AERIAL PHOTOGRAPHIC ANALYSIS
COMPARING AQUATIC IMPACTS OF S.C. 38/U.S. 501 UPGRADE WITH PROPOSED I-73

DILLON, MARION, & HORRY COUNTIES, SOUTH CAROLINA

March, 2012

Prepared by:

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Linden, VA 22642

Prepared For:

Southern Environmental Law Center
&
Coastal Conservation League

The following report represents my best professional judgment based on the analysis of aerial photography and the review of site maps and other identified documents.

Donley E. Kisner

Donley E. Kisner, Vice President/Senior Wetlands Analyst

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EXECUTIVE SUMMARY

The South Carolina Department of Transportation ("SCDOT") proposes to construct a new interstate to the Myrtle Beach area, which would be designated I-73, with a priority focus on the section of the project between I-95 and the Myrtle Beach area. The proposed new location I-73 would closely parallel the existing primary route to Myrtle Beach, but would have far greater aquatic impacts.

The report, which relies on aerial photographic analysis and other available documentation as described, quantifies the wetlands that would be impacted by an upgrade to an interstate or expressway for portions of S.C. 38 and U.S. 501 between I-95 and the Conway Bypass (S.C. 22). Using either a three-hundred-foot wide footprint, or a two-hundred-foot wide footprint, the analysis demonstrates that the number of wetland acres that would be impacted by upgrading the existing highway corridor would be significantly less than the amount of wetlands that would be impacted by the new interstate highway, I-73, at the location proposed by SCDOT.

According to the permit application submitted to the Department of the Army and the South Carolina Department of Health and Environmental Control by the SCDOT for a permit to place fill associated with the construction of a new four-lane interstate roadway, 313 acres of wetlands would be impacted by this segment of the proposed new location I-73. By contrast, upgrading the existing corridor would impact approximately 119 acres of wetlands based on a three-hundred-foot wide footprint and approximately 50 acres of wetlands based on a two-hundred-foot wide footprint.

Acres of wetlands impacted by Interstate 73 proposed route	313	Acres of wetlands impacted by a 300' wide upgrade route	118.9	Acres of wetlands impacted by a 200' wide upgrade route	49.5

According to the permit application submitted by the SCDOT, 13 perennial streams totaling 3,155 linear feet and 9 intermittent streams totaling 705 linear feet would be disturbed by the proposed new location I-73 between I-95 and the Conway Bypass. This equates to 22 stream crossings totaling 3,860 linear feet of stream disturbance. Twenty-four perennial and 12 intermittent streams were identified using both aerial photographs and U.S. Geological Survey topographic maps along the existing route for the upgrade alternative. Exact linear footage of additional impacts would depend on the upgrade design, but the corridor is already a divided four-lane highway. Consistent with

the wetland impacts, it is reasonable to conclude that there would be significantly less disturbance to streams by adding a minimal amount of additional linear footage to these already-impacted streams by upgrading the existing corridor compared to the disturbances that would occur to twenty-two new stream crossings if I-73 were to be constructed.

Number of new stream crossings impacted by Interstate 73 proposed route	22	Number of new stream crossings impacted by upgrade route	0

STATEMENT OF OPINIONS

Aerial Photographic Analysis

Environmental Research, Inc. was contacted by the Southern Environmental Law Center and the Coastal Conservation League, to acquire aerial photography and conduct a wetlands analysis of the I-73 alternative corridor in Dillon, Marion, and Horry Counties, South Carolina. The I-73 alternative corridor would consist of upgrades to portions of S.C. 38 and U.S. 501 that are located between Interstate 95 (northern end of the study area) and S.C. 22 (southern end of the study area). S.C. 22 is also known as the Conway Bypass. The I-73 alternative site is located on the Oak Grove, Latta, Marion, Mullins, Centenary, Galivants Ferry, and Horry 7.5-minute topographic maps produced by the United States Geological Survey.

The general purpose of the analysis is to determine whether the impacts to wetlands and streams, as a result of utilizing currently existing highway segments as an alternative to constructing a new interstate highway, would be smaller or larger.

The findings from the aerial photographic analysis show that within a three-hundred-foot wide corridor superimposed on the existing portions of S.C. 38 and U.S. 501, between Interstate 95 and S.C. 22, there are approximately 119 acres of wetlands, and within a two-hundred-foot wide footprint there are approximately 50 acres of wetlands.[1] These are the acreages of wetlands that would be impacted if the entire portions of either of these footprint widths were required in order to upgrade this existing highway corridor to either an expressway or an interstate.

For the purpose of presenting wetland acreage findings from the aerial photographic analysis, the study area is divided into three sections: the Marion Bypass; the Little Pee Dee River floodplain; and the remaining section of the study area, which consists of three additional, non-contiguous, portions of highway. These additional portions of the study area (referred to as Other Areas) are located north of the Marion Bypass terminating at Interstate 95, south of the Marion Bypass terminating at the Little

[1] Federal guidance states that the desirable rights-of-way needed to accommodate large trucks without allowing vehicles to encroach on curbs of shoulders, ranges from approximately 140 foot for four-lane arterials to approximately 165 foot for eight-lane arterials. See Federal Highway Administration, Alternative Intersection/Interchanges Informational Report (April, 2010). Accordingly, a two-hundred-foot wide corridor represents a most realistic, but conservative footprint of the anticipated impact of a further upgrade of the existing corridor.

Pee Dee River floodplain, and south of the Little Pee Dee River floodplain terminating at S.C. 22.

The Marion Bypass has 31.2 acres of wetlands that lie within the three-hundred-foot wide footprint centered on the existing highway and 2.4 acres of wetlands that lie within the two-hundred-foot wide footprint. The Little Pee Dee River floodplain has 37.9 acres of wetlands that lie within the three-hundred-foot wide footprint of the existing highway and 35.1 acres of wetlands that lie within the two-hundred-foot wide footprint. The three additional, non-contiguous, portions of highway have a combined total of 49.8 acres of wetlands that lie within the three-hundred-foot wide footprint of the existing highway and 12 acres of wetlands that lie within the two-hundred-foot wide footprint. This equates to a total of 118.9 acres of wetlands that lie within a three-hundred-foot wide footprint of the existing highway and 49.5 acres of wetlands that lie within a two-hundred-foot wide footprint for the entire route.

In addition, it should be noted that the aquatic resources within the footprint of the upgrade alternative have already been impacted in a number of ways along the corridor. For example, wetland water regimes (duration of inundation or soil saturation) have been reduced due to the construction of drainage ditches and impoundments. These impacts were the result of both the original highway construction and follow-on highway improvements, as well as common practices used to increase the acreage of land that could be utilized for agriculture. Further, reductions in the way water moves through many of the wetlands adjacent to the highway (wetland connectivity) have been significantly impacted. Causeways constructed to reduce the length of the bridges crossing the floodplain have already impacted the larger wetlands in the Little Pee Dee River floodplain. Therefore, the Little Pee Dee River floodplain, which would be significantly impacted by the I-73 proposal, would experience minimal additional impacts to wetlands if the alternative were chosen due to the upgrades that have already been performed on this section of the route and the size of the highway footprint that already exists along this portion of U.S. 501.

FIGURES

The conclusions in this report are illustrated in the following figures, which are described below in sequence.

FIGURE 1:

Figure 1 is a mosaic of the Florence and Kingstree 1:100,000-scale United States Geological Survey topographic maps. This figure depicts both the approximate location of the SCDOT's proposed route I-73 as a new location interstate highway closely paralleling the alternative existing route which could be upgraded along portions of S.C. 38 and U.S. 501 between Interstate 95 and S.C. 22. This figure also contains summary tables containing information on the differences in wetlands and stream impacts between the proposed route for I-73 and the alternative route, which is discussed in greater detail throughout this report.

FIGURE 2:

Figure 2 is a mosaic of the Florence and Kingstree 1:100,000-scale United States Geological Survey topographic maps. This figure depicts the locations of the three sections along the alternative route (the Marion Bypass, the Little Pee Dee River floodplain, and the remaining section of the study area which consists of three additional, non-contiguous, portions of highway) discussed for ease of understanding the conclusions in this report. It also includes again the approximate location of the SCDOT's proposed route for a new location interstate highway.

FIGURE 3:

Figure 3 and the following figures utilize a mosaic of aerial photographs taken at various times during the leaf-off season in early 2010. These figures illustrate comparisons between the landscapes of the proposed route for the new interstate highway and that of the proposed alternative utilizing existing portions of S.C. 38 and U.S. 501, located between Interstate 95 and S.C. 22. This figure depicts the Marion Bypass along the alternative route with the approximate location of this section of the proposed new interstate to the east. The Marion Bypass has 31.2 acres of wetlands that lie within the

three-hundred-foot wide footprint of the existing highway and 2.4 acres of wetlands that lie within the two-hundred-foot wide footprint.

Within this report there are no breakouts of wetland acreages that are impacted by comparable sections of the proposed new interstate highway, such as the Little Pee Dee River floodplain, due to the unavailability of those statistics in the permit application for I-73.

FIGURE 4:

Figure 4 depicts the Little Pee Dee River floodplain along the upgrade route with the approximate location of this section of the proposed new interstate to the east. The Little Pee Dee River floodplain has 37.9 acres of wetlands that lie within the three-hundred-foot wide footprint of the existing highway and 35.1 acres of wetlands that lie within the two-hundred-foot wide footprint.

This figure illustrates that a much greater extent of the Little Pee Dee River floodplain would be impacted by the proposed new interstate highway than by the existing route due to the greater width of the floodplain along the proposed I-73 location and the additional crossing of the Lake Swamp tributary of the Little Pee Dee River to the south.

FIGURE 5:

Figure 5 depicts the remaining section of the study area which consists of the three additional, non-contiguous, portions of highway. These additional portions of the study area (referred to as Other Areas in Figure 2) are located north of the Marion Bypass terminating at Interstate 95, south of the Marion Bypass terminating at the Little Pee Dee River floodplain, and south of the Little Pee Dee River floodplain terminating at S.C. 22. The three additional, non-contiguous, portions of highway have a combined total of 49.8 acres of wetlands that lie within the three-hundred-foot wide footprint of the existing highway and 12 acres of wetlands that lie within the two-hundred-foot wide footprint. These portions of the upgrade alternative route are those that have received the least amount of upgrades to date.

METHODOLOGY

A search of government and commercial sources was undertaken to obtain the most current aerial photographs covering the study area, including at least one date of color infrared aerial photographs. The color infrared aerial photographs from 1999 were analyzed stereoscopically. Stereoscopic viewing involves using the principle of parallax (observing a feature from slightly different positions) to observe a three-dimensional representation of the areas of interest. This enhances the photo-interpretation process by allowing the analyst to observe vertical as well as horizontal spatial relationships of features.

Historical aerial photographs from three different dates spanning the period from 1999 to 2010 were acquired. The 1999 aerial photographs are color infrared and were analyzed stereoscopically to most effectively identify the wetlands within the study area. The two additional dates of aerial photographs are natural color and include 2009 leaf-on photographs and 2010 leaf-off photographs. These aerial photographs were analyzed to both enhance the quality of the wetlands analysis and to update changes to wetlands that had taken place since 1999. National Wetlands Inventory (NWI) wetlands data and Soil Conservation Service hydric soils data was utilized as additional collateral information to assist in the identification of wetlands. A complete list of the aerial photography and other collateral data used for this analysis can be found in the reference section of this report.

The process of photographic analysis involves the visual examination and comparison of many components of the photographic image. These components include tone, color, texture, shape, size, pattern, and landscape context of the individual elements of a photograph. The analyst identifies features and “signatures” associated with specific environmental conditions. The term “signature” refers to a combination of components and/or characteristics that indicate a specific condition or pattern of environmental significance. Academic and professional training, photo-interpretation experience gained through field reconnaissance comparing aerial photographic signatures with ground observations, repetitive observations of similar features or activities, and the deductive logic of the analyst as well as background information from collateral sources are all critical factors employed in a photographic analysis. Details related to my experience in

aerial photographic wetlands interpretation can be found in the Curriculum Vitae section of this report.

Digital print enlargements covering the upgrade alternative corridor in the northeastern corner of South Carolina that is the subject of this report have been reproduced to illustrate various details of the analysis. Due to factors inherent in the printing process and the fact that the prints are monoscopic (single frame, not stereo), they do not exhibit the same level of detail that is visible in the original aerial photographs.

REFERENCES

AERIAL PHOTOGRAPHS

DATE	SOURCE	SCALE	TYPE[2]	MISSION	ROLL / FRAME(S)
1999-02-14	USGS	1:40,000	CIR	NAPP	Roll 11221 / Frames 13-19, 85-87; Roll 11222 / Frames 15-19, 70-74
1999-02-15	USGS	1:40,000	CIR	NAPP	Roll 11223 / Frames 54-57, 87-89
1999-02-16	USGS	1:40,000	CIR	NAPP	Roll 11226 / Frames 13-18
2009 Summer	USDA	1-meter GSD (ground sample distance)	CC	NAIP 09	Digital tiled orthoimagery
2010	USGS; Furgo Earthdata, Inc.	30-cm GSD (ground sample distance)	CC	Dillon, Horry, and Marion counties, SC	Orthomosaic

MAPS

USGS 7.5-minute topographic map for Centenary, SC
USGS 7.5-minute topographic map for Galivants Ferry, SC
USGS 7.5-minute topographic map for Horry, SC
USGS 7.5-minute topographic map for Latta, SC
USGS 7.5-minute topographic map for Marion, SC
USGS 7.5-minute topographic map for Mullins, SC
USGS 7.5-minute topographic map for Oak Grove, SC
USGS 1:100,000-scale topographic map for Florence, SC-NC
USGS 1:100,000-scale topographic map for Kingstree, SC

DOCUMENTS

July 28, 2006. Comments regarding "I-73 Southern Project Draft EIS; No. 20060245." From J. David Farren (Senior Attorney, Southern Environmental Law Center) to Patrick Tyndall (Federal Highway Administration, SC Division) and Mitchell Metts (SC Department of Transportation).

April 2010. Alternative Intersections/Interchanges: Informational Report (AIIR). Publication No. FHWA-HTR-09-060. U.S. Department of Transportation, Federal Highway Administration. Research, Development, and Technology, Turner-Fairbank Highway Research Center, McLean, VA.

[2] Film Type: CIR – Color Infrared, CC – Conventional Color

January 26, 2011. Joint Public Notice regarding an application by the South Carolina Department of Transportation (P/N # SAC 2008-1333-DIS). Prepared by the Corps of Engineers (Charleston District) and the S.C. Department of Health and Environmental Control.

March 25, 2011. The Grand Strand Expressway – An Alternative to the Proposed I-73 to the Myrtle Beach, SC area. Prepared by Smart Mobility for the South Carolina Coastal Conservation League.

March 28, 2011. Comments regarding "Application for Section 404 Permit/Section 401 Water Quality Certification for I-73 Project in South Carolina (P/N #2008-01333-DIS)." From J. David Farren (Senior Attorney, Southern Environmental Law Center) to Stephen A. Brumagin (U.S. Army Corps of Engineers, Charleston District) and Mark Griffin (Project Manager, S.C. Department of Health and Environmental Control).

U.S. Department of Agriculture, Soil Conservation Service, Hydric Soils of the United States – Miscellaneous Publication Number 1491.

U.S. Department of Agriculture, Soil Conservation Service, Soil Surveys for Dillon, Marion, and Horry Counties, South Carolina (SSURGO).

U.S. Fish and Wildlife Service, National Wetlands Inventory data, mapped to February 1994 aerial photographs.

Undated. Data Collection Technical Memorandum for the South Carolina Department of Transportation's (SCDOT) Interstate 73 (I-73) environmental impact statement (EIS). Prepared by the LPA Group, Inc.

APPENDIX A

Figures 1 – 5

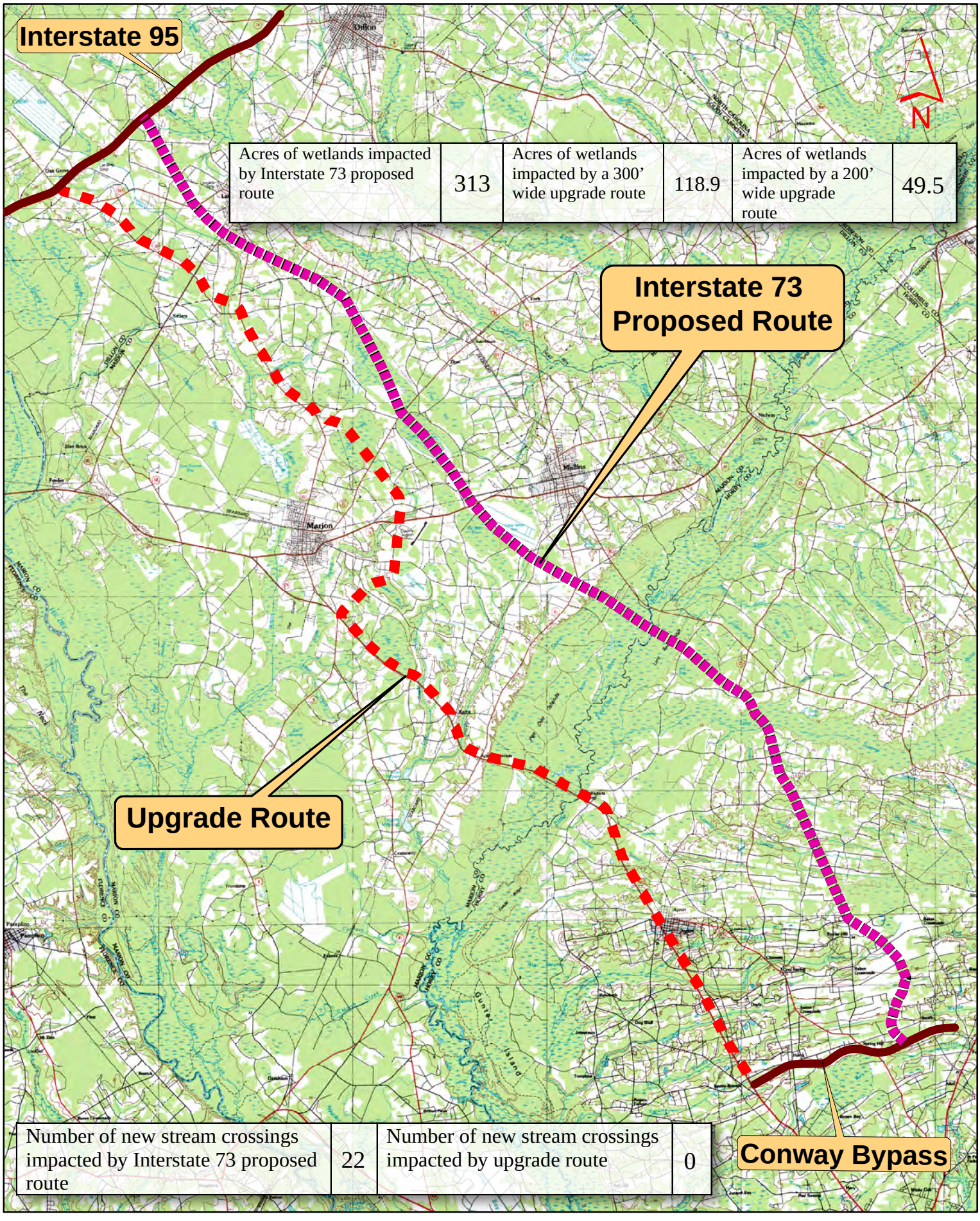

Figure 1

1 inch equals 3.95 miles

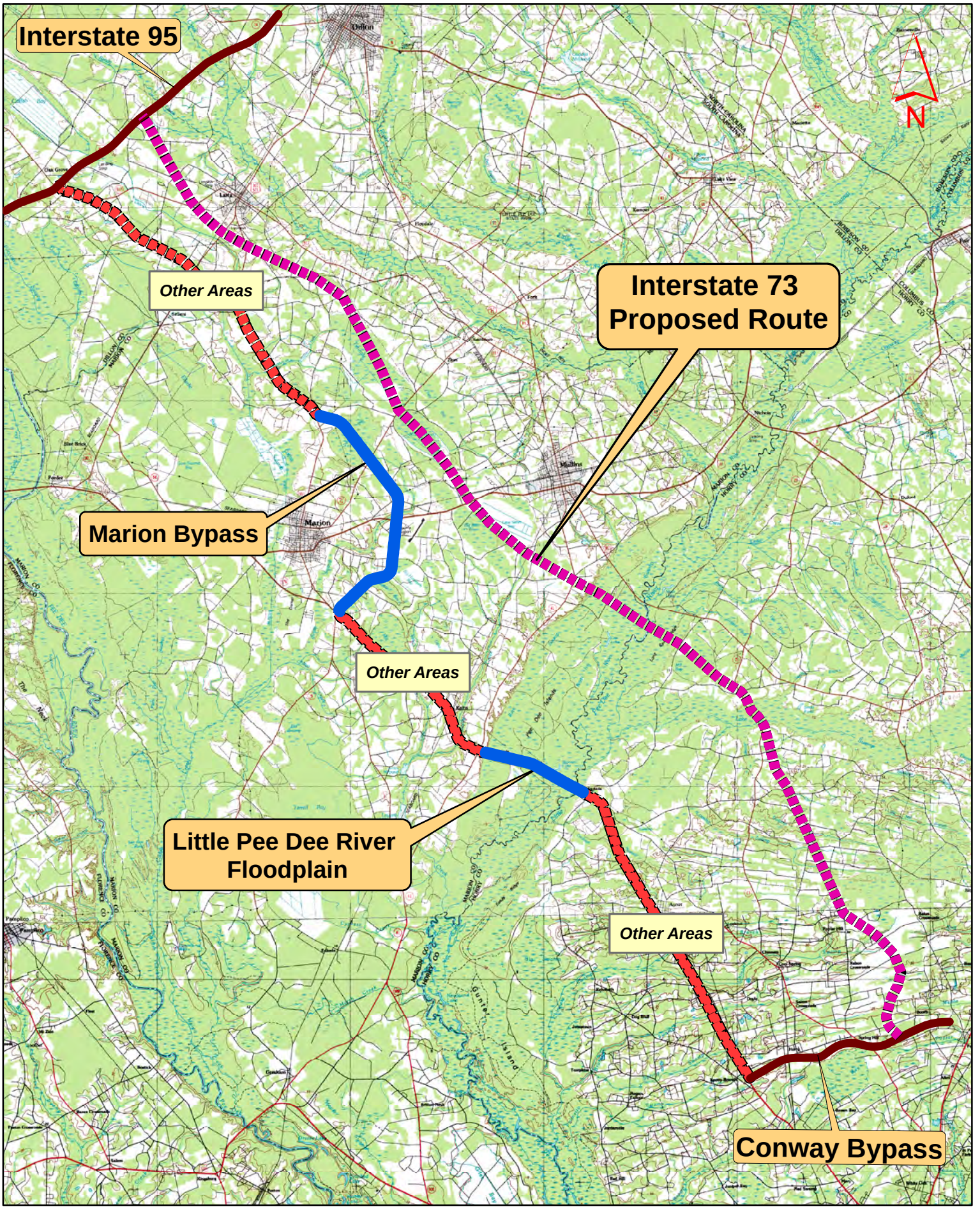

Figure 2

1 inch equals 3.95 miles

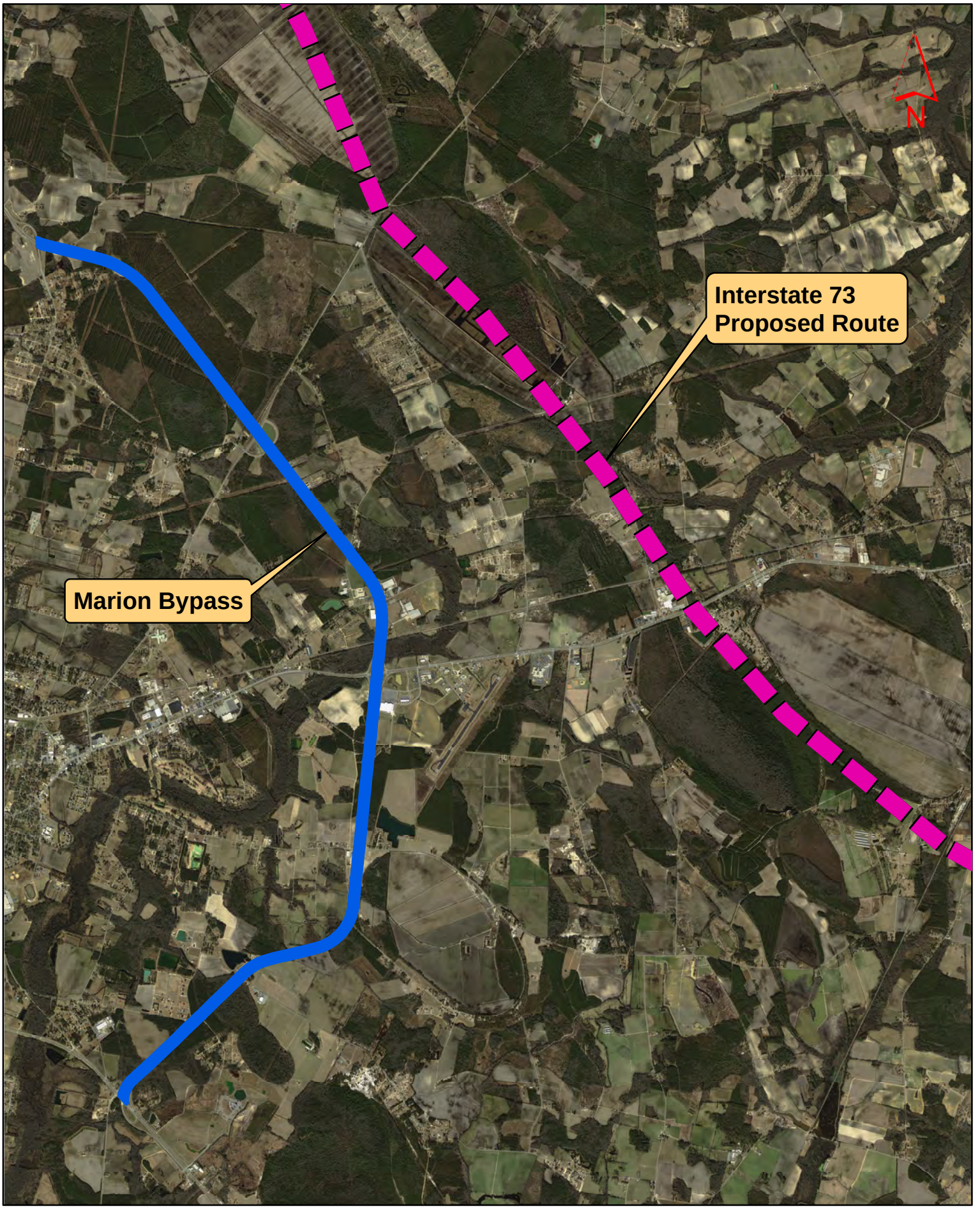

Figure 3

1 inch equals 0.90 miles

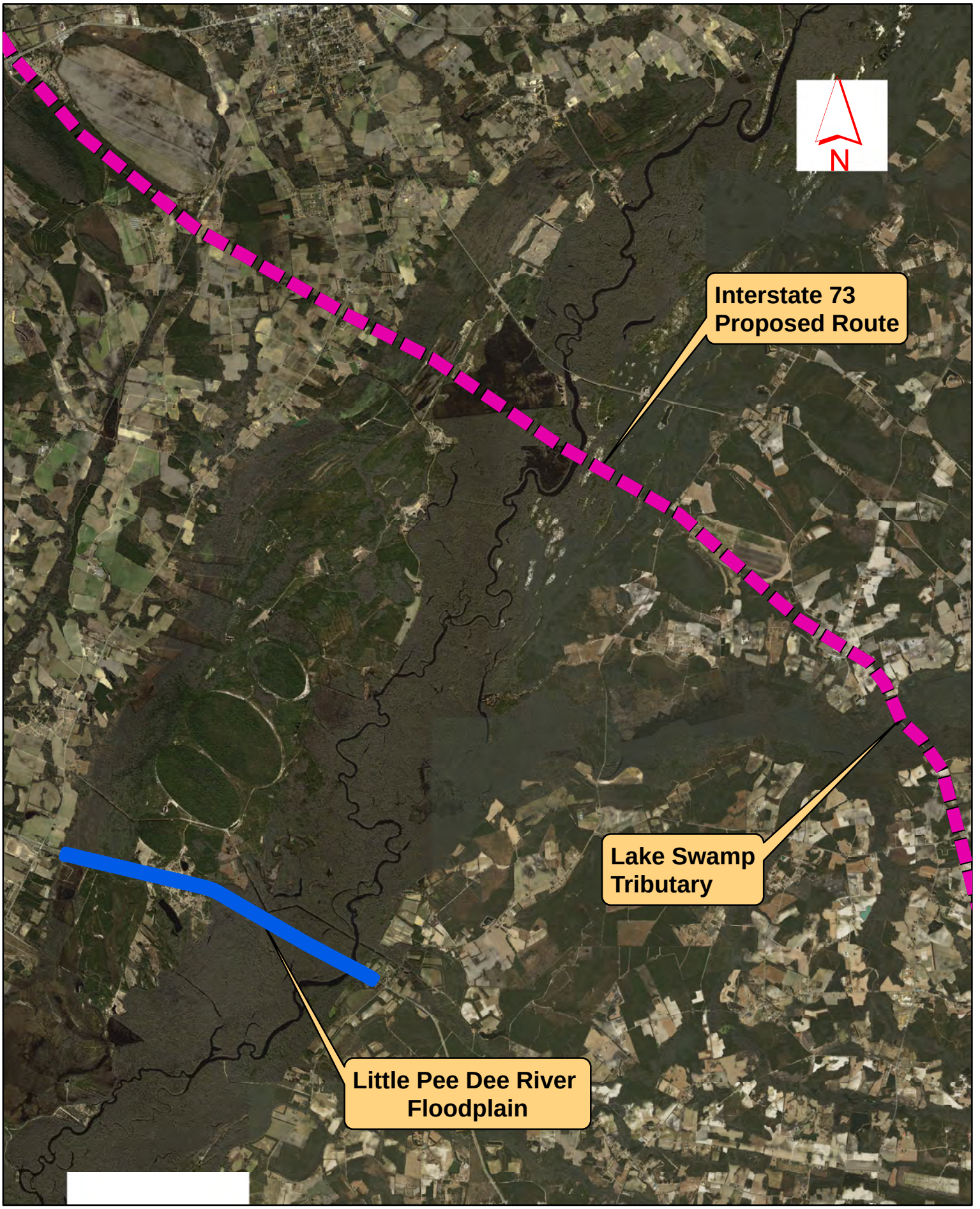

Figure 4

1 inch equals 1.25 miles

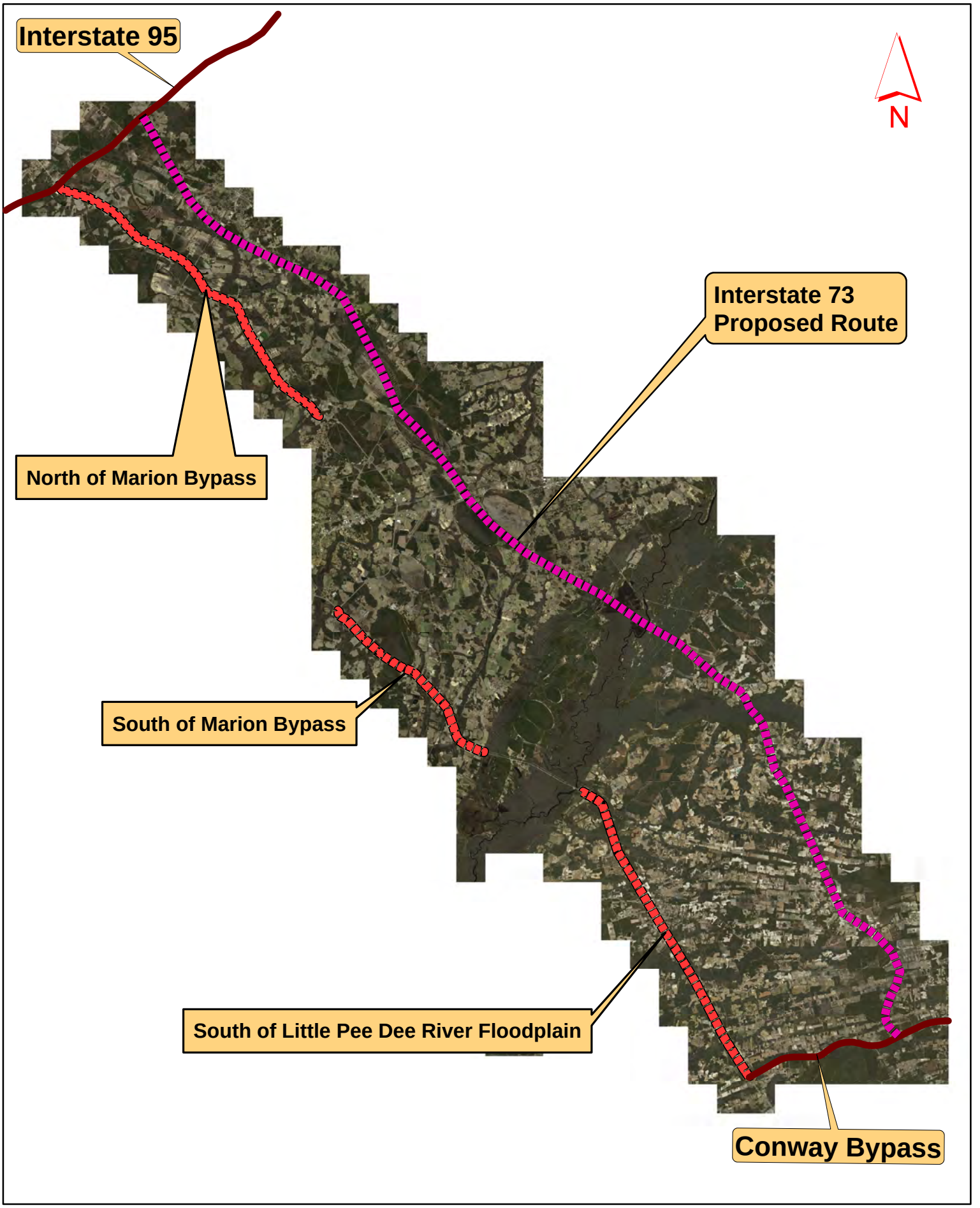

Figure 5

1 inch equals 3.95 miles

APPENDIX B

Curriculum Vitae

DONLEY E. KISNER
Curriculum Vitae

VICE PRESIDENT, ECOLOGICAL RESOURCE MAPPING

Mr. Kisner directs the Ecological Resources Analysis and Mapping Section of Environmental Research. He has twenty-seven years experience as an Imagery Analyst specializing in wetlands and landuse/landcover interpretation and associated field reconnaissance for aerial photographic signature development and accuracy assessment. For the past ten years Donley has served as Project Manager on ERI's subcontracts with Dewberry & Davis on the USGS Cartographic Services Contracts. Tasks associated with this effort include staff training, cost estimating, stereo compilation, quality control, project scheduling and tracking, along with serving as a liaison with the prime contractors and with USGS personnel. Mr. Kisner has also served as Project Manager on ERI's subcontracts with Lockheed Martin on the EPA Remote Sensing Services Support Contracts and has performed numerous historical aerial photographic analyses documenting environmental conditions and operations of mining and industrial facilities, identification of wetlands, and provided support for large scale modeling projects by integrating wetlands data with other environmental datasets. Mr. Kisner has also performed aerial photographic analysis, quality control, and other supporting roles for projects for the U.S. Army Environmental Center, the U.S. Department of Justice, the U.S. Environmental Protection Agency, the U.S. Corps of Engineers, various state agencies, and engineering and law firms.

Mr. Kisner conducted three years of research and quality control for the EPA's EMAP program into Land Use and Land Cover classification system development. His management experience prior to ERI includes directing the U. S. Fish & Wildlife Service's Wetlands Status and Trends project for the Geonex Corporation, as well as Wetlands Manager for EPA's EPIC contract for the Bionetics Corporation. Mr. Kisner has had training using the Federal Manual for Identifying and Delineating Jurisdictional Wetlands and has extensive experience in use of the Cowardin, et al, Classification System for Identifying Wetlands and Deepwater Habitats.

PROFESSIONAL EXPERIENCE

July, 1993 - Present: **Environmental Research, Inc. Linden, VA**
Vice President, Technical Operations

As the director of the Ecological Resources Analysis and Mapping Section of Environmental Research, Inc., Mr. Kisner provides remote sensing analyses and quality control for environmental investigations and natural resource mapping. Mr. Kisner provides expert witness services throughout the country in support of wetlands, landuse/landcover, and environmental investigations of mining and industrial facilities litigation. Donley conducts various historical and current aerial photographic analyses and land use/land cover mapping projects for a variety of Federal and State agencies, and engineering and law firms. Donley serves as Production Manager on various remote sensing services provided by ERI to a variety of government agencies and private organizations.

PROFESSIONAL EXPERIENCE (Continued)

August, 1989 - April, 1993: **Bionetics Corporation, Warrenton, VA**
Imagery Analyst

Mr. Kisner provided a broad range of aerial photography based analyses, including analysis of aerial photography and available site related data to document environmental conditions and operations of industrial facilities to support EPA's research and regulatory programs, analysis of aerial photography for the identification of Upland/Wetland boundaries, detailed wetland identification using the Cowardin, et al, Classification System for Wetlands and Deepwater Habitats, and other land cover and land use analyses using the Anderson Classification System and the Brown and Lowe classification system for Biotics Communities of the Southwestern United States.

For EPA's EMAP Program, Mr. Kisner developed Land Use and Land Cover classification systems, followed up by managing projects performed to evaluate these systems. He acted as liaison between EPA and EMAP's Agroecosystem Resource Group. Mr. Kisner participated in the organization of the EPA/USGS's co-sponsored forum on Land Use and Land Cover Classification, and was a participant in several peer reviews and workshops with EMAP Resource Groups.

May, 1984 - July, 1989: **Martel Laboratories, St. Petersburg, FL**
Photo Interpreter/Status and Trends Manager

Mr. Kisner was responsible for performing wetland interpretation from aerial photography for the U. S. Fish and Wildlife Service's National Wetland Inventory. He conducted intensive fieldwork throughout the U. S. for the purpose of developing color infrared aerial photographic signatures for the identification and classification of wetlands. Aerial photographic signature development is accomplished through repetitive visits to numerous wetlands of all types to compare the photographic image with what is visible on the ground in the same location. Mr. Kisner prepared technical reports, maintained budgeting schedules, trained new personnel, and maintained professional client/contractor relationships.

As a result of gained expertise, Mr. Kisner performed quality control of wetland interpretations at the regional offices of the National Wetlands Inventory located in Atlanta, Georgia and Denver, Colorado. In addition, Mr. Kisner managed the Fish and Wildlife Services Status and Trends Project, which consisted of a team of five photo interpreters and four cartographic and computer technicians.

EXPERT WITNESS TESTIMONY

Provided expert witness testimony, May 24, 2005 for:
BA 64-04A, BA 65-04A: Theodore and Mary Louise Nayden
Anne Arundel County, MD Board of Appeals

Deposition testimony, July 21, 2010 for:
Quapaw Tribe of Oklahoma v. Blue Tee, et al, Tulsa, Oklahoma
Civil Action No. 03-CV-846-CVE-PJC

PROFESSIONAL REPORTS, PAPERS, AND SEMINARS

Produced 12 Aerial Photographic Site Analyses for a variety of clients to support litigation.

Provided technical quality control review for approximately 20 additional Aerial Photographic Site Analyses for a variety of clients to support litigation.

Authored 43 Aerial Photographic Site Analyses for the U.S. Environmental Protection Agency's Characterization Research Division, Monitoring Sciences Branch, Las Vegas, NV.

Authored three Aerial Photographic Site Analyses for the U.S. Environmental Protection Agency's Environmental Photographic Interpretation Center (EPA/EPIC), Warrenton, VA.

Steve Leo, Glen Hickerson, and Donley Kisner, July/August 2006. "Fecal Coliform TMDL Implementation, Analysis of Color Infrared Aerial Photographs to Detect Failing Septic Systems". Stormwater, The Journal for Surface Water Quality Professionals

Kisner, D. E., D. M. Muchoney, S. Pelczarski, K. K. Stout, and R. E. Sullivan. 1991. EMAP Landscape Characterization Information Requirements Summary. Report No. TS-PIC-90385, EPA/EPIC, Warrenton, VA.

Muchoney, D. M., D. E. Kisner, K. K. Stout, D. J. Norton. 1990. EMAP Land Cover/Land Use Classification for Landscape Characterization. Report No. TS-PIC-90384. US EPA/EPIC, Warrenton, VA.

TRAINING

Expert in use of the Cowardin, et al, classification system for Identifying Wetlands and Deepwater Habitats and the Anderson et al Classification System for Land Use and Land Cover.

Federal Manual for Identifying and Delineating Jurisdiction Wetlands,
Wetland Training Institute, Poolesville, Maryland

Interim Regional Supplement to the Corps of Engineers Wetland Delineation Manual: Atlantic and Gulf Coastal Plain Region,
Georgetown, Delaware

USGS Topographic Map Update Training
Rolla, Missouri and Fairfax, Virginia

Training related to USGS specifications for updating maps with specific emphasis on the Raster Graphic Revision Process (RGR) used for performing Basic Graphic Revisions,
Rolla, Missouri and Fairfax, Virginia

EDUCATION

University of South Florida, Tampa, FL
Bachelor Degree in Geography, 1984

Fairmont State College, Fairmont, WV
June, 1974 - December, 1978

Undergraduate coursework concentrated on physical geography, cartography, and aerial photography interpretation. Graduate coursework included soils and wetland plant identification.

PROFESSIONAL AFFILIATIONS

Society of Wetlands Scientists

Arizona Riparian Council

American Society for Photogrammetry and Remote Sensing