R-4702

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STATE OF NORTH CAROLINA
DEPARTMENT OF TRANSPORTATION

MICHAEL F. EASLEY
GOVERNOR

1534 MAIL SERVICE CENTER, RALEIGH, N.C. 27699-1534

W. LYNDO TIPPETT
SECRETARY

May 9, 2002

MEMORANDUM TO: Mr. Lanny T. Wilson, Member, Board of Transportation
Mr. Louis W. Sewell, Jr., Member, Board of Transportation
Mr. D. M. Campbell, Jr., Member, Board of Transportation
Mr. H. Allen Pope, P.E., Division Engineer, Division 3
Mr. Terry R. Gibson, P.E., Division Engineer, Division 6
Mr. David King
Mr. Calvin Leggett, P.E.
Mr. Troy Peoples, P.E. (3) Attention: Jim Dunlop, P.E.
Mr. John Williamson
Mr. Bill Gilmore, P.E. (2)
Ms. Deborah Barbour, P.E.
Mr. Jay Bennett, P.E.
Mr. Blake Norwood, P.E.
Mr. A. L. Avant
Mr. Ray McIntyre, P.E.
Mr. Doug Lane
Mr. Burt Tasaico, P.E., Attention: Omar S. Sultan

FROM: Mr. Derrick W. Lewis, P.E.
Feasibility Studies Unit

SUBJECT: Feasibility Study FS-0103C, US 421 Improvements from US 13 to I-95. Includes interchange modifications at I-95. Harnett and Sampson Counties.

Our staff has completed a feasibility study for the proposed project referenced above. This brief analysis suggests improvements that would be logical if the project were to be funded. A copy of our report is attached for your information. Please note that this report recommends improving US 421 from just north of SR 1607 to I-95, a distance of 5.6 miles. A copy of our report is attached for your information.

DWL/dwl
Attachment

cc: Mr. Len Hill, P.E.
Mr. Len Sanderson, P.E.

PHONE 919-733-2039 FAX 919-733-3585

FEASIBILITY STUDY

US 421 Improvements
From US 13 to I-95

Harnett and Sampson Counties

Divisions 3 and 6

FS-0103C

Prepared by
Kimley-Horn and Associates, Inc.
for the
Program Development Branch
Division of Highways
N. C. Department of Transportation

Ron Hairr
Project Manager
Kimley-Horn and Associates, Inc.

Derrick W. Lewis, P.E.
Feasibility Studies Unit

5/3/02
Date

Harnett and Sampson Counties

US 421 Improvements
From US 13 to I-95

FS-0103C

I. General Description

This feasibility study describes the recommended improvements to US 421 in Harnett and Sampson Counties. The project study limits (see Figure 1) are from US 13 to I-95, a distance of 9.5 miles.

It is recommended that portions of US 421 be widened from 1,000 feet north of SR 1607 (Christmas Tree Road) to I-95 using a combination of 4-lane divided and 3-lane cross-sections. From US 13 to 1,000 feet north of SR 1607 (Christmas Tree Road), US 421 does not require additional improvements to accommodate an acceptable level of service for the projected 2025 design year traffic volumes. The cross-section through the Plain View area (from 1,000 feet north of SR 1607 to SR 1617) is recommended to be a 3-lane curb and gutter section, 36 feet wide face-to-face of curbs, on 100 feet of right-of-way (ROW). The cross-section would include a 10-foot berm from the face of curb to accommodate future sidewalks. The cross-section from SR 1617 to the Mingo Swamp Bridge is recommended to be a 3-lane section, 36 feet wide, with 8-foot shoulders on 100 feet of ROW. For the remaining segment, Mingo Swamp Bridge to I-95, a four-lane divided section with 12-foot travel lanes, a 30-foot raised median and 8-foot shoulders on a 150-foot ROW is proposed. Median openings would be provided approximately every 1,500 feet in this segment, as needed. The typical eight-foot shoulder width includes a four-foot paved shoulder.

In addition to the improvements to US 421, improvements to the I-95/US 421 interchange are recommended to improve the operation of the interchange. Currently, NC 55 ties into the northeast on-ramp for I-95. To improve the control of access and capacity of the I-95 on-ramp, it is recommended that NC 55 be relocated east along US 421 a distance of approximately 1,400 feet. All four quadrants of the I-95/US 421 interchange have two-way vehicular movement on each ramp. To improve the safety and operation of the interstate interchange, it is recommended that access to the ramps is removed and two-way movement prohibited by converting the ramps to fully-controlled access facilities.

It is anticipated that there will be approximately one residential and two businesses relocated due to this project. A preliminary estimate of cost was prepared by NCDOT. This estimate includes approximately $ 17,750,000 for construction and $ 14,700,000 for ROW for a total cost of $ 32,450,000.

Construction	$ 17,750,000
Right-of-way	$ 14,700,000
Total Cost	$ 32,450,000

Need for Project

The purpose of this project is to increase the traffic carrying capacity of US 421 in Harnett and Sampson Counties.

US 421 is designated as a major thoroughfare in the current Dunn-Erwin Thoroughfare Plan and a principal arterial in the North Carolina Statewide Functional Classification System.

US 421 between US 13 and I-95 is currently a 2-lane, 24-foot wide facility with 1-3-foot paved shoulders. Additional turn lanes are provided at select locations along the corridor including NC 242 and Plain View Elementary School. There are two signalized intersections along the corridor, located at the intersections of US 421 with US 13 and with the I-95 NB ramps.

Currently, the traffic estimates range between 4,200 and 9,200 vehicles per day (vpd) with the highest volumes recorded at the northern limits of the project between the Mingo Swamp Bridge and I-95 (see Figures 2a and 2b, 2001 Traffic Estimates). Residential and commercial growth has occurred throughout the corridor with significant growth experienced recently near the I-95 interchange. Notable commercial development between the Mingo Swamp Bridge and I-95 include Godwins Manufacturing Company Inc., South River Electric Membership Corp., and a car dealership.

Traffic projections provided by NCDOT estimate the 2025 volumes between 7,800 and 19,200 vpd for this section of US 421 (see Figures 2c and 2d, 2025 Traffic Estimates.

The current 2002-2008 Transportation Improvement Program lists a High Hazard Eliminator Project W-4411, which provides for the widening of US 421 from Mingo Swamp Bridge to SR 1005 in Sampson County. The 0.9-mile project will widen US 421 from two to three lanes.

Also, NCDOT and the municipalities mutually adopted the current thoroughfare plan for the Towns of Dunn and Erwin in June 2000. The thoroughfare plan identifies a US 421 Bypass of Dunn and Erwin that begins just west of the Mingo Swamp Bridge and terminates at SR 2013 (Avery Road) north of the municipalities. The Statewide Planning Branch, NCDOT has indicated that the proposed bypass is currently unfunded.

Capacity analyses were performed for the PM peak hour for the existing (2001) and 2025 projected traffic volumes along the US 421 corridor. The anticipated levels-of-service (LOS) for the US 421 corridor were determined using methodologies contained in the *Highway Capacity Manual* (HCM) Arterial and Intersection Analysis, and are indicated in Tables 1 and 2.

Table 1 US 421 PM Peak Hour Arterial Analysis Results				
US 421 Segment		2001 Two-Lane Highway	2025 Two-Lane Highway	2025 Proposed Widening
1	US 13 to 1,000' north of SR 1607	**720 vph – LOS C** *(5,400 vpd)*	**1,150 vph – LOS D** *(9,600 vpd)*	**LOS D** 2-lane section
2	1,000' north of SR 1607 to SR 1617	**720 vph – LOS C** *(5,400 vpd)*	**1,400 vph – LOS D** *(10,500 vpd)*	**LOS C** 3-lane section
3	SR 1617 to SR 1005	**720 vph – LOS C** *(5,400 vpd)*	**1,400 vph – LOS D** *(10,500 vpd)*	**LOS C** 3-lane section
4	SR 1005 to Mingo Swamp Bridge	**831 vph – LOS D** *(6,800 vpd)*	**1,687 vph – LOS E** *(13,800 vpd)*	**LOS D** 3-lane section
5	Mingo Swamp Bridge to I-95 Interchange	**1,124 vph – LOS D** *(9,200 vpd)*	**2,347 vph – LOS E** *(19,200 vpd)*	**LOS B** 4-lane section

-HCS Two-Lane Highways Release 1.5, Service Flow Rate in Vehicles per Hour– Level of Service
-HCS Multi-Lane Highways Release 3.2, Level of Service

Table 2 US 421 PM Peak Hour Intersection Capacity Analysis Results			
Intersection	Existing Intersection LOS (Delay)	No Improvements 2025 LOS (Delay)	Improved 2025 LOS (Delay)
NC 55 at US 421	B (13.6)	E (63.1)	D (50.0)*
US 13 at US 421	B (10.4)	B (12.2)	N/A

HCS Signalized Intersections Version 3.2
* With Dual Southbound Left-Turn Lanes along US 421

The capacity analysis indicates that the segment of US 421 between the Mingo Swamp bridge and I-95 is currently operating at LOS D for 2001. This segment of US 421 is expected to degrade to LOS E by 2025 if no improvements are implemented. US 421 between the Mingo Swamp bridge and SR 1005 (Green Path Road) is anticipated to operate at LOS D in 2025 with the implementation of the widening project (TIP # W-4411). The remaining segments of US 421 between SR 1005 and US 13 are anticipated to operate at LOS D by 2025, without improvements.

Additionally, the intersection of US 421/NC 55 is expected to operate at LOS E by 2025 without improvements.

Accident data obtained for the US 421 corridor from 1998-2000 shows from US 13 to the Mingo Swamp Bridge the accident rate is 208 crashes per 100 million vehicle miles (100MVM) traveled. The statewide average for rural U.S. routes with a 2-lane undivided section is 194 crashes per 100MVM traveled. Thirty-two percent of the accidents in this stretch were rear-end collisions, 6% involved a vehicle running off the road to the right, and 19% involved left-turning vehicles. All of these represent types of accidents that could potentially be avoided or reduced if the roadway is widened. Along existing US 421, from the Mingo Swamp bridge to I-95, the accident rate is 106 crashes per 100MVM traveled.

III. Environmental Screening

The following is a preliminary review of environmental issues that have a potential impact to the project. The information obtained for the environmental screening is from readily available database information only. No survey work other then a field inspection was prepared for this study. The environmental screening is not a substitute for the project planning/environmental documentation process. The purpose of the environmental screening is to identify potential environmental issues early in the process. For the purpose of this study, potential environmental issues were identified within a 200-foot corridor along the existing US 421 alignment between the I-95 northbound ramps and US 13. Figures 3A and 3B, the Environmental Screening Maps, show the locations of potential environmental issues.

Historic Properties

As part of the environmental screening process, the North Carolina State Historic Preservation Office (SHPO) was contacted to determine if any historic resources on the National Register of Historic Places or state lists exist within the proposed project corridor. A log tobacco barn is located approximately 3,400 feet northeast of the intersection of US 421 and SR 1633; however, it is not on either the National Register of Historic Places or any North Carolina Surveys. Harnett County has never been surveyed and Sampson County has not been surveyed in 20 years.

For the purpose of this screening, a field inspection was conducted to identify properties within the study corridor that had the potential to be older then 50 years. Based on the field review one house was identified as seen in Figure 4, Photo B.

Floodplains

Both Harnett County and Sampson County are regular participants in the National Flood Insurance Program. Federal Emergency Management Agency (FEMA) floodplain map Panels 37085C 0185 D, Harnett County, North Carolina and 370220 0025 B, Sampson County, North Carolina were reviewed to determine whether the proposed project corridor would cross the 100-year floodplain. The 100-year floodplain is located along the Harnett/Sampson County line at Mingo Swamp and also along Beaverdam Swamp. The width of the floodplain located at the US 421 crossing of Mingo Swamp and Beaverdam Swamp are approximately 2,000 feet and 200 feet, respectively. No base flood elevations were provided. When constructing this project, local and state regulations regarding the 100-year floodplain should be followed.

Stream Classification

The proposed project corridor is located in the Cape Fear River Basin. The project corridor crosses the Mingo Swamp, Beaverdam Swamp, Jumping Run, and the Little Coharie Creek. All of the preceding water bodies are classified as Swamp Waters (Sw) and freshwater streams that support aquatic life and are suitable for secondary recreation (C). All freshwaters are classified as (C) as a minimum. The Swamp Waters designation classifies waters as waters that have low velocities and other natural characteristics that are different from adjacent streams. These water bodies should be surveyed and have the appropriate coordination with the North Carolina Department of Environment and Natural Resources (NCDENR) and the U.S. Army Corps of Engineers (USACE) during any environmental document study.

Wetlands

National Wetland Inventory (NWI) maps for the Dunn, Mingo, and Timothy quads (USGS) were reviewed to determine whether the proposed project corridor would impact any wetlands. The proposed project corridor would cross three wetlands associated with Mingo Swamp, Beaverdam Swamp, and Jumping Run. Also, seven small pockets of wetlands adjacent to US 421 exist. During the preparation of any environmental assessment, it is recommended that these wetlands be surveyed and delineated. Proper permitting from the U.S. Army Corps of Engineers should be obtained before construction of the project, and appropriate mitigation measures should be taken.

Threatened and Endangered Species

The North Carolina Natural Heritage Program was contacted to determine the presence of any threatened and endangered species within the proposed project corridor. Three rare plant species were found within the proposed project corridor. Table 3 describes these species and their associated habitats.

A survey for these species should be completed during preparation of any environmental assessment, and if these species are found to be present, additional investigations should be taken.

Table 3
Threatened and Endangered Species Found within the US 421 Corridor (US 13 to I-95)

Name *(Scientific Name)*	Federal Status[1]	State Status[2]	Habitat
American blueheart (*Buchnera americana*)	--	C	glades, open forests, stream banks, found probably primarily on mafic or calcareous rock
Spring-flowering goldenrod (*Solidago verna*)	FSC	T	mesic to moist pinelands and pocosin ecotones
Carolina bogment (*Macbridea caroliniana*)	FSC	T	blackwater swamps, savanna/pocosin ecotones, ditches

[1]Definitions of Federal Status: LE=Endangered, LT=Threatened, FSC=Species of Special Concern.
[2]Definitions of State Status: E=Endangered, T=Threatened, C=Candidate

Source: North Carolina Natural Heritage Program, 2001.

Environmental Justice

Executive Order 12898 requires that Federal agencies identify and address disproportionately high and adverse effects of federally funded projects on minority and low-income projects. The 1990 Census data were reviewed for high levels of minorities, elderly, and percent of people living below the poverty level and for lower than normal family median income. Table 4 indicates the areas of potential environmental justice concerns. As of the date of this study, the appropriate data from the 2000 Census were not available for use.

Table 4
Areas of Potential Environmental Justice Concern

Census Tract (Block Group)	Components of Environmental Justice Analysis†			
	Minorities	Age	Poverty Level	Median Family Income
701 (1)	N	N	N	N
702 (1)	N	N	N	N
9703 (1)	N	Y	N	N
9703 (2)	N	N	N	N

†Y indicates areas of higher than normal amounts of minority population, elderly (age 65 or over) population, population below the poverty level, and lower than normal family median income. N indicates no concerns associated with the particular Block Group.

Source: U.S. Census Bureau, 1990.

The 9703 (1) Block Group, where age represents a possible environmental justice concern, lies to the north of US 421 in Sampson County.

Hazardous Materials

Because of the liability associated with purchasing properties containing hazardous materials issues, state and Federal databases were reviewed using information provided by First Search Technology Corporation. Sixteen sites within the proposed corridor were determined to contain potential hazardous materials. One site is a Resource Conservation and Recovery Act hazardous materials generator. Thirteen sites contained underground or aboveground storage tanks, and two sites contained leaking underground or aboveground storage tanks. Figures 3A and 3B show the location of sites of potential concern, and Table 5 provides information regarding each site. Before purchasing right-of-way property for the proposed project corridor, a Phase I environmental audit should be conducted to precisely determine potential hazardous materials impacts.

Table 5 Potential Hazardous Materials Impacts to US 421 Corridor				
	Facility Name	**Facility Address**	**Type of Potential Impact**	**Distance / Direction**
1	Hasty Mart #38	1801 E. Cumberland St., Dunn	UST/AST[a]	0.01 mi. NE
2	Phillips 66 Co. #25485	US 421 and I-95	UST/AST	0.01 mi. NE
3	Short Stop #9	1008 E. Cumberland Street, Dunn	UST/AST	0.10 mi. NW
4	Wrights Texaco	1009 E. Cumberland Street, Dunn	UST/AST	0.10 mi. NW
5	Susan E. Tart, Inc. Property	I-95/US 421 NE Corner, Box 220, Dunn	LUST/AST[b]	0.12 mi. NE
6	Howard L. Tart	915 East Broad Street, Dunn	UST/AST	0.22 mi. NW
7	Servco	810 E. Cumberland Street, Dunn	UST/AST	0.25 mi. NW
8	Wayne Oil Co.	815 E. Cumberland Street, Dunn	RCRA/RCRIS GEN[c]	0.25 mi. NW
9	VRP Associates	I-95 and Pope Road, Dunn	2 UST/ASTs	0.43 mi. SW
10	Raynors Mini Mart	600 E. Cumberland St., Dunn	UST/ASTs	0.44 mi. NW
11	Pope Road & I-95 BP	I-95, Dunn	UST/ASTs	0.44 mi. SW
12	Pop Mart	415 Spring Branch Road, Dunn	UST/ASTs	0.45 mi. SW
13	T-Mart 21	511 Spring Branch Road, Dunn	UST/ASTs	0.48 mi. SW
14	Short Stop #1 (Former)	509 E. Cumberland Street, Dunn	UST/AST, LUST/AST	0.49 mi. NW
Total			13 UST/ASTs 2 LUST/ASTs 1 RCRA GEN	

[a]UST/AST = Underground/Aboveground Storage Tank – Regulated underground/aboveground storage tanks

[b]LUST/AST = Leaking Underground/Aboveground Storage Tank – Leaking underground/aboveground storage tanks.

[c]RCRA/RCRIS GEN = Resource Conservation and Recovery Act/Resource Conservation and Recovery Information System Generators – Lists information pertaining to facilities that treat, store, or dispose of EPA-regulated hazardous waste.

Source: Environmental First Search Corporation, 2001.

IV. Description of Alternates

The following two alternates were identified for further study. The proposed cross-section for each alternate was determined based on existing (2001) and 2025 traffic projections provided by NCDOT.

Table 6
US 421 Widening
Alternates

Segment		Alternate 1 Cross-section	Alternate 2 Cross-section (Recommended)
1	US 13 to 1,000' north of SR 1607	4-lane divided with depressed median	2-lane section
2	1,000' north of SR 1607 to SR 1617	5-lane undivided curb & gutter	3-lane undivided curb & gutter
3	SR 1617 to SR 1005	4-lane divided with depressed median	3-lane undivided with shoulder
4	SR 1005 to Mingo Swamp Bridge	4-lane divided with depressed median	3-lane undivided with shoulder
5	Mingo Swamp Bridge to I-95 Interchange	4-lane divided with raised median	4-lane divided with raised median

Alternate 1

Alternate 1 improves the corridor to a multilane roadway from US 13 in Spivey's Corner to I-95 in Dunn. For a detailed view of Alternate 1, please refer to the Alternate 1 Conceptual Design. The first segment of the project, from US 13 to 1,000 feet north of SR 1607 (Christmas Tree Road), would be widened to a four-lane divided section with 12-foot-wide travel lanes, a 34-foot depressed median, and 8-foot shoulders on 150 feet of ROW. Through the community of Plain View, from 1,000 feet north of SR 1607 to SR 1617 (Old US 421), US 421 would be widened to a 5-lane undivided curb and gutter section, 60 feet wide face-to-face of curbs, on 100 feet of ROW. The cross-section would include a 10-foot berm from the face of curb to accommodate future sidewalks. The segment of US 421 from SR 1617 to SR 1005 (Green Path Road) would be widened to a 4-lane divided section with 12-foot travel lanes, a 34-foot depressed median, and 8-foot shoulders, on 150 feet of ROW. From SR 1005 to the Mingo Swamp Bridge (Harnett County line), the roadway would also be widened to a 4-lane divided section with 12-foot travel lanes, a 34-foot depressed median and 8-foot shoulders, on 150 feet of ROW. In the divided segments, median openings would be provided approximately every 2,500 feet, as needed to provide access to facilities along the roadway. The typical eight-foot shoulder section includes a four-foot paved shoulder.

From Mingo Swamp Bridge to I-95, US 421 would be widened to a four-lane divided section with 12-foot travel lanes, a 30-foot raised median and 8-foot shoulders. The cross-section would be 78 feet wide shoulder to shoulder on a 150-foot ROW. Median openings would be provided approximately every 1,500 feet in this segment, as needed.

Alternate 2
(Recommended)

Alternate 2 proposes to widen segments of the corridor from US 13 to I-95 with a combination of 4-lane divided and 3-lane cross-sections. The segments (with proposed cross-sections noted) for this alternate are shown in Figures 5A and 5B. A more detailed design can be seen in the Alternate 2 Conceptual Design. From US 13 to 1,000 feet north of SR 1607, the cross-section would remain as a 2-lane facility. The cross-section through the Plain View area (from 1,000 feet north of SR 1607 to SR 1617) would be a 3-lane curb and gutter section, 36 feet wide face-to-face of curbs, on 100 feet of ROW. The cross-section would include a 10-foot berm from the face of curb to accommodate future sidewalks. The cross-section from SR 1617 to the Mingo Swamp Bridge would include a 3-lane section, 36 feet wide, with 8-foot shoulders on 100 feet of ROW.

In Alternate 2, US 421 would be widened from the Mingo Swamp Bridge to I-95 to a four-lane divided section with 12-foot travel lanes, a 30-foot raised median and 8-foot shoulders. The cross-section would be 78 feet wide shoulder to shoulder on a 150-foot ROW. Median openings would be provided approximately every 1,500 feet in this segment, as needed.

Additional Design Considerations

Regardless of the alternate, improvements to the I-95 / US 421 interchange are recommended to improve the operation of the interchange. Currently, NC 55 ties into the northeast on-ramp for I-95. The 2001 average daily traffic for NC 55 at this location is approximately 5,000 trips per day. This volume is expected to reach 11,800 by 2025. To improve the control of access and capacity of the I-95 on-ramp, it is recommended that NC 55 be relocated east along US 421 a distance of approximately 1,400 feet. This would improve the operation of the existing signal at I-95 NB ramps/US 421 by avoiding the need for an additional eastbound left-turn lane for US 421. This recommendation may require an additional signal on US 421. However, relocating NC 55 to the east would improve the access for the planned development located northeast of the interchange.

All four quadrants of the I-95/US 421 interchange have two-way ramp/street access problems associated with the on-off ramps. Drivers do not expect to encounter turning vehicles along the ramps to an interstate. As volumes increase along the interstate corridor, vehicle conflicts and incidents can be expected to increase as well. To improve the safety and operation of the interchange it is recommended that the ramps be converted to controlled access facilities. Figure 6 illustrates the concepts for the interchange improvements.

Table 7 provides a breakdown of the cost estimates for Alternates 1 and 2 by segment. The cost of Alternate 1 is $ 37,000,000 for construction and $ 20,200,000 for ROW, for a total cost of $ 57,200,000. The cost of Alternate 2 is $ 17,750,000 for construction and $ 14,700,000 for ROW, for a total cost of $ 32,450,000. In addition, estimated residential, business and church relocations are noted for each segment.

Table 7
US 421 Widening
Cost Estimate

Segment		Alternate 1	Alternate 2 (Recommended)
1	Construction	$ 13,600,000	NA
	ROW (Res-Bus-Church)	$ 5,775,000 (27-2-0)	NA
2	Construction	$ 7,200,000	$ 4,000,000
	ROW (Res-Bus-Church)	$ 3,025,000 (1-0-0)*	$ 3,025,000 (1-0-0)*
3	Construction	$ 3,900,000	$ 2,200,000
	ROW (Res-Bus-Church)	$ 1,300,000 (2-3-0)	$ 1,625,000 (0-1-0)
4	Construction	$ 2,600,000	$ 1,850,000
	ROW (Res-Bus-Church)	$ 1,925,000 (3-1-1)	$ 1,875,000 (0-0-0)
5	Construction	$ 9,700,000	$ 9,700,000
	ROW (Res-Bus-Church)	$ 8,175,000 (0-1-0)	$ 8,175,000 (0-1-0)
	Construction	**$ 37,000,000**	**$ 17,750,000**
	ROW (Res-Bus-Church)	**$ 20,200,000 (33-7-1)**	**$ 14,700,000 (1-2-0)**
	Total	**$ 57,200,000**	**$ 32,450,000**

* 10 Graves +/- may be affected.

V. Additional Comments

Based on the environmental screening there is a potential historic property located within the ultimate right-of-way for Alternate 2 that could be impacted. The house is located approximately 0.15 miles west of SR 1005 along US 421. Additionally, a cemetery is located approximately one mile south of SR 1005. The impact to the cemetery would be avoided with Alternate 1. See Figures 3A and 3B for a reference.

An alternative design cross-section (for both Alternate 1 and 2) using a five-lane curb and gutter section between the Mingo Swamp Bridge to I-95 was also investigated during the functional design phase of this study. This design concept utilized 60 feet wide face-to-face curb and gutter section on 100 feet of ROW to reduce the width of the roadway through the most developed portion of this section of US 421. Right-of-Way and construction cost estimates for the alternative cross-section were prepared and

were found to reduce the total costs for Alternate 1 from $ 57,200,000 to $ 53,850,000 and a reduction for Alternate 2 from $ 32,450,000 to $ 29,100,000.

Appendix

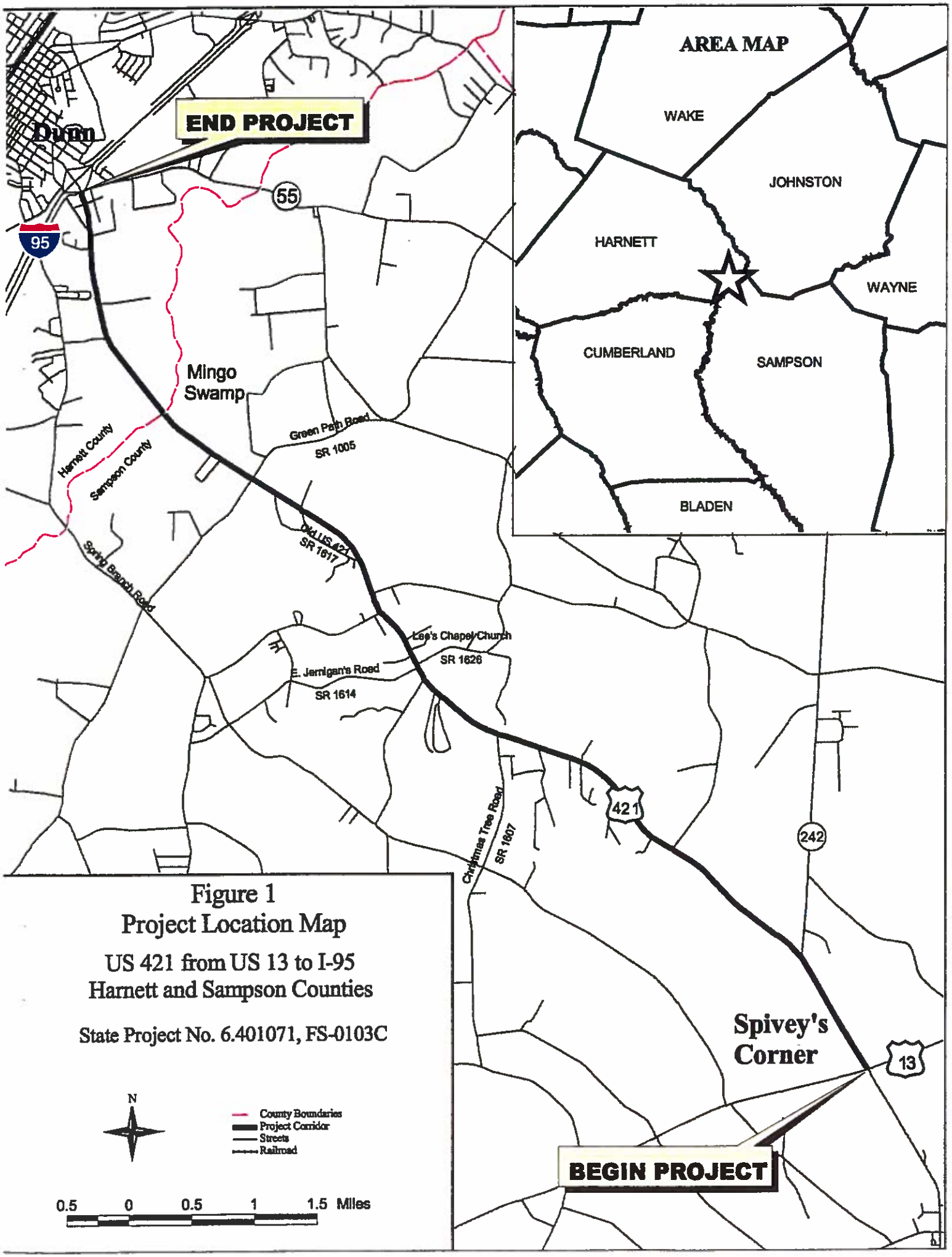
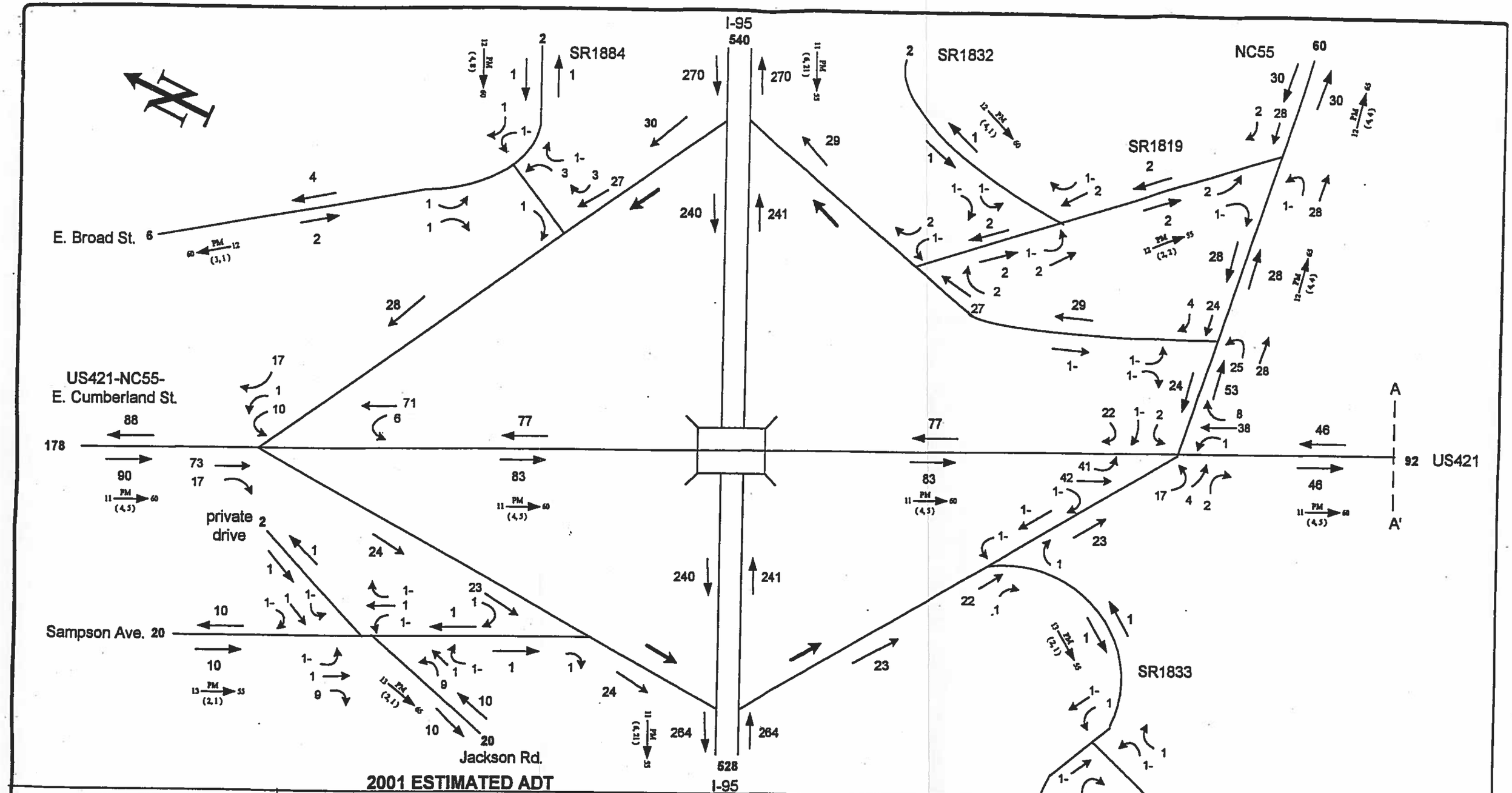


Figure 1
Project Location Map

US 421 from US 13 to I-95
Harnett and Sampson Counties

State Project No. 6.401071, FS-0103C



LEGEND

VPD—# OF VEHICLES PER DAY IN 100'S
- MUCH LESS THAN #### VPD
X MOVEMENT PROHIBITED
→ ONE-WAY MOVEMENT

DHV —PM (4,9)→ D

DHV DESIGN HOURLY VOLUME (%) = K30
K30 = 30'TH HIGHEST HOURLY VOLUME
PM PM PEAK PERIOD
D DIRECTIONAL SPLIT (%)
→ INDICATES DIRECTION OF D
REVERSE FLOW FOR AM PEAK
(d,t) DUALS, TT-ST'S (%)

LOCATION:
US421 from I-95 in Dunn in Harnett County to US13 in Sampson County

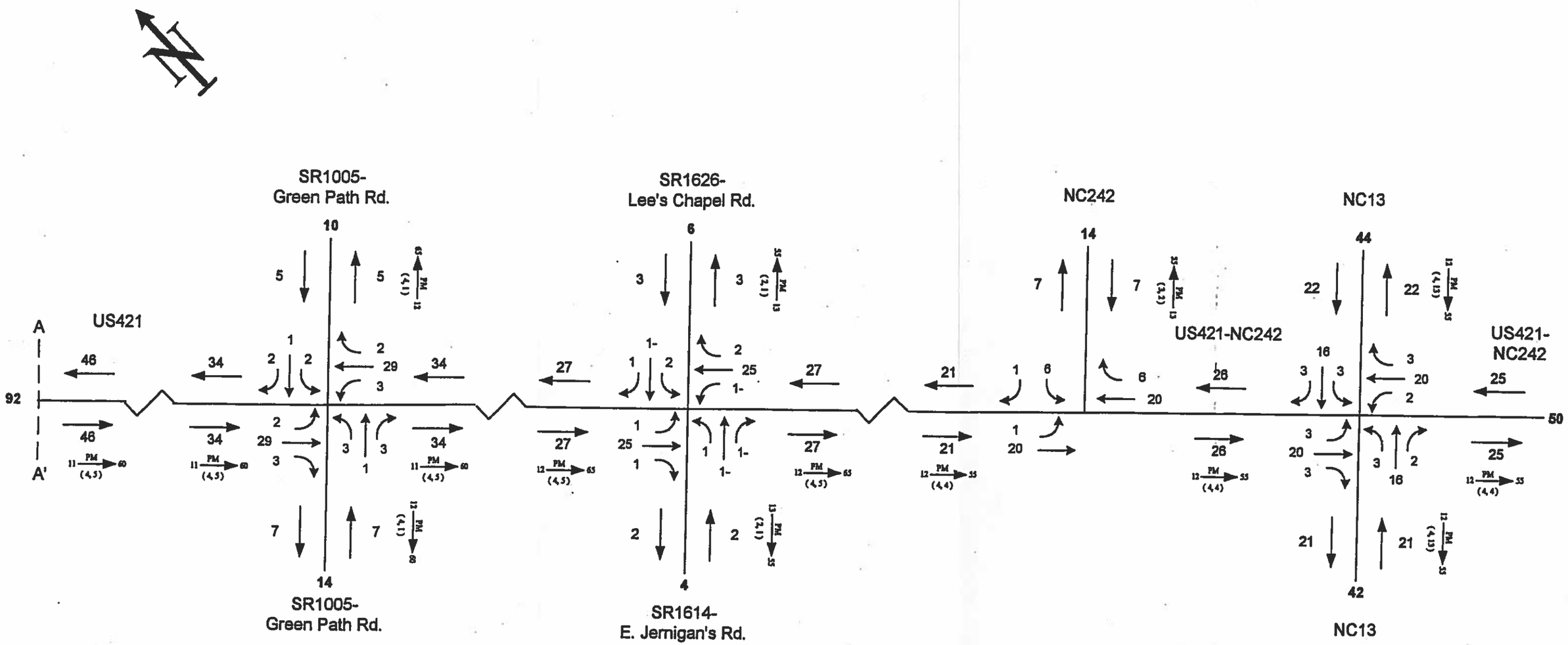
PROJECT:
Widen US421 to a multilane facility.

COUNTY: Harnett, Sampson

DIV.: 3, 6 **DATE:** Feb., 2001

TIP # FS 0103C **W. O. #** 6.401071

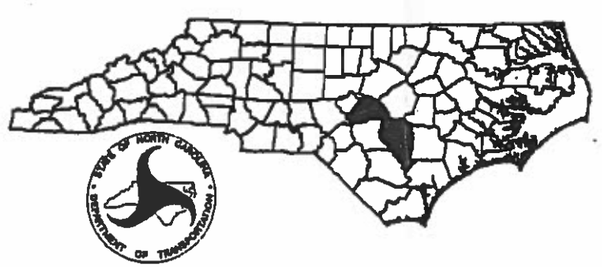
Figure 2a



2001 ESTIMATED ADT

LEGEND

- #### VPD—# OF VEHICLES PER DAY IN 100'S
- ####- MUCH LESS THAN #### VPD
- X MOVEMENT PROHIBITED
- ⟶ ONE-WAY MOVEMENT
- DHV —PM (d,t)→ D
- DHV DESIGN HOURLY VOLUME (%) = K30
  K30 = 30'TH HIGHEST HOURLY VOLUME
- PM PM PEAK PERIOD
- D DIRECTIONAL SPLIT (%)
- ⟶ INDICATES DIRECTION OF D
- REVERSE FLOW FOR AM PEAK
- (d,t) DUALS, TT-ST'S (%)



LOCATION:
US421 from I-95 in Dunn in Harnett County to US13 in Sampson County

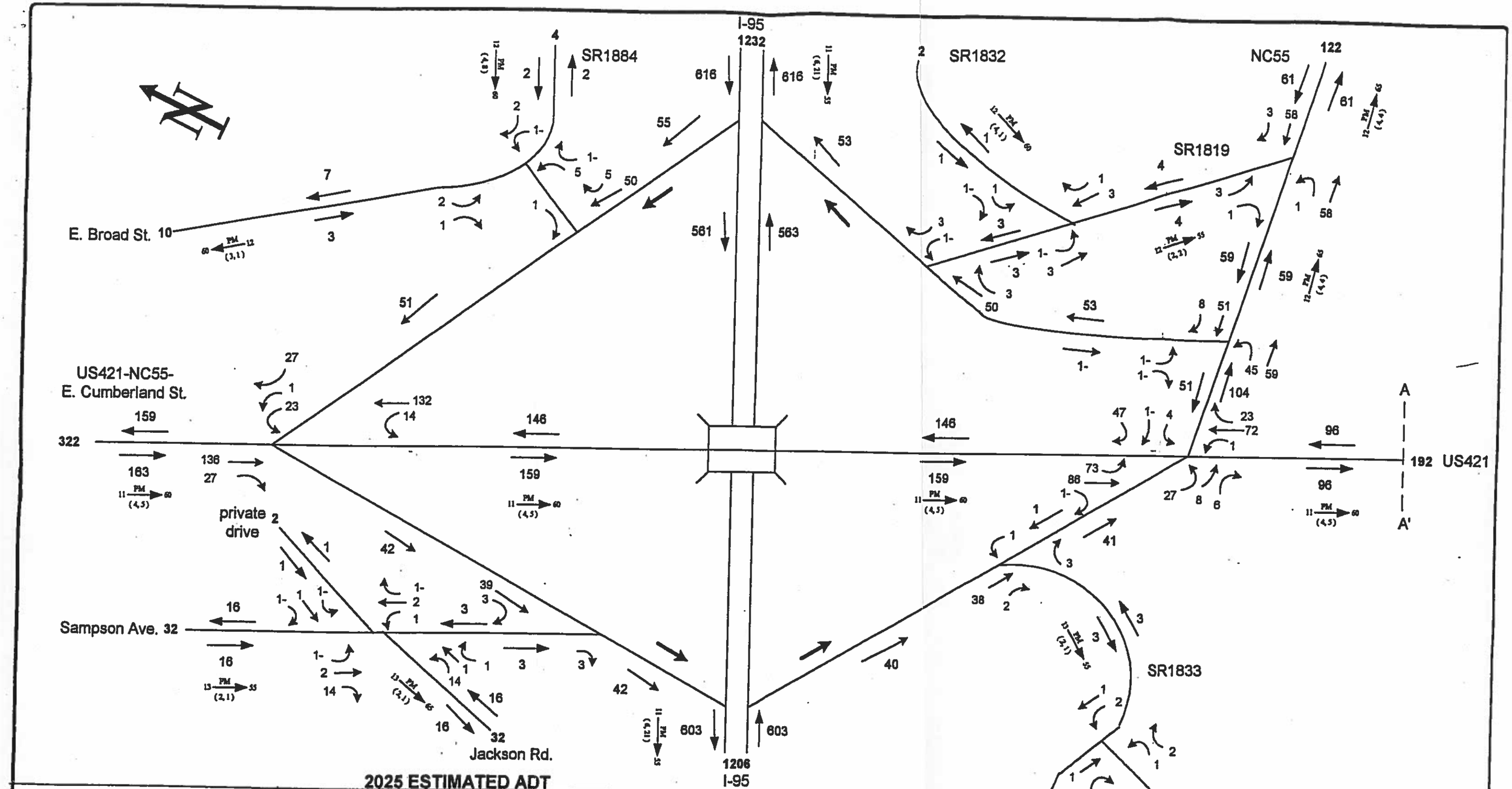
PROJECT:
Widen US421 to a multilane facility.

COUNTY: Harnett, Sampson

DIV.: 3, 6 **DATE:** Feb., 2001

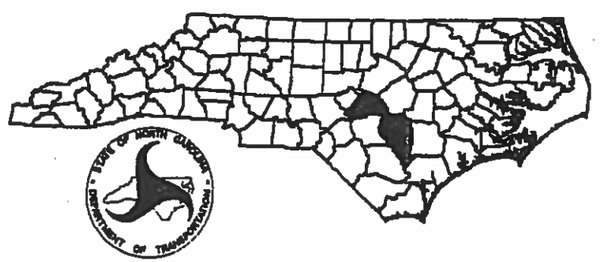
TIP # FS 0103C **W. O. #** 6.401071

Figure 2b



LEGEND

- #### VPD—# OF VEHICLES PER DAY IN 100'S
- ####- MUCH LESS THAN #### VPD
- X MOVEMENT PROHIBITED
- → ONE-WAY MOVEMENT
- DHV —PM (d,t)→ D
- DHV DESIGN HOURLY VOLUME (%) = K30
  K30 = 30'TH HIGHEST HOURLY VOLUME
- PM PM PEAK PERIOD
- D DIRECTIONAL SPLIT (%)
- → INDICATES DIRECTION OF D
- REVERSE FLOW FOR AM PEAK
- (d,t) DUALS, TT-ST'S (%)



LOCATION:
US421 from I-95 in Dunn in Harnett County to US13 in Sampson County

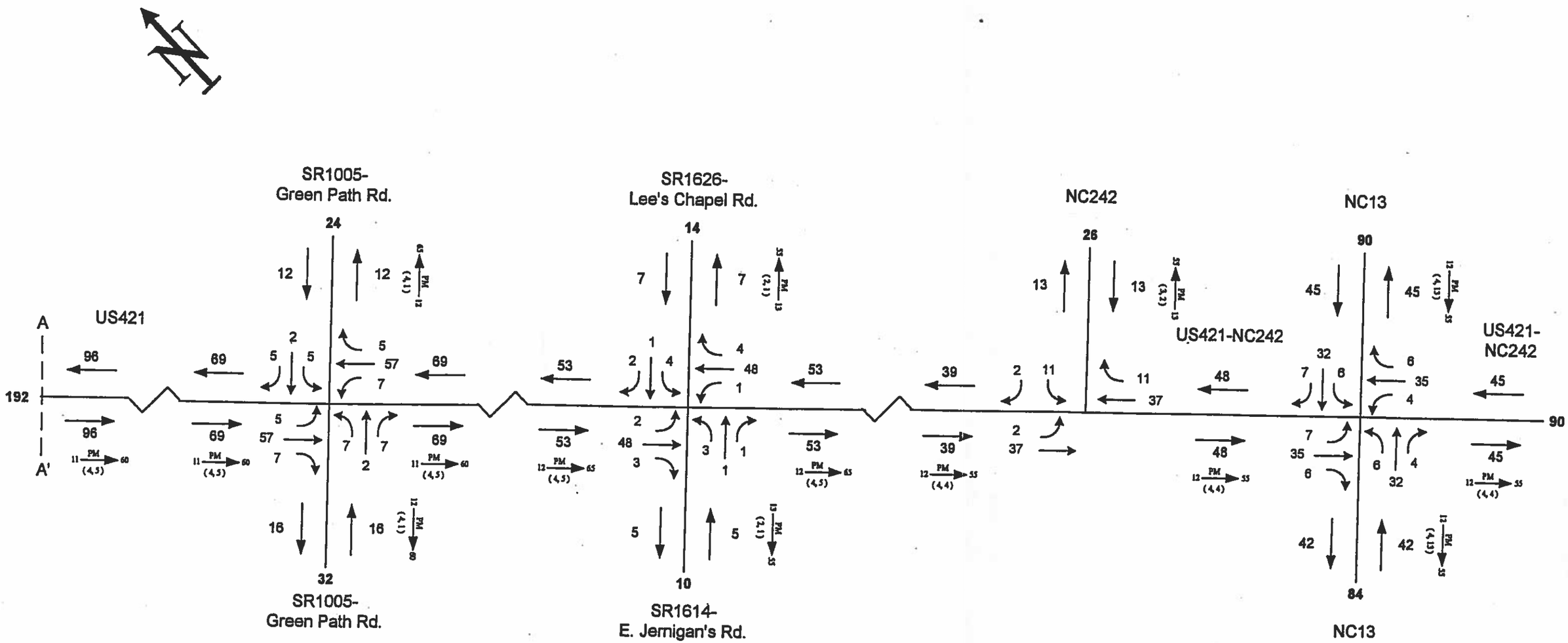
PROJECT:
Widen US421 to a multilane facility.

COUNTY: Harnett, Sampson

DIV.: 3, 6 **DATE:** Feb., 2001

TIP # FS 0103C **W. O. #** 6.401071

Figure 2c



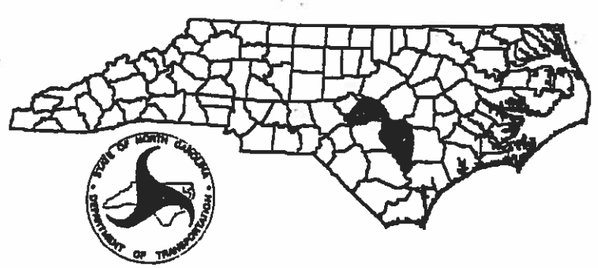
2025 ESTIMATED ADT

LEGEND

VPD—# OF VEHICLES PER DAY IN 100'S
- MUCH LESS THAN ### VPD
X MOVEMENT PROHIBITED
→ ONE-WAY MOVEMENT

DHV —PM (d,t)→ D

DHV DESIGN HOURLY VOLUME (%) = K30
K30 = 30'TH HIGHEST HOURLY VOLUME
PM PM PEAK PERIOD
D DIRECTIONAL SPLIT (%)
→ INDICATES DIRECTION OF D
REVERSE FLOW FOR AM PEAK
(d,t) DUALS, TT-ST'S (%)



LOCATION:
US421 from I-95 in Dunn in Harnett County to US13 in Sampson County

PROJECT:
Widen US421 to a multilane facility.

COUNTY: Harnett, Sampson

DIV.: 3, 6 **DATE:** Feb., 2001

TIP # FS 0103C **W. O. #** 6.401071

Figure 2d

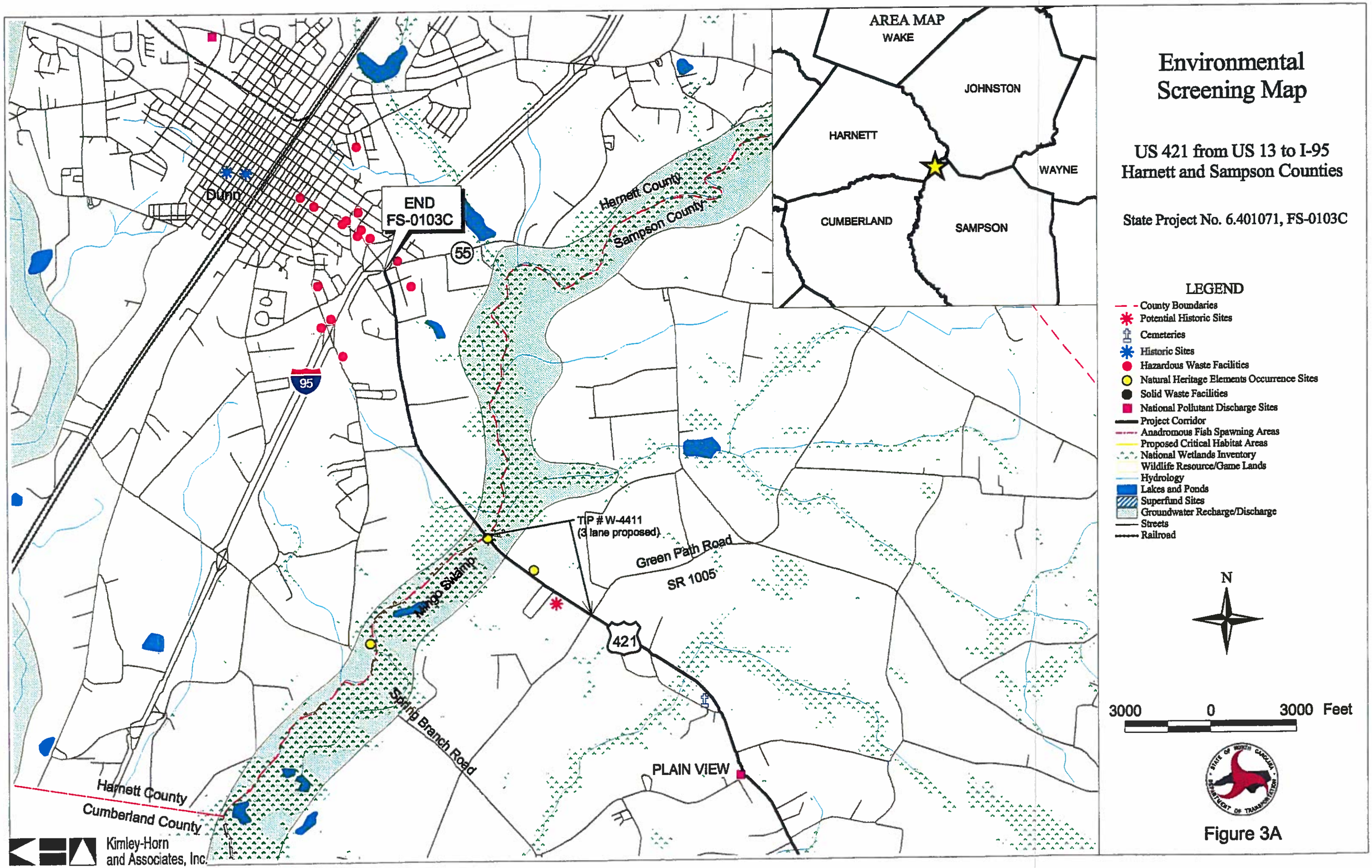
Figure 4
Photographs

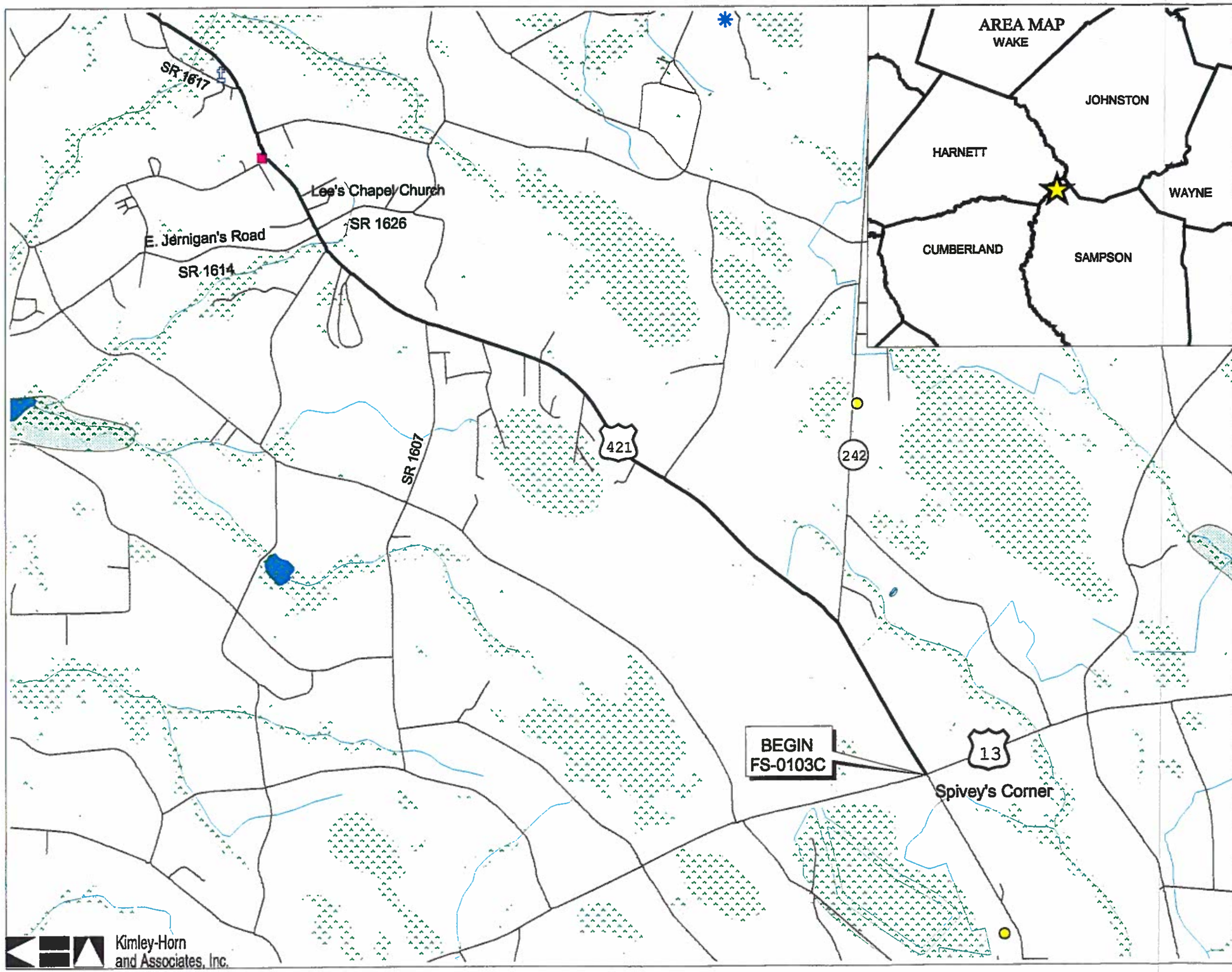
Photo A
Looking NB on US 421 at US 13

Photo B
0.15 miles NW of Green Path Rd.

Photo C
Looking NB on US 421 at I-95 NB Exit Ramp

Photo D
Looking NB along US 421


Environmental Screening Map
US 421 from US 13 to I-95
Harnett and Sampson Counties
State Project No. 6.401071, FS-0103C
AREA MAP
WAKE
JOHNSTON
HARNETT
WAYNE
CUMBERLAND
SAMPSON
LEGEND
County Boundaries
Potential Historic Sites
Cemeteries
Historic Sites
Hazardous Waste Facilities
Natural Heritage Elements Occurrence Sites
Solid Waste Facilities
National Pollutant Discharge Sites
Project Corridor
Anadromous Fish Spawning Areas
Proposed Critical Habitat Areas
National Wetlands Inventory
Wildlife Resource/Game Lands
Hydrology
Lakes and Ponds
Superfund Sites
Groundwater Recharge/Discharge
Streets
Railroad
N
3000 0 3000 Feet
Figure 3A
Dunn
END
FS-0103C
55
95
Harnett County
Sampson County
TIP # W-4411
(3 lane proposed)
Green Path Road
SR 1005
Mingo Swamp
421
Spring Branch Road
PLAIN VIEW
Harnett County
Cumberland County
Kimley-Horn
and Associates, Inc.



Environmental Screening Map

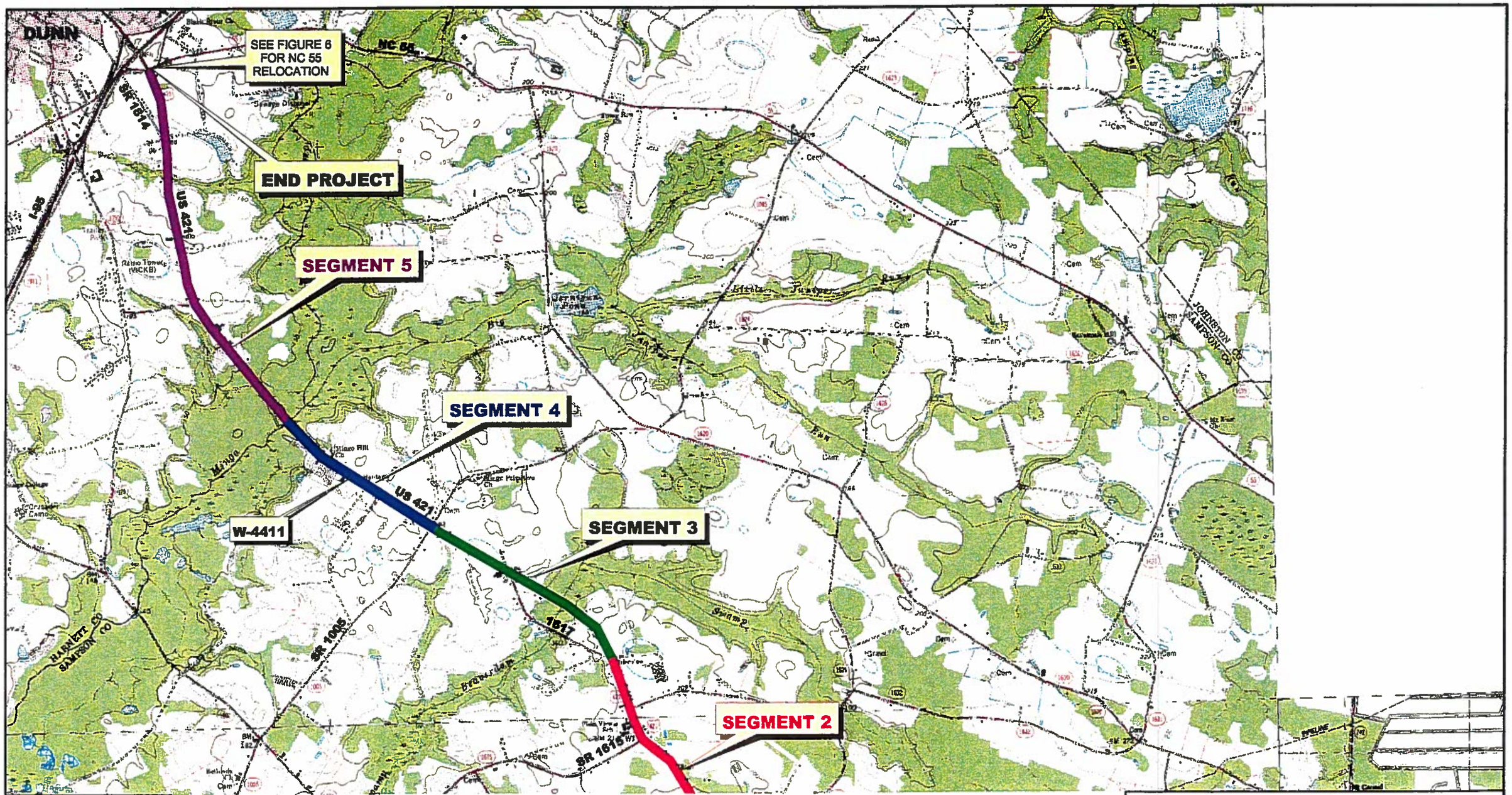
US 421 from US 13 to I-95
Harnett and Sampson Counties

State Project No. 6.401071, FS-0103C

LEGEND

- County Boundaries
- Potential Historic Sites
- Cemeteries
- Historic Sites
- Hazardous Waste Facilities
- Natural Heritage Elements Occurrence Sites
- Solid Waste Facilities
- National Pollutant Discharge Sites
- Project Corridor
- Anadromous Fish Spawning Areas
- Proposed Critical Habitat Areas
- National Wetlands Inventory
- Wildlife Resource/Game Lands
- Hydrology
- Lakes and Ponds
- Superfund Sites
- Groundwater Recharge/Discharge
- Streets
- Railroad

Figure 3B



LEGEND

- SEGMENT 1 - No Improvements (North of US 13 to North of SR 1607)
- SEGMENT 2 - 3 Lane Section (Curb & Gutter) (North of SR 1607 to SR 1617)
- SEGMENT 3 - 3 Lane Section (Shoulder) (SR 1617 to SR 1005)
- SEGMENT 4 - 3 Lane - Currently Programmed Project TIP W-4411 (SR 1005 to Mingo Swamp Bridge)
- SEGMENT 5 - 5a - 4 Lane Divided with Raised Median (Mingo Swamp Bridge to I-95)
  5b - 5 Lane Undivided Section (Mingo Swamp Bridge to I-95)

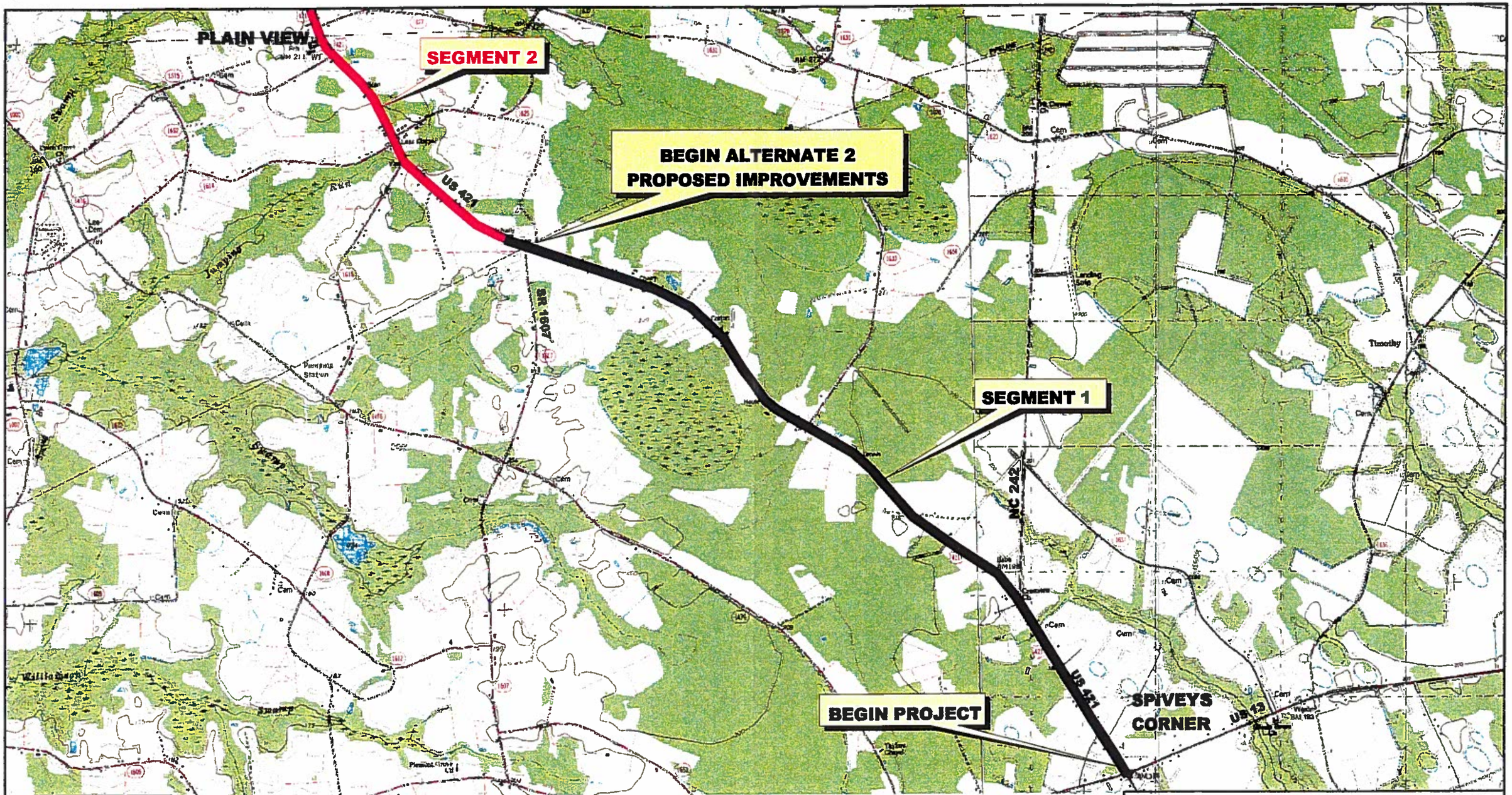
Modified After USGS 7.5' Quads, Dunn, NC-1973, Mingo, NC-1974, Timothy, NC-1986.

N

NOT TO SCALE

Figure 5A
Alternate 2 Proposed Cross-section Segments

US 421 from US 13 to I-95
Harnett and Sampson Counties
State Project No. 6.401071, FS-0103C



LEGEND

- SEGMENT 1 - No Improvements (North of US 13 to North of SR 1607)
- SEGMENT 2 - 3 Lane Section (Curb & Gutter) (North of SR 1607 to SR 1617)
- SEGMENT 3 - 3 Lane Section (Shoulder) (SR 1617 to SR 1005)
- SEGMENT 4 - 3 Lane - Currently Programmed Project TIP W-4411 (SR 1005 to Mingo Swamp Bridge)
- SEGMENT 5 - 5a - 4 Lane Divided with Raised Median (Mingo Swamp Bridge to I-95)
  5b - 5 Lane Undivided Section (Mingo Swamp Bridge to I-95)

Modified After USGS 7.5' Quads, Dunn, NC-1973, Mingo, NC-1974, Timothy, NC-1986.

N

NOT TO SCALE

Figure 5B
Alternate 2 Proposed Cross-section Segments

US 421 from US 13 to I-95
Harnett and Sampson Counties
State Project No. 6.401071, FS-0103C

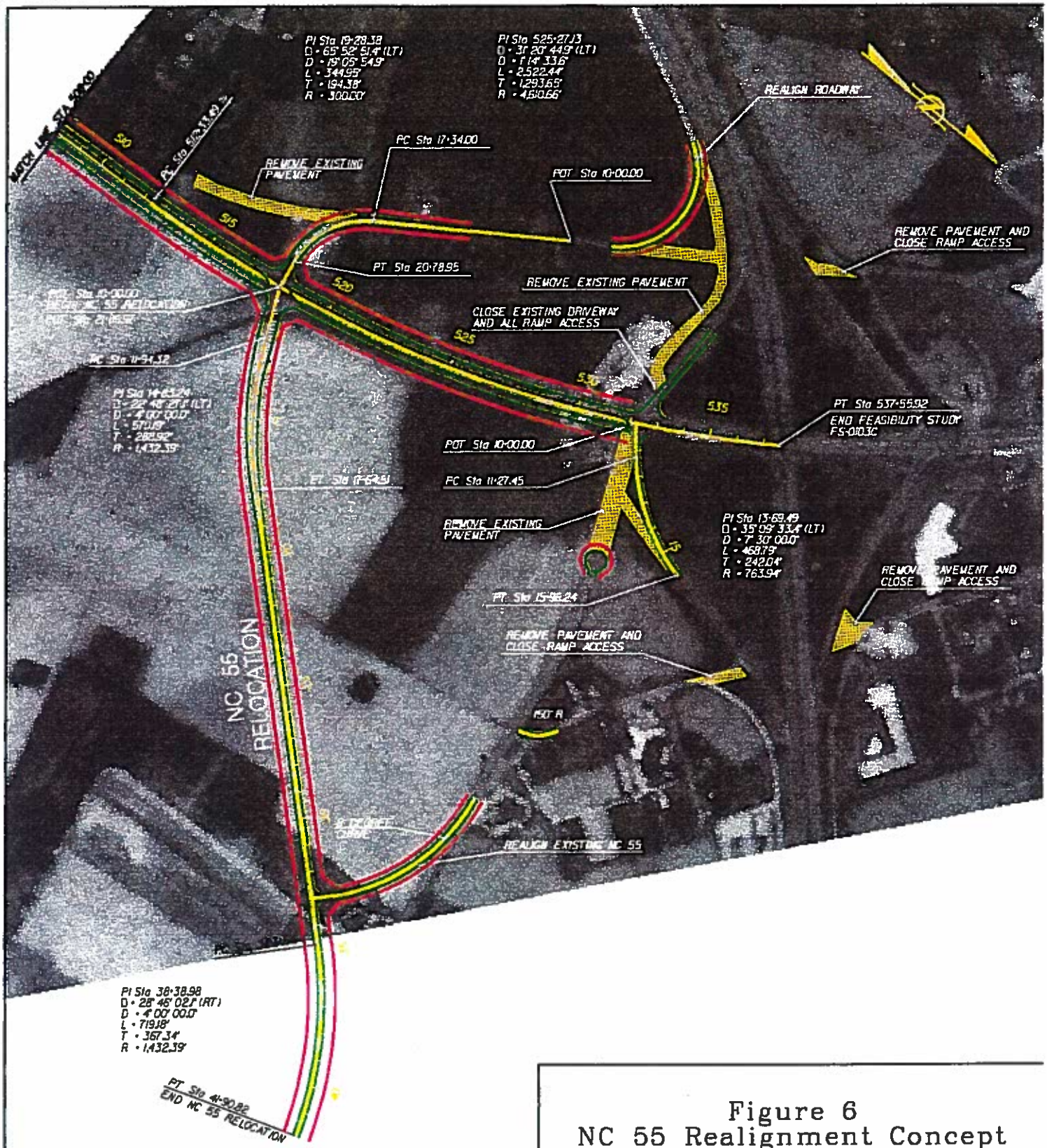


Figure 6
NC 55 Realignment Concept

US 421 from US 13 to I-95
Harnett and Sampson Counties

State Project No. 6.401071, FS-0103C

500' 0 500'