

**Feasibility Study**

**NC 410 IMPROVEMENTS**

**From US 74/76 near Chadbourn to US 701  
at the South Carolina State Line near Tabor City**

**Columbus County**

**Division 6  
FS-0406A**



Feasibility Studies Unit  
Program Development Branch  
N.C. Department of Transportation

Documentation Prepared by Stantec Consulting Services Inc.

**Paul R. Koch, PE**  
**Project Manager, Stantec**

**Derrick W. Lewis, PE**  
**Feasibility Studies Unit Head**  
**NCDOT**

**Nicole M. Hackler**  
**Feasibility Studies Engineer**  
**NCDOT**

11/21/2005

**Date**

# FEASIBILITY STUDY REPORT

## NC 410 IMPROVEMENTS From US 74/76 near Chadbourn to US 701 at the South Carolina State Line near Tabor City Columbus County FS-0406A

### I. General Description

This feasibility study addresses the improvements to NC 410 from US 74/76 near Chadbourn to US 701 at the South Carolina state line near Tabor City in Columbus County. Existing NC 410, as well as the majority of the secondary roads in the studied portion of Columbus County, are two-lane rural roadways with shoulders. The proposed improvements include a combination of widening and new alignment to provide a multi-lane facility for NC 410 through this area. The approximate length of the project is 17 miles. Exhibit 1 shows the project location.

This study is the initial step in the planning and design process for this project and is not the product of exhaustive environmental or design investigations. The purpose of this study is to describe the proposed project, including costs, and to identify potential problems that may require consideration in the planning and design phases.

### II. Need for Project

The purpose of the project is to provide a multi-lane connector between US 74 near Chadbourn and US 701 at the South Carolina state line. The provision of a new multi-lane connector will provide better traffic flow, increased safety, and enhanced economic development in the southern portion of Columbus County. NC 410 is designated as a rural principal arterial in the North Carolina Statewide Functional Classification System.

Several letters were received from local government and planning entities in response to requests for comments on this project. Letters in support of improving NC 410 to a 4-lane connector from US 74 to US 701 were received from Tabor City, the Town of Chadbourn, and the Tabor City Committee of 100, Inc. The Town of Chadbourn's letter includes a Town Council resolution supporting the need for the project and references similar resolutions passed by the Columbus County Towns of Fair Bluff, Cerro Gordo, and Tabor City. In addition to emphasizing the need for the project, the Tabor City letter specifically supports an alternative west of Chadbourn (which corresponds to the recommended Alternative A).

Existing NC 410 is a two-lane shoulder facility, with pavement width varying from 20 to 24 feet, that runs south through the Town of Chadbourn where the land use is a mixture of commercial and residential. The facility crosses the railroad and then heads south into the more rural portion of the county. Land use along the corridor south of Chadbourn is mostly agricultural and low-density residential, with driveways directly accessing NC 410. NC 410 shares a relatively short four-lane undivided shoulder section, with pavement width varying from 44 to 48 feet, with US 701 near the state line. This section is lined with a mix of commercial and industrial development.

There are no programmed projects, other than bridge replacement projects in the general vicinity, in the 2006-2012 TIP that would affect the alternatives developed for this study. However, several "North Carolina Moving Ahead" (NCMA) projects have been completed in the

immediate vicinity of this project. Three NCMA improvements involved adding left turn lanes at the intersections of NC 410 with SR 1004, SR 1308, and SR 1314/1315. The remaining NCMA projects were widenings of NC 410 to three-lanes along the following segments: from US 76 to US 76 Bus. (Strawberry Blvd) in Chadbourn; from US 701 to the signalized intersection of US 701 Byp./Bus. with NC 410 in Tabor City; and a curb & gutter section from the commercial driveway just south of the US 701 Byp./Bus. Intersection with NC 410 to the existing curb & gutter section in Tabor City.

Accident data was reviewed for NC 410 from US 74 north of Chadbourn to US 701 at the South Carolina state line for the period of March 1, 2000 through February 28, 2004. The results for this three year period included 139 reported crashes consisting of no fatal crashes, 57 non-fatal injury crashes, and 82 property damage only crashes. The total crash rate for the section of NC 410 north of US 701 is 180.81 which is almost equal to the 2001-2003 Statewide crash rate of 184.65 for two-lane rural NC routes. As traffic increases, higher accident rates may occur as a result of increased opportunities for conflict between through traffic and vehicles entering and exiting driveways along NC 410. Additional lanes, specifically providing storage for turning vehicles, would be expected to mitigate the accident potential.

### III. Traffic Operations

The highest base year (2004) Average Daily Traffic (ADT) volumes along the two-lane sections of NC 410 between US 74 and the South Carolina line are estimated to be 3,800 vehicles per day (vpd). The four-lane section, routed in common with US 701, carries approximately 10,300 vpd. For the design year 2030, the highest estimated traffic volume along NC 410 north of US 701 will be approximately 8,500 vpd. The four-lane section is projected to carry approximately 21,500 vpd. Based on the NCDOT vehicle classification statistics for this type of roadway, truck traffic is estimated to make up approximately 17 percent of daily traffic.

The base year and projected traffic volumes are both within the acceptable range for the capacity of the existing cross-sections. Based on highway capacity analysis, the two-lane rural highway section between Chadbourn and US 701 performs at LOS B during the base year and LOS C during the design year. The multi-lane section shared by NC 410 and US 701 will perform at LOS A through the design year.

### IV. Alternatives Studied

Three multi-lane alternatives were studied for this improvement. Cost estimates were prepared for both freeway and non-freeway options for each of the alternatives. Each alternative is proposed as a four-lane divided facility with a 46-foot median and shoulders on a 220-foot wide right of way. Each of the alternatives, shown on the attached exhibits, is described below:

**Alternative A** begins at the US 74 / SR 1528 (Bird Cage Road) interchange and bears southwest to bypass the Town of Chadbourn on its west side. Alternative A then heads south, primarily using the alignment of SR 1300 (Old Stake Road) until it intersects with SR 1308 (Ten Mile Road). From this point south, Alternative A uses the majority of the SR 1308 alignment to US 701. From this point, all of the alternatives share a common alignment along US 701 to the South Carolina state line. With the exception of the multi-lane section of US 701, all proposed segments that utilize existing roads would require widening from two lanes to a four-lane divided section. The partially-controlled access option for Alternative A would include the following major cost items:

Interchanges

- US 74 (A three-quadrant interchange exists. The project will add a ramp in the northeast quadrant and widen the existing bridge over US 74.)

Intersections (where signals are anticipated)

- SR 1528, SR 1574, US 76, SR 1414, SR 1422, SR 1412, SR 1419, SR 1420, SR 1418, SR 1442, SR 1004, SR 1340, SR 1378, SR 1314, SR 1310/SR 1308, US 701, NC 410 Bus., SR 1305, NC 904

Bridges

- Railroad Grade Separations of NC 410 @ CSX near Chadbourn
- Railroad Grade Separations of NC 410 @ CSX near Clarendon
- Dual bridges for NC 410 @ Grissett Swamp

Stream Crossings (Culverts)

- 19 crossings

**Alternative B** has the same beginning point as Alternative A and shares a common alignment from US 74 to just south of US 76. From this point, Alternative B bears south and utilizes SR 1317 (Clarendon Road) until it intersects with SR 1308 (Ten Mile Road). From this point south, Alternative B shares its alignment with Alternative A and uses the majority of the SR 1308 alignment to US 701. All of the alternatives share a common alignment along US 701 to the South Carolina state line. With the exception of the multi-lane section of US 701, all proposed segments that utilize existing roads would require widening from two lanes to a four-lane divided section. The partially-controlled access option for Alternative B would include the following major cost items:

Interchanges

- US 74 (A three-quadrant interchange exists. The project will add a ramp in the northeast quadrant and widen the existing bridge over US 74.)

Intersections (where signals are anticipated)

- SR 1528, SR 1574, US 76, SR 1423, SR 1422, SR 1421, SR 1317, SR 1420, SR 1442, SR 1004, SR 1340, SR 1339, SR 1329, SR 1378, SR 1314, SR 1308, US 701, NC 410 Bus., SR 1305, NC 904

Bridges

- Railroad Grade Separations of NC 410 @ CSX near Chadbourn
- Railroad Grade Separations of NC 410 @ CSX near Water Branch
- Dual bridges for NC 410 @ Grissett Swamp

Stream Crossings (Culverts)

- 12 crossings

**Alternative C** begins at the US 74 / SR 1585 (Union Valley Road) interchange, utilizes the SR 1585 alignment to SR 1436 (Georgia Pacific Road), and then bears southwest on new location crossing SR 1429 (Slippery Log Road), SR 1005 (Peacock Road), SR 1426 (Cedar Branch Road), and SR 1427 before tying into NC 410. The alignment then follows the NC 410 alignment to US 701 where it joins the common alignment with Alternatives B and C along US 701 to the South Carolina state line. With the exception of the multi-lane section of US 701,

all proposed segments that utilize existing roads would require widening from two lanes to a four-lane divided section. The partially-controlled access option for Alternative C would include the following major cost items:

Interchanges

- US 74 (A diamond interchange exists. The project will require widening the existing bridge over US 74.)

Intersections (where signals are anticipated)

- NC 130, SR 1429, SR 1005, SR 1426, SR 1427, NC 410 Bus., SR 1004, SR 1339, SR 1324, SR 1329, SR 1314, US 701, NC 410 Bus., SR 1305, NC 904

Bridges

- Railroad Grade Separations of NC 410 @ CSX near Chadbourn
- Dual bridges for NC 410 @ Grissett Swamp

Stream Crossings (Culverts)

- 7 crossings

**TABLE: ALTERNATIVES SUMMARY**

	Alternative A (Recommended)	Alternative B	Alternative C
<b>Relocations – Partial Control of Access</b>			
Residences	30	24	64
Businesses	4	4	3
<b>Cost Estimates – Partial Control of Access</b>			
Construction (Partial Control of Access)	\$ 84,300,000	\$ 82,800,000	\$ 75,000,000
Right-of-way (Partial Control of Access)	\$ 14,700,000	\$ 19,100,000	\$ 22,500,000
<b>TOTAL COST</b> (Partial Control of Access)	<b>\$ 99,000,000</b>	<b>\$ 101,900,000</b>	<b>\$ 97,500,000</b>
<b>Relocations – Full Control of Access</b>			
Residences	65	71	121
Businesses	11	5	8
<b>Cost Estimates – Full Control of Access</b>			
Construction (Full Control of Access)	\$ 147,900,000	\$ 151,100,000	\$ 140,000,000
Right-of-way (Full Control of Access)	\$ 44,700,000	\$ 50,900,000	\$ 63,100,000
<b>TOTAL COST</b> (Full Control of Access)	<b>\$ 192,600,000</b>	<b>\$ 202,000,000</b>	<b>\$ 203,100,000</b>

The Alternatives Summary Table shows a comparison of the estimated construction and right-of-way costs for the three alternatives. The table also shows the estimated number of residential and business relocations. Each of the cost items listed in the previous sections are included in these estimates.

## V. Interim Alternatives

Because the design year traffic is within the capacity of a two-lane facility, and construction of a multi-lane facility will bear a relatively high construction cost, interim improvements were also evaluated.

Four interim alternatives were studied for this improvement. With the exception of Alternative D, the Interim Alternatives share alignments with the multi-lane alternatives, but require substantially less construction and right-of-way. Cost estimates were prepared for each interim alternative with the option of crossing railroads with grade separations or at-grade crossings. Each interim alternative is proposed as a two-lane facility with four-foot paved shoulders on a 100-foot wide right of way. This right-of-way width is not sufficient to accommodate possible widening to the ultimate four lane section. The letter designations of the interim alternatives, shown on the attached exhibits, correspond to the multi-lane alternatives (e.g. the alignment of Alternative A and Interim Alternative A are identical, etc.) with the exception of Interim Alternative D. Interim Alternative D includes a segment on new location that is not included in the multi-lane alternatives. See the attached exhibits for further details. The Interim Alternatives are described below:

**Interim Alternative A** shares the alignment of the multi-lane Alternative A. With the exception of the multi-lane section of US 701, the proposed improvements will provide a consistent two-lane roadway with two 12-foot lanes and four-foot paved shoulders on a 100-foot right-of-way. Exclusive right and left turn lanes will be provided at all intersections anticipated to be signalized. Interim Alternative A includes the following major cost items:

Intersections (where signals are anticipated and exclusive turn lanes would be provided)

- SR 1528, SR 1574, US 76, SR 1414, SR 1422, SR 1412, SR 1419, SR 1420, SR 1418, SR 1442, SR 1004, SR 1340, SR 1378, SR 1314, SR 1310/SR 1308, US 701, NC 410 Bus., SR 1305, NC 904

Bridges (costs provided with and without grade separations)

- Railroad Grade Separation, NC 410 @ CSX near Chadbourn
- Railroad Grade Separation, NC 410 @ CSX near Clarendon
- Widen bridge, NC 410 @ US 74

Stream Crossings (Culverts)

- 19 crossings

**Interim Alternative B** shares the alignment of the multi-lane Alternative B. With the exception of the multi-lane section of US 701, the proposed improvements will provide a consistent two-lane roadway with two 12-foot lanes and four-foot paved shoulders on a 100-foot right-of-way. Exclusive right and left turn lanes will be provided at all intersections anticipated to be signalized. Interim Alternative B includes the following major cost items:

Intersections (where signals are anticipated and exclusive turn lanes would be provided)

- SR 1528, SR 1574, US 76, SR 1423, SR 1422, SR 1421, SR 1317, SR 1420, SR 1442, SR 1004, SR 1340, SR 1339, SR 1329, SR 1378, SR 1314, SR 1308, US 701, NC 410 Bus., SR 1305, NC 904

Bridges (costs provided with and without grade separations)

- Railroad Grade Separation, NC 410 @ CSX near Chadbourn
- Railroad Grade Separation, NC 410 @ CSX near Water Branch
- Widen bridge, NC 410 @ US 74

Stream Crossings (Culverts)

- 12 crossings

**Interim Alternative C** shares the alignment of the multi-lane Alternative A. With the exception of the multi-lane section of US 701, the proposed improvements will provide a consistent two-lane roadway with two 12-foot lanes and four-foot paved shoulders on a 100-foot right-of-way. Exclusive right and left turn lanes will be provided at all intersections anticipated to be signalized. Interim Alternative C includes the following major cost items:

Intersections (where signals are anticipated and exclusive turn lanes would be provided)

- NC 130, SR 1429, SR 1005, SR 1426, SR 1427, NC 410 Bus., SR 1004, SR 1339, SR 1324, SR 1329, SR 1314, US 701, NC 410 Bus., SR 1305, NC 904

Bridges (costs provided with and without grade separations)

- Railroad Grade Separation, NC 410 @ CSX near Chadbourn
- Widen bridge, NC 410 @ US 74

Stream Crossings (Culverts)

- 7 crossings

**Interim Alternative D** has the same beginning point as Interim Alternatives A and B and shares a common alignment from US 74 to just north of SR 1423. From this point, Interim Alternative D bears southeast on new alignment before tying into a common alignment with Interim Alternative C just south of SR 1427. The alignment then follows the NC 410 alignment to US 701 where it joins the common alignment with Interim Alternatives A, B and C along US 701 to the South Carolina state line. See the attached exhibits for further details. With the exception of the multi-lane section of US 701, the proposed improvements will provide a consistent two-lane roadway with two 12-foot lanes and four-foot paved shoulders on a 100-foot right-of-way. Exclusive right and left turn lanes will be provided at all intersections anticipated to be signalized. Interim Alternative D includes the following major cost items:

Intersections (where signals are anticipated and exclusive turn lanes would be provided)

- SR 1528, SR 1574, US 76, SR 1414, SR 1423, SR 1422, SR 1421, SR 1317, SR 1427, SR 1004, SR 1339, SR 1324, SR 1329, SR 1318, SR 1314, US 701, NC 904, SR 1305

Bridges (costs provided with and without grade separations)

- Railroad Grade Separation, NC 410 @ CSX near SR 1421
- Railroad Grade Separation, NC 410 @ CSX near SR 1414
- Widen bridge, NC 410 @ US 74

Stream Crossings (Culverts)

- 10 crossings

The Interim Alternatives Summary Table shows a comparison of the estimated construction and right-of-way costs for the four alternatives. The table also shows the estimated number of residential and business relocations. Each of the cost items listed under Interim Alternatives are included in these estimates.

**TABLE: INTERIM ALTERNATIVES SUMMARY**

	Interim Alternative A (Recommended)	Interim Alternative B	Interim Alternative C	Interim Alternative D
<b>Relocations</b>				
Residences	10	12	11	18
Businesses	0	0	1	0
<b>Cost Estimates – With Grade Separated Railroad Crossings</b>				
Construction	\$ 37,100,000	\$ 37,500,000	\$ 33,600,000	\$ 37,600,000
Right-of-way	\$ 6,500,000	\$ 6,800,000	\$ 6,900,000	\$ 8,400,000
<b>TOTAL COST</b> (grade separations)	<b>\$ 43,600,000</b>	<b>\$ 44,300,000</b>	<b>\$ 40,500,000</b>	<b>\$ 46,000,000</b>
<b>Cost Estimates – With At-Grade Railroad Crossings</b>				
Construction	\$ 33,700,000	\$ 33,500,000	\$ 31,700,000	\$ 33,800,000
Right-of-way	\$ 6,500,000	\$ 6,800,000	\$ 6,900,000	\$ 8,400,000
<b>TOTAL COST</b> (at-grade crossings)	<b>\$ 40,200,000</b>	<b>\$ 40,300,000</b>	<b>\$ 38,600,000</b>	<b>\$ 42,200,000</b>

**VI. Recommendations**

Due to the substantially higher number of anticipated residential relocations, Alternative C is not recommended. Alternative B runs immediately adjacent to the CSX railroad corridor on its eastern side for the majority of its length. This physical constraint necessitates that all additional right-of-way associated with Alternative B would need to be acquired east of the existing centerline. This could potentially complicate measures to minimize impacts when more detailed planning and design phases are conducted. Therefore, Alternative B is not a recommended alternative.

Alternative A with partial control of access from US 74 to US 701, as described in Section IV, is the recommended alternative for this project. In comparison to the other options, Alternative A allows for minimal impacts to residences, businesses, and the rail corridor while also containing project costs at a reasonable level.

Should funding constraints dictate that interim improvements be implemented, Interim Alternative A is recommended. It is also recommended that the proposed railroad crossings included along this alternative are grade separated due to the associated safety benefits. Although Interim Alternative A is not the lowest cost Interim Alternative, it allows improvements to be phased towards the ultimate implementation of the multi-lane Alternative A which has the least impacts among the multi-lane alternatives. Should the ultimate section be desired in the future (a four-lane divided highway with partial control of access), the asymmetrical placement of the interim two-lane section on the ultimate four-lane right of way width would allow for ease in retrofitting. The costs for this additional right of way would add approximately \$8.2 million dollars to the Interim Improvements indicated above.

## **VII. Additional Comments**

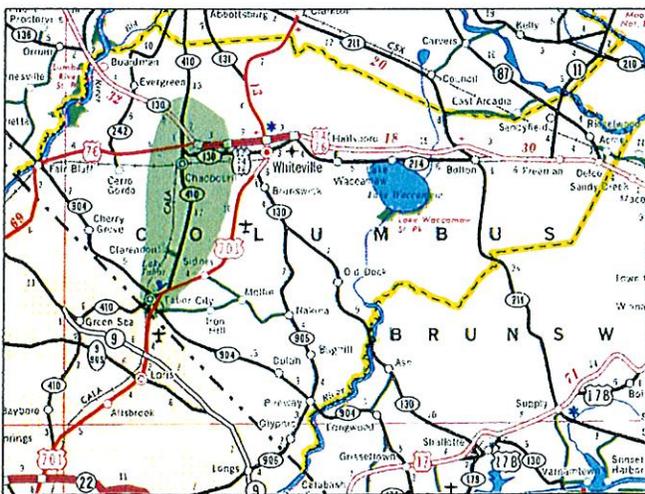
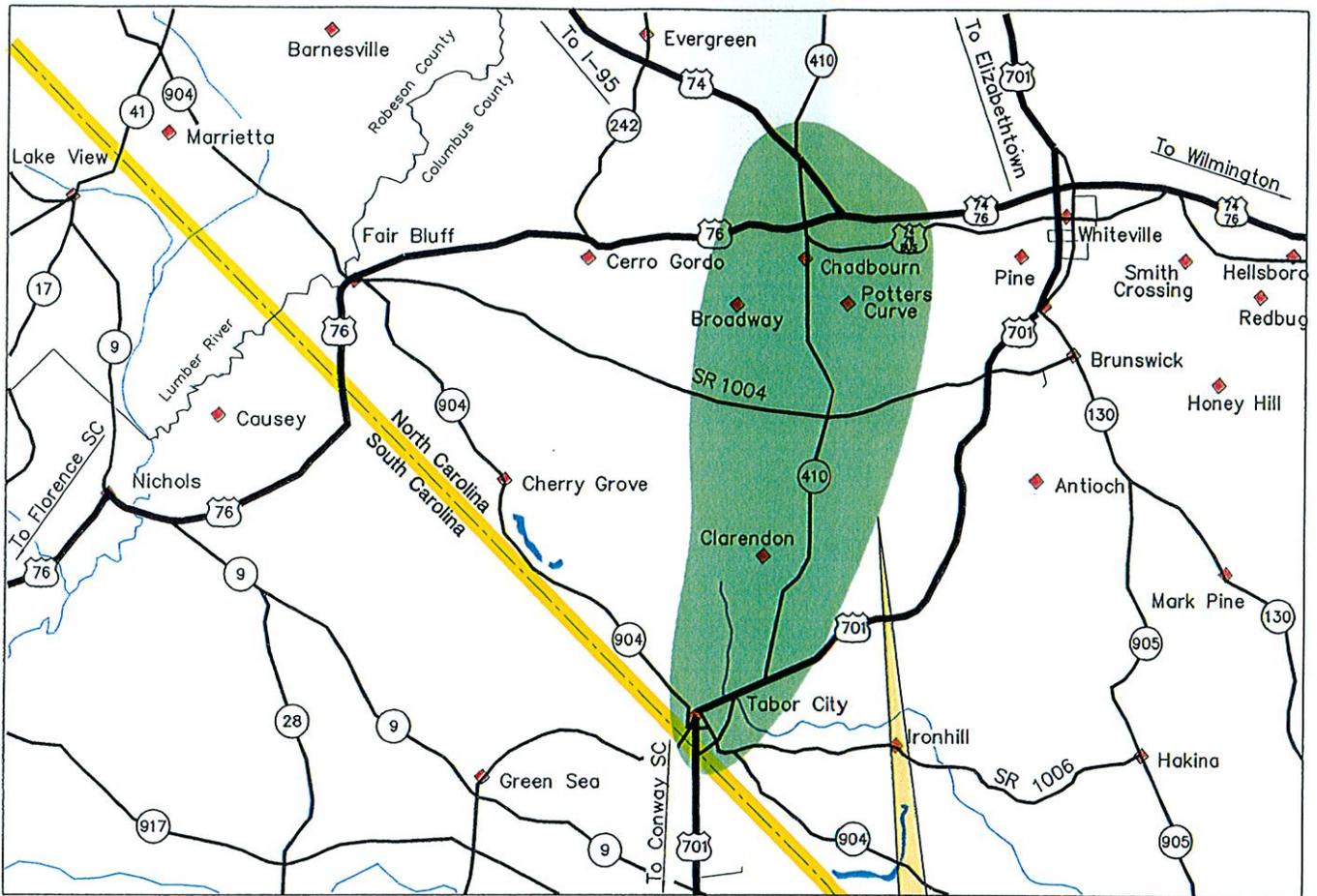
An exhaustive environmental screening was not conducted for this study. However, the following information summarizes conclusions about the project study area based on existing data.

*Archeological and Historic Architectural Properties* – Based on current information, there are three properties along SR 1300 (Old Stake Road) that would need to be evaluated for potential impacts to historic architecture from Alternative A. There are two properties on SR 1414 (Braswell Road) that would need to be evaluated for potential impacts to historic architecture from Alternatives A and B. There are no known archaeological sites within the project study area. Due to the size of the study area, it is anticipated that surveys for both archeological and historic architectural properties will be required during the project planning phase.

*Protected Species* – The United States Fish and Wildlife Service (USFWS) lists six federally protected species for Columbus County as of the January, 2004 listing. The listing includes two birds (bald eagle, red-cockaded woodpecker), two fish (shortnose sturgeon, Waccamaw silverside), and two plants (rough-leaf loosestrife, Cooley's meadowrue). The bald eagle is currently proposed for de-listing. Surveys for these species will be necessary during the project planning phase.

*Wetlands* – A preliminary review of National Wetlands Inventory (NWI) mapping indicates that there are many palustrine wetland systems within the project study area. Wetland types range from freshwater marshes and pine scrublands to bottomland forests near waterbodies (USFWS, 2004). It is anticipated that all three of the alternatives will impact wetlands. Detailed wetland delineations will be conducted during the project planning phase.

*Streams* – The proposed improvements include from 7 to 19 stream crossings where major drainage structures are likely to be required. Evaluation of structure type and sizing will be conducted at the project planning phase.



Columbus County



**Project Vicinity**



North Carolina  
Department of Transportation

**FS-0406A**

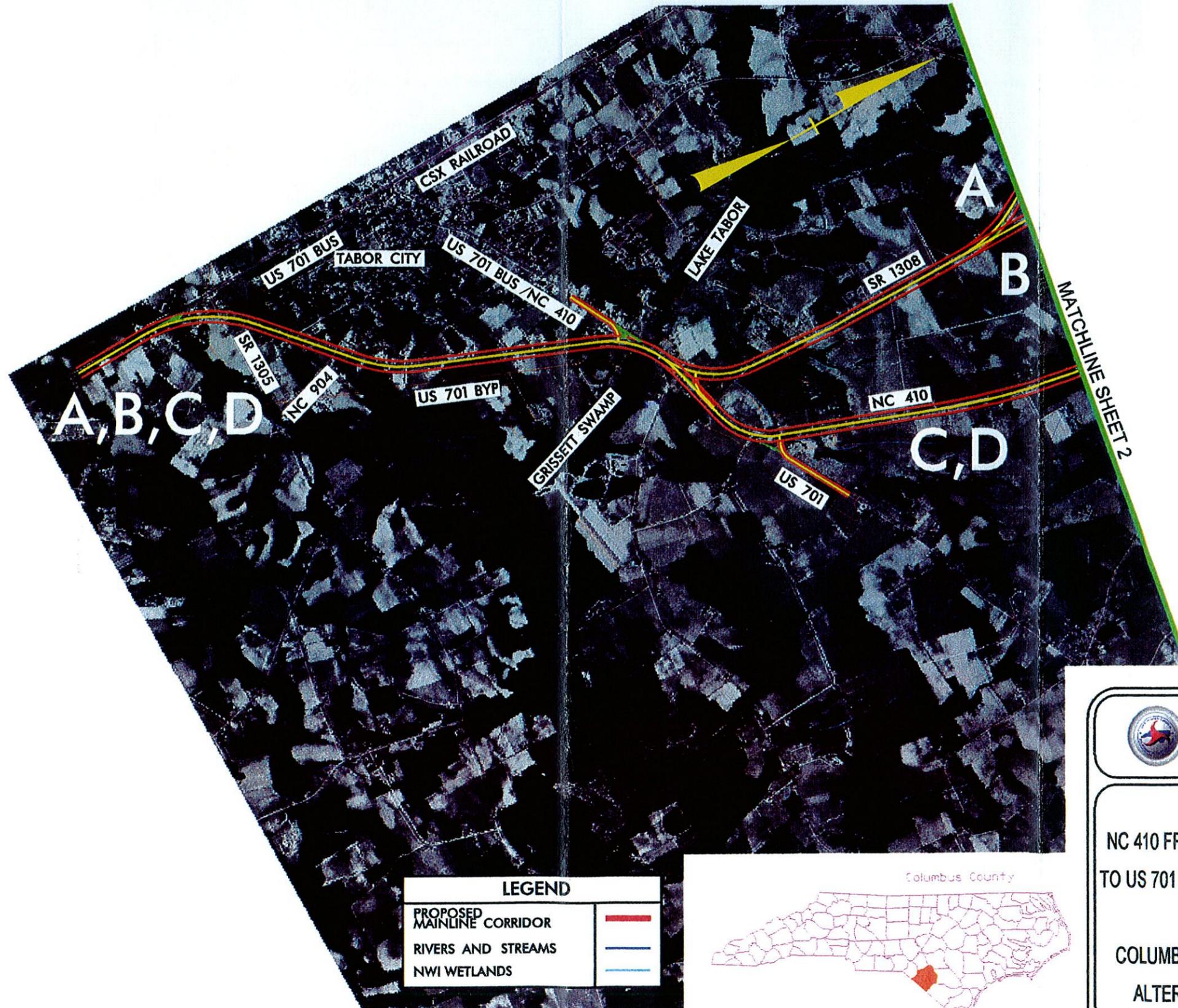
NC 410 from US 74/76 near Chabourn to  
to US 701 at South Carolina State Line  
near Tabor City

Columbus County, North Carolina

**Project Vicinity**

Not to Scale

Exhibit 1



LEGEND	
PROPOSED MAINLINE CORRIDOR	
RIVERS AND STREAMS	
NWI WETLANDS	



North Carolina  
Department of Transportation

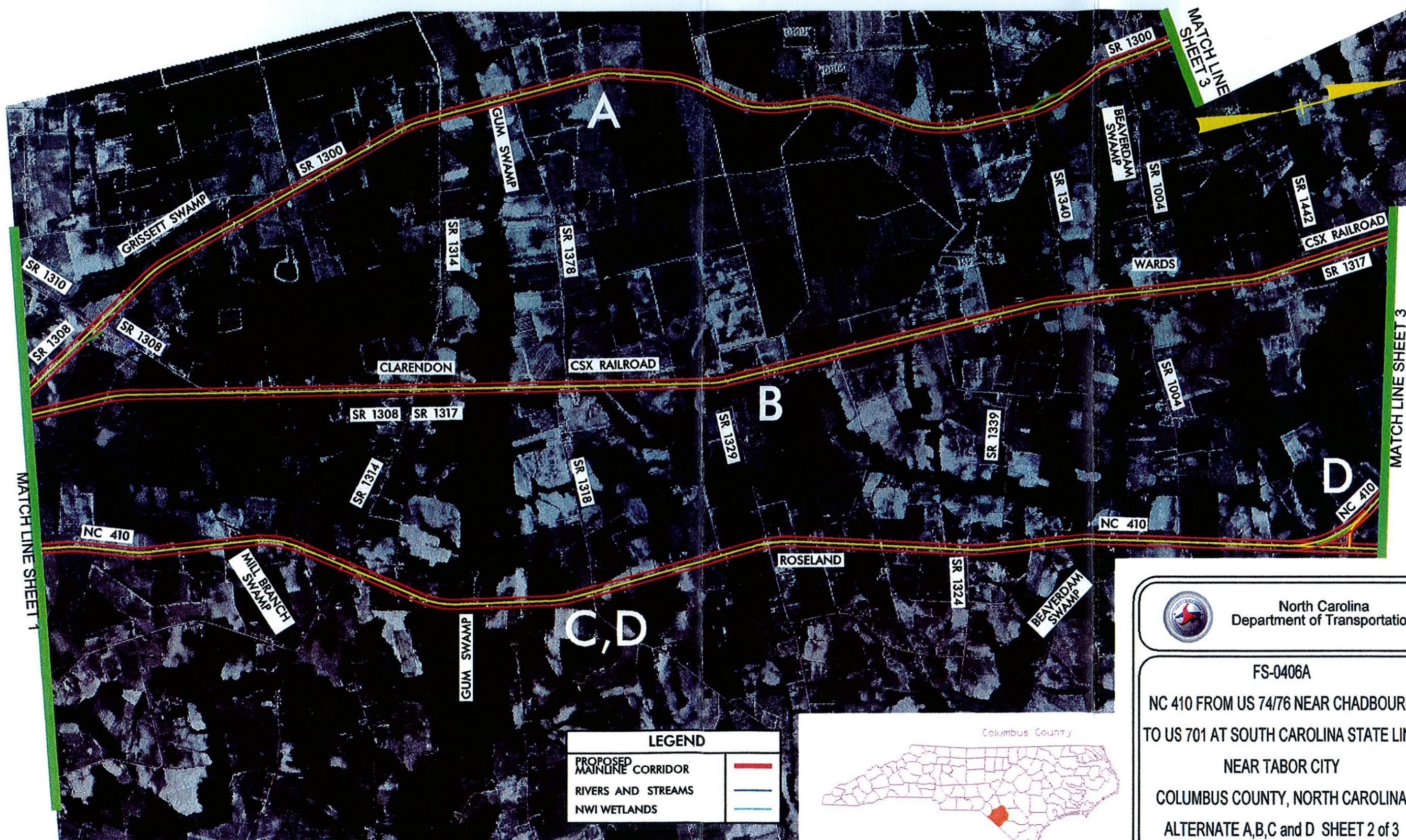
FS-0406A  
NC 410 FROM US 74/76 NEAR CHADBOURN  
TO US 701 AT SOUTH CAROLINA STATE LINE  
NEAR TAVOR CITY

COLUMBUS COUNTY, NORTH CAROLINA

ALTERNATE A,B,C & D SHEET 1 of 3

Scale: 1"=2500'

July 2005

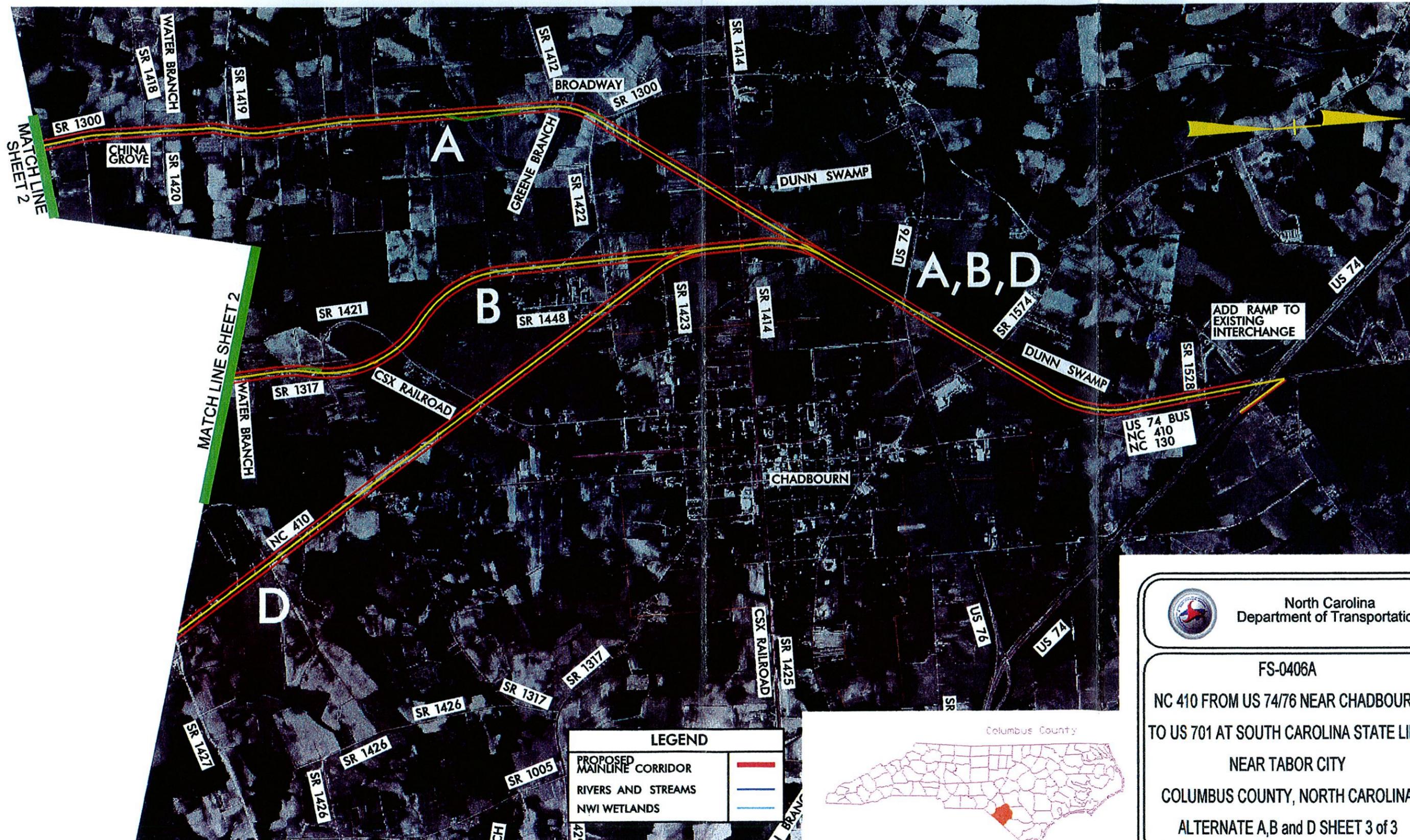


LEGEND	
PROPOSED MAINLINE CORRIDOR	
RIVERS AND STREAMS	
NWI WETLANDS	




 North Carolina  
Department of Transportation

FS-0406A  
 NC 410 FROM US 74/76 NEAR CHADBOURN  
 TO US 701 AT SOUTH CAROLINA STATE LINE  
 NEAR TABOR CITY  
 COLUMBUS COUNTY, NORTH CAROLINA  
 ALTERNATE A,B,C and D SHEET 2 of 3  
 Scale: 1"=2500' July 2005



North Carolina  
Department of Transportation

FS-0406A

NC 410 FROM US 74/76 NEAR CHADBOURN  
TO US 701 AT SOUTH CAROLINA STATE LINE

NEAR TABOR CITY

COLUMBUS COUNTY, NORTH CAROLINA

ALTERNATE A,B and D SHEET 3 of 3

Scale: 1"=2500'

July 2005

