Comment noted. NCDOT is aware of the recent promulgated regulations for the North Carolina 401 Water Quality Certification. All proposed stream crossings for the project are identified in the FEIS, and mitigation planning will incorporate these new regulations. Mitigation for the proposed impacts to streams will be arranged and through the NCDENR Ecosystem Enhancement Program (EEP) under the Memorandum of Agreement (MOA) between the USACE, NCDOT, and NCDENR of 2002.</p>

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	during the 404/401 Permit review. Culvert extensions and/or stream relocations exceeding 150 feet linear distance of stream channel at any single crossing will likely require mitigation. If it is determined that stream mitigation will be necessary NCDOT should include a stream mitigation plan in the FEIS documents.	
5	NCDOT proposes placement of culvert at all stream crossings, except for the two river crossings. NCDOT should explain whether or not there is potential for anadromous fish use of the smaller streams to be crossed by the project. DWQ will require bridging of all streams where anadromous fish use in present, in order to protect this use.	Anadromous fish habitat is addressed in Section 3.4.4 and Section 4.1.3.7 of the FEIS. The preferred alignment includes bridged stream crossings in addition to the Cape Fear River by bridging. Efforts to minimize impacts to stream systems are discussed in the FEIS.
6	The FEIS should include a discussion of methods which may be utilized to minimize temporary wetland impacts during construction of the bridges at the Cape Fear River and Northeast Cape Fear River. For example, the document could discuss pros and cons associated with top-down bridge construction techniques.	A construction method discussion is included in Section 4.1.4. This discussion describes the feasible and reasonable methods of construction under consideration and the predicted impacts associated with these methods.
7	DWQ is developing a Pond Policy in accordance with 15A NCAC 2H.0505 b). The policy is currently undergoing internal review within our agency, and may be in effect prior to the construction date of the Wilmington Bypass. We suggest that NCDOT address impacts to ponds (if any) within the FEIS.	Comment noted. Discussion is included in the FEIS.
8	NCDOT should provide qualitative information on each specific wetland site in all study corridors. Data sheets for DWQ's Wetland Rating System would be sufficient. This will be integral to the selection of a Preferred Alternative.	Comment noted. Discussion and ratings are included in the FEIS.
9	NCDOT should provide evidence that all water supply sources were located within one mile of stream crossings on all the proposed alternatives.	One water supply source was identified within one mile of a stream crossing in the project area on Toomer's Creek (see Sections 3.4.3.2 and 4.1.3.4 in the Final EIS for additional detail.).
10	NCDOT should ensure that the sediment and erosion control measures are not placed in wetlands and are incorporated into the construction contract awarded for this project.	NCDOT Best Management Practices for erosion control will be incorporated into contract specifications. Major erosion control measures, such as Type A silt basins, will not be located in wetlands, however, "minor" devices, such as silt fence, may be used within wetland areas where necessary to adequately control sedimentation.
11	NCDOT should stipulate that borrow material will be taken from upland sources in the construction contract awarded for this project. Potential borrow sites should be located and described.	The contractor will be responsible for locating and maintaining the borrow sites during construction. As per the standard NCDOT construction contract, fill material for this project will be excavated from approved borrow sites, and excess waste will be deposited at approved upland sites.  Also see response to Comment 15, EPA March 28, 1997.

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12	Based upon the wetland impacts described in the EIS and Individual 401 Water Quality Certification will likely be applicable to this project. Final permit authorization will require formal application by NCDOT and written concurrence from DWQ. Please be aware that this approval will be contingent upon evidence of avoidance and minimization of wetland and stream impacts to the extent practical, and provision of wetland and stream mitigation where necessary.	Comments noted.
13	DWQ appreciates the opportunity to provide comments on the EIS. DOT is reminded that issuance of a 401 Water Quality Certification requires satisfaction of water quality concerns, to ensure that water quality standards are met and no uses are lost.	Comments noted.
<b>U.S. Department of Commerce, National Marine Fisheries Office February 25, 1997</b>		
1	The DEIS should specifically describe the riverine wetlands being impacted by each of the four alternatives.	Impacts to jurisdictional wetlands are addressed in the FEIS in Section 4.1.3.7.
2	The cost estimates should be broken down into wetland types and locations with bridging cost estimates associated with each location. The additional costs for mitigating the loss of wetlands, if bridges are not constructed, also are not addressed. These additional mitigation costs must be considered if costs are to be used to justify one alternative versus another.	Bridging costs have been discussed through the Merger Team Process. Mitigation for the proposed impacts to wetlands and streams will be arranged and through the NCDENR Ecosystem Enhancement Program (EEP) under the Memorandum of Agreement (MOA) between the USACE, NCDOT, and NCDENR of 2002.
3	The DEIS identifies 12 additional highway projects involving wetland losses in the vicinity of this project. Given this large number of projects in the Cape Fear and Northeast Cape Fear River area, we believe that a comprehensive assessment of cumulative wetland losses should be a part of the National Environmental Policy Act documents for all projects in this area.	The assessment of wetland impacts for each of the 12 vicinity projects identified in the DEIS are not discussed in the FEIS; however, Section 4.2.6.2 presents the cumulative wetland impact for the projects comprising the northern loop around Wilmington. The cumulative analysis indicates that between 474 and 508 acres of wetlands would be cumulatively impacted by these.
4	Revise Table (Page 3-51) to more clearly depict acreage of riverine wetlands that would be filled as a result of the crossings of the Cape Fear River and its tributaries.	No riverine wetlands will be filled by the project.
5	Bridge approaches constructed on fill in wetlands. . .explain how existing drainage patterns in wetlands will be maintained if extensive filling of wetlands for bridge approaches are proposed.	Existing drainage patterns in wetlands will be examined and mitigated through the placement of culverts to facilitate the floodplain flow and existing drainage patterns in wetlands will be maintained if extensive filling of wetlands for bridge approaches are proposed.
6	The assessment of impacts in Section 4.3.3 do not consider the impact of lost wetland functions and values on fishery resources. Impacts resulting in the loss of water quality maintenance and habitat functions should be mitigated and discussed in a compensatory mitigation plan.	Comment noted. The FEIS contains an Essential Fish Habitat Assessment which addresses these concerns in Section 4.1.3.7.

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7	Identify the wetland impacts of all available bridge construction techniques, including top-down construction.	A discussion of wetland impacts for construction methods is included in the FEIS. The following bridge construction methods currently under consideration are Haul Road Access and Work Bridge Access. See Section 4.1.4.8.
<b>U.S. Department of the Interior, Fish and Wildlife Service February 27, 1997</b>		
1	If unavoidable losses occur, there should be sufficient compensation to ensure that there is no net loss of the functions and values provided by these wetlands.	Comment noted.
2	Alternative 8 appears to be the least environmentally damaging. If issues involving federally-protected species are successfully resolved, the FWS recommends that NCDOT consider Alternative 8.	Comment noted.
3	In order to prevent harm to the natural biotic communities, the project should ensure that the natural, daily water exchange continues to occur. We recommend that the final design include features to ensure that the project does not disrupt hydrological flow within the streams and wetlands of the project area. We recommend that the final design includes measures to allow the passage of amphibians, reptiles, and small mammals.	The final design will include the evaluation of hydrological flow patterns in the vicinity of the project and will identify points along the corridor that will incorporate all culverts and pipes. Culverts will be sized to accommodate the passage of most amphibian, reptile, and small mammal species. Wildlife passages have been included in the design of the project. The type(s), locations and clearances to be provided were decided through coordination with USFWS, NC Wildlife Resources Commission, and the project Merger Team.
4	We recommend that all feasible design features and construction techniques be employed to minimize the permanent loss of wetlands. These measures would include the use of steeper side slopes, eliminating lateral side drainage ditches, and/or minimized clearing limits.	All practicable design features and construction techniques will be employed to minimize the permanent loss of wetlands. Side slopes need to be set based on typical local material properties.
5	We recommend that the NCDOT should make the commitment to bridge all major wetland systems in the project area.	NCDOT has committed to bridging major wetland systems as documented through the project Merger Team process. All bridging information and documentation of Merger Team concurrence are included Appendix E, of the FEIS
6	For unavoidable wetland impacts. . . the document indicates that a potential mitigation site would be areas within a 2,800-acre tract along the Northeast Cape Fear River which has been proposed as a conservation area by the USACE. The FWS is concerned that the use of parts of this tract by the NCDOT as compensation could lead to a situation where two agencies were seeking to use the same land in conjunction with two different projects.	Mitigation for the proposed impacts to wetlands and streams will be arranged through the NCDENR Ecosystem Enhancement Program (EEP) under the Memorandum of Agreement (MOA) between the USACE, NCDOT, and NCDENR of 2002.
7	There is a concern over the use of a mitigation plan which relies entirely on preservation. We strongly encourage locating disturbed and/or degraded wetlands along the lower Northeast Cape Fear River which could be	Mitigation for the proposed impacts to wetlands and streams will be arranged through the NCDENR Ecosystem Enhancement Program (EEP) under the Memorandum of Agreement (MOA) between the USACE,

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	restored and/or enhanced. A comprehensive plan of compensatory mitigation which provides on-site, in-kind replacement of the function and values of these wetlands should be developed.	NCDOT, and NCDENR of 2002.
8	With regard to the rough-leaved loosestrife ( <i>Lysimachia apserulaefolia</i> ) and Cooley's meadowrue ( <i>Thalictrum cooleyi</i> ). Field investigations of these sites have not been made, and a biological conclusion on the impacts is "unresolved".	Informal Section 7 consultations have been held regarding potential impacts to these species and the results and Biological Conclusions on the impacts were resolved and are presented in Section Chapter 7 and 4.1.3.7.
9	Precise impacts to the southern colony of the RCW are unresolved.	This issue was resolved through additional studies and Informal Section 7 Consultation and is document in Section 4.1.3.7.
10	The DEIS states that the project would have no effect on the wood stork due to the absence of habitat. The FWS disagrees with the basis for this conclusion. While this species is considered a rare, summer visitor to the Wilmington area habitat is present. The FWS recommends that the NCDOT reconsider the basis for the biological conclusion for this species.	A reevaluation of potential habitat within the study area has concluded that some roosting habitat is available. However, current information indicates that the project is north of the known wood stork habitat. Therefore, the biological conclusion has been changed to May Effect and is documented in correspondence letter received from the USFWS dated June 17,2004 and be found in Appendix A of the FEIS
11	The FWS considers the project area to be within the summer range of the migrating Indian manatee ( <i>Trichechus manatus</i> ). The list provided by the FWS for precautions for construction should be strictly adhered to in order to avoid impacts to the manatee	The list of precautions provided by the FWS for the protection of the manatee will be implemented during construction of this project (The guideline for manatee protection is included in Appendix G of the FEIS).
12	If unavoidable losses occur, there should be sufficient compensation to ensure that there is no net loss of the functions and values provided by theses wetlands.	Comment noted.
<b>U.S. Department of the Interior, Office of Environmental Policy and Compliance February 27, 1997</b>		
1	We believe that the three sections of the bypass are interdependent, and that our review of the overall bypass project would have been facilitated by the preparation of a single NEPA document.	Comment noted.
2	We believe that NCDOT should make every effort, including the bridging of all riparian wetlands, to avoid and minimize the permanent loss of these wetland areas. If unavoidable losses occur, there should be sufficient compensation to ensure that there is no net loss of the functions and values provided by these wetlands.	Since this comment was made the project entered into the Section 404/NEPA Merger Process. These issues were addressed and agreed upon as documented in the FEIS and Specifically in Section 4.1.4.8 and Section Chapter 7.
3	The summary of the Purpose and Need appear to be more of a justification for the construction of a four-lane divided controlled access freeway than a statement of needs which require solution.	The purpose and need has been restructured in the FEIS to better identify the need for the project. See Chapter 1 of the FEIS
4	Analysis of Alternatives eliminated several alternatives that impacted the red-cockaded woodpecker and kept four that also impacted the species.	Selection of the Preferred Alternative was resolved in 1998 and is documented in the FEIS.

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	Although the DEIS does not specify a preferred alternative, based on data presented, Alternative 8 appears to be the least environmentally damaging. If issues involving federally protected species are resolved, the FWS recommends that NCDOT consider the selection of Alternative 8 unless other data becomes available.	
5	We recommend that the final design include features to ensure that the project does not disrupt hydrological flow within the streams and wetlands of the project area.	This issue will be addressed in the final design phase of the project.
6	We recommend in the final design include measures to allow the passage of amphibians, reptiles, and small mammals.	Wildlife crossings have been incorporated into the preliminary design of the project as documented in Section 4.1.3.3 of the FEIS.
7	We support the construction techniques that are part of NCDOT's standard procedures to minimize environmental impacts.	Comment noted.
8	We recommend employing using steeper side slopes, eliminating lateral side drainage ditches and or minimized clearing limits to reduce impacts to wetlands. We believe bridging wetlands near major streams and the Cape Fear River would significantly reduce the permanent loss of wetlands. We recommend that the Final EIS contain a commitment to bridge all major wetland systems in the project area.	All practicable efforts to avoid and minimize impacts to wetlands and streams have been include in the preliminary design of the project. These efforts include reducing side slopes where possible and bridging streams and wetlands as documented in the FEIS and through the Merger 01 Process.
9	We are concerned that the USACE and NCDOT are looking at the same area for conservation purposes in conjunction with two different projects. We encourage the NCDOT to seek out disturbed and/degraded wetlands along the lower Cape Fear River that could be restored or enhanced. If the project will result in a net loss of wetland functions and values, this loss should be evaluated qualitatively and if possible quantitatively in the FEIS. NCDOT should develop a comprehensive plan of compensatory mitigation that provides onsite, in-kind replacement of the function and values of these wetlands. The plan should rely primarily on restoration and/or enhancement and use preservation only as a minor component to protect and augment the replacement wetlands. The plan should not result in a net loss of wetland functions and values.	Mitigation for the proposed impacts to wetlands and streams will be arranged and through the NCDENR Ecosystem Enhancement Program (EEP) under the Memorandum of Agreement (MOA) between the USACE, NCDOT, and NCDENR of 2002. Wetland functions will be taken into account during mitigation planning. Opportunities for on-site mitigation will be evaluated as they become available.
10	Update after the field investigations information about the two federally listed endangered plants (rough-leaved loosestrife and Cooley's meadow rue). Update the information on the red-cockaded woodpecker after the foraging habitat analysis and coordinate with the FWS before the selection of a preferred alternative. FWS recommends that the NCDOT reconsider the basis for the "no effect" on the wood stork due to the absence of habitat. There is summer habitat available for the species in the project area. Also, it should be noted that the FWS disagrees with the characterization of the	Section 4.1.3.5 and Appendix G of the FEIS contain detailed information concerning protected species identified within or potentially occurring within the project study corridor.

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	manatee's range. The FWS regards the project area to be within the summer range of the manatee. The DEIS includes a list of precautions supplied by the FWS and the rigorous adherence to these conditions would allow project construction without adverse impacts to the manatee.	
<b>N.C. Department of Environment, Health, and Natural Resources, Division of Parks and Recreation March 3, 1997</b>		
1	In previous comments on this project, the Division has expressed concerns about impacts to several high quality natural areas within the project area, including both upland and wetland habitats. Although the document identifies these sites by name (p 3-50; 4-47), they are not mentioned in the discussion of the possible impacts of the alternative alignments, nor are they indicated on any of the maps. Impacts to the 421 Sandridge and Cape Fear River Marshes appear to be unavoidable, but other sites, such as Battle Royal Bay and Alligator Branch Sandhills and Flatwoods, can be still largely avoided, depending on selection between the alternatives. We therefore would like the document to be modified to give more explicit consideration of these sites in the comparison of relative impacts of the proposed alternatives.	Impacts to IPAs are discussed in Section 4.1.3.5 of the Final EIS.
2	The impacts to Battle Royal Bay, for instance, can be largely avoided if Alternatives 8 & 9 are selected over Alternatives 2 & 3. The presence of a colony of red-cockaded woodpeckers (Southern Colony, Fig. 3.9a and 3.9b) also favors the selection of Alternatives 8 & 9. Avoidance of impacts to the Battle Royal Bay Priority Natural Heritage Area gives further weight to this decision and should therefore be mentioned in the document.	Impacts to IPAs are discussed in Section 4.1.3.5 of the Final EIS.
3	A portion of the Alligator Branch Sandhills and Flatwoods appears to be crossed by the combined alignments just to the north of Malmo, although the study corridor depicted on the maps appears wide enough to allow for adjustments. The two northern colonies of red-cockaded woodpeckers (see Fig. 3.9a and 3.9c) occur within the Priority Natural Heritage Area and identification of the boundaries of this site should be considered in decisions to adjust the alignments in this area.	Impacts to IPAs are discussed in Section 4.1.3.5 of the Final EIS.
4	Impacts to the 421 Sandridge and Cape Fear Marshes appear to be unavoidable. Impacts to these sites may be compensated, however, through appropriate mitigation. We strongly support the Corp's proposal to protect conservation lands along the Northeast Cape Fear River, particularly since it gives attention to upland habitats along the bluffs and adjoining sandridge as buffer areas for the wetlands. We would also like to see, however, the marshlands along the Cape Fear River be considered for	Comments noted.

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	similar mitigation, along with the adjoining portions of the 421 Sandridge. We also continue to support bridging the entire floodplains of both the Northeast Cape Fear and Cape Fear Rivers in order to minimize impacts to these significant tracts of tidal freshwater marsh.	
5	We also support the development of compensatory mitigation for unavoidable losses of non-riparian wetlands within the project area. We would like to see mitigation be in-kind and located as close to the areas of impact as possible. In this regard, we recommend that both Battle Royal Bay and the Alligator Branch Sandhills and Flatwoods be considered for possible mitigation efforts.	Comments noted. Mitigation for the proposed impacts to wetlands and streams will be arranged and through the NCDENR Ecosystem Enhancement Program (EEP) under the Memorandum of Agreement (MOA) between the USACE, NCDOT, and NCDENR of 2002.
<b>N.C. Department of Environment, Health, and Natural Resources, Legislative and Intergovernmental Affairs March 13, 1997</b>		
1	The Department of Environment, Health, and Natural Resources has reviewed the DEIS for the proposed Wilmington Bypass from US 421 to US 17.	Comment noted.
2	This is a well prepared document, however, several areas need further clarification as noted in the attached comments from our agencies. We ask that the Department of Transportation work with our agencies to assure that these concerns are adequately addressed in the final document.	Comment noted.
<b>N.C. Wildlife Resources Commission, Habitat Conservation Program March 13, 1997</b>		
1	The subject document adequately discusses benefits, social impacts, and traffic analysis of the final build alternatives. The document also adequately describes anticipated impacts to the natural environment. We remain concerned over wetland impacts, impacts to the red-cockaded woodpecker, and impacts to identified natural heritage areas. We feel that bridging all wetlands adjacent to the Cape Fear River is the only practicable way to minimize wetland impacts for any alternative.	Comments noted.
2	We are particularly concerned over the impacts to the foraging areas of the RCW colony on Alternatives 2 and 3. These alternatives also bisect Battle Royal Bay and area identified by the Natural Heritage Program as a unique natural area. Some of these habitats have unique assemblage of flora and fauna that are dependent upon connectivity to other habitats for feeding and breeding sites. If these connections are severed by the new highway, these areas will cease to provide valuable habitat for many species. The final document should discuss measures that will be employed to maintain wildlife habitat connectivity.	Impacts to IPAs and measures to maintain habit are discussed in Section 4.1.3.5 of the Final EIS.

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3	At this time, we concur with the DEIS for this project. We request that the final document describe proposed mitigation in more detail and include further discussion on the items noted above. Currently we view Alternative 9 as the least environmentally damaging alternative.	Comment noted.
<b>U.S. Environmental Protection Agency March 28, 1997</b>		
1	In accordance with Section 102(2)(C) of the National Environmental Policy Act (NEPA) and Section 309 of the Clean Air Act, EPA is providing comments . . . We are also taking this opportunity to provide additional comments on the I-40 to US 17 North Connector because it is a component of the US 17 Bypass . . . and should be part of a single NEPA analysis. . .	Comment noted.
2	The EPA expressed concern, in April 1995, that the NEPA review of the central segment project had proceeded independent of other segments of the US 117 bypass of Wilmington in apparent conflict with NEPA Guidelines. While impacts to natural and socioeconomic resources for a particular segment may be moderate, the impacts would be significant for a total bypass on new alignment in the Wilmington area. Accordingly, EPA is pleased that decisions have been delayed on the central segment until a comprehensive review of the entire US 17 south to US 17 north can be accomplished. More importantly, we see that a new alternative alignment for the central segment has come to the forefront as a result of citizen and interagency findings that the first draft EIS did not identify all potentially viable alignments.	Comment noted.
3	These segments are all envisioned in the Transportation Improvement Program for Wilmington with the stated primary purpose of separating local traffic from through traffic.	Comment noted.
4	We do not see a significant improvement for key thoroughfares for a project costing approximately \$135 million. Comparing DEIS design year No-Build Table 1.4 and Build Alternatives Table 2.7, predicted level of service (LOS) for many roadway segments either is unchanged or improved to no better than LOS C. Benefit to alleviating Central Business District/Historic District traffic appears marginal. Further, it is not clear why this project is stated to benefit the access to the Port of Wilmington, on the opposite east side of the Cape Fear River south of the City. Similarly, this segment is planned to connect with US 17 much further west of SR 133, to Sunny Point Military Terminal, which would indicate minimal utility for movement of military cargo.	During preparation of the FEIS new traffic data was collected for the Wilmington Bypass which indicates a large volume of traffic using the Bypass than what was indicated in the DEIS. In future years the level of service on US 17 between the project terminus on US 17 and downtown Wilmington is projected to reach and failing conditions. While the proposed project would not fully resolve this issue it would improve future year conditions by providing an alternative route for through traffic thereby helping to relieve traffic from Central Business district. As congestion delays increase along the main north-south corridors, i.e., College Road, Kerr Avenue, future year travel flow between the southern and northern areas will seek alternative travel paths. As Wilmington continues to develop and the travel pressures mount in Wilmington's central area, viable access between parts of the northern and southern areas will be achieved

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		<p>by using the west side of the planning area, US 421 and the Bypass. In addition, it is expected that trucks entering the Wilmington area from the north/northeast directions will access the port using the Bypass and US 421. The Bypass would provide an alternative Travel route for military transport to Sunny Point Military Terminal via the Bypass to NC 87.</p>
5	<p>Mass transit is not considered seriously in either document. A FHWA reference is cited which concludes that mass transit should be considered only for urbanized areas having greater than 200,000 population. Although the City has 55,530, portions of New Hanover and Brunswick Counties combined with the city should put the urban population over 200,000.</p>	<p>Brunswick County was recently added to the Wilmington Metropolitan Statistical Area (MSA), a 2000 population of 160,327 persons. Brunswick County had a 2000 population of 73,143. Accordingly, mass transit should not be considered an economically viable option to relieve traffic congestion.</p> <p>In addition, the Mass Transit Alternative (MTA) does not meet project purpose and need for several reasons: 1) A population of 200,000 is a combination of both counties, and is spread out over a large, generally rural, area. This type of population disbursement is not conducive to an effective mass transit system; 2) MTA would not remove most of the through traffic traveling between US 17 N/I-40 and Brunswick County (US 17 S, Brunswick Co. beaches, etc.); 3) the Wilmington Bypass provides additional river crossing for both the NECFR and the CFR; and 4) US 17 has been designated as part of the Intrastate System and is to include the Wilmington Bypass as part of that system.</p>
6	<p>Another basic concern with the alternatives evaluation is the lack of apparent consideration of a US 17 bypass to the south of Wilmington. If it was or is contemplated, or if an entire circumferential expressway of Wilmington has been considered, they should be discussed. Since access to the Port and to Sunny Point Military Terminal are objectives of these projects, a southern bypass would better meet these transportation objectives. If this alternative was discarded for environmental reasons that should be explained. All possible options should also be addressed and discussed in the subject documents.</p>	<p>Although a southerly route around Wilmington was first conceived as part of the Greater Wilmington Thoroughfare Plan, since then circumstances have changed enough to warrant the elimination of the route. There were several reasons why the Wilmington Bypass study areas were located to the north of Wilmington rather than the south. The primary reason was that existing development had built out the area south of the City. A bypass constructed here could result in substantial social and economic impact, and could entail substantial relocation impacts such that the benefits would not outweigh the impacts. If a bypass were located to the south of the City, traffic traveling to and from the Port of Wilmington would still have to use downtown streets to access I-40. River-going vessel traffic volumes south of the City and the State Port are greater than to the north. Constructing a bridge in the heavily traveled segment of the river would not be as safe. The Port of Wilmington is North Carolina's largest seaport and it accommodates large ocean-going vessels, including barges containing petroleum products and liquid- and dry-bulk materials. In addition, the river is wider south of Wilmington, which would add to the cost of bridge construction and therefore require a greater expenditure of funds.</p>

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		<p>Furthermore, a river crossing of the CFR south of the city would require extremely high vertical clearance to accommodate the larger vessels that navigate that portion of the river, which in turn would result in extremely high bridge structure costs.</p> <p>The existing alternative corridors are composites of the overall least impacting alternative segments analyzed in the June 1991 report titled, <i>Preliminary Alternatives Analysis Technical Memorandum</i>. Details of this analysis can be found in this document and in document titled, <i>The Development of Projects R-2633A/B, R-2633C and R-2405 contained in the North Carolina Department of Transportation's Transportation Improvement Program</i> (page 8), dated June 1995.</p>
7	We concur with the alternatives analysis that has resulted in alternative alignments 2, 3, 8, and 9 for final analysis plus the no-action alternative.	Comment noted.
8	Two relatively generic issues not fully addressed in either document are the plans for parallel service roads and amount of fill for a project. So much of the alternative corridors traverse low areas making the amount of filling a big engineering and environmental concern. The eastern I-40 Connector would be an example of a 100 percent fill road project. The amount of fill and the borrow areas should be identified. Since this filling would greatly elevate the roadway, it is likely to bisect productive wildlife habitat and present a major obstacle to animal movements. This impact should also be mitigated along low areas of any selected alignment.	<p>The contractor will be responsible for locating and maintaining the borrow sites during construction. As per the standard NCDOT construction contract, fill material for this project will be excavated from approved borrow sites, and excess waste will be deposited at approved upland sites.</p> <p>A service road study has been completed and is included in the consideration of impacts presented in the FEIS. Impacts to wildlife are presented in Section 4.1.3.7.</p>
9	A large percentage of the proposed western segment of the freeway corridor, shown in Figure 3.3, Future Land Use, appears to be planned for open rural use. A major expressway through the area will create a major stimulus for various types of development. The area of the eastern I-40 Connector has the same designation, and the highway could greatly alter that undeveloped area.	Commercial development pressure will be felt at interchange locations but will be limited by zoning, and the current land limits of public water and sewer availability. The remainder of the bypass is a controlled access facility. Therefore, there will be no access to the freeway except at interchange locations.
10	NCDOT's noise impact criteria for noise increases have different thresholds than EPS's target levels. Noise increases are considered substantial by NCDOT if: a) existing noise levels are less than or equal to 50 dBA Leq and predicted noise levels cause an increase of 15 dB or more, or b) existing noise levels are greater than 50 dB and predicted noise levels cause an increase of 10 dB or more. EPA considers all increases in noise an impact, but believes that increases of 10 dB or greater at any ambient level are substantive. This is based on the fact that a 10 dB increase is perceived as a doubling of noise at all existing noise levels and for every 10 dB increase.	Comment noted.

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11	FHWA has noise abatement criteria for resultant noise levels. Substantial resultant noise levels at residences are those that approach or exceed 67 dB Leq, and for businesses, those that approach or exceed 72 dB Leq. In general, these criteria seem workable to EPA. According to FHWA guidance, noise mitigation must be considered when predicted noise levels meet the criteria.	Comment noted. FHWA guidance has been used when determining the impacts and mitigation measures of the project. Noise impacts and mitigation are presented in Section 4.1.2.1.
12	The western segment noise impacts are predicted for 17 sites. We are assuming Table 4.9 in the DEIS identifies all receptors impacted whether slightly or substantially. Based on this table, EPA considers four receptors predicted to be substantively elevated... It is unclear if the numbers under the "Description" column are intended as separate receptors or as stations sites representing a cluster of residences. It is also unclear as to what kind of receptors were affected, residence or businesses.	<p>Receptors as noted in the Technical Memorandum and DEIS are specific residences unless otherwise noted with a remark. All receptors identified in the alignment corridor were assumed to be FHWA activity category B sites as described in Table 4.8 of the DEIS, which required abatement consideration for noise levels greater than 67dBA Leq. Minimum ambient noise levels were assumed to be 50 dBA Leq in the project area. (Specific existing noise levels by receptors are shown in Table 4.9) NCDOT considers a minimum substantial impact to be a predicted increase of 15 dBA Leq at sites having existing levels of 50 dBA or less; therefore, the 65 dBA Leq contour was used to identify noise sensitive areas.</p> <p>An updated noise impact analysis was conducted for the FEIS. See response to Comment 11 above.</p>
13	NCDOT concluded that noise barriers were considered "economically unreasonable." It is unclear what types of noise barriers have been considered. Synthetic noise barriers are perhaps the NCDOT method of choice, there are other options that are less expensive and perhaps more appropriate in given situations. Vegetative earthen berms, slight alignment shifts, installation of air conditioners, . . .	<p>For the purposes of planning, NCDOT estimates the costs for concrete noise barriers. Additional analysis will be conducted during final design, when other alternative mitigation measures may be considered. Coordination with the community will continue to address concerns related to this issue.</p> <p>An updated noise impact analysis and barrier analysis was conducted for the FEIS. The results of the analysis are summarized in Section 4.1.2.1 of the FEIS.</p>
14	Clarification is needed to document noise impacts for the western segment. There should be verification of the number of impacted residences (17 vs 17 stations), and an estimation of number of residents given. Noise mitigation of various types should be further considered since impacts were documented and mitigation costs may not be much relative to the cost of the entire project.	An updated noise impact analysis and barrier analysis was conducted for the FEIS. The results of the analysis are summarized in Section 4.1.2.1 of the FEIS.
15	It is unclear from the document how the reference percentage of minorities for the study area (27.6%) was determined (pg 4-6). We assume that data	A revised environmental justice assessment was conducted in September of 2005 and has been incorporated in the FEIS (Section 4.1.1.3). In the

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	<p>were used from the 1990 US Census were aggregated among Census blocks as was done for the Central Segment of the bypass. This should be clarified. Also, the DEIS (p 4-6) reveals that the reference percentage of minorities in the study area is exactly the same as the reference percentage of low-income groups. Relocations estimates in Table 4.2 are helpful but they should be placed in perspective relative to census data or a reference percentage. We note that all areas less than the reference percentage of 27.6 percent.</p>	<p>revised assessment, a threshold value of 21.6 percent was used for minority populations. This threshold was set using the average percent of the population that is minority for Brunswick and New Hanover counties using U.S. Census data for 2000. The method used to set the threshold is explained in Section 4.1.2.1 of the FEIS.</p>
16	<p>It is unclear from the DEIS and Noise TM Addendum if the noise-impacted receptors include minorities and/or low-income populations. Are any clusters of minorities and/or low-income groups affected? Is there an EJ societal impact? We note that noise was provided for the central segment of the proposed bypass.</p>	<p>The DEIS and Noise TM do not disaggregate model results by race or economic standing. Preliminary analysis suggested that environmental justice would not be an issue for the Brunswick County portion of the project. Therefore, no attempts were made to estimate race and economic standing of affected residences/residents.</p> <p>As noted in the response to Comment 15 above, a revised environmental justice assessment was conducted in September of 2005 and has been incorporated in the FEIS (Section 4.1.1.3).</p>
17	<p>The low-income populations appear to be similar to the project area by that there are clusters of minorities affected. The percent of minorities appears to be substantially lower in some areas and substantially higher in others.</p>	<p>A revised environmental justice assessment was conducted in September 2005 and has been incorporated into the FEIS (Section 4.1.1.3). In the revised assessment, low-income populations at the block group level were compared to a threshold value determined by the average low-income population for Brunswick and New Hanover counties using 2000 U.S. Census data. It was determined that the recommended alignment would not have a disproportionate impact on low-income populations.</p>
18	<p>NCDOT/FHWA should continue to pursue other mitigative methods to avoid or skirt impacted communities to reduce the number of relocations and community disruption. This appears to be particularly appropriate for the US 17 south interchange.</p>	<p>Avoidance of residential areas and the minimization of relocations is NCDOT's primary ameliorative tool. However, design and environmental constraints dictate that avoidance of all residences is unlikely. The recommended alignment in the FEIS was shifted west from the Preferred Alternative in the DEIS near the southern terminus to avoid and minimize impacts to the community near the US 17 interchange.</p>
19	<p>[Need] clarification on methodology for EJ. "No net effect" appears incorrect. The net effect is not the only factor; rather, how individual pockets or communities may be directly affected. Mitigation should be pursued even if it can not be a total resolution.</p>	<p>A revised environmental justice assessment was conducted and documented in a report dated September 2005. The method used in the revised assessment and results of the assessment is documented in the FEIS. Based on the revised assessment, the recommended alignment is not expected to have a disproportionate negative impact on low-income or minority populations.</p>
20	<p>We note that the top-down method of bridge construction is under</p>	<p>During construction, BMPs for in-water and over-water construction will be</p>

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	consideration for both the Cape Fear and Northeast Cape Fear Rivers. We agree with the environmental merits of this method but would also like to have operational water quality protection safeguards designed into the project.	implemented, which will incorporate monitoring and enforcement of operational standards.
21	As with most highway projects on new location, the long-term impacts from secondary development are of concern to EPA. These impacts have not been covered in the documents. Please discuss the capabilities of local government's development laws pertaining to water quality and wetlands protection. Where local laws fail to protect sensitive resources, it is incumbent on the project sponsor to impose conditions to help protect water quality impacts by development.	Stormwater runoff from the project will be contained as part of the project. NCDOT has no jurisdiction to impose land use and development controls on development. However, local government has the ability to control development through zoning, issuance of permits, and water quality objectives. Brunswick County, and the Towns of Leland and Navassa, have land use plans as required by CAMA. These plans identify sensitive areas, and development and environmental potential and constraints.
22	[With regard to building on fill] we would like assurances that the site is fully considered including long-term changes in floodplains and flow caused by development of watersheds. Also, we recommend selection of culverting methods that limit obstruction of anadromous fish migration.	Culvert design will appreciate and maintain the existing flow of water through floodplains and will be of sufficient design not to obstruct anadromous fish migration.
23	The DEIS indicates that a conceptual mitigation plan will be included in the FEIS and a final mitigation plan established prior to a Section 404 Permit. This is satisfactory provided agencies are not asked to comment on a Section 404 Public Notice prior to a final mitigation plan.	Mitigation for the proposed impacts to wetlands and streams will be arranged through the NCDENR Ecosystem Enhancement Program (EEP) under the Memorandum of Agreement (MOA) between the USACE, NCDOT, and NCDENR of 2002.
24	Compensatory off-site mitigation . . . This tract (USACE Conservation Area) is earmarked by the Corps as a conservation area for mitigating dredging project activities in the Wilmington harbor area. It has been Congressionally authorized but remains unfunded [and should not be considered for mitigation for this project]. If conservation of any land is seriously considered for the mitigation plan, EPA would want to see effective development constraints instituted around the tracts perimeter to buffer the conservation area.	Mitigation for the proposed impacts to wetlands and streams will be arranged through the NCDENR Ecosystem Enhancement Program (EEP) under the Memorandum of Agreement (MOA) between the USACE, NCDOT, and NCDENR of 2002.
25	EPA is requesting much more detailed information be provided on wetlands impacted by the western segment and final plan for mitigation prior to Section 404 permitting decisions.	Mitigation for the proposed impacts to wetlands and streams will be arranged and through the NCDENR Ecosystem Enhancement Program (EEP) under the Memorandum of Agreement (MOA) between the USACE, NCDOT, and NCDENR of 2002.
26	[The project may impact RCW] and the area around the Leland Industrial Park is planned for future development. It is not possible from the information presented to define how much of similar, suitable habitat exists...it is likely there are others proximal to the corridors surveyed...how was the center point of the [foraging] circle located since the colonies have multiple nest sites. A jeopardy opinion is a potentially fatal flaw to the highway alignment so it would be appropriate to describe in the FEIS the	A discussion of predicted direct impacts to threatened and endangered species is included in the FEIS in Section 4.1.3.7. A discussion of indirect and cumulative impacts to threatened and endangered species is included in Section 4.2.5.1.

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	various criteria considered key to the survival of a colony. Unfortunately, there is no information about the sensitivity of the species to highway construction and operational activities such as noise, air pollutants, presence of people, etc.	
27	Two endangered plants, Cooley's meadowrue and the rough-leaf loosestrife are potentially affected by the western segment, and moderately suitable habitats have been identified. A rare habitat, the Battle Royal Bay, is mentioned in the DEIS but not located. It is a low growing type of Carolina bay. We understand it is located in the vicinity of the proposed highway north of the possible junction with US 17 south. It should be discussed relative to project impact.	The Battle Royal Bay habitat is located approximately 2.5 miles north of the proposed junction of the Bypass with US 17 in Brunswick County. A discussion of predicted direct impacts to threatened and endangered species is included in Section 4.1.3.7.
28	Secondary development . . . has not been addressed. . . the broader concern is the indirect impact. Particular emphasis should be given to interchange development.	Land at interchanges will be more attractive for commercial development; however, water and sewer service have been identified as the most important factor affecting many types of commercial services (e.g., restaurants and other services) (Hartgen, 1992). Secondary (indirect) and cumulative impacts are addressed in the project Indirect and Cumulative impact Assessment Technical Document, October 2005 and are summarized in the Section 4.2 of the FEIS. Secondary development around interchanges is addressed.
29	All of Brunswick and New Hanover counties are in attainment for all applicable pollutants. Modeling the projected project's impact for carbon monoxide, the most problematic auto emission, indicates no exceedance of either the 1 hour or 8 hour ambient quality standards. Several interchanges were modeled, where numerous starting and stopped conditions occur indicated no violations would occur. It is noted that the 8-hour standard (9.0ppm) is predicted to be approached (7.1ppm) at an interchange with NC 133 within the central segment in New Hanover County.	Comment noted.
30	Reviewing the available mitigation for fugitive dust during construction seems to indicate measures would be implemented in reaction to excessive dust rather than routinely to preclude a problem condition.	NCDOT construction specifications require contractors to control fugitive dust. Best Management Practices (e.g., the use of water sprayers) will be implemented during construction and are discussed in Section 4.1.4.
31	The indirect impact of secondary development should be addressed with particular emphasis at interchanges.	Secondary (indirect) and cumulative impacts are addressed in the project Indirect and Cumulative impact Assessment Technical Document, October 2005 and are summarized in the Section 4.2 of the FEIS. Secondary development around interchanges is addressed.
32	We rate Alternatives 2 and 3 as "EO-2" (Environmental Objection, more information requested). We rate Alternatives 8 and 9 "EC-2 (Environmental Concerns, more information required). . .of the build alternative presented,	Comment noted. The US 17 interchange design presented in the DEIS was based on Functional Design Plans incorporating desirable DOT and FHWA design standards. During the Preliminary Design Phase further

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	Alternative 9 appears to be the least disruptive. . . Efforts should be taken to reconfigure this interchange (at US 17) to avoid or reduce these expected community impacts. The RCW and endangered plants concerns need to be satisfactorily resolved. Proper resolution requires inclusion of developmental constraints limiting the prospects of future adverse impacts to the endangered species.	evaluation of this interchange was undertaken. Design standards and guidelines have been established by both NCDOT and FHWA, however, measures were taken to further reduce impacts to both the human and natural environment as documented through the project Merger 01 Process and resolved through Concurrence Point 4A.
33	These wetland losses and those for the central and western segments should be addressed in a comprehensive mitigation plan.	Impacts to jurisdictional wetlands is contained in Section 4.1.3.7 of the FEIS. Mitigation for the proposed impacts to wetlands and streams will be arranged through the NCDENR Ecosystem Enhancement Program (EEP) under the Memorandum of Agreement (MOA) between the USACE, NCDOT, and NCDENR of 2002.
34	EPA is willing to participate in interagency efforts to help identify acceptable alternatives for addressing the transportation needs of the Wilmington area.	Comment noted. NCDOT appreciates the opportunity to work with EPA.
35	A preferred alternative has not been identified for either the western or central segments. Therefore, EPA has rated each alternative in each segment separately.	Comment noted.
<b>Department of the Army, Wilmington District Corps of Engineers April 7, 1997</b>		
1	Based on several panels of the May 1986 Brunswick County Flood Insurance Rate Map (FIRM) and the April 1986 New Hanover County FIRM, all of the designated flood plains which would be impacted by the project are mapped approximately, with the exception of the Cape Fear River. The river has detailed flood elevations determined from coastal storm surge, but no floodway is defined. For the affected streams, we suggest that the two counties involved be contacted to ensure compliance with their flood plain ordinances.	A floodplain evaluation was conducted in accordance with Executive Order 11988 "Floodplain Management" and 23 CFR 650, Subpart A "Location and Hydraulic Design of Encroachments on Floodplains." The Cape Fear River has no regulatory floodway within the limits of the project area; therefore, no encroachments or modifications to such a floodway would occur.
2	The proposed bridge should be constructed so as to not interfere with the operation and maintenance of the Federal navigation channel in the Cape Fear River. To accomplish this, we request that a minimum of a 100-foot wide navigation opening be provided, 50 feet from the channel centerline on either side. To assure this clearance, please contact this office prior to design and construction of the bridge.	A navigational clearance no less than 55 feet vertical and no less than 100 feet horizontal will be provided. Coordination with USCG will continue through final design of project.
<b>Department of the Army, Wilmington District Corps of Engineers April 23, 1997</b>		
1	As planning has continued on the three components of the Wilmington Bypass, (TIP R-2633A/B, C and TIP R-2405), it has become apparent that the cumulative environmental impacts associated with these projects will be significant. According to the draft environmental documents for these	Comment noted. NCDOT intends to minimize and avoid impacts to wetland and stream systems as much as possible through the design process and by the use of bridge crossings. Impacts to waters of the United States and efforts to minimize those impacts are described in

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	projects, approximately 400 acres of riverine, bottomland, pocosin, and flatwood wetland habitats will be adversely impacted by the proposed projects. .it is incumbent upon the NCDOT to demonstrate that all impacts to wetlands have been avoided to the maximum extent practicable. You should be aware that this will likely require more bridging of high quality wetlands than is described in the DEIS.	Sections 4.1.3.7 and 4.1.4.8 of the FEIS respectively.
2	We felt that the information regarding the type and level of impact to wetlands adjacent to the Cape Fear River, Toomers Creek and other creek systems in the study area was confusing. Although information regarding the amount of wetlands that could be avoided with additional bridging is provided, these amounts do not correspond with information regarding wetland impacts found in the various environmental impact summary tables.	Comment noted. Impacts to waters of the United States and efforts to minimize those impacts are described in Sections 4.1.3.7 and 4.1.4.8 of the FEIS respectively.
3	Extensive areas of tidal freshwater marshes exist in the study corridor; this habitat type was not identified as being impacted in the document.	The tidal freshwater marsh identified within the corridor will be crossed by bridging therefore no impacts to this wetland system are identified in the FEIS. Impacts to waters of the United States and efforts to minimize those impacts are described in Sections 4.1.3.7 and 4.1.4.8 of the FEIS respectively.
4	Table S -1, Is there any indication that the wet pine flatwoods are located on pine plantations subject to normal silvicultural rotations? This table does not indicate that the project will impact any Pocosin wetlands. Is this correct?	In the time period since the issuance of the DEIS, refined and updated data pertaining to habitats within the expanded study area has become available. Much of the wet pine flatwoods are located on International Paper Company property. Pocosin wetlands had been grouped together with wet pine flatwoods in previous reporting. Data reported in Section 0 of the FEIS indicates that approximately 42 acres of Pocosin wetlands would be impacted. Impacts to waters of the United States and efforts to minimize those impacts are described in Sections 4.1.3.7 and 4.1.4.8 of the FEIS respectively.
5	Page 3-55, Section 3.3.1.4, Wetland Natural Systems. This section should include a discussion of wetland functions that will potentially be impacted by the proposed project. The project has the potential to impact a significant amount of bottomland and tidal freshwater systems.	Comment noted. Impacts to waters of the United States and efforts to minimize those impacts are described in Sections 4.1.3.7 and 4.1.4.8 of the FEIS respectively. Mitigation for the proposed impacts to wetlands and streams will be arranged and through the NCDENR Ecosystem Enhancement Program (EEP) under the Memorandum of Agreement (MOA) between the USACE, NCDOT, and NCDENR of 2002.
6	Page 4-50, Section 4.3.1.3, Avoidance and Minimization. NCDOT should demonstrate that the proposed crossing of the Cape Fear River is at the narrowest, practical location. For example, will shifting the corridor south reduce the total wetland crossing length?	The crossing of the Cape Fear River was partially determined due to the location of the CP & L Plant and other businesses located along the river. In addition to the fixed terminus at US 421 and the potential business relocations along the river, the locations of the Towns of Leland and Navassa were a consideration. Among the 36 alternatives first evaluated

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		<p>in 1991 (see Preliminary Alternatives Analysis Technical Memorandum, 1991) there were four segments west of the Cape Fear River and R-2633C terminus whose elimination affected the position of the river crossing. They were B-15, B-16, B-17, and C-2. B-15 was eliminated due to the impacts and residential relocations in Leland and the conflict with the Leland Land Use Plan. B-16 was eliminated due to the elimination of B-10 and B-15, both impacting the Towns of Leland and Navassa, as well as impacting 401 acres of wetland. B-17 was eliminated for the same associations with B-10 and B-15. Connection between the remaining segments and the R-2633C terminus influenced the position of the river crossing. In addition, there are engineering constraints related to the juxtaposition of the roadway and river as well as the safety limitations of the roadway's degree of curvature.</p>
7	<p>Page 4-50, Section 4.3.1.3, Construction Impacts. It would be helpful if specific construction impacts could be discussed in the final EIS, especially in the vicinity of the Cape Fear River.</p>	<p>The construction methods currently under consideration are Work Bridge Access and Floating Barges. Specific impacts for each of these construction methods are presented in the FEIS (Section 4.1.4.8).</p>
8	<p>Page 2-29, Section 2.3.3, Cost Estimates and page 4-51, Section 4.3.1.3, Avoidance and Minimization. The information regarding the amount of wetlands that will be bridged and filled at the Cape Fear River is confusing. The information seems to indicate that, for each alternative, exactly half of the riverine wetlands will be bridged. This does not agree with the preliminary hydraulic information and bridge lengths found in the <i>Water Resources Technical Memorandum</i>.</p>	<p>Comment noted. The bridge length used in the Water Resources Technical Memorandum (September 1996) account for the minimum hydraulic opening required. As stated on page 2-29 of the DEIS, the bridge lengths used here include both the length of bridge needed for the hydraulic opening, and the length of bridge required to span the wetlands adjacent to the river. This clarification is included in the FEIS.</p>
9	<p>Page 4-51, Section 4.3.1.3, Avoidance and Minimization, Minimization of impacts would also include the further reduction of median widths in wetlands adjacent to the Cape Fear River and other riparian corridors.</p>	<p>The current median width is the minimum width desirable for freeway operating conditions.</p>
10	<p>Page 4-51, Section 4.3.1.3, Mitigation. We encourage NCDOT to include a mitigation plan in the final EIS. This mitigation plan should address impacts to wetland functions and how the proposed mitigation will compensate for the loss of these functions. Although the COE conservation area is mentioned in the document, no information is provided on wetland restoration or enhancement opportunities on this property. NCDOT should not rely entirely on preservation to satisfy compensatory mitigation needs. NCDOT is reminded that avoidance of impacts must be demonstrated prior to the determination of compensatory mitigation needs.</p>	<p>Comment noted. Mitigation for the proposed impacts to wetlands and streams will be arranged through the NCDENR Ecosystem Enhancement Program (EEP) under the Memorandum of Agreement (MOA) between the USACE, NCDOT, and NCDENR of 2002.</p>
11	<p>Page 4-64, Section 4.4, Construction Impacts. We suggest that the list of relevant BMP's also include a commitment not to clear and grub wetlands or high ground adjacent to open water habitat until the actual in-stream work will commence.</p>	<p>Clearing and grubbing of areas will be accomplished using Best Management Practices to minimize soil erosion and surface runoff into open water habitat.</p>

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12	Page S-7, Table S-1, Page 3-51, Table 3.12; and page 4-78, Table 4.10. The information found on page 2-29 regarding additional bridge length and costs relative to wetland fill amounts does not correspond to the information contained in the referenced tables.	<p>Table S-1 does not address additional bridge length or cost. Table 3.12 does not address bridge length or cost. Table 4.10 is identical to Table S-1. The text on page 2-29 addresses those additional bridge lengths and additional costs associated with each alternative when considering the bridging of wetlands in addition to those waterways requiring bridging for hydrological and geotechnical reason alone.</p> <p>The FEIS includes a table with specific wetland types. Bridge lengths were determined through the project Merger 01 Process and formerly agreed to through signing of Concurrence Point 2A.</p>
13	The Natural Resources Technical Memorandum. It appears that the terminus of all 4 alternatives at US 17 in Brunswick County overlay the headwaters of Morgans Branch. We suggest shifting the corridor either east of west to avoid the potential need for stream relocations in this area.	Possible alignment shifts north of the proposed US 17 interchange in order to minimize impacts to the Morgan's Branch headwaters were investigated through the Merger Team process and the alignment was shifted to minimize impacts to this resources. Agreed on the alignment was reached through signing of Concurrence Point 4A.
<p><b>U.S. Department of Commerce, National Marine Fisheries Office</b>  <b>September 1, 1997</b></p>		
1	Shortnose sturgeon may occur in the Cape Fear River crossed by the project. Mitigation measures developed as a result of collaboration between NCDOT, Mary Moser and Fritz Rhode include: Drilled shaft construction with emplacement of turbidity curtains and removal of sediments to upland sites. If drilled shaft construction cannot be used, pile foundation constructed will be restricted to a period outside of a "no in-water construction" window from February through May, temporary bridges or barges will be used to access areas so that temporary dredging will not be required, High Quality Erosion Control Standards will be implemented and strictly enforced during construction, and any dredging required will be restricted to bucket/clam shell dredges. We concur that the proposed Wilmington Bypass is not likely to adversely affect shortnose sturgeon or any other listed species within our jurisdiction if these measures are implemented.	Comment noted. Information pertaining to the moratorium set for protection of the shortnose sturgeon is contained in Section 4.1.4.8 of the FEIS.
<p><b>N.C. Department of Environment, Health and Natural Resources, Division of Parks and Recreation</b>  <b>January 27, 1998</b></p>		
1	The Natural Heritage Program database contains a record for the Greenfield Ramshorn snail from the section of Town Creek close to the confluence with tributaries that may be affected by the proposed project. Although the species has not yet been listed by either the state or federal governments, it status is extremely precarious. Any impacts from this	Water quality protection safeguards will be investigated and, where feasible, deck drainage back to retention ponds will be used. During construction, BMPs for in-water and over-water construction will be implemented, which will incorporate monitoring and enforcement of operational standards. A list of BMPs and NCDOT standards are included

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	project could lead to its extinction. We strongly recommend that sediment and erosion controls that meet standards for protection of High Quality waters be employed for all project segments within the Town Creek drainage. We further recommend that all bridge crossings be provided with spill-containments structures and that no weep holes be placed above the stream channels. Further protection measures should be discussed with the USFWS, NC Nongame and Endangered Wildlife Program and Bill Adams (USACOE).	in Section 4.1.4.
<b>U.S. Department of Commerce, National Marine Fisheries Office January 28, 1998</b>		
1	All riverine wetlands must be bridged with bridge design and construction techniques being selected to minimize impacts to wetlands and fishery resources. Impacts associated with construction techniques are of great concern to the NMFS in areas which support an annual anadromous fish migration. The use of construction techniques which minimize impacts to fisheries is essential for agreement on federal authorization by the NMFS.	Impacts to anadromous fish species will be minimized through bridging the Cape Fear River. Impacts to anadromous fish habitat are addressed in Section 4.1.3.7 and Section 4.1.4.8 of the FEIS.
2	PNAs must be protected from discharges of storm water run-off, both temporary and permanent, as well as, other pollutants associated with highway and bridge construction.	Comment noted. Water quality protection safeguards will be investigated. During construction, BMPs for in-water and over-water construction will be implemented, which will incorporate monitoring and enforcement of operational standards. A list of BMPs and NCDOT standards are included in Section 4.1.4.
3	Seasonal work restrictions protecting anadromous and estuarine fishery resources which include the endangered shortnose sturgeon ( <i>Acipenser brevirostrum</i> ), must be in place and strictly adhered to. Since the shortnose sturgeon is an inhabitant in the Cape Fear River system, in accordance with the Endangered Species Act of 1973, as amended, it is the responsibility of the appropriate federal regulatory agency to review its activities and programs and to identify any activity or program that may affect endangered or threatened species or their habitat. Therefore consultation with our Protected Resources Division at the letterhead address must be initiated. If it is determined that these activities may adversely affect any species listed as endangered or threatened, then formal consultation is required. To date, we have no record of any coordination or consultation with our Protected Resources Division.	Since this comment was registered, NMFS has been involved with NCDOT in reviewing the project's potential to impact anadromous and estuarine fishery resources including the endangered shortnose sturgeon. An agreement was reached through Informal Section 7 Consultations with NMFS that a construction moratorium would be imposed during the months of the spawning run to protect this and other anadromous species. Discussion relating to efforts to avoid and minimize impacts to shortnose sturgeon are contained in Section 4.1.3.7 and Section 4.1.4.8 of the FEIS
4	An acceptable mitigation plan to compensate for unavailable wetland losses must be an integral part of the project plans. Any mitigation proposed must be in accordance with the 1990 MOA between the EPA and the DOA concerning the Determination of Mitigation under the Clean Water Act	Mitigation for the proposed impacts to wetlands and streams will be arranged through the NCDENR Ecosystem Enhancement Program (EEP) under the Memorandum of Agreement (MOA) between the USACE, NCDOT, and NCDENR of 2002.

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	Section 404 (b)(1) Guidelines. As currently proposed, none of the alternatives have demonstrated compliance with this MOA in the areas of wetland avoidance and impact minimization.	
5	Recent mitigation plans for wetland losses associated with other sections of the Wilmington Bypass have included wetland preservation as a component. While wetland preservation could be a part of a mitigation plan, preservation alone is unacceptable to the NMFS as a total mitigation package. At a minimum, adequate wetland mitigation must provide a 1:1 replacement ratio, in-kind, and in the same river basin as that of the losses.	Mitigation for the proposed impacts to wetlands and streams will be arranged through the NCDENR Ecosystem Enhancement Program (EEP) under the Memorandum of Agreement (MOA) between the USACE, NCDOT, and NCDENR of 2002.
<b>N.C. Department of Environment Health and Natural Resources, Division of Coastal Management February 5, 1998</b>		
1	The project will require a CAMA Major Permit. It is recommended that final bridge length determinations be based not only on hydraulic considerations, but also on minimization of wetland impacts, especially those wetlands whose productivity as a system is dependent on tidal inundation and overbank flooding.	Bridge lengths were determined through the Section 404/NEPA Merger Process for the project. Agency field reviews of bridge lengths were conducted on 1/11/05 as part of the Merger process and included representatives from NCDOT.
2	Unavoidable coastal resource loss should be mitigated pursuant to 7M 0700.	Comment noted.
3	Roadway design should minimize impacts to surface waters and wetlands from stormwater runoff.	Stormwater runoff from the project will be contained as part of the project. During the preliminary engineering design of the recommended alignment, stormwater drainage systems will be designed to meet the requirements of the National Pollutant Discharge Elimination System (NPDES) program. State stormwater certification (Regulation 15A NCAC 2H.1000) would also be required. Requirements for this certification vary by the classifications of waters to which the project would drain.
4	Strong consideration should be given to the use of design features which minimize the direct discharge of stormwater to surface waters including closed bridge drainage systems, grassed swales and shoulder sections in lieu of curb and gutter, as well as stormwater detention basins.	Water quality protection safeguards will be investigated. During construction, BMPs for in-water and over-water construction will be implemented, which will incorporate monitoring and enforcement of operational standards. A list of BMPs and NCDOT standards are included in Section 4.1.4.7.  BMPs to control stormwater runoff include directing sheet flow over grassed shoulder slopes and shallow flat slope ditches, using stone lined ditches in lieu of rigid concrete pavement, and using storage where necessary and practicable to reduce discharge of roadway runoff into sensitive receiving waters. <sup>265</sup> In flat areas, such as the project site, long-term stormwater drainage is typically provided through grass swales parallel to the roadway. Vegetated swales will reduce water quality impacts

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		to surface water by catching oil, grease, and other pollutants and preventing them from draining to the area streams and rivers.
<b>N.C. Wildlife Resources Commission, Habitat Conservation Program February 5, 1998</b>		
1	We have reviewed the permit application to assess the potential impacts of the four build alternatives on wetlands, rare and endangered species, rare natural community types, wildlife habitat and fishery resources. At this time, Alternative 9, with avoidance and minimization measures, appears to least damaging new location alternative.	Comment Noted  Through implementation of the project Merger 01 Process, avoidance and minimization was achieved through Concurrence Point 4A.
2	Specific avoidance and minimization measures that need to be explored are bridging the entire Cape Fear River and Toomers Creek floodplains, providing bridge clearances to allow for public access to the cutoff portion of Sutton Lake Game Lands, crossing wetlands at the narrowest locations, and designing perpendicular creek crossings, and adhering to in-water work moratoria as required.	Proposed design plans include bridging of the Cape Fear River and its adjacent wetlands. Through implementation of the project Merger 01 Process, avoidance and minimization was achieved through Concurrence Point 4A.
3	NCDOT should immediately begin searching for wetland mitigation in the vicinity of this project. Although NCDOT has existing wetland mitigation sites in the area, we know of no suitable riverine mitigation to compensate for the impacts of R-2633A/B.	Comment Noted
<b>N.C. Wildlife Resources Commission, Habitat Conservation Program February 6, 1998</b>		
1	After reviewing the potential impacts to wetlands, rare and endangered species, rare natural community types, wildlife habitat and fishery resources, we feel that Alternative 9 would be the least damaging build alternative. Although wetland mitigation has only been discussed informally at this time, we expect an opportunity to review wetland mitigation in the final 404 Permit package. We find Alternative 9 consistent with our Policies and Guidelines for Conservation of Wetlands and Aquatic Habitats officially adopted by the Wildlife Resources Commission.	Comment Noted
<b>Department of the Army, Wilmington District Corps of Engineers February 20, 1998</b>		
1	After review of your proposal, the National Marine Fisheries Service (letter dated Jan. 28, 1998) and the North Carolina Wildlife Resources Commission (letter dated Feb. 05, 1998), provided comments regarding your proposal. As you are aware, significant concerns relative to potential impacts to high quality wetlands adjacent to the Cape Fear River, Toomers Creek, and other locations in the project area have been raised. It is our	Impacts to these wetlands will be minimized to the greatest extent possible by avoidance and bridging. Impacts to waters of the United States are discussed in Section 4.1.3.7 of the FEIS.

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	understanding that you intend to address these issues in the Final EIS.	
<b>Department of the Army, Wilmington District Corps of Engineers March 16, 1998</b>		
1	We have concluded Alternative 9 represents the least environmentally damaging practicable alternative of the four evaluated. We urge DOT to commit to bridging all wetlands contiguous with the Cape Fear River. Also, a cursory inspection of the southern end of Alternative 8 and 9 revealed the proposed roadway lies on top of an unnamed tributary to Morgan Branch. Efforts to relocate the freeway out of this area should be made. A final permit decisions will not be made until all practicable efforts to minimize wetland impacts have been undertaken and a mitigation plan provides for the full functional replacement of impacted waters and wetlands for the entire project is reviewed and approved by the Corps of Engineers and the NCDWQ.	Comment noted. Through implementation of the project Merger 01 Process, avoidance and minimization was achieved through Concurrence Point 4A.
<b>N.C. Department of Environment Health and Natural Resources, Division of Coastal Management April 8, 1998</b>		
1	A Consistency Determination will be required for the project. A CAMA Permit will be required for those portions of the project that are located within Areas of Environmental Concern.	Comment noted.
2	A 401 Water Quality Certification is required from the NC Division of Water Quality.	The recommended alignment will be designed to comply with state water quality standards. Water quality certification will be obtained prior to construction, in accordance with Section 401 of the Clean Water Act.
3	Sedimentation and Erosion Control requirements and the Memorandum of Agreement between the DOT and Division of Land Quality must be adhered to.	Comment noted.
4	Mitigation to compensate for unavoidable wetland losses should be developed and conducted in coordination with the NC Division of Parks and Recreation Natural Heritage Program, the NC Wildlife Resources Commission and the NC Division of Marine Fisheries and the Division of Coastal Management.	Mitigation for the proposed impacts to wetlands and streams will be arranged through the NCDENR Ecosystem Enhancement Program (EEP) under the Memorandum of Agreement (MOA) between the USACE, NCDOT, and NCDENR of 2002.
5	The Cape Fear River Corridor Plan should be a factor considered during project and construction planning.	The project was evaluated for consistency with local land use and development plans including the Cape Fear Corridor Plan, and was found to be consistent with the goals and objectives of these plans.
6	We recommend that the DOT pursue the least environmentally damaging alternative, Alternative 9 appears to be the least environmentally damaging.	The Alternative was selected as the Preferred Alternative in 1998 as documented in Chapter 1 of the FEIS.
<b>Department of the Army, Wilmington District Corps of Engineers May 26, 1998</b>		

#	AGENCY COMMENT	RESPONSE
1	After review of the Public Notice, the issues raised by NCDENR letter of April 8, 1998 should be addressed in the final EIS.	NCDENR's issues were addressed through the project's Section 404/NEPA Merger Process which was entered into in 1999.
<b>N.C. Department of Cultural Resources November 7, 1996</b>		
1	We concurred that none of the properties appear eligible for listing in the National Register of Historic Places. All parties present signed a concurrence form to that effect. The only property within the area of potential effect for the reasonable and feasible alternates that is eligible for the National Register is the Goodman House and Doctor's Office.	Comment noted.
<b>N.C. Department of Cultural Resources October 1 2003</b>		
1	We concur with URS Corporation that no further archaeological investigation is needed in connection with seven of the nine sites assessed. One site has been recommended eligible for listing in the National Register of Historic Places and if avoidance is not possible impact mitigation should be implemented prior to construction. Another site is outside the currently proposed right-of-way and no other work is required at this site. However, if right-of-way changes require construction activity to impact this site, NCDOT must comply with North Carolina General Statutes, Chapter 65, Article 5, concerning treatment of cemeteries.	Comment noted.
<b>N.C. Department of Environment and Natural Resources February 24, 2004</b>		
1	It has come to our attention that the Wilmington Bypass will have a direct impact on important biological resources where the proposed roadbed crosses the 421 Sand Ridge Significant Natural Heritage Area just south of the Sutton electrical plant	Comment noted. Impacts to Natural Heritage Program Identified Priority Areas are presented in Section 4.1.3.5 of the FEIS.
2	It appears there may be an opportunity to greatly reduce this impact by a very slight realignment of the roadbed.	Comment noted. Through implementation of the project Merger 01 Process, avoidance and minimization was achieved through Concurrence Point 4A.
3	It is our understanding that the roadbed is currently planned to cross through the northern portion of the area outlined in the attached image [see Appendix E]. This area contains the population of Pickering's dawnflower ( <i>Stylisma pickeringii</i> var. <i>pickeringii</i> ) that is believed to be the source of the original 1834 collection from which the species was first described, and thus is regarded as the "type site" for the species. Also present at this site is a significant part of one of only two populations of Florida scrub frostweed ( <i>Helianthemum nashii</i> ) known outside of peninsular Florida. This	Comment noted. Impacts to protected species are presented in Section 4.1.3.5.

#	AGENCY COMMENT	RESPONSE
	area and the adjacent habitat support populations of four rare animals: Eastern fox squirrel ( <i>Sciurus niger</i> ), Southern hognose snake ( <i>Heterodon simus</i> ), Coachwhip ( <i>Masticophis flagellum</i> ), and Chicken turtle ( <i>Dierochelys reticularis</i> ).	
4	Of great importance is the fact that the area outlined in the attached image [see Appendix E] west of the railroad bed and south of the Sutton plant contains what appears to be the best remaining unaltered natural habitat for these species in all of the 421 Sand Ridge natural area. The outlined area includes the only remaining occurrence of the Xeric of the Sand Barren Variant; this latter community variant is critical to the dawnflower and frostweed populations.	Comment noted.
5	By moving the proposed roadbed slightly northward towards the Sutton plant, nearly all of the most critical habitat and rare plant populations may be saved, and habitat fragmentation will be reduced.	A lateral shift of the roadbed is not feasible. The crossing of the Cape Fear River was partially determined due to the location of the CP & L Plant and other businesses located along the river. The fixed terminus at US 421 and the potential business relocations along the river were considerations in selecting the proposed route. Among the 36 alternatives first evaluated in 1991 (see Preliminary Alternatives Analysis Technical Memorandum, 1991) there were four segments west of the Cape Fear River and R-2633C terminus whose elimination affected the position of the river crossing. They were B-15, B-16, B-17, and C-2. B-15 was eliminated due to the impacts and residential relocations in Leland and the conflict with the Leland Land Use Plan. B-16 was eliminated due to the elimination of B-10 and B-15, both impacting the Towns of Leland and Navassa, as well as impacting 401 acres of wetland. B-17 was eliminated for the same associations with B-10 and B-15. Connection between the remaining segments and the R-2633C terminus influenced the position of the river crossing. In addition, there are engineering constraints related to the juxtaposition of the roadway and river as well as the safety limitations of the roadway's degree of curvature.
6	The status of referenced species was provided.	Comment noted.
<b>U.S. Fish and Wildlife Service June 17, 2004</b>		
1	Regarding Dr. Gregory Thorpe's letter of April 16, 2004 and Phillip Harris, III' letter of June 2, 2004; two documents were provided (Wilmington Bypass, Addendum to Natural Systems Technical memorandum, April 2004 and Red-Cockaded Woodpecker Foraging Habitat Analysis for Brunswick County Cluster #1) that listed NCDOT's biological determinations for 14 federally protected species.	Comment noted.
2	By way of letter dated May 11, 2004 the FWS provided comments and	Comment noted.

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	concurred with all but two determinations. In light of additional information provided on June 2, 2004; these comments supersede our May 11, 2004 letter.	
3	FWS believes the project will have no effect on the green sea turtle, Kemp's ridley sea turtle, leatherback sea turtle and loggerhead sea turtle, piping plover, seabeach amaranth, the eastern cougar and Cooley's meadowrue.	Comment noted.
4	NCDOT has rendered a "no effect" conclusion for the bald eagle. Potential habitat exists but, given the results of surveys, FWS would concur with a "may affect, not likely to adversely affect conclusion for the bald eagle.	The FEIS reports a Biological Conclusion of No Effect for the bald eagle. No bald eagle nests have been recorded by the USFWS, NCWRC, NHP, or found during the rare species surveys, thus the bald eagle is not expected to occur within the project area
5	We recommend that you contact NOAA Fisheries with your request for concurrence for the shortnose sturgeon.	Informal Section 7 Consultations have been held with NCDOT, NCDMF, USFWS, and NMFS concerning the shortnose sturgeon.
6	Based on information provided, FWS concurs that the project may affect, but is not likely to adversely affect rough-leaved loosestrife, wood stork, West Indian manatee, and red-cockaded woodpecker..	Comment noted, the FEIS reflects this concurrence.
7	Please replace the old guidelines, <i>Precautionary Guidelines for General Construction in areas Which May be Used by the West Indian Manatee in North Carolina</i> , 2003; with the new guidelines available at <a href="http://nc-es.fws.gov/mammal/mammal.html">http://nc-es.fws.gov/mammal/mammal.html</a> .	Comment noted - guidelines are updated in the FEIS and are included in Appendix G.
<b>N.C. Division of Water Quality August 27, 2004</b>		
1	At the last Merger Team meeting it was determined that no new information was presented by NCDOT that warranted re-opening CP-4A. The NCDOT intended to schedule a public meeting with the Spring Hill community and asked that each Merger Team agency have a representative present to answer questions. While DWQ supports the concept of a public hearing with the Spring Hill Community and will gladly attend, we feel it is premature to have a public meeting at this time.	Comment noted.
2	DWQ requests NCDOT explore the following issues before proceeding with a public meeting: DWQ asks that NCDOT perform the same noise impact study for the Center-Green and the 4A alternative as the new alternative 1/Center/East-Orange alternatives.	A supplement to the Noise Technical Memorandum was produced in September 2005 and compares the Red, Green, and Pink alternatives and was provided to Merger Team members.
3	There were some discrepancies in bridge lengths among the tables for the Orange, Green and Red alternatives; please correct discrepancies for a more accurate comparison among alternatives. DWQ prefers to see wetlands bridged rather than filled. It would be beneficial to see a comparison that shows the wetlands bridged with the appropriate bridge	The bridge lengths presented to the Merger Team are accurate based on the assumed lengths prior to determining bridge lengths in the field. Bridge lengths for all potential alternatives were determined at a 1/11/05 field meeting with the Merger Team.

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	lengths required.	
4	DWQ requests the correct number of residences and legitimate businesses that would be relocated by each alternative.	The relocations for each alternative were provided to the project Merger Team for consideration in selecting the Concurrence Point 4A alignment.
5	DWQ would like to see a comparative analysis between the Red, Green and Orange alternatives and the distance to the affected property owner's home.	A comparative analysis was performed and presented to the project Merger Team as documented in Chapter 7 of the FEIS. Concurrence on CP 4A was reached on an alignment in this area on November 17, 2005.
6	DWQ requests that other alternatives be considered. DWQ is concerned with the higher impact numbers associated with each new alternative and is available to assist NCDOT with the development of additional alternatives.	This issue was resolved through the project Merger Process. Concurrence on CP 4A was reached on an alignment in this area on November 17, 2005.
<b>U.S. Federal Highway Administration March 17, 2005</b>		
1	It is the position of the FHWA that selecting the Red alignment is in non-compliance with the principles of Executive Order 12898 on environmental justice. The Red alignment was developed without full and fair public involvement of the impacted Spring Hill community.	The environmental justice assessment was updated and documented in a report dated September 2005. The Spring Hill community was fully involved in the revised assessment. The results of the revised assessment indicated that the Red alignment would have a disproportionate adverse effect on minority populations in the community of Spring Hill. With the results of the revised assessment and through the avoidance and minimization process, the Merger Team reached concurrence on CP 4A on a revised alignment shifted away from Spring Hill.
2	It is the belief of FHWA that the Spring Hill community did not have the opportunity to fully and fairly participate in the transportation decision-making process.	A revised environmental justice assessment was conducted and documented in a report dated September 2005. The Spring Hill community was fully involved in the revised assessment.
3	There is a high potential for a Title VI complaint if the Red alternative remains as the selected alignment. The 1996 DEIS documents similar efforts were made to avoid and minimize impacts in communities in Leland and Navassa. The question will be raised if there were efforts made to avoid and minimize impacts to the community of Spring Hill. With the LEDPA corridor being of a sufficient width to avoid or minimize impacts to this community, failure to reduce impacts could result in a Title VI complaint.	A revised environmental justice assessment was conducted and documented in a report dated September 2005. The Spring Hill community was fully involved in the revised assessment. The results of the revised assessment indicated that the Red alignment would have a disproportionate adverse effect on minority populations in the community of Spring Hill. With the results of the revised assessment and through the avoidance and minimization process, the Merger Team reached concurrence on CP4a on a revised alignment shifted away from Spring Hill.

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## **7.2 PUBLIC INVOLVEMENT**

In this section, methods used for public outreach are described and a brief summary of public meetings is provided. Public meetings were conducted in four forums: elected officials' meetings, citizens' informational workshops, small group meetings, and a public hearing.

### **7.2.1 OUTREACH METHODS**

Outreach methods prescribed in the PIP and used throughout the project included mailing lists, newsletters, and a telephone hotline.

#### **7.2.1.1 Mailing List**

A computerized mailing list consisting of elected officials, civic and business groups, local governmental agencies, and interested persons was compiled at the beginning of the study and continually updated throughout the study process. The mailing list, as well as announcements in local papers was used to notify the public of the study's initiation, progress and proposals as well as dates, times and locations of the citizens' informational workshops. At the time of the DEIS preparation, the list contained 964 names. At the time of the preparation of the FEIS, the mailing list contained 1,190 names.

#### **7.2.1.2 Newsletters**

Newsletters addressing R-2633A/B were prepared and mailed to project stakeholders at the following points throughout the study:

November 1990	June 1994	February 1998
March 1991	January 1996	January 2003
June 1991	October 1996	February 2003
August 1992	September 1997	March 2005

In addition to containing information about the study, the newsletters included a form for interested persons to make comments or add their names to the mailing list. The February 2003 and March 2005 newsletters were hand delivered by mailbox canvassing of the neighborhoods on the south side of US 17 in the vicinity of the proposed interchange. The March 2005 newsletter was also hand delivered by mailbox canvassing and door-to-door delivery in the Spring Hill Community. The purpose of hand delivering the newsletters was to augment the mailing and newspaper notification of the upcoming workshops and to broaden project awareness.

It should be noted that in early newsletters, the project is referred to as R-2633B and the future Wilmington Bypass segment west of US 421 is referred to as R-2633A. The correct TIP number is R-2633C for the proposed project in New Hanover County and R-2633A/B for the subject segment west of US 421.

#### **7.2.1.3 Telephone Hotline**

A toll-free telephone number was published in each newsletter and made available to local organizations and agencies in order to provide immediate response to public concerns and comments. Responses from knowledgeable staff were provided either immediately or within one business day.

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## 7.2.2 MEETING SUMMARY

Meetings were held in four formats: elected officials' meetings, citizens' informational workshops, small group meetings, and a public hearing. A timeline of when meetings were held, descriptions of the meeting formats, and brief summaries of meeting proceedings are summarized in this section. More detailed records of each meeting are provided in Appendix H.

### 7.2.2.1 Timeline of Public Involvement Activities

DATE	DESCRIPTION
11/29/1990	Elected officials meeting
11/29/1990	Citizens' informational workshop
03/13/1991	Small group meeting – Navassa Town Council
03/14/1991	Small group meeting – Leland Town Council
03/27/1991	Elected officials meeting
03/27/1991	Citizens' informational workshop
04/11/1991	Small group meeting – St. James A.M.E. Church
05/07/1991	Small group meeting – New Hanover County Board of Commissioners
02/20/1996	Citizens' informational workshop
12/1996	DEIS submitted for review
10/09/1997	Public hearing for DEIS
02/11/2003	Small group meeting – Navassa community
02/20/2003	Citizens' informational workshop
04/08/2004	Small group meeting – Spring Hill community
12/13/2004	Small group meeting – Spring Hill community
03/31/2005	Elected officials' meeting
03/31/2005	Citizens' informational workshop
05/17/2005	Small group meeting – Spring Hill community
06/29/2005	Small group meeting – Spring Hill community

### 7.2.2.2 Description of Meeting Types

#### **Small Group Informational Meetings**

Nine small group meetings were held throughout the period of study. Staff members were available throughout the study process for presentations and question-and-answer sessions with neighborhood organizations, civic groups, and local organizations. The public was informed of staff availability for meetings through the newsletters.

#### **Citizens' Informational Workshops**

Five citizens' informational workshops were held throughout the period of study. Two workshops were held in order to receive public comments on the range of preliminary alternatives prior to the public hearing for the DEIS. All workshops were held in an "open house" format.

#### **Elected Officials' Meetings**

Elected officials meetings were held two times during the study and coincided with citizens' informational workshops. Local elected officials and planning organization members were advised of staff availability for presentations.

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## **Public Hearings**

A public hearing was held following the submittal of the DEIS in order to formally hear comments pertaining to the DEIS.

### **7.2.2.3 Chronological Summaries of Meeting Proceedings**

#### **November 29, 1990 – Elected Officials’ Meeting**

The initial elected officials’ meeting was held on Thursday, November 29, 1990, at 2:00 P.M. at the Navassa Town Hall located in Navassa, North Carolina. The meeting was conducted by the URS project manager for the study. Twenty-eight public officials and members of the press were in attendance. NCDOT and URS study team members were introduced and the SEPA EIS process was explained.

Graphics consisted of a board-mounted blow-up of the project schedule as well as a mounted 1"=1000' scale aerial photo mosaic of the study area delineating major cultural features. Handouts consisted of a small study area map, meeting agenda, and project schedule. The group was briefed on the study process and the meeting was concluded with a presentation of the workshop slide show.

During the question and answer period, the following points were raised:

- Support was expressed for connecting a bypass between I-40 and US 421 and then upgrading US 421 and US 17.
- Many representatives from Brunswick County expressed concern that the bypass would stop at US 421 and only meet the needs of Wilmington and New Hanover County.
- One official expressed concern that since this was a SEPA document, federal funding could never be obtained and that the bypass would be precluded from being incorporated into the existing US 17 system.
- Officials from both Navassa and Leland expressed concern that a bypass running through their communities would have severe land use impacts.
- Some officials expressed the view that the bypass should be located near the Brunswick County Industrial Park.
- Other questions were focused upon standard EIS procedures and schedules.

The meeting resulted in a newspaper article in the *Wilmington Morning Star*.

#### **November 29, 1990 – Citizens’ Informational Workshop**

The initial citizens’ informational workshop was held on Thursday, November 29, 1990 from 4:00pm to 8:00pm at the Leland Middle School Cafeteria located in Leland, North Carolina. The meeting was held in an "open house" format. Four URS project team members and two NCDOT project team members were available to answer questions and provide information to those in attendance. At this time, the project extended to US 17 in Brunswick County and only SEPA applied.

Workshop exhibits included a 1"=400' aerial of the study area, a board-mounted 1"=1000' scale aerial of the study area depicting cultural features, a 1"=1000' scale aerial of the study area

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utilized as a draw-your-own-corridor exhibit, and a board-mounted project schedule. In addition, a brief slide show explaining the EIS process and project schedule was shown throughout the evening.

A total of 128 citizens registered at the workshop, 11 of whom completed a comment card or mailed comments in shortly after the workshop. Based on these comments, as well as conversations between citizens and the study team, the following major discussion items were identified:

#### Bypass Locations - Brunswick County

The bypass should be located away from downtown Navassa and Leland and closer towards the Leland Industrial Park.

The bypass should be located closer to Leland and Navassa.

The bypass should only connect I-40 to US 421 and then improvements should be made to existing US 421 and US 17.

#### Bypass Locations - New Hanover County

Wrightsboro citizens, a New Hanover County community located north of Wilmington, were very concerned that the workshop was not held in their community. Project staff agreed to hold a small group meeting in the area (this meeting was subsequently held on April 11, 1991, at the St. James A.M.E. Church located in Castle Hayne, North Carolina). The next Citizens Informational Workshop will also be held in this area.

A number of individuals felt the bypass should be located north of Castle Hayne.

#### Miscellaneous Issues

A number of abandoned landfills and other potential hazardous material sites were located on the exhibits by citizens.

There was a great deal of confusion among the participants regarding the Wilmington Bypass study and the ongoing thoroughfare plan update. Many citizens had attended recent meetings held by the Statewide Planning Group and were convinced that a corridor had already been selected.

Through the workshop, the toll-free telephone number, and returned mail-in forms following the workshop, an additional 75 people (approximately) requested to be added to the current mailing list of 500 persons.

#### **March 13, 1991 – Small Group Meeting – Navassa Town Council**

The SEPA process was explained to the town council and citizens and the meeting was opened to questions from attendees. Generally, issues discussed included the location of interchanges, opposition to one proposed alignment, the timing of right-of-way condemnation, options available to those who do not want to sell property to the state, who selects the preferred alternative, when the preferred alternative will be selected, where citizens can review environmental documents, and whether it would be less expensive to widen existing roads.

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### **March 14, 1991 – Small Group Meeting – Leland Town Council**

The SEPA process was explained to the town council and citizens and the meeting was opened to questions. Generally, issues discussed included whether segment-specific impact data would be available at the upcoming citizens' informational workshop, the importance of noise impacts in the assessment process, the location of interchanges, criteria for locating interchanges, whether the US 17/74/76 bridge over the Brunswick River would be replaced, whether crossing utilities is a problem, the speed limit of the new road, types of access controls, and the deadline for comments on the preliminary alternatives.

### **March 27, 1991 – Elected Officials' Meeting**

The second elected officials' meeting was held on Wednesday, March 27, 1991, at 1:00pm in the Wilmington City Council Chamber located in Wilmington, North Carolina. The meeting was conducted by the URS project manager for the study. Fourteen public officials and members of the press were in attendance. NCDOT and URS study team members were introduced. The project schedule, SEPA EIS process and progress to date were reviewed.

Graphics consisted of a board-mounted blow-up of the project schedule as well as a mounted 1"=1000' scale aerial photo of the study area with an overlay depicting the 26 preliminary alternatives. Handouts consisted of a small preliminary alternatives map, meeting agenda, project agenda, evaluation criteria and impact tables for the preliminary alternatives. The group was briefed on the study process and concluded with a presentation of the workshop slide show. During the question and answer period, the following points were made:

A number of officials wanted to know if the traffic analysis would be completed prior to the selection of the reasonable and feasible alternatives.

One Brunswick County official asked if there were alternatives other than the 26 preliminary alternatives under consideration. He indicated that the County would send a letter asking why NC 87 was not considered as an alternative route.

A number of public officials wanted to know the deadline for comments that would influence the selection of the reasonable and feasible alternatives.

Some officials expressed concern that if the bypass only went to US 421, it would never be extended into Brunswick County.

Board of Transportation member Estell Lee stated that she had made it clear to the Board of Transportation that the extension of the bypass to US 421 would be a temporary solution and that the bypass would be eventually extended into Brunswick County.

Some Brunswick County officials said they would support a bypass to US 421 with widening of existing US 421 if it was only a temporary solution.

Other questions focused upon standard EIS procedures and schedules.

This meeting and the following public workshop resulted in two newspaper articles in the *Wilmington Morning Star*.

### **March 27, 1991 – Citizens' Informational Workshop**

The second citizens' informational workshop was held on Wednesday, March 27, 1991, from 4:00pm to 8:00pm in the Emma B. Trask Middle School Cafeteria located in Wilmington, North

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Carolina. The meeting was held in an "open house" format. Four URS project team members and two NCDOT project team members were available to answer questions and provide information to those in attendance. At this time, the project extended to US 17 in Brunswick County and only SEPA applied.

Workshop exhibits included a board-mounted 1"=1000' scale aerial of the study area depicting cultural features and the 26 preliminary alternatives, a table-mounted 1"=1000' scale aerial of the study area depicting natural features and the 26 preliminary alternatives, a board-mounted project schedule, a board-mounted typical section, board-mounted lists of the evaluation factors and board-mounted impact tables for the 26 preliminary alternatives. In addition, a brief slide show explaining the SEPA EIS process and project schedule was shown throughout the evening.

A total of 118 citizens registered at the workshop, nine of whom completed comment sheets and/or mailed their comments to URS and or NCDOT following the workshop. Based on these comments as well as conversations between citizens and the study team, the following major discussion items were identified:

#### Bypass Locations - New Hanover County

Several area residents believe that the proposed connection to I-40 should be moved slightly north to the existing SR 1336 (Sidbury Road) overpass.

Two individuals mentioned that the proposed corridor(s) should be moved further north into Castle Hayne.

Several individuals indicated a preference for the construction of a new corridor from I-40 to US 421 then continuing down the existing US 421, US 74/76 and US 17 corridors.

A resident of Castle Hayne recommended using the existing Blue Clay Road alignment for the proposed corridor.

Several Wrightsboro residents indicated that Segment A-4, and the alternatives associated with it, are far too disruptive to the community.

One citizen objected to all alternatives involving Segment A-1 because of its involvement with wetlands, floodplains and impacts to residences.

A number of citizens said there was a need for an interchange at Blue Clay Road due to the heavy industrial zoning of the surrounding property.

A number of citizens felt that existing NC 210 (Pender County) should be the route for the bypass.

One citizen objected to any alternative crossing Lake Sutton.

One citizen objected to any alternatives involving Segments A-9 and A-10 due to impacts on wetland areas.

A number of citizens expressed support for Alternative 2.

One Wrightsboro citizen wrote in support of Alternative 23 and was opposed to any alternative involving Segments A-4, A-9 and A-10.

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### Bypass Locations - Brunswick County

A Brunswick County resident thinks that existing NC 87 should be studied as a potential corridor segment.

A number of Brunswick County citizens objected to any alternative passing through Leland or Navassa.

A Brunswick County citizen supports any alternative that passes through the Leland Industrial Park.

A number of Brunswick County residents objected to the low clearance of the existing US 17/74/76 bridge over the Brunswick River. They said that any widening of US 17/76/76 should provide for greater navigational clearance.

### Miscellaneous Issues

Retired residents of the Wrightsboro community are concerned about being forced to relocate at this time in their lives.

Several residents of the Wrightsboro community expressed interest in a possible small group meeting, particularly after the selection of the reasonable and feasible alternatives.

Wrightsboro community residents would like to know more about NCDOT relocation assistance and procedures.

A Brunswick County resident indicated that as soon as the preferred alternative is selected, the NCDOT should coordinate with both Brunswick and New Hanover counties to restrict any further development within the corridor in order to keep control of right-of-way acquisitions.

Approximately 20 persons requested to have their names placed on the current mailing list of over 500 people through the workshop, the toll-free telephone number, and returned mail-in forms following the workshop.

### **April 11, 1991 – Small Group Meeting – St. James A.M.E. Church**

The meeting was requested by Reverend Anthony Watson and attended by about 113 citizens. The study process was explained and was followed by a question and answer session. Questions generally revolved around bypass alternatives, the EIS process, means of mitigating community impacts, and other issues.

### **May 7, 1991 – Small Group Meeting – New Hanover County Board of Commissioners**

The meeting was requested by Commissioner Fred Retchin and was attended by approximately 125 citizens. Key points raised in discussion included the consideration of upgrading existing facilities rather than building a new road and potential traffic problems for Wrightsboro citizens caused by an interchange at US 117/ NC 133.

### **February 20, 1996 – Citizens' Informational Workshop**

The third Citizens Informational Workshop was held on February 20, 1996, from 5:00 P.M. to 8:00 P.M. in the Leland Middle School Cafeteria in Leland, North Carolina. The meeting was held in an "open house" format. Five URS project team members, four NCDOT project team

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members, and one FHWA project team member were available to answer questions and provide information to those in attendance.

Workshop presentations included seven exhibits depicting a typical roadway cross-section, the project study area and adjacent project R-2633C, preliminary alternatives (on aerial photograph), existing land uses (on aerial photograph), National Wetland Inventory wetlands (on aerial photograph), the project schedule, and a NEPA process flowchart.

A total of 71 citizens registered at the workshop, six of whom completed comment sheets.

### **October 9, 1997 – Public Hearing for DEIS**

The purpose of the public hearing was mainly to gather comment on the four alternative corridor locations for R-2633A/B. A history of the project, description of the possible geographic location of the project corridor, tentative project schedule and instructions for providing comment were provided during the hearing. Comments provided during the hearing are summarized in further detail in Appendix H, but generally included concerns regarding the accuracy of some information in the DEIS, the alternatives eliminated from further study, impacts to personal property, impacts on traffic, and delaying the project schedule for the A/B portion of the project.

### **February 11, 2003 – Small Group Meeting – Navassa Community**

The meeting, requested by Eulis Willis, Mayor of Navassa, was held at Leland Middle School at 6:30pm. There was an opportunity for residents of the Town of Navassa to raise questions regarding the project. The main issues discussed at the meeting included property access, impacts to properties, changes in traffic, land values, noise and an old packing house.

### **February 20, 2003 – Citizens' Informational Workshop**

A fourth citizens' informational workshop was held on February 20, 2003, from 4:00pm to 7:00 pm in the Leland Middle School cafeteria located in Leland, North Carolina. The workshop was held in an "open house" format. Four URS project team members, seven NCDOT project team members, and one FHWA project team member were available to answer questions and provide information to those attending.

Workshop presentations included exhibits of two sets of project maps depicting the study area, approximate right-of-way limits, proposed centerline, and proposed bridge lengths. Other displays available for review included a board displaying the DEIS Alternatives, the NEPA/404 Merger Process, and maps of R-2633C. Handouts were distributed describing the purpose and format of the workshop, background information and project schedule.

A total of 135 citizens registered at the workshop, four of whom completed a comment form at the meeting. Also, representatives from the *Wilmington Star* and Wilmington Television Station Channel 6 (WECT) were in attendance. A summary of those comments as well as a summary of the workshop is provided in Appendix H.

### **April 8, 2004 – Small Group Meeting – Spring Hill Community**

A meeting was held with members of the Spring Hill community at the Town Creek Park Recreation Center at 7:00pm to hear and address community concerns regarding the project. Issues raised included why the proposed project was shifted from its previous alignment, why the alignment could not be shifted further west, and how many property owners would be affected.

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### **December 13, 2004 – Small Group Meeting – Spring Hill Community**

The meeting was held with members of the Spring Hill community at the Town Creek Park Recreation Center at 6:30pm to inform the community that the Merger Team decided against shifting the alignment. Several public officials were in attendance at the meeting. After listening to concerns voiced by the community, the Merger Team committed to taking a second look at alternative alignments to see if there was a way to avoid and minimize impacts to natural systems and the Spring Hill community.

### **March 31, 2005 – Elected Officials' Meeting**

The elected officials' meeting was held between the hours of 3:30pm and 4:30pm at the Leland Middle School Cafeteria located in Leland, North Carolina. Several NCDOT project team members, URS Corporation project team members, and agency representatives were available to answer questions and provide information to those in attendance.

Pre-addressed comment forms were available at the "Comment Station" as well as a comment box. Written comments regarding the proposed project were accepted at the workshop and by mail during the comment period. Exhibits displayed at the workshop consisted of project maps showing the study area, approximate right of way limits, proposed centerline, and proposed bridge locations. Preliminary design drawings of the project were also displayed and included five alternative alignments just north of the proposed US 17/Wilmington Bypass interchanges. Other graphical displays available for review included a board displaying the project schedule and process and a board presenting the NEPA/404 Merger Process. Wilmington Bypass Section C (R-2633 C) Maps were also available.

A total of 18 people registered at the meeting. Based on conversations between public officials and the project study team, the public official present supported the project. Questions generally focused on the project schedule and details pertaining to traffic movement in the vicinity of interchanges and other details associated with the preliminary design.

### **March 31, 2005 – Citizens' Informational Workshop**

The workshop was held between the hours of 4:30pm and 7:30pm at the Leland Middle School Cafeteria located in Leland, North Carolina. Several NCDOT project team members, URS project team members, and agency representatives were available to answer questions and provide information to those in attendance.

Pre-addressed comment forms were available at the "Comment Station" as well as a comment box. Written comments regarding the proposed project were accepted at the workshop and by mail during the comment period. Exhibits displayed at the workshop consisted of project maps showing the study area, approximate right of way limits, proposed centerline, and proposed bridge locations. Preliminary design drawings of the project were also displayed and included five alternative alignments just north of the proposed US 17/Wilmington Bypass interchanges. Other graphical displays available for review included a board displaying the project schedule and process and a board presenting the NEPA/404 Merger Process. Maps of R-2633C were also available.

A total of 170 citizens registered at the Citizens Informational Workshop, 20 of who completed a comment form at the meeting. Based on these comments, as well as conversations between citizens and the project study team, the following project related issues were identified as public concerns:

Favor Pink Alignment (4)

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Property Concerns (4)

Support Project (4)

Proposed Toll Road (3)

Map Requests (5)

News media in attendance included representatives from the *Wilmington Star-News*.

**May 17, 2005 – Small Group Meeting – Spring Hill Community**

The meeting was held with members of the Spring Hill community at the Saint James AME Zion Church at 6:30pm to address some of the concerns raised by members of the Spring Hill community at the Merger Team meeting held in January, 2005 and to gather more information about the community and their opinions of the Red and Pink alignments for use in the environmental justice assessment. Some of the topics discussed included air quality, noise, traffic, development, the alignment selection process and unique features and qualities of the Spring Hill community.

**June 29, 2005 – Small Group Meeting – Spring Hill Community**

The meeting was held with the Spring Hill community at the Saint James AME Zion Church at 6:00pm to discuss and finalize a record of the May 17, 2005 meeting and to record the community's official response to questions distributed to the representatives of Spring Hill following the May 17, 2005 meeting. The questions pertained to the characteristics of the Spring Hill community.



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## **CHAPTER 8. REFERENCES**



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## CHAPTER 8. REFERENCES

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**CHAPTER 9.**  
**INDEX AND LIST OF ACRONYMS**

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## 9.2 LIST OF ACRONYMS

- AASHTO - American Association of State Highway and Transportation Officials
- Ac - Acres
- ADT - Average daily traffic
- AEC - Area of Environmental Concern
- APE - Area of potential effect
- BEMC - Brunswick Electric Membership Corporation
- BITS - Brunswick Interagency Transit System
- BMP - Best Management Practice
- CAMA - Coastal Area Management Act
- CBD - Central business district
- CEO - Chief Executive Officer
- CEQ - Council on Environmental Quality
- CFRPO - Cape Fear Area Rural Planning Organization

- CGIA - Center for Geographic Information Analysis
- CO - Carbon monoxide
- CP - Concurrence Point
- dB - Decibels
- dBA - Decibels of A-weighted noise
- DCM - Division of Coastal Management
- DEIS - Draft Environmental Impact Statement
- DEM - Division of Environmental Management
- DENR - Department of Environment and Natural Resources
- DMF - Division of Marine Fisheries
- DMF - Division of Marine Fisheries
- DWQ - Division of Water Quality
- E - Endangered
- EEP - Ecosystem Enhancement Program
- EFH - Essential Fish Habitat

- 
- EIS - Environmental Impact Statement
  - EMC - Environmental Management Commission
  - EO - Executive Order
  - ESA - Endangered Species Act
  - FEIS - Final Environmental Impact Statement
  - FEMA - Federal Emergency Management Agency
  - FFS - Free flow speed
  - FHA - Foraging Habitat Analysis
  - FHWA - Federal Highway Administration
  - FIRM - Flood Insurance Rate Map
  - FMC - Fishery Management Councils
  - FMP - Fisheries Management Plan
  - FPPA - Farmland Protection Policy Act
  - FSC - Federal species of concern
  - Ft - Feet
  - GE - General Electric
  - GIS - Geographic Information System
  - gpm - Gallons per minute
  - GPS - Global positioning system
  - Ha - Hectares
  - HAPC - Habitat areas of particular concern
  - HPO - State Historic Preservation Office
  - I - Interstate
  - ILM - Wilmington International Airport
  - IP - International Paper
  - IPA - Identified Priority Area
  - Kph - Kilometers per hour
  - kV - Kilovolt
  - LCFWASA - Lower Cape Fear Water and Sewer Authority
  - LEDPA - Least environmentally damaging practicable alternative
  - Leq - Equivalent sound level
  - LOS - Level of service
  - LRTP - Long range transportation plan
  - M - Meters
  - MGD - Million gallons per day
  - MOA - Memorandum of agreement
  - Mph - Miles per hour
  - MPO - Metropolitan Planning Organization
  - MSFCMA - Magnuson-Stevens Fishery Conservation and Management Act
  - MSL - Mean sea level
  - MW - Megawatt
  - NAAQS - National Ambient Air Quality Standards
  - NAC - Noise Ambient Criteria
  - NCDA - North Carolina Department of Agriculture
  - NCDENR - North Carolina Department of Environment and Natural Resources
  - NCDOT - North Carolina Department of Transportation
  - NCHRP - National Cooperative Highway Research Program
  - NCSPA - North Carolina State Port Authority
  - NCWRC - North Carolina Wildlife Resource Commission
  - NEPA - National Environmental Policy Act
  - NHP - Natural Heritage Program

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- NHS - National Highway System
  - NMFS - National Marine Fisheries Service
  - NO2 - Nitrogen dioxide
  - NOAA - National Oceanic and Atmospheric Administration
  - NOI - Notice of Intent
  - NPDES - National Pollutant Discharge Elimination System
  - NRCS - Natural Resources Conservation Service
  - NRHP - National Register of Historic Places
  - NSA - Noise sensitive areas
  - NSTM - *Revised Addendum to the Natural Systems Technical Memorandum (2006)*
  - NWTP - Northwest Water Treatment Plant
  - O3 - Ozone
  - OSA - Office of State Archaeology
  - Pb - Lead
  - PIP - Public involvement plan
  - PM10 - Particulate matter less than 10 microns in diameter
  - PM2.5 - Particulate matter less than 2.5 microns in diameter
  - Ppm - Parts per million
  - PT - Proposed threatened
  - RCW - Red cockaded woodpecker
  - Rd - Road
  - ROD - Record of Decision
  - ROW - Right of way
  - RPO - Rural Planning Organization
  - SC - Special Concern
  - SEPA - North Carolina (State) Environmental Policy Act
  - SO2 - Sulfur dioxide
  - SPL - Sound pressure level
  - SR - Significantly rare
  - SR - State Route
  - STRAHNET - Strategic Highway Network
  - T - Threatened
  - T/SA - Threatened due to similar appearance
  - TDM - Transportation Demand Management
  - TIP - Transportation Improvement Program
  - TNM - Traffic noise model
  - TSM - Transportation system management
  - USACE - United States Army Corps of Engineers
  - USDA - United States Department of Agriculture
  - USDOT - United States Department of Transportation
  - USEPA - United States Environmental Protection Agency
  - USFDA - United States Food and Drug Administration
  - USFWS - United States Fish and Wildlife Service
  - USGS - United States Geological Service
  - UST - Underground storage tank
  - WMPO - Wilmington Urban Area Metropolitan Planning Organization
  - WRC - Wildlife Resource Commission
  - WWTP - Wastewater treatment plant

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