North Carolina Department of Transportation
Transportation Planning Branch

Supplemental Technical Report

for the 2006 Comprehensive Transportation Plan for Lincoln County

February 2006

Supplemental Technical Report for the 2006 Comprehensive Transportation Plan for Lincoln County

Prepared by the: Transportation Planning Branch
N.C. Department of Transportation

In Cooperation with: Lincoln County
The Federal Highway Administration
U.S. Department of Transportation

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Acknowledgments

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I. Introduction

The economic and social well being of Lincoln County (known throughout this document as the planning area) depends on the quality of the transportation facilities that exist in the area. A well-planned system will meet the existing travel demands, as well as keep pace with the growth of the region into the future.

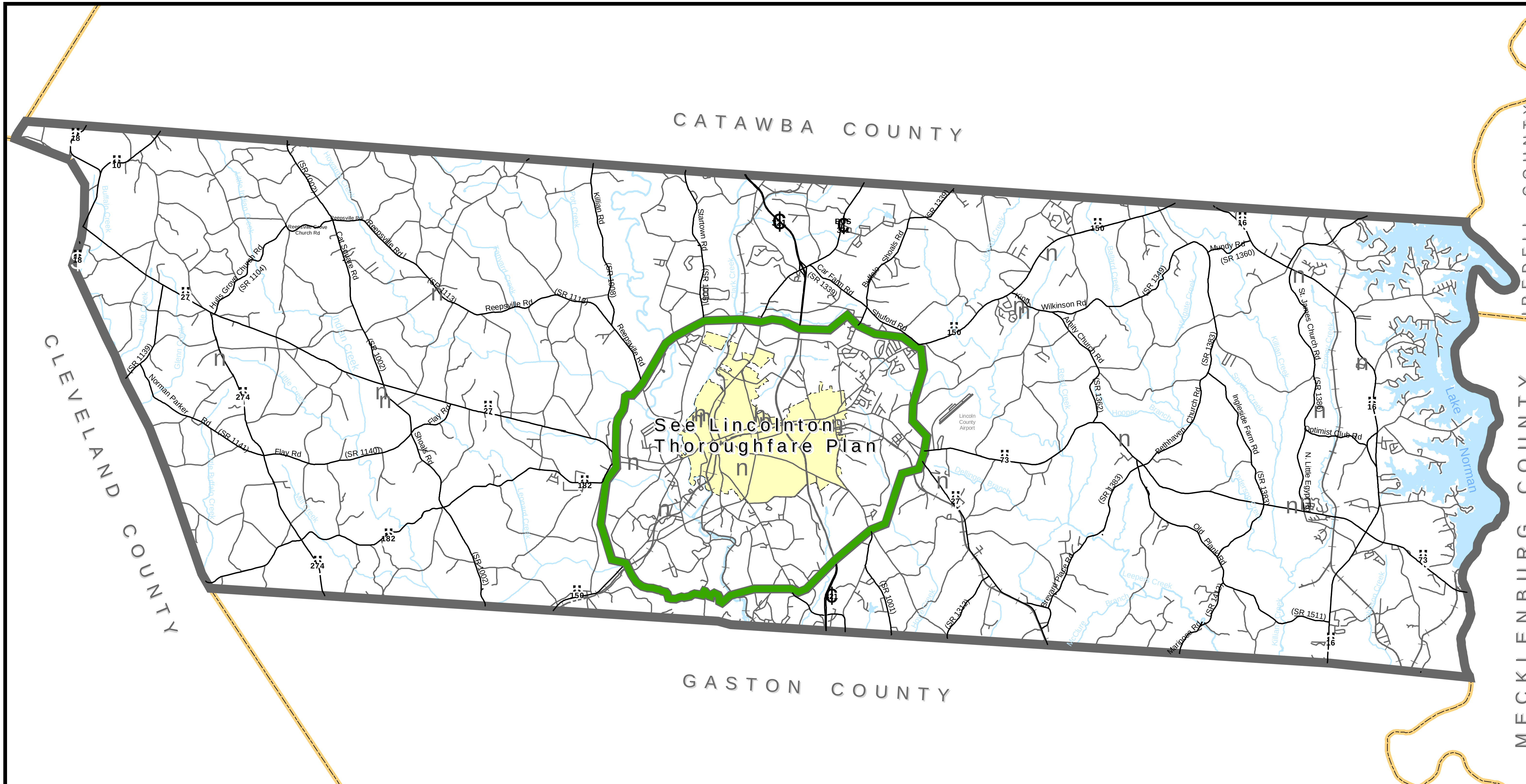
This report is a detailed record of the technical analysis used to develop the Comprehensive Transportation Plan (CTP) for the planning area. This report should be used as a guide for future planning endeavors for this area and as a starting point for future study updates. The intent of the technical report is to document how the recommendations were determined for the planning area and enable the duplication of the technical analysis if needed.

II. Development of Highway Element

The development of the highway element of the CTP for the planning area required the completion of a trend line analysis to illustrate travel in the planning area. This method is best used for small urban areas and rural counties where little growth and few new transportation facilities are anticipated. Most of the traffic travels from Lincoln County to other surrounding areas such as Charlotte. This analysis was used in recreating observed 2003 base year and the creating 2030 design year annual average daily traffic (AADT) counts.

Definition of the Planning Area

The planning area is defined as the county boundary minus the 1998 Lincolnton thoroughfare planning boundary. **Figure 1** shows the planning area for Lincoln County, which excludes Lincolnton.



PREPARED BY THE
NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
TRANSPORTATION PLANNING BRANCH

IN COOPERATION WITH THE
U.S. DEPARTMENT OF TRANSPORTATION
FEDERAL HIGHWAY ADMINISTRATION

BASE MAP DATE: AUGUST 2004

0 1 2 4 Miles

LEGEND

- n SCHOOLS
- NETWORK ROADS
- STUDY AREA
- URBAN THOROUGHFARE PLANNING AREA
- MUNICIPAL BOUNDARY

FIGURE 1

Study Area

Lincoln County

NORTH CAROLINA

Identification of the Road Network

Since the purpose of the trend line analysis was to duplicate the prevailing conditions of the existing major roadways in the county, the base network need to include enough roadways to accurately represent the traffic patterns found within the planning area. The base year network chosen includes all functionally classified roadways, along with other roads of importance as suggested by the local area planning staff.

The roads included on the base year analysis are as follows: Amity Church Road (SR 1362), Brevard Place Road (SR 1383), Buffalo Shoals Road (SR 1339), Cat Square Road (SR 1002), David's Chapel Church Road (SR 1139), Flay Road (SR 1140), Hulls Grove Church Road (SR 1104), Ingleside Farm Road (SR 1383), Killian Road (SR 1008), King Wilkinson Road (SR 1349), Mariposa Road (SR 1412), Mundy Road (SR 1360), NC 10, NC 16, NC 18, NC 27, NC 73, NC 150, NC 182, Norman Parker Road (SR 1141), North Little Egypt Road (SR 1386), Old Plank Road (SR 1511), Optimist Club Road (SR 1380), Reepsville Road (SR 1113), Shoals Road (SR 1002), St. James Church Road (SR 1386), Startown Road (SR 1005), US 321, and US 321 BUS. NC 16 Bypass was an addition made to this analysis to represent the recommended CTP improvements for the design year.

Several key data elements for each roadway in the road network were needed to aid the development of the trend line analysis and to supplement the documentation of the resulting CTP. Roadway capacity, which is the measure of how much traffic a roadway is designed to carry under given physical conditions, was input to the trend line analysis to determine operational deficiencies. For planning studies, the capacity assigned to each network roadway is based upon the capacity for each roadway at level of service (LOS) D. In the absence of standardized LOS capacities for North Carolina roadways, the Florida Department of Transportation LOS tables were used to establish the capacity at LOS D for each roadway on the road network. The capacities were based on a rural undeveloped area except for NC 16, which was based on a developed area. The following information was required for each roadway in order to employ the Florida LOS tables:

- Number of lanes;
- Number of signals per mile;
- Presence of medians; and
- Presence of left turn lanes.

The CTP report includes an inventory of all roadways included in the highway analysis and resulting plan. This inventory includes the pavement width, number of lanes, posted speed limit and right of way for each roadway. These data, along with the data required to determine the capacity, were obtained through field investigations and the NCODT Mileage Inventory.

Socioeconomic Data Analysis

Socioeconomic data for Lincoln County was collected as part of a regional transportation planning initiative in 2000. These data were also projected to the year 2030 as part of this regional initiative. Upon verifying the validity of these with local planning staff, they were used as the base and future year conditions for the trend line analysis.

Population

The base year population of the planning area was 42,981. The projected future year population is 92,300. This reflects the projected growth rates of 1% in the western portion of the county, 0 to 3 % in the central portion of the county and 2 to 6% in the eastern portion of the county.

Existing Zoning and Future Development

Lake Norman Rural Planning Organization (RPO) and local planning staff provided zoning maps and input into the types of development expected in the future within the county. This information helped to pinpoint where projected traffic might be destined in the future. **Figures 4a, b,** and **c** in the planning report illustrate the zoning districts and future land use within the county.

Traffic Count Analysis

Traffic count information is used in the trend line analysis to establish past traffic growth characteristics in order to project target volumes for the design year. In order to facilitate the completion of the analysis in a timely process, AADT counts were used. The Traffic Surveys Unit of the NCDOT Transportation Planning Branch compiles AADT counts yearly on numerous roadways across the state. This analysis used volumes collected from the years 1983 to 2003 for each network road.

The 2003 AADT counts, which are presented in **Figure 9**, served as the base year volumes in the trend line analysis. These base year AADT volumes were projected to the 2030 design year in order to determine a rough estimate of future travel within the planning area. The projected volumes were established through the application of the simple interest formula, regression analysis, and input from the county planners.

An analysis of the growth trends observed between 1983 and 2003 was performed for the AADT volumes on each of the network roadways using the following simple interest formula:

$$Growth\ Rate = (AADT_{Present}/AADT_{Past}) \wedge (1/Year_{Future} - Year_{Present})$$

The resulting growth rate observed at each station was applied to the 2003 AADT, resulting in the target volume for the 2030 design year presented in **Figure 10**.

A regression analysis of the past AADT volumes was completed by determining the graphical trend lines for these observed volumes and then projecting these trend lines to the design year, resulting in target volumes for the 2030 design year. A comparison of the results of the simple interest analysis and the regression analysis is illustrated in **Table 1** below, which is a summary of the existing and projected volumes.

Table 1. Traffic Count Summary

Roadway	Section	2003 Observed Volumes	2030 Projected Volumes		
			Simple Interest	Regression Analysis	Final Target
NC 18	Near Catawba County Line	2,300	**1,900**	**2,400**	**5,000**
NC 27	E of Daniels Church Road	6,400	**14,000**	**10,800**	**10,800**
NC 73	E of Amity Church Road	10,000	**48,600**	**17,800**	**17,800**
NC 150	S of Crouse Road	8,900	**12,000**	**12,000**	**12,000**
NC 274	N of NC 182	2,100	**2,900**	**2,850**	**2,900**
NC 182	W of Brown Road	2,200	**3,800**	**4,300**	**4,300**
US 321	1998 Lincolnton Planning Boundary	25,000	**42,700**	**110,000**	**42,700**

The AADT volumes were modified slightly based on the local planner's input and based on the projected growth rates near these roadways.

Mode Choice

Coordination with the local planners ensured that there were no planned improvements that would bring other modes of transportation to the planning area that are suitable for inclusion in the development of the CTP. Therefore, all trips were assumed to occur on the highway network.

The base and design year travel assignments resulting from this analysis were examined to highlight any deficiencies in the highway system. The results of this analysis and the resulting highway element of the CTP are documented in the CTP study report.

III. Development of Other CTP Elements

In addition to the highway element, the CTP for Lincoln County consists of a public transportation and rail element and a bicycle element. The public transportation and rail element of the CTP represents the existing and proposed transportation infrastructure and services and designates active and inactive rail corridors. The bicycle element of the CTP represents on-road and off-road existing, proposed, and needs improvement facilities.

At this time, there are no technical processes to aid the development of these plan elements for counties. As a result, these plan elements represent an inventory of existing facilities and recommendations for planned facilities determined through close coordination with the county, NCDOT Public Transportation Division, NCDOT Bicycle & Pedestrian Division, and the NCDOT Rail Division. More details concerning the development of these plan elements is included in the CTP study report.

IV. Cost Estimates

Cost estimates for recommended improvements were calculated based on 2005 unit costs for the construction of each facility and the costs of right of way and property acquisitions within each project limits.

The construction cost for each improvement includes the costs to either widen an existing facility or construct a new roadway facility, the costs to either widen an existing bridge or construct a new bridge, and the costs for constructing any new grade separations or interchanges. The roadway construction costs also include the costs for the inclusion of sidewalks, the widening to include bicycle lanes, wetland mitigation, utility construction and adding any turning lanes.

The right of way cost for each improvement includes the costs of any vacant land needed, any existing building that must be taken, proximity damages that occur when an existing building close to, but not within, the proposed right of way limits, and the relocation of any utilities. Unit costs for right of way were based on the current retail value of land within the planning area.

The cost estimates for the planning area recommendations are summarized below.

Campground Road

Improve the existing facility to a four-lane divided curb and gutter roadway to accommodate future traffic volumes.

Construction	**Cost**
2.5 miles of widening to 4-lane divided roadway with curb and gutter	$7,250,000.00
4,080.00 square feet of widening existing bridge	$408,000.00
Total Project Cost	**$31,436,000.00**

Catawba River Path

Provide a multi-use path to connect Killian Road to Lincolnton.

Construction	**Cost**
2.30 miles of a new multi-use pathway	$690,000.00
2,080.00 square feet of a new bridge	$176,800.00
Right of Way	
5.58 acres of vacant residential land	$760,090.00
Total Project Cost	**$1,930,927.00**

Fairfield Forest Road

Improve the existing facility to current standards with bicycle lanes.

Construction	Cost
1.20 miles of adding 2-foot paved shoulder for bicycles	$130,800.00
Total Project Cost	**$536,900.00**

Fairfield Forest Road Path

Provide a multi-use path to connect Fairfield Forest Road to the East Lincoln Recreational Center.

Construction	Cost
1.80 miles of a new multi-use pathway	$540,000.00
Right of Way	
4.4 acres of vacant residential land	$599,400.00
Total Project Cost	**$1,379,000.00**

Forney Creek Path

Provide a multi-use path to connect to the designated NC Bike Route 6 (Piedmont Spur).

Construction	Cost
3.30 miles of a new multi-use pathway	$990,000.00
Right of Way	
8.00 acres of vacant residential land	$1,089,700.00
Total Project Cost	**$2,515,600.00**

Howards Creek Path

Provide a multi-use path to connect Cansler Road and to the designated NC Bike Route 6 (Piedmont Spur) to Lincolnton.

Construction	Cost
5.70 miles of a new multi-use pathway	$1,710,000.00
2,000.00 square feet of a new bridge	$170,000.00
0.47 acres of wetland mitigation	$28,200.00
Right of Way	
13.8 acres of vacant residential land	$1,879,800.00
Total Project Cost	**$4,539,900.00**

Killian Creek Path

Provide a multi-use path to connect East Lincoln Recreational Center on Optimist Club Road to the designated NC Bike Route 6 (Piedmont Spur).

Construction	**Cost**
4.00 miles of a new multi-use pathway	$1,200,000.00
Right of Way	
9.70 acres of vacant residential land	$1,321,300.00
Total Project Cost	**$3,049,800.00**

NC 10

Improve the existing facility to current standards and provide bicycle lanes.

Construction	**Cost**
0.70 miles of widening to 24-foot section	$665,000.00
1.70 miles of widening existing shoulder to add 4 ft paved shoulder	$370,600.00
Total Project Cost	**$4,251,100.00**

NC 18

Improve the existing facility to current standards and provide bicycle lanes.

Construction	**Cost**
3.66 miles of widening existing shoulder to add 4 ft paved shoulder	$797,900.00
Total Project Cost	**$3,275,300.00**

NC 27

Improve the existing facility to a four-lane divided curb and gutter roadway to accommodate future traffic volumes.

Construction	**Cost**
5.73 miles of widening to 4-lane divided roadway with curb and gutter	$16,617,000.00
4,080.00 square feet of widening existing bridge	$408,000.00
Right of Way	
1 existing residence	$136,200.00
1 existing office	$287,300.00
Total Project Cost	**$70,012,900.00**

NC 182
Improve the existing facility to current standards and provide bicycle lanes.

Construction	Cost
10.70 miles of widening to 24-foot section	$10,165,000.00
10.70 miles of widening existing shoulder to add 4 ft paved shoulder	$2,332,600.00
Total Project Cost	**$51,302,600.00**

Inactive Rail Corridor
Provide a multi-use path to connect Catawba County and Gaston County and to connect to the existing Lincolnton greenway system.

Construction	Cost
6.60 miles of a new rail to trail pathway	$2,640,000.00
Total Project Cost	**$2,640,000.00**

Northbrook III School Road
Improve the existing facility to current standards and provide bicycle lanes.

Construction	Cost
4.19 miles of widening to 24-foot section	$3,980,500.00
4.19 miles of widening existing shoulder to add 4 ft paved shoulder	$913,400.00
Total Project Cost	**$20,089,500.00**

Old NC 18
Improve the existing facility to current standards and provide bicycle lanes.

Construction	Cost
1.38 miles of widening to 24-foot section	$1,311,000.00
1.38 miles of widening existing shoulder to add 4 ft paved shoulder	$300,800.00
Total Project Cost	**$6,616,600.00**

Optimist Club Road
Improve the existing facility to current standards and provide bicycle lanes.

Construction	Cost
2.00 miles of widening to 24-foot section	$1,900,000.00
2.00 miles of widening existing shoulder to add 4 ft paved shoulder	$436,000.00
Total Project Cost	**$9,589,300.00**

Reepsville Road
Improve the existing facility to current standards and provide bicycle lanes.

Construction	Cost
12.00 miles of widening to 24-foot section	$11,400,000.00
12.00 miles of widening existing shoulder to add 4 ft paved shoulder	$2,616,000.00
Total Project Cost	**$57,535,700.00**

Webbs Road
Improve the existing facility to current standards with bicycle lanes.

Construction	Cost
2.50 miles of adding 2-foot paved shoulder for bicycles	$272,500.00
Total Project Cost	**$1,118,600.00**

Fairfield Forest Road Path
Provide a multi-use path to connect Webbs Road to the East Lincoln Recreational Center.

Construction	Cost
1.90 miles of a new multi-use pathway	$570,000.00
Right of Way	
4.6 acres of vacant residential land	$626,600.00
Total Project Cost	**$1,447,200.00**

V. Public Involvement

Lincoln County hosted two drop-n session to offer the public an opportunity to comment on the proposed CTP. These two sessions were held on May 18, 2005 in the Commissioner's Room of the Lincolnton Citizen's Center and on May 19, 2005 in the East Lincoln Recreation Center.

At each public drop-in session, each sheet of the proposed CTP and a large aerial photograph of the county were presented at different stations. Explanations of the features for each CTP element were also presented at each respective station. Representatives from the County and the NCDOT were available to explain the proposed CTP and answer questions. Attendees were encouraged to write comments on each CTP element on post-it notes and attach the notes to the actual CTP maps. Attendees were also asked to mark their places of residence on the aerial photography and told the County and NCDOT representatives about any transportation or development concerns in their area. Attendees were also asked to complete a survey on the effectiveness of the public involvement effort for the Lincoln County study.

Appendix F presents a listing of public drop-in session attendees, a summary of questions asked by attendees at the meetings with responses, and the results of the public involvement effectiveness survey.

VI. Conclusion

Lincoln County is a growing county that will require improvements to their transportation systems over the next thirty years, as evidenced by this transportation study. While this plan covers a 27-year planning period, most studies for counties are updated every five to ten years. While the trend line approach may not be used in the next study, this report will enable the modeler to understand the assumptions that were made to develop the recommended improvements.