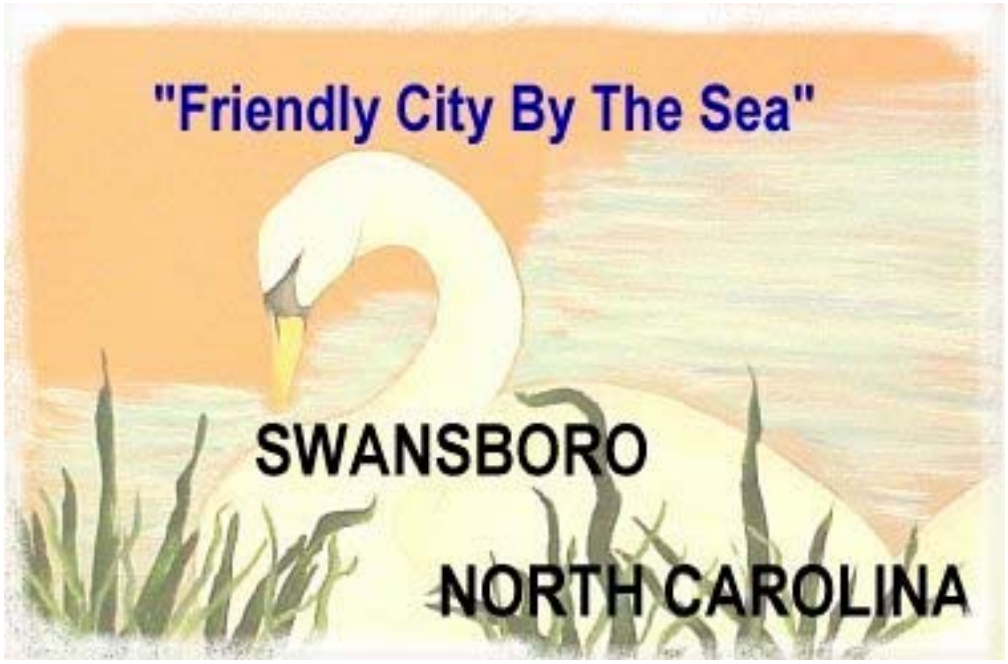
North Carolina Department of Transportation
Transportation Planning Branch

Comprehensive Transportation Plan



Town of Swansboro

October 2007

Comprehensive Transportation Plan
Study Report

Town of Swansboro

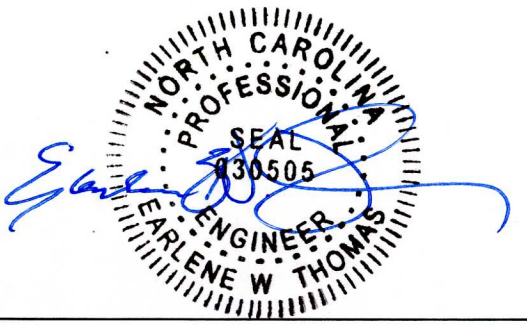
Prepared by the:

Transportation Planning Branch
Division of Highways
N.C. Department of Transportation

In Cooperation with:

The Town of Swansboro
Down East Rural Planning Organization
The Federal Highway Administration
U.S. Department of Transportation

October 2007



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Acknowledgments

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Executive Summary

In January of 2005, the Transportation Planning Branch of the North Carolina Department of Transportation and the Town of Swansboro entered an agreement to cooperatively develop the Swansboro Comprehensive Transportation Plan. This multi-modal transportation plan is a product of this cooperative effort.

This report documents the findings of this study, along with recommendations for improvements that were developed. In addition, this report presents cross-section recommendations, and environmental features found in the study area.

The recommendations for improvements are listed below. A more detailed discussion of these recommendations can be found in Chapter 2. Definitions for recommended improvements can be found in Appendix B.

- NC 24 (Freedom Way / Corbett Avenue)
  In accordance with the NCDOT Strategic Highway Corridor Plan, it is recommended that NC 24 be improved to an expressway. This would entail the implementation of improvements including, access management strategies, to improve safety, increase mobility and reduce congestion.

  The sections of NC 24 between Norris Road (SR 1445) and Hammock Beach Road (SR 1511); and between Front Street and the eastern planning area boundary are designated bicycle routes in accordance with the *Jacksonville City to the Sea Bicycle Route* and the *Swansboro Bicentennial Trail* route maps. Depending on the preferred cross section, improvements should include AASHTO standard bicycle-safe bridge railing height of 54" at any new bridge locations and wide outside lanes (4-ft) in curb and gutter sections or wide paved shoulders (4-ft) in both directions of shoulder sections.

- Queens Creek Road (SR 1509)
  It is recommended that SR 1509 be improved to a boulevard. The existing two- and three-lane facility should be improved to a four-lane divided highway with partial control of access. Improvements will significantly increase capacity, improve safety and relieve congestion.

- Belgrade-Swansboro Road (SR 1434)
  It is recommended to widen roadway to two 12-foot lanes from NC 24 (Freedom Way) to the northern planning area boundary. This will improve safety and increase the capacity of the roadway.

  The section between Swansboro Loop (SR 1444) and the northern planning area boundary is designated a bicycle route in accordance with the *Swansboro Bicentennial Bicycle Trail* route maps. Depending on the preferred cross section,

improvements should include AASHTO standard bicycle-safe bridge railing height of 54" at any new bridge locations, wide outside lanes (4-ft) in curb and gutter sections, and wide paved shoulders (4-ft) in both directions of shoulder sections.

- Swansboro Loop (SR 1444)
  It is recommended to widen roadway to two 12-foot lanes from Belgrade-Swansboro Road (SR 1434) to Main Street Ext. (SR 1447). This will improve safety and increase the capacity of the roadway.

  The entire length of Swansboro Loop (SR 1444) is designated a bicycle route in accordance with the *Swansboro Bicentennial Bicycle Trail* route maps. Depending on the preferred cross section, improvements should include AASHTO standard bicycle-safe bridge railing height of 54" at any new bridge locations, wide outside lanes (4-ft) in curb and gutter sections, and wide paved shoulders (4-ft) in both directions of shoulder sections.

- Main Street (SR 1447)
  It is recommended to widen entire roadway to two 12-foot lanes. This will improve safety and increase the capacity of the roadway.

  The section of roadway between Swansboro Loop (SR 1444) and NC 24 East is designated a bicycle route in accordance with the *Swansboro Bicentennial Bicycle Trail* route maps. Improvements should include AASHTO standard bicycle-safe bridge railing height of 54" at any new bridge locations and wide outside lanes (4-ft) in curb and gutter sections or wide paved shoulders (4-ft) in both directions depending on the preferred cross section.

- Norris Road (SR 1445)
  It is recommended to widen entire length of roadway to two 12-foot lanes. This will improve safety and increase the capacity of the roadway.

  Norris Road (SR 1445) is designated a bicycle route in accordance with the *Jacksonville City to the Sea* bicycle route maps. Depending on the preferred cross section, improvements should include AASHTO standard bicycle-safe bridge railing height of 54" at any new bridge locations, wide outside lanes (4-ft) in curb and gutter sections, and wide paved shoulders (4-ft) in both directions of shoulder sections.

- Hammock Beach Road (SR 1511)
  It is recommended to widen entire length of roadway to two 12-foot lanes. This will improve safety and increase the capacity of the roadway.

  Hammock Beach Road is designated a bicycle route in accordance with the *Jacksonville City to the Sea* bicycle route maps. Depending on the preferred cross section, improvements should include AASHTO standard bicycle-safe bridge railing height of 54" at any new bridge locations, wide outside lanes (4-ft) in curb and gutter sections, and wide paved shoulders (4-ft) in both directions of shoulder sections.

- Old Hammock Road (SR 1512)
  It is recommended to widen entire length of roadway to two 12-foot lanes. This will improve safety and increase the capacity of the roadway.

  Upon the Town's request, it is recommended that Old Hammock Road be designated a bicycle route. This addition will provide a needed link to the transportation network by connecting the *Jacksonville to the Sea* and the *Swansboro Bicentennial Trail* routes.

  In accordance with State regulations and depending on the preferred cross section, improvements should include AASHTO standard bicycle-safe bridge railing height of 54" at any new bridge locations, wide outside lanes (4-ft) in curb and gutter sections, and wide paved shoulders (4-ft) in both directions of shoulder sections.

Swansboro's Plan and Report are a result of a coordinated effort between Town Staff, Council Members and the citizens of Swansboro. The Town Commissioners adopted the Swansboro Comprehensive Transportation Plan on August 15, 2006. Although the Town Commissioners adopted this plan, it should be noted that the Town does not support the designation of NC 24 as an expressway. The North Carolina Department of Transportation adopted this plan on November 2, 2006.

Implementation of the plan rests largely with the Town of Swansboro and its citizens. The Town should work with the Down East Rural Planning Organization to prioritize their transportation needs. This organization is responsible for presenting the transportation needs to the North Carolina Department of Transportation. Transportation needs throughout the State exceed the available funding; therefore, local areas should aggressively pursue funding for the projects they desire.

Adopted by:

Town of Swansboro
Date: August 15, 2006

NCDOT
Date: November 2, 2006

Endorsed by:

Down East RPO
Date: September 26, 2006

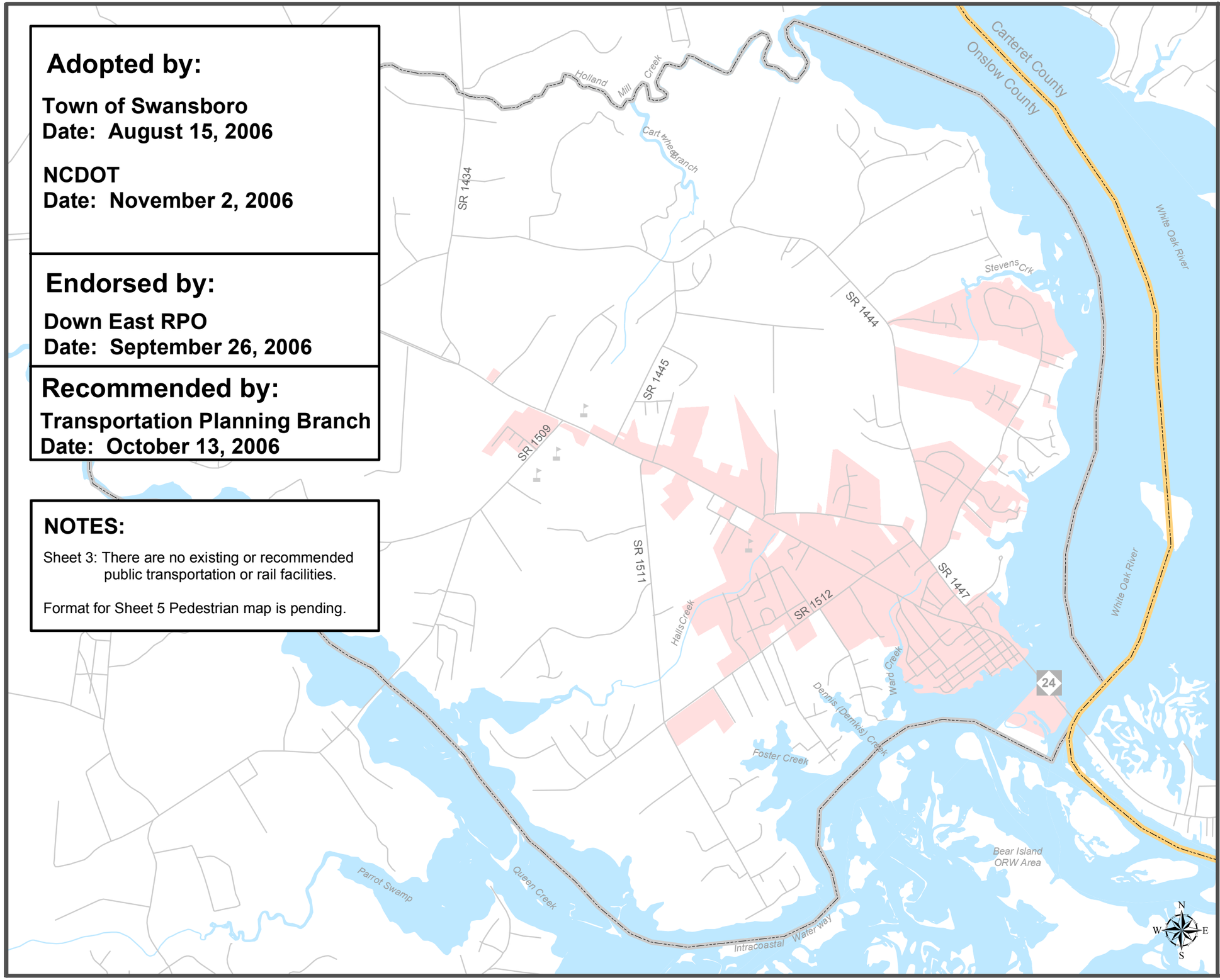
Recommended by:

Transportation Planning Branch
Date: October 13, 2006

NOTES:

Sheet 3: There are no existing or recommended public transportation or rail facilities.

Format for Sheet 5 Pedestrian map is pending.



SM

Town Of Swansboro

Onslow County
North Carolina

Comprehensive Transportation Plan

Plan date: May 12, 2006

Legend

- County Boundary
- Schools
- Planning Boundary
- Roads
- Railroad
- Rivers and Streams
- Other Water Bodies
- City Boundary

0 0.25 0.5 1
Miles

Figure 1 (Sheet 1 of 5)

Base map date: February 7, 2005

Refer to CTP document for more details

Highway Map

SM

Town Of Swansboro

Comprehensive Transportation Plan

Plan date: May 12, 2006

Legend

Freeways
- Existing
- Needs Improvement
- Recommended

Expressways
- Existing
- Needs Improvement
- Recommended

Boulevards
- Existing
- Needs Improvement
- Recommended

Other Major Thoroughfares
- Existing
- Needs Improvement
- Recommended

Minor Thoroughfares
- Existing
- Needs Improvement
- Recommended

- Existing Interchange
- Proposed Interchange
- Existing Grade Separation
- Proposed Grade Separation

0 0.25 0.5 1
Miles

Figure 1 (Sheet 2 of 5)

Base map date: February 7, 2005

Refer to CTP document for more details

Bicycle Map

Town Of Swansboro

Comprehensive Transportation Plan

Plan date: May 12, 2006

Legend

On-road
- Existing
- Needs Improvement
- Recommended

Off-road
- Existing
- Needs Improvement
- Recommended

0 0.2 0.4 0.8
Miles

Figure 1 (Sheet 4 of 5)

Base map date: February 7, 2005

Refer to CTP document for more details

N W E S

Carteret County
Onslow County
White Oak River
Bear Island ORW Area
Intracoastal Waterway
Queen Creek
Parrot Swamp
Dix Creek
Foster Creek
Dennis (Demkis) Crk
Ward Creek
Halls Creek
Hidden Creek
Cart - wheel Branch
Holland Mill Creek
Jumpin Run
Wild Oak Dr
Clamdigger
Marsh Hen Ct
Creekside Woods
Meadow Creek
Queens Haven
Smallwood
Castle
Ivybridge
Nordeen Ln
Raven Ridge Ct
Ella Ln
Ira Lp
Colony Ln
Nellie Ln.
Pittman Rd.
Howell Rd.
Turtle Cove Dr.
Kings Pkwy
Quail Trl
Youpon Dr.
Quail Point Dr.
Queens Rd.
Tulip Ln
Freedom Way
Piney Grove Bapt Ch Rd
Seth Thomas Ln
Leslie Ln.
April Ln
Pope Ln
Belgrade-Swansboro Rd.
Poston Dr
Walnut Dr.
Burns Ln
Corbett Rd.
Norris Rd.
Scott Place Rd
Limbaugh
Oak Crossing
White Marlin Ln
Blue Water Ln
N / S Plantation Dr.
Stevens Crk
River Reach Dr. W
River Reach Dr.
River Reach Ct.
Mt Pleasant Rd.
Hilltop Dr.
Swansboro Loop
Bonita Ln
Main St. Extension
Port West
Corbett Ave.
Lisk Dr.
Sabiston Dr.
Church St.
Chestnut St.
Walnut St.
W. Bread St.
Spring St.
Main St.
Front St.
S. Water St.
Deer Island Rd.
Glancy Rd
Seashore Dr.
Williams Rd
Fredricka Ln
Old Hammock Rd.
Hammock Beach Rd.
Woodlawn
Ashley
Ned Ln
John L Hurst
FFA Camp Rd.
4-H Camp Rd.
NC 24
SR 1434
SR 1445
SR 1444
SR 1447
SR 1512
SR 1511
SR 1509
24

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I. Introduction

An area's transportation system is its lifeline, contributing to its economic prosperity and social well being. The importance of a safe and efficient transportation infrastructure cannot be overstressed. This system provides a means of transporting people and goods from one place to another quickly, conveniently, and safely. A well-planned system will meet the existing travel demands, as well as keep pace with the growth of the region. The Town of Swansboro recognized the importance of this process of planning for future transportation needs and requested transportation planning assistance from the Transportation Planning Branch of the North Carolina Department of Transportation (NCDOT).

The Town of Swansboro is located in eastern Onslow County. The Town is approximately 15 miles east of Jacksonville and approximately 20 miles west of Morehead City. The geographical location is shown in Figure 2.

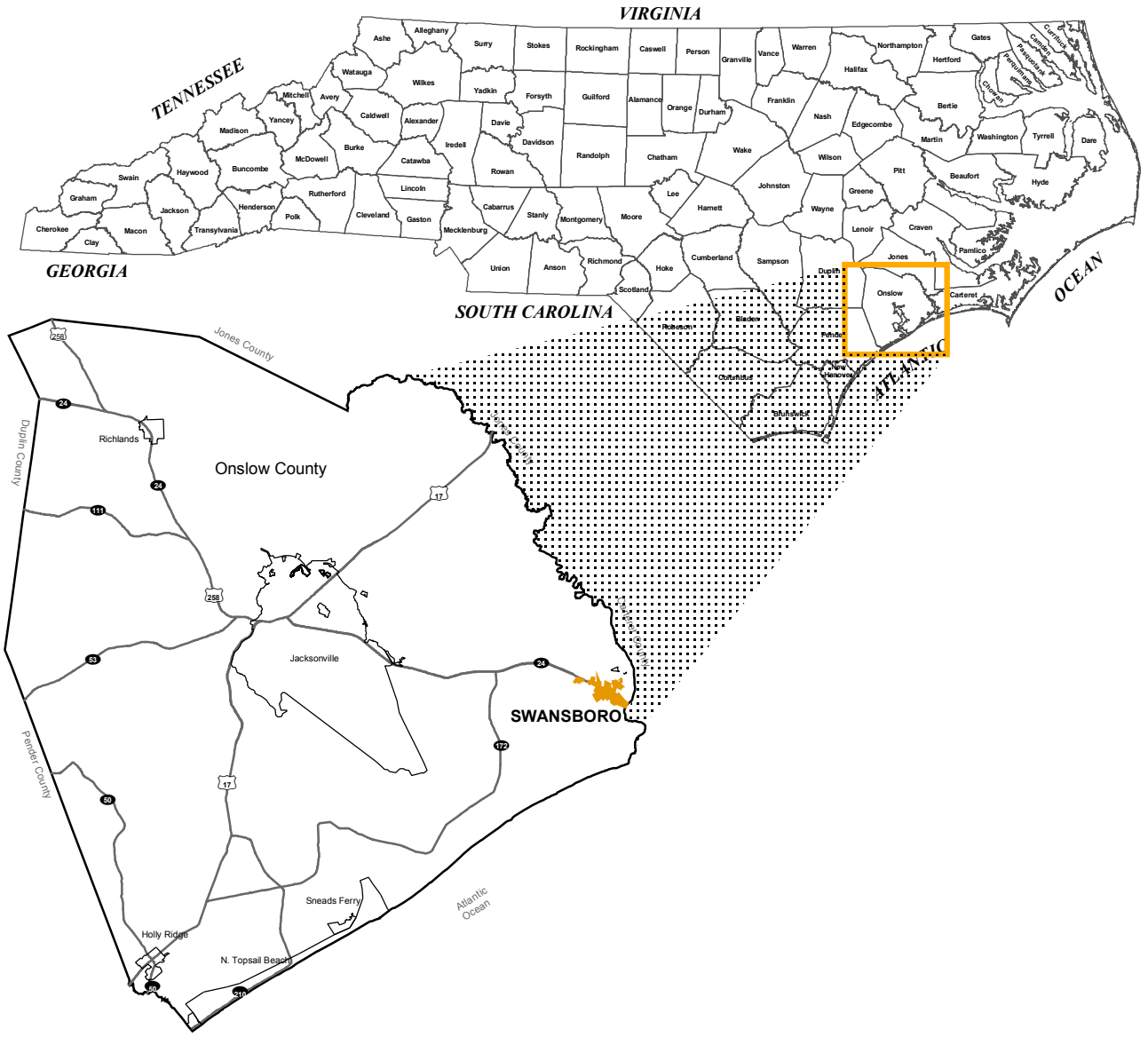
This report documents the development of the 2006 Swansboro Comprehensive Transportation Plan (CTP) shown in Figure 1. In addition, this report presents recommendations for each relevant mode of transportation in the Town. A comprehensive transportation plan is developed to ensure that the transportation system will be progressively enhanced to meet the needs of the planning area. It will serve as an official guide, providing a well-coordinated, efficient, and economical transportation system that utilizes all modes of transportation. This document will be used by local officials to ensure that planned transportation facilities reflect the needs of the public, while minimizing the disruption to local residents, businesses, and the environment.

The purpose of this study is to examine present and future transportation needs of the area and develop a transportation plan to meet these needs. The plan recommends those improvements that are necessary to provide an efficient transportation system within the 2005-2035 planning period. The recommended cross-sections outlined in Appendix D for these improvements are based on existing and projected conditions.

The proposed Comprehensive Transportation Plan is based on the projected growth for the planning area as coordinated with the Town Planners. It is possible that actual growth patterns will differ from those logically anticipated. As a result, it may be necessary to accelerate or delay the development of some recommendations found within this plan. Some portions of the plan may require revisions in order to accommodate unexpected changes in development. Therefore, any changes made to one element of the Comprehensive Transportation Plan should be consistent with the other elements.

Initiative for implementing the CTP rests predominately with the policy boards and citizens of the planning area. The Town of Swansboro and the North Carolina

Department of Transportation shares the responsibility for the construction of the recommended projects. As transportation needs throughout the State exceed available funding, it is imperative that the local planning area aggressively pursues funding for desired projects.



NCDOT TPB
TRANSPORTATION PLANNING BRANCH

Figure 2

Geographic Location

Town Of Swansboro

Onslow County
North Carolina

Pepared By The
North Carolina Department of Transportation
Transportation Planning Branch

In Cooperation With
The Town of Swansboro
The Down East RPO
The U.S. Department of Transportation
Federal Highway Administration

N
W E
S

0 37.5 75 150
Miles

BASE MAP DATE: FEBRUARY 7, 2005

II. Recommendations

This chapter contains recommendations that are based on the ability of the area's roadway system to serve existing and anticipated travel demands. The objective is to reduce congestion and improve safety by eliminating both existing and projected deficiencies in the transportation system. The adopted plan represents a transportation system that will address anticipated traffic and land development needs.

HIGHWAY MAP

The highway element of the Swansboro Comprehensive Transportation Plan (CTP) is presented in Figure 1 (Sheet 2). This plan includes roadways within the Town that fall into five general categories: freeways, expressways, boulevards, other major thoroughfares, and minor thoroughfares. Refer to Appendix C for an inventory of the existing and recommended highway attributes and Appendix D for a listing of typical cross-sections used by NCDOT.

The process of formulating and evaluating recommendations for the facilities in the CTP involves many factors including the goals and objectives of the area, existing roadway conditions, identified roadway deficiencies, environmental impacts, and existing and anticipated land development. Consideration of these factors led to the development of the recommended improvements. A detailed description for each is given below.

Major Thoroughfare Improvements

NC 24 (Freedom Way / Corbett Avenue)

- Project Recommendation: In accordance with the NCDOT Strategic Highway Corridor (SHC) Report, it is recommended that NC 24 be improved to expressway standards. Recommendations would include converting the five-lane facility into a four-lane divided facility, and implementing access management strategies, i.e., reduction and/or timing of traffic signals, shared driveways, access roads, etc. The proposed project is 4.5 miles in length.

- Transportation Demand: NC 24 is functionally classified as a principal arterial and primarily serves intra-state travel. It is an essential east-west route that accommodates travel between Charlotte, Fayetteville, Jacksonville and Morehead City. The corridor is also a primary route for military traffic between Fort Bragg, Camp Lejeune, and the State Port at Morehead City.

- Roadway Capacity and Deficiencies: The current annual average daily traffic (AADT) on NC 24, within the planning area, ranges from 17,800 to 24,700 vehicles per day (vpd). The capacity of the roadway ranges from 37,800 to 44,000 vpd. The projected 2035 AADT of 30,400 to 38,600 vpd will result in sections of NC 24 being near capacity. Eight to ten percent of the route's traffic is due to truck traffic.

The facility is currently operating between a level of service (LOS) range of B to C. Continued traffic growth at the current rate without any facility improvements would result in the LOS being as high as "D". (Refer to Chapter 4 for a detailed explanation of LOS).

- Safety Issues: Between the years of 2000 and 2005, the seven highest accident intersections within the planning area occurred along NC 24. Improving NC 24 to expressway standards may potentially include the reduction of traffic signals and driveways, the removal of the center turning lane, or the construction of super street intersections. These improvements will ease congestion and reduce the potential for crashes.

- Social Demands and Economic Development: The NC 24 corridor serves as the hub for economic development for the Town. Ninety-five percent of all the Town's commercial development is located along this corridor. It is anticipated that the proposed enhancements will promote new economic growth for the town. As development occurs along NC 24 it is important that alternative forms of access is planned to allow for greater capacity along this Strategic Highway Corridor.

  As a SHC, it has been determined that NC 24 contributes toward statewide mobility and connectivity, promotes a vision of modern transportation, and is supportive of economic opportunities and environmental excellence. Economic development is fostered by the usage of NC 24 as a truck route for many port operations.

- System Linkage: The primary purpose of North Carolina Strategic Highway Corridors is to provide a network of high-speed, safe, reliable highways throughout the State. As a SHC, the eastern portion of NC 24 provides connectivity between three major state activity centers and four other strategic corridors. {Fayetteville (I-95), I-40, Jacksonville (US 17), and the Port of Morehead City (US 70)}.

  This segment of NC 24 is also identified as a hurricane evacuation and a Strategic Highway-Corridor Network (STRAHNET) route. Further, it is a designated route on the North Carolina Intrastate System and the National Highway System.

- Modal Interrelationships: Portions of NC 24 in the planning area is designated as part of the Jacksonville to the Sea Bicycle Route and the Swansboro Bicentennial Bicycle Route. Due to these designations, bicycle traffic can be expected along NC 24. The recommended improvements to NC 24 will improve safety for bicyclist by decreasing vehicle congestion and constructing a median to reduce traffic conflicts. Coordination with the NCDOT Division of Bicycle and Pedestrian Transportation is recommended prior to the implementation of any improvements.

- Relationship to Other Plans: The recommendations made for NC 24 are consistent with the North Carolina Strategic Corridor Plan that also designates this segment of

NC 24 as an Expressway. This project is not identified on any other adopted transportation plan.

Queens Creek Road (SR 1509)

- Project Recommendation: It is recommended that a four-lane divided boulevard with partial control of access be constructed from NC 24 to the Town's southern planning boundary (Queen Creek Bridge). The proposed project length is 1.5 miles.

- Transportation Demand: Within the planning area Queens Creek Road is functionally classified as a minor collector. This north-south route primarily serves as a connector between NC 172, Camp Lejeune's southeast gate and Swansboro (NC 24E). Queens Creek Road also provides access to the area's only high school (Swansboro High School) and an adjacent elementary school (Queens Creek Elementary School), both of which are major traffic generators.

- Roadway Capacity and Deficiencies: Currently, the AADT for the northern portion of this route is 10,200 vpd and the southern portion is 8,000 vpd. The capacity is 14,200 and 12,100 vpd respectively. By the year 2035 this facility is projected to be well over capacity carrying between 16,300 and 21,400 vpd. Currently Queens Creek Road is operating between a LOS between C and D, without any improvements the LOS is projected to be between D and E.

- Safety Issues: If no improvements are made, the projected congestion will create the potential for increased crash rates. The widening of this facility will provide increased capacity and greater maneuverability resulting in safer driving conditions.

- Social Demands and Economic Development: This north-south corridor is located in the southern portion of the planning area. Although there are only a few small commercial establishments along this corridor; large traffic generators such as Swansboro High and Elementary Schools, residential developments, retail establishments on the northern end, and Camp Lejeune generate a large traffic demand on this route.

- System Linkage: This route is a connector between NC 24 and NC 172. Due to the fact that NC 24 is a primary carrier of beach traffic and NC 172 provides access to Camp Lejeune, Queens Creek Road provides a critical link to the area's transportation network.

- Relationship to Other Plans: This route is not identified in any other transportation plan.

Widening Projects

The following roadway sections are recommended widening projects that will improve safety and increase capacity. Each section of roadway listed below currently has lane widths less than 12 feet and, based on the traffic volumes on the roads, are

recommended to be widened. Before any roadway improvements are made, especially to roads that are a part of the NC Bike Route System, the NCDOT Division of Bicycle and Pedestrian Transportation should be consulted on the most appropriate cross section.

- Belgrade-Swansboro Road (SR 1434) It is recommended that SR 1434 be widened from two 10-foot lanes to two 12-foot lanes from NC 24 (Freedom Way) to northern planning area boundary.
- Swansboro Loop (SR 1444) It is recommended that SR 1444 be widened from two 10-foot lanes to two 12-foot lanes from Belgrade-Swansboro Road (SR 1434) to Main Street (SR 1447).
- Norris Road (SR 1445) It is recommended that the entire length of SR 1445 be widened from two 9-foot lanes to two 12-foot lanes.
- Main Street (SR 1447) It is recommended that the entire length of SR 1447 be widened from two 9-foot lanes to two 12-foot lanes.
- Hammock Beach Road (SR 1511) It is recommended that the entire length of SR 1511 be widened from two 9-foot lanes to two 12-foot lanes.
- Old Hammock Road (SR 1512) It is recommended that the entire length of SR 1512 be widened from two 11-foot lanes to two 12-foot lanes.

Bicycle Map

The NCDOT envisions that all citizens of North Carolina and visitors to the State be able to walk and bicycle safely and conveniently to their chosen destinations with reasonable access to roadways. Information on events, funding, maps, policies, and processes dealing with this mode of transportation are available by contacting the NCDOT Division of Bicycle and Pedestrian Transportation.

Two State designated bike routes traverse the Swansboro Planning Area. The "Jacksonville City to the Sea Bike Route" and the "Swansboro Bicentennial Bicycle Route" are both signed routes and run along several local roads within the planning area.

Recommendations:

Jacksonville City to the Sea Bicycle Route - Improve sections of Belgrade-Swansboro Road (SR 1434), Norris Road (SR 1445) Corbett Avenue (NC 24), and Hammock Beach Road (SR 1511) to meet current AASHTO standards. Improvements should include AASHTO standard bicycle-safe bridge railing height of 54" at new bridge locations and wide outside lanes (4-ft) in curb and gutter sections or wide paved shoulders (4-ft) in both directions depending on the preferred cross section.

The current shoulder widths are not wide enough to provide adequate safety to bicyclists. The total project length covers approximately 5 miles of roadway.

Swansboro Bicentennial Route - Improve sections of Swansboro Loop (SR 1444), Main Street (SR 1447) and Corbett Ave. (NC 24) to meet current AASHTO standards. Improvements should include AASHTO standard bicycle-safe bridge railing height of 54" at new bridge locations and wide outside lanes (4-ft) in curb and gutter sections or wide paved shoulders (4-ft) in both directions depending on the preferred cross section.

The current shoulder widths are not wide enough to provide adequate safety to bicyclists. The total project length covers approximately 3.3 miles of roadway.

Proposed Route - Designate a new bicycle route along Old Hammock Road (SR 1512) to provide connectivity between the *Jacksonville City to the Sea Bike Route* and the *Swansboro Bicentennial Bicycle Route*. Current shoulder widths are not wide enough to safely accommodate proposed bicycle traffic, therefore, it is recommended that the current facility be improved to current AASHTO standards.

Improvements should include AASHTO standard bicycle-safe bridge railing height of 54" at new bridge locations and wide outside lanes (4-ft) in curb and gutter sections or wide paved shoulders (4-ft) in both directions depending on the preferred cross section. The total project length covers approximately 1.4 miles of roadway.

Public Transportation and Rail Map

There is neither fixed route public transportation, or any active, or inactive rail corridors within the study area. Therefore, a map of this element is not included in the plan.

Pedestrian Map

The format for the Pedestrian Map is still under development; therefore no map is included.

III. Implementation

Implementation is one of the most important aspects of the comprehensive transportation plan. If implementation is not an integral part of this process, the effort and expense associated with developing the plan will be lost. There are several tools available for use by the Town to assist in the implementation of the CTP. They are described in detail in this chapter.

State-Municipal Adoption of the CTP

The Towns of Swansboro and the North Carolina Department of Transportation have mutually approved the CTP shown in Figure 1. The mutually adopted plan can now serve as a guide for the Department of Transportation in the development of the transportation system for the Town. The approval of this plan by the Town also enables standard road regulations and land use controls to be used effectively in the implementation of this plan. As a part of the plan, the Town and Department of Transportation shall reach agreement on the responsibilities for existing and proposed streets and highways. Facilities which are designated a State responsibility will be constructed and maintained by the Division of Highways. Facilities which are designated a municipal responsibility will be constructed and maintained by the municipality.

Methods Used to Protect the Adopted CTP

Subdivision Regulations

Subdivision regulations require every subdivider to submit to the Town Planning Commission a plan of any proposed subdivision. It also requires that subdivisions be constructed to meet certain standards. Through this process, it is possible to require the subdivision streets to conform to the CTP and to reserve or protect necessary right-of-way for proposed roads and highways that are a part of the CTP.

The construction of subdivision streets to adequate standards reduces maintenance costs and simplifies the transfer of streets to the State Highway System. Appendix E outlines the recommended subdivision design standards as they pertain to road construction.

Since some of the proposed thoroughfares are outside the existing Town Limits, it is recommended that additional building setbacks and/or right-of-way reservation conforming to the CTP also be applied in the Onslow County Comprehensive Transportation Plan. This will allow for the orderly implementation of the plan in the fringe areas of the towns without disrupting adjoining landowners.

Zoning Ordinances

A zoning ordinance can be beneficial to transportation planning by designating appropriate locations of various land uses and allowable densities of residential development. This provides a degree of stability on which to make future traffic projections and to plan streets and highways.

Other benefits of good zoning ordinance are: (1) the establishment of standards of development which will aid traffic operations on major thoroughfares and (2) the minimization of strip commercial development which creates traffic friction and increases the traffic accident potential.

Future Street Line Ordinances

A municipality with legislative approval may amend its charter to be empowered to adopt future street line ordinances. This ordinance, enacted for selected streets, is particularly beneficial for planned future improvements, such as roadway widening. Through a metes-and-bounds description of a street's future right-of-way requirements, the municipality may prohibit new construction or reconstruction of structures within the future right-of-way. This approach requires specific design hearings to be held as an opportunity for affected property owners to obtain information about what to expect and to make necessary adjustments without undue hardship.

Roadway Corridor Official Maps

A Roadway Corridor Official Map (Official Map) is a document adopted by the North Carolina Board of Transportation which allows the reservation of roadway corridors as provided by General Statutes 136-44.50 through 136-44.54. Official Maps place temporary restrictions on private property rights by prohibiting the issuance of a building permit or the approval of a subdivision on property within an adopted alignment, for up to a three-year period beginning when a request for development is denied. The Official Map in effect serves as notice to developers that the State or Municipality intends to acquire specific property. This process is a beneficial tool in directing development so that sites can be reserved for public improvements in anticipation of actual need.

Development Reviews

The District Engineer’s Office and the Traffic Engineering Branch of the North Carolina Department of Transportation review driveway access to any state-maintained road. In addition, any development expected to generate large volumes of traffic (e.g., shopping centers, fast food restaurants, or large industries) should be comprehensively studied by the Traffic Engineering Branch, the Project Development and Environmental Analysis Branch, and/or the Roadway Design Unit of NCDOT. If reviewed at an early stage, it is often possible to significantly improve the development’s accessibility while preserving the integrity of the CTP.

Funding Sources

Capital Improvements Program

A capital improvement program makes it easier to build a planned transportation system. It consists of two lists of projects. The first is a list of local projects that are designated as a municipal responsibility and are to be implemented with municipal funds. The second is a list of highway projects designated as State responsibility to be included in the State's Transportation Improvement Program.

Transportation Improvement Program

North Carolina's Transportation Improvement Program (TIP) is a document that lists all major transportation projects, and their funding sources, planned by the NCDOT for a seven-year period. Every two years, when the TIP is updated, completed projects are removed, programmed projects are advanced, and new projects are added.

During biennial TIP public hearings, municipalities, local citizens groups, and other interested parties request projects to be included in the TIP. The group requesting a particular project(s) should submit to the NCDOT Board of Transportation Member representing their area the following: a letter with a prioritized summary of requested projects, TIP candidate project request forms, and project location maps with a description of each project. Refer to Appendix G for an example of a TIP project request packet. Local areas should work within their respective Rural Planning Organizations (RPO) to develop local and regional project priorities.

The Board of Transportation reviews all of the project requests from each area of the state. Based on the technical feasibility, need, and available funding, the board decides which projects will be included in the TIP. In addition to highway construction and widening, TIP funds are available for bridge replacement, highway safety projects, public transit projects, railroad projects and bicycle facilities.

Industrial Access Funds

If certain economic conditions are met, Industrial Access Funds are available for construction of access roads for industries that plan to develop property that does not have access to any state-maintained road. The NCDOT Secondary Roads Office should be contacted for information on Industrial Access Funds.

Small Urban Funds

Small Urban Funds are annual discretionary funds that are made available to municipalities with qualifying projects on the state system. The maximum amount is one million dollars per year per highway division. Requests for Small Urban Fund assistance should be directed to the Division Engineer or to the Program Development Branch of NCDOT.

The North Carolina Highway Trust Fund Law

The Highway Trust Fund Law was established in 1989 as a plan with four major goals for North Carolina's roads and highways. These goals are:

1. To complete the remaining 1,716 miles of four lane construction on the 3,600 mile North Carolina Intrastate System.
2. To construct a multilane connector in Asheville and portions of multilane loops in Charlotte, Durham, Greensboro, Raleigh, Wilmington, and Winston-Salem.
3. To supplement the secondary roads appropriation in order to pave, by 1999, 10,000 miles of unpaved secondary roads carrying 50 or more vehicles per day, and all other unpaved secondary roads by 2006.
4. To supplement the Powell Bill Program.

Over the thirty year planning period, the Town should look forward to the paving of most, if not all, of its unpaved roads on the state maintained system. Also, there will be an increase in Town's Powell Bill Funds if these newly paved roads are in the Town's Corporate Limits.

For more information on the Highway Trust Fund Law, contact the Program Development Branch of the North Carolina Department of Transportation.

Implementation Recommendations

Table 1 gives recommendations for the most suitable funding sources and methods of implementation for the major project proposals of the Swansboro CTP.

Table 1

Funding Sources and Recommended Methods of Implementation

Projects	Funding Sources				Methods of Implementation				
	Local Funds	TIP Funds	Indust. Access	Small Urban	CTP	Subdiv. Ord.	Zoning Ord.	Future Street Lines	Develop Review
NC 24 Access Mgmt		X			X		X	X	X
SR 1509 Widening		X			X	X	X	X	X
SR 1434 Widening	X			X	X			X	
SR 1444 Widening	X			X	X			X	
SR 1445 Widening	X			X	X			X	
SR 1447 Widening	X			X	X			X	
SR 1511 Widening	X			X	X			X	
SR 1512 Widening	X			X	X			X	

IV. Population, Land Use, and Existing Transportation System

In order to fulfill the objectives of an adequate thirty-year transportation plan, reliable forecasts of future travel patterns must be achieved. Such forecasts depend on careful analysis of the following items: historic and potential population changes; significant economic trends; character and intensity of land development; and the ability of the existing transportation system to meet existing and future travel demand. Secondary items that influence forecasts include the effects of legal controls such as zoning ordinances and subdivision regulations, availability of public utilities and transportation facilities, and topographic and other physical features of the area.

Population

Since the volume of traffic on a roadway is related to the size and distribution of the population that it serves, population data is used to aid the development of the transportation plan. Future population estimates typically rely on the observance of past population trends and counts. Table 2 presents the population and housing trends for Swansboro, the Swansboro Township, and Onslow County as established by the U.S. Census Bureau.

Table 2

Population Growth

Area	Year	Population	Housing Units
Onslow	1970	103,126	25,547
	1980	112,784	35,437
	1990	149,838	47,526
	2000	150,355	55,726
	2005	157,738	-
Swansboro Township	1970	20,800	1,882
	1980	23,446	3,225
	1990	10,115	4,588
	2000	15,103	6,602
	2005	-	-
Swansboro	1970	1,207	410
	1980	976	420
	1990	1,165	586
	2000	1,426	770
	2005	1,734	-

The most important population estimate for development of a CTP is that of the planning area. Even though government census data is not available for the transportation planning area, other methods of estimation of population are available. Using a combination of census data, building permits and a 2005 housing "windshield survey", a final count of 2,313 households inside the Swansboro Planning Area was determined by the following method:

- The total number of dwelling units for each of the ten Traffic Analysis Zones (TAZs) were estimated by adding the 2000 Census totals to the number of new houses built between 2000 and 2005;
- Each zone's average person per household, as established by the 2000 Census, was then multiplied by the number of households to determine zonal populations;
- Finally, the population sum for the ten zones was used as the planning area total. (See the Traffic Model Section for a detailed explanation of TAZs.)

Planning area totals and projections are shown in Table 3. The North Carolina Department of Transportation – Transportation Planning Branch and the Town of Swansboro agreed upon the population projections in February 2006.

Table 3

Population Projections for the Swansboro Planning Area

Year	Town of Swansboro	Planning Area
2000	1,459	4,594
2005	2,618	5,480
2035	5,073	9,447

Economy and Employment

An important factor considered in estimating the future traffic growth of an area is its economic base. The number of employers and the employee's income or purchasing power influences how much population can be supported in the area and the number of motor vehicles that will be locally owned and operated. Generally, as the family income increases so does the number of vehicles owned, as well as the number of vehicle trips generated per day by each household. An accurate projection of the future economy of the area is essential to estimating future travel demand.

Factors which will influence economic growth and development in the Swansboro Planning Area over the planning period is development along the NC 24 corridor and the continued revitalization of the downtown area. The working population in the planning area is mainly a mixture of retail trade, educational services, accommodation and food services, and other services. Base year employment data, shown in Table 4, was developed by estimating the number of employees by sector in each TAZ, then

totaling the TAZ subtotals. Employee estimations were based on ESC data, information from the Town Planner and a windshield survey.

Future year projections were calculated by multiplying the base year percentage of each employer sector by the future estimated total number of employees. Employment categories depicted are based on the North American Industry Classification System (NAISC). A detailed description of the employment sectors and subsectors can be found at, www.naics.com.

Table 4

Employment Data and Projections for the Swansboro Planning Area

Employment Sector	2005 Employment	2035 Employment
Utilities	5	9
Construction	88	152
Manufacturing	15	26
Wholesale Trade	25	43
Retail Trade	606	1,044
Transportation and Warehousing	2	3
Information	14	24
Finance and Insurance	59	102
Real Estate and Rental and Leasing	46	79
Professional, Scientific, and Technical Services	76	131
Administrative and Support and Waste Management and Remediation Services	65	112
Educational Services	402	693
Health Care and Social Assistance	49	84
Arts, Entertainment, and Recreation	25	43
Accommodation and Food Services	158	272
Other Services	127	219
Public Administration	32	55
Total	1794	3091

Land Use

Land use refers to the physical patterns of activities and functions within an area. Traffic demand on a road often can be attributed to adjacent land use. For example, a shopping center generates larger traffic volumes than a residential area. The spatial distribution of different types of land uses is a predominant determinant of when, where, and to what extent traffic congestion occurs. The travel demand between different land uses and the resulting impact on traffic conditions varies depending on the size, type, intensity, and spatial separation of development. Even commercial and residential traffic generation patterns have different peaks based on the time of day and the day of the week. Figure 3 depicts the Town of Swansboro's existing land use plan.

For transportation planning purposes, land use is divided into the following categories:

- Residential: All land is devoted to the housing of people, with the exception of hotels and motels.
- Commercial: All land is devoted to retail trade including consumer and business services and their offices; this may be further stratified into retail and special retail classifications. Special retail would include high-traffic establishments, such as fast food restaurants and service stations; all other commercial establishments would be considered retail.
- Industrial: All land is devoted to the manufacturing, storage, warehousing, and transportation of products.
- Public: All land is devoted to social, religious, educational, cultural, and political activities; this would include the office and service employment establishments.
- Agricultural: All land is devoted to the use of buildings or structures for the raising of non-domestic animals and/or growing of plants for food and other production.

Anticipated future land development is a logical extension of the present spatial land use distribution. Determination of where expected growth is to occur within the planning area facilitates the location of proposed thoroughfares or the improvements of existing thoroughfares. Areas of expected development and growth is described below:

Residential – With the anticipation of extended sewer service, future residential development is expected to concentrate in the southern portion of the planning area, along Hammock Beach Rd. (SR 1511) and Old Hammock Rd. (SR 1512). Similarly, Town Staff expects residential growth to continue with the second phase of sewer expansion in the area of Norris Road (SR 1445) and Swansboro Loop (SR 1444).

Commercial/Retail – Commercial land use is currently concentrated along NC 24 (Corbett Ave.) through Town and in the downtown area. These areas are currently developed with shopping centers and some strip commercialization. Future development is expected to continue along the NC 24 corridor.

Industrial – Industrial development has occurred primarily along Seth Thomas Lane and Leslie Lane (SR 1737). Future industrial development is expected to follow suit.

Public – The planning area has numerous public areas and open spaces. The Town owns several parks, schools, open play spaces, and waterfront properties. As residential growth continues, plans for additional recreational spaces are anticipated.

The Swansboro Future Land Use Plan is illustrated in Figure 4. The illustrations of the existing as well as the anticipated land use patterns was extracted from the *Town of Swansboro Comprehensive Plan: A 20-Year Planning Guide* dated October 2000.

The preparation of this map was financed in part through a grant provided by the North Carolina Coastal Management Program, through the funds provided by the North Carolina Coastal Management Act of 1972, as amended, which is administered by the Office of Ocean and Coastal Resource Management, National Oceanic and Atmospheric Administration.

Figure 3
Existing Land Use
Town of Swansboro
November 1996

Legend

- Undeveloped/Agricultural
- Single-Family Residential
- Multi-Family Residential
- Manufactured Home
- Commercial
- Institutional
- Industrial
- Recreational
- Town Limits
- ETJ
- Watershed Boundary
- School
- Cemetery

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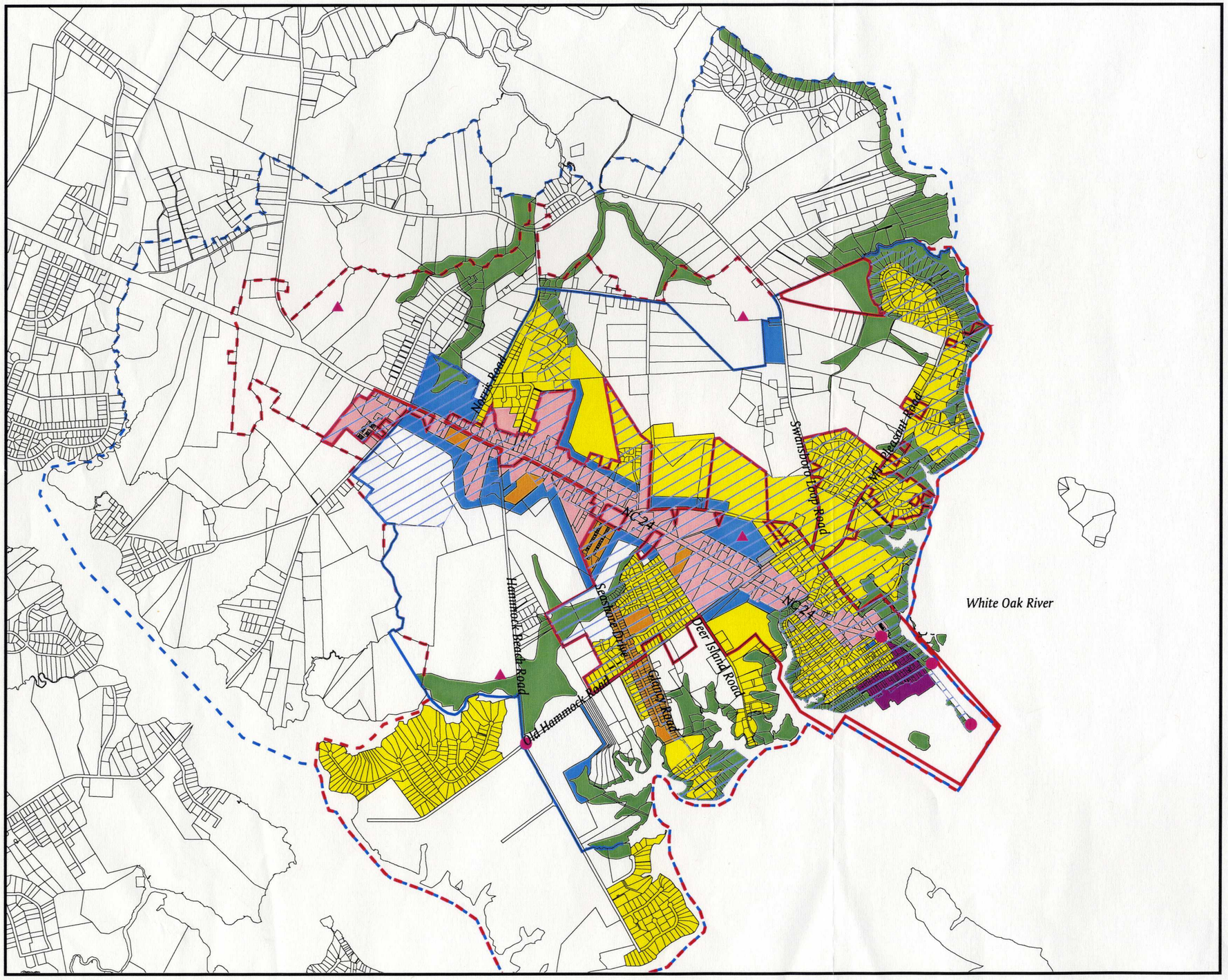
Scale: 1" = 1,500'

1/29/99

The Wooten Company

Figure 4

Town of Swansboro Future Land Use Map



- Corporate Limits
- Extraterritorial Jurisdiction
- Corporate Limits - 20 Year Projection
- ETJ - 20 Year Projection
- Low Density Residential
- Medium Density Residential
- High Density Residential
- Areas of Environmental Concern & Fragile Areas
- Historic District
- Commercial
- Office & Institutional
- Light Industrial
- Infill Development
- Commercial Nodes
- Future Parks

N
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2000 0 2000 4000 Feet

The preparation of this map was financed in part through a grant provided by the North Carolina Coastal Zone Management Program, through funds provided by the Coastal Zone Management Act of 1972, as amended, which is administered by the Office of Ocean and Coastal Resource Management, National Oceanic and Atmospheric Administration.

Roadway System

An important stage in the development of a CTP is the analysis of the existing roadway system and its ability to serve the area's travel desires. Emphasis is placed not only on detecting the existing deficiencies, but also on understanding the causes of these deficiencies. Roadway deficiencies may result from inadequacies such as pavement widths, intersection geometry, or intersection controls. Deficiencies may also be a result of system problems, such as the need to construct missing travel links, bypass routes, loop facilities, or additional radial routes.

An analysis of the roadway system looks at both current and future travel patterns and identifies existing and anticipated deficiencies. This is usually accomplished through a traffic crash analysis, roadway capacity deficiency analysis, and a system deficiency analysis. The information derived from these analyses, along with population growth, economic development potential, and land use trends, is used to determine the potential impacts of the future system.

Traffic Crash Analysis

Traffic crashes are often used as an indicator for locating congestion and roadway problems. While often the result of driver error or vehicle malfunction, crashes may also be a result of the physical characteristics of the roadway. Deficiencies such as poor design, obstructions, traffic conditions, limited sight distance and inadequate signing may all lead to a crash. Crash patterns obtained from an analysis of crash data can lead to the identification of improvements that will reduce the number of crashes.

A crash analysis performed for the Swansboro Planning Area included crash frequency, type and severity. Crash frequency is the total number of reported collisions and contributes to the ranking of the most problematic intersections. These high crash intersections are illustrated in Figure 5. Crash type provides a general description of the crash and allows the identification of any trends that may be correctable through roadway or intersection improvements. Crash severity is the crash rate based upon injuries and property damage incurred.

The severity of every accident is measured with a series of weighting factors developed by the NCDOT Division of Highways (DOH). These factors define a fatal or incapacitating crash as 47.7 times more severe than one involving only property damage, and an accident resulting in minor injury is 11.8 times more sever than one with only property damage. In general, a higher severity index indicates more severe accidents. Listed below are levels of severity for various severity index ranges.

Severity	*Severity Index*
low	< 6.0
average	6.0 to 7.0
moderate	7.0 to 14.0
high	14.0 to 20.0
very high	> 20.0

Table 5 depicts a summary of the crashes occurring in the planning area between January 2000 and December 2005. This table only includes locations with 5 or more accidents. The "Total" column indicates the total number of accidents reported within 150-ft of the intersection during the study period indicated. The severity listed is the average accident severity for that location.

Table 5

High Crash Intersections
January 1, 2000 to December 31, 2005

Locations	Angle	Rear	Left End	Right Turn	Sideswipe Turn	Other	Total	Severity
NC 24*								
Old Hammock	4	8	9	1	4	3	29	2.79
Main	2	8	1		1	2	14	3.11
CL-Carteret		7			1		8	4.70
Taylor	3	2		1		1	7	2.06
Front		2			1	3	6	1.00
Norris	1				1	3	5	3.96
Elm	1				1	3	5	2.48

*Note: All seven intersections listed involved routes that intersected with NC 24.

The NCDOT is actively involved with investigating and improving many of these locations. To request a more detailed analysis for any of the locations depicted or other intersections of concern, contact the Division Traffic Engineer. Contact information for the Division Traffic Engineer is included in Appendix A.

Existing Bridge Conditions

Bridges are a vital element of a highway system. First, they represent the highest unit investment of all elements of the system. Second, any inadequacy or deficiency in a bridge reduces the value of the total investment. Third, a bridge presents the greatest opportunity of all potential highway failures for disruption of community welfare. Finally, and most importantly, a bridge represents the greatest opportunity of all highway failures for loss of life. For these reasons, it is imperative that bridges be constructed to the same design standards as the system of which they are a part.

The Transportation Improvement Program (TIP) development process for bridge projects involves consideration of several evaluation methods in order to prioritize needed improvements. A sufficiency index is used to determine whether a bridge is sufficient to remain in service, or to what extent it is deficient. The index is a percentage

in which 100 percent represents a sufficient bridge and zero represents an insufficient or deficient bridge. Factors evaluated in calculating the index are listed below.

- structural adequacy and safety
- serviceability and functional obsolescence
- essentiality for public use
- type of structure
- traffic safety features

The NCDOT Bridge Maintenance Unit inspects all bridges in North Carolina at least once every two years. A sufficiency rating for each bridge is calculated and establishes the eligibility and priority for replacement. Bridges having the highest priority are replaced as Federal and State funds become available.

A bridge is considered deficient if it is either structurally deficient or functionally obsolete. A bridge that is at least ten years old is considered structurally deficient if it is in relatively poor structural condition or has an insufficient load-carrying capacity due to either the original design or to deterioration. A bridge is considered functionally obsolete if it is narrow, has inadequate under-clearances, has insufficient load-carrying capacity, is poorly aligned with the roadway, and/or can no longer adequately serve existing traffic.

A bridge must be classified as deficient in order to qualify for Federal replacement funds. Additionally, the sufficiency rating must be less than 50% to qualify for replacement or less than 80% to qualify for rehabilitation under federal funding. An inventory of the bridges within the planning area is provided in Table 6.

Table 6

Bridge Inventory

Bridge No.	Facility	Water Feature	Location	Year Built	SD	FO	Rating
660025	NC 24	White Oak River	W. of County Line	2001	N	N	85
660030	NC 24	White Oak River	E. of County Line	2001	N	N	80
660077	SR 1509	Queens Creek	1.5 mi S. of NC 24	1962	N	Y	46.7
660156	SR 1444	Br. Of White Oak	.1 mi W. of SR 1445	1997	N	N	99.5
660157	SR 1444	Br. Of White Oak	.3 mi E. of SR 1445	1994	N	N	99.7

Notes: * Denotes the bridge is in the current Transportation Improvement Program.

Traffic Model

In order to develop an efficient CTP for the Swansboro Planning Area, it was necessary to develop and calibrate a traffic model of the area. Developing a traffic model requires the following steps: defining the study area, collecting traffic counts and socioeconomic data, determining the trip generation characteristics of the study area, calibrating the traffic model so that it duplicates patterns of the study area, and projecting the socioeconomic data to the design year. Once the socioeconomic data has been projected, the model may be used to evaluate various street system problems and alternate solutions to the problems.

The Study Area

One of the first steps in the development of a CTP is to define the planning area. The planning area is generally the limits to which urbanization is expected to occur during the 30-year planning period.

Once established, the planning area is then subdivided into traffic analysis zones (TAZs). These zones were established based on similar land uses and census blocks. They facilitate the collection of data and the distribution of traffic. Figure 7 depict the Swansboro Planning Area and TAZs.

The Street Network

The purpose of the traffic model is to replicate the conditions on the Town's street system. Therefore, it is necessary to represent the actual street system in the model in order to emulate the traffic patterns as closely as possible. Generally, all the major arterials and some of the major land access or collector streets are represented on the street system model. Figure 7 illustrates the planning area's modeled road network.

Street capacity is an important component of the model. The volume to capacity ratio (v\c) gives us our best indication of present and future traffic congestion. Speed and distance are the major factors that define the minimum time paths from zone to zone. The model uses the minimum time paths as the basis for assigning traffic to streets.

NCDOT TPB
TRANSPORTATION PLANNING BRANCH

Figure 5

Crash Locations

Legend

- High Crash Locations
- Rivers and Streams
- County Boundary
- Planning Boundary

Town Of Swansboro

Onslow County
North Carolina

Pepared By The
North Carolina Department of Transportation
Transportation Planning Branch

In Cooperation With The
U.S. Department of Transportation
Federal Highway Administration

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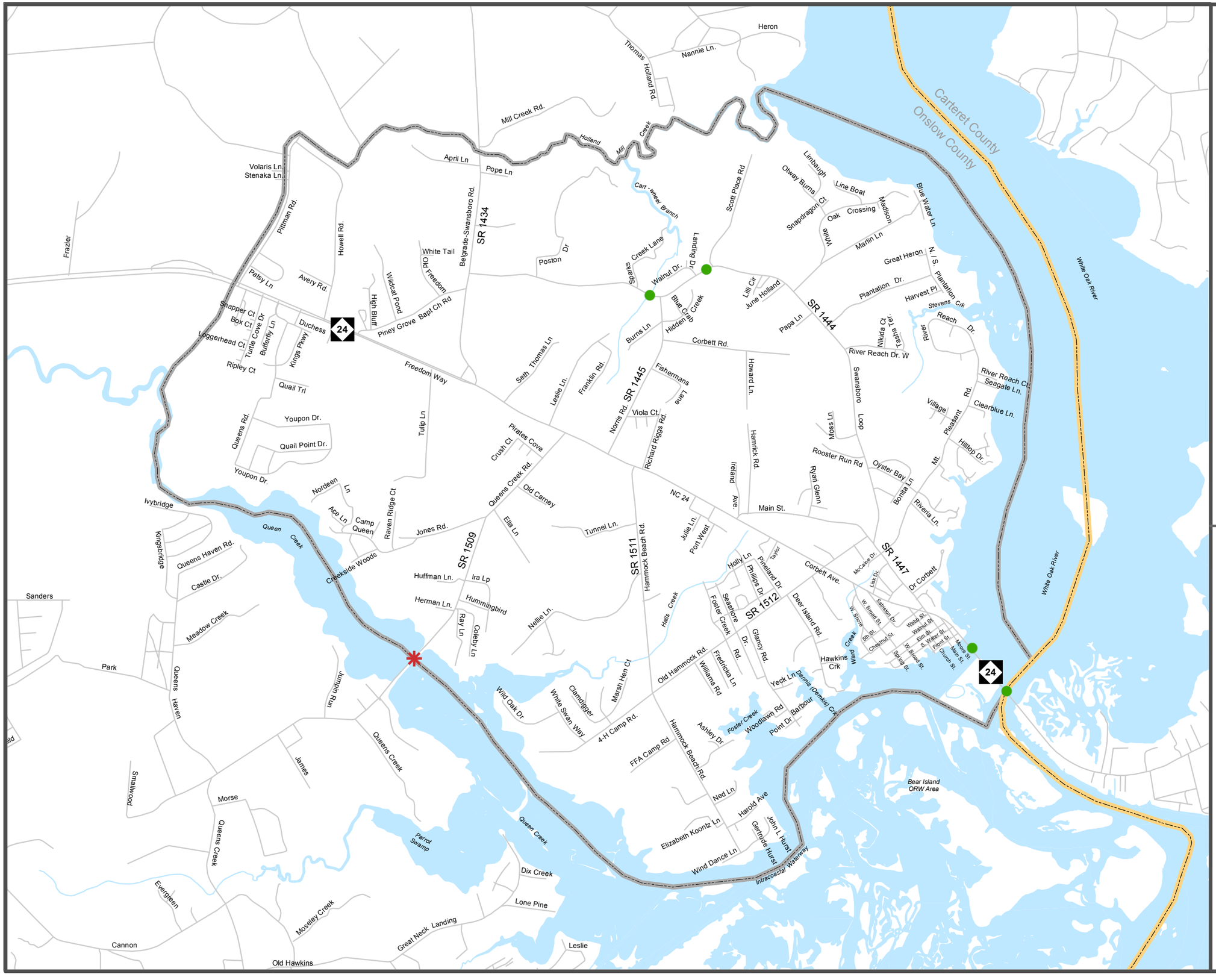
0 0.25 0.5 1
Miles

Base map date: February 7, 2005



NCDOT TPB
TRANSPORTATION PLANNING BRANCH

Figure 6

Deficient Bridges

Legend

- Adequate Bridges
- Deficient Bridges
- Rivers and Streams
- County Boundary
- Planning Boundary

Town Of Swansboro

Onslow County
North Carolina

Pepared By The
North Carolina Department of Transportation
Transportation Planning Branch

In Cooperation With The
U.S. Department of Transportation
Federal Highway Administration

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W E
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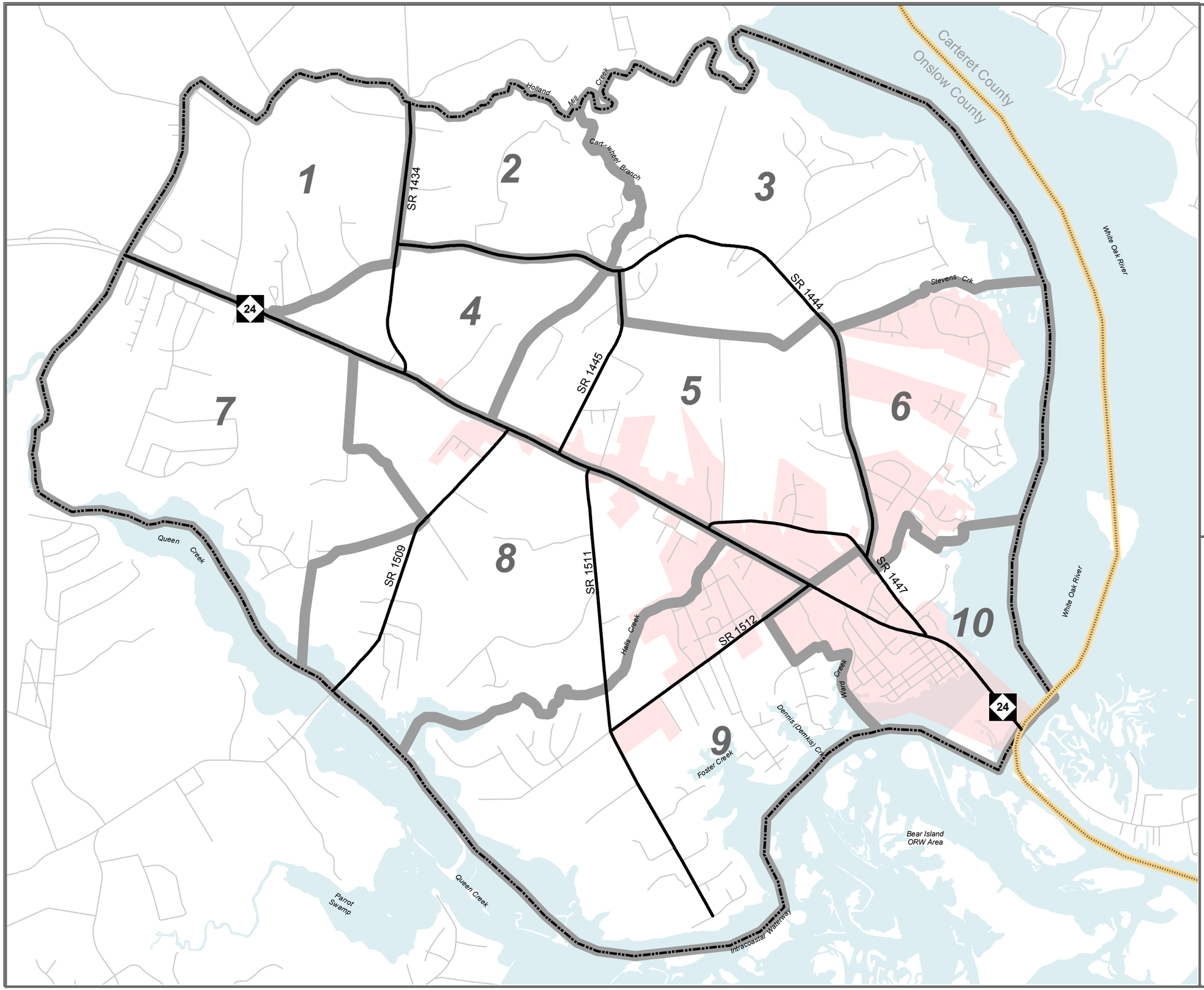
0 0.3 0.6 1.2
Miles

Base map date: February 7, 2005



NCDOT TPB
TRANSPORTATION PLANNING BRANCH

Figure 7

Network Roads Traffic Analysis Zones

Legend

- Network Roads
- County Boundary
- Planning Area Boundary
- Traffic Analysis Zones (TAZs)
- City Boundary
- 00 Zone Numbers

Town Of Swansboro

Onslow County
North Carolina

Pepared By The
North Carolina Department of Transportation
Transportation Planning Branch

In Cooperation With The
Town Of Swansboro
Down East RPO
Federal Highway Administration

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0 0.25 0.5 1
Miles

Base map date: February 7, 2005

Data Requirements

In order to produce a traffic model that is an adequate representation of the transportation network, certain data inputs are required. The collection of traffic count and socioeconomic data are vital components of any model. Traffic counts furnish the average number of vehicles traveling a network route and provide a basis for calibrating the model. They also show a snapshot of the traffic conditions in the planning area. Socioeconomic data (housing counts and employment estimates) are necessary in order to generate traffic for the model.

- Traffic Counts: The model must be calibrated against existing conditions in the study area. In order to calibrate the model, 2005 Average Annual Daily Traffic (AADT) counts from the Traffic Survey Unit were used as well as some additional counts taken by the Down East RPO. Additionally, volumes were taken on network routes where they cross the planning area boundary. Counts crossing the planning area boundary depict how much traffic is entering and exiting the planning area.

- Socioeconomic Data: The required data consists of housing counts and an employment survey. The housing counts are used in the model as the generator of trips and employment is used as the attractor of trips. Base year dwelling units and employment estimates were based on data collected from the Employment Securities Commission (ESC), windshield surveys performed by TPB during the summer of 2005, and census data. The projection of socioeconomic data to the future year of 2035 was performed cooperatively with the Town, and was based on past trends and anticipated growth within the planning area. Appendix F shows the total housing for each zone.

  The employment data collected was categorized by North American Industry Classification System (NAICS) and grouped by employment sectors. Appendix F shows the total employment for each traffic zone.

Commercial Vehicles

Commercial vehicles have somewhat different trip generation characteristics than do privately owned vehicles. An estimation of commercial vehicles was performed based on the nature of the business.

Trip Generation

Trip generation is the process by which external station traffic counts, housing data, and employment data are used to generate traffic volumes that duplicate the traffic volumes on the street network. The technical definition of a trip is slightly different than the definition of a trip used by the general public. Technically, a trip only has one origin and one destination while the layman will often group, or chain, several short trips together as one longer trip.

Traffic inside the planning area has three major components: through trips, external-internal trips, and internal trips. Through trips are produced outside the study area and pass through enroute to a destination outside the planning area. Internal-external trips have one end of the trip outside of the planning area. Internal trips have both their origin and destination inside the planning area. Table 7 gives a summary of each trip type.

Table 7

Travel Data Summary

Type	2005	2035
Average Daily Trips per DU	6	6
Through Trips	33,124	56,928
Internal Trips	11,579	22,863
Internal < > External	13,976	25,112
Total Daily Trips	58,679	104,903

- Through Trips: The through trip table for this study was developed based on *Technical Report 3* (Synthesized Through Trip Table for Small Urban Areas By Dr. David G. Modlin, Jr.). Once these volumes were developed, the Fratar balancing method was then used to balance the trip interchanges so that the total number of through trips at each external station is consistent with the total number of through trips at every other station. Generally five iterations are sufficient to balance the estimate between external zones.

- External<>Internal Trips: The external-internal trip volume was determined by subtracting the through trip volume at each station from the total traffic volume at that station. Table 8 lists the external-internal and through trip values.

- Internal Trip Distribution: The internal trip volume was determined by multiplying the total trips by zone attractiveness. Zone attractiveness was derived by utilizing population, housing, and employment data to produce an attraction factor for each zone. The internal trips were distributed zone to zone based on percent attractiveness.

Table 8

External Station Summary

External Station	Base Year – 2005 Total AADT	Base Year – 2005 Two-Way Thru Trips	Base Year – 2005 IE-EI Trips	Future Year – 2035 Total AADT	Future Year – 2035 Two-Way Thru Trips	Future Year – 2035 IE-EI Trips
1	18,000	12,960	5,040	30,397	21,888	8,509
2	3,000	1,802	1,198	6,080	3,970	2,110
3	8,000	4,804	3,196	16,329	9.850	6,479
4	18,100	13,558	4,542	29,234	21,220	8,014

Model Calibration

The purpose of a traffic model is to predict the traffic on a street system at some future point in time; however, if the model is not accurate, it is useless for this purpose. Therefore, the model must duplicate the existing traffic pattern. The actual calibration of the model is an iterative process in which incremental changes are made either in the trip generation, trip distribution, or the street network. The purpose of each change is to allow the model to more accurately reflect the real world conditions upon which it is based. Only when the model can adequately reflect the existing traffic pattern should it be used to predict traffic in the future. The model was calibrated to 2005 AADT volumes.

Accuracy Checks

There were two checks made on the model. The first is to follow trips through all the steps involved in the model. The purpose of this check is to ensure that no trips have been accidentally added to or subtracted from the model, and that no trips have been counted twice.

The second check for the model, is to match the traffic volumes on the links in the model with the AADT at the same locations. The 'link counts' can be used to find particular places in the network where there are problems. Comparing the link counts with the ground counts for the links in this model did not reveal any significant problems with the model.

Data Projections to the Design Year

In order to make use of the model the base year data must be modified to reflect assumed conditions in the design year (2035). These projections were used to produce trip productions and attractions in the same manner as the base year (2005).

Housing Units
Future dwelling units were estimated by averaging the growth rates for Onslow County, the Swansboro Township, and Swansboro. This average rate was then extended linearly to the design year. The number of dwelling units within the planning area is projected to increase by 2.21%, totaling 4,456 housing units.

Population
The population of the planning area was estimated by multiplying the design year housing unit totals by the projected number of persons per household (pph). The population was distributed throughout the planning area by multiplying the base year percentage of population per zone by the projected population. Table 3 depicts the base and future year population estimates.

Employment
The Transportation Planning Branch and the Town Staff projected and distributed the 2035 employment to the zones were growth was anticipated. Those projections were added to the 2005 data. Employment projections throughout the planning area indicated steady growth. Appendix F depicts the projected 2035 employment by traffic analysis zone.

External and Through Trips
For the design year, external and through trips were projected from the base year using a linear projection of the past growth rate at each external station. External station data can be found in Table 8.

Roadway Deficiencies

Width Deficiencies

NCDOT's roadway design standards establish criteria for minimum pavement widths, dependent on the type of facility, the design speed, and the current and design year AADT. These criteria dictate 12-foot lanes for all highways with design speeds greater than 50 miles per hour (mph) and design year AADT greater than 2,000 vehicles per day (vpd). In addition to criteria for designing new facilities, there are standards for minimum tolerable lane widths on existing roads. These minimum tolerable lane widths are summarized below in Table 9.

Table 9

Minimum Tolerable Lane Widths

Average Daily Traffic (vpd)	Principle Arterials	Minor Arterials	Collectors
Over 2000	11ft	11ft	11ft
400 - 2000	-	10ft	10ft
100 - 400	-	10ft	9ft
Below 100	-	-	9ft

There are a number of roads in the Swansboro Planning Area that have substandard lane widths. Due to the substantial cost of upgrading all secondary roads to standard 12-foot lanes, narrower widths may have to be tolerated until sufficient funds are available for improvements. Roads within the planning area that have substandard widths and, based on the volume of traffic on the road, are recommended to be widened to 12-foot lanes are listed below.

- Belgrade-Swansboro Road (SR 1434): From NC 24 (Freedom Way) to northern planning area boundary.
- Swansboro Loop (SR 1444): From Belgrade-Swansboro Road (SR 1434) to Main Street (SR 1447).
- Main Street (SR 1447): Entire length of route beginning and ending on NC 24 (Corbett Ave.).
- Norris Road (SR 1445): Entire length of route from NC 24 (Corbett Ave.) to Swansboro Loop (SR 1444).

- Hammock Beach Road (SR 1511): Entire length of route, from NC 24 (Corbett Ave.) to end of state maintenance.

- Old Hammock Road (SR 1512): Entire length of route from NC 24 (Corbett Ave.) to Hammock Beach Rd. (SR 1511).

Capacity Deficiencies

Capacity deficiencies occur when the traffic volume of a roadway is eighty percent or more of roadway's capacity. Travel volumes are based on the total number of vehicles that use a roadway on a typical day. These volumes are based on annual average daily traffic (AADT) counts taken annually by the NCDOT Traffic Survey Group.

Capacity is the maximum number of vehicles which have a "reasonable expectation" of passing over a given section of roadway, during a given time period under prevailing roadway and traffic conditions. Many factors contribute to the capacity of a roadway, including the following:

- Geometry of the road, including number of lanes, horizontal and vertical alignment, and proximity of perceived obstructions to safe travel along the road;
- Typical users of the road, such as commuters, recreational travelers, and truck traffic;
- Access control, including streets and driveways, or lack thereof, along the roadway;
- Development adjacent to the road, including residential, commercial, and industrial developments;
- Number of traffic signals along the route;
- Peaking characteristics of the traffic on the road;
- Characteristics of side-roads feeding into the road; and
- Directional split of traffic or the percentages of vehicles traveling in each direction along a road at any given time.

A comparison of the 2005 traffic volumes for the planning area's network roads and their respective capacities did not reveal any deficiencies. Figure 8 depicts the 2005 AADT for the Swansboro Planning Area. The projected 2035 volumes are shown in Figure 9 and listed in Appendix C. The projected traffic volumes in Figure 9 were estimated without considering any of the recommended roadway improvements.

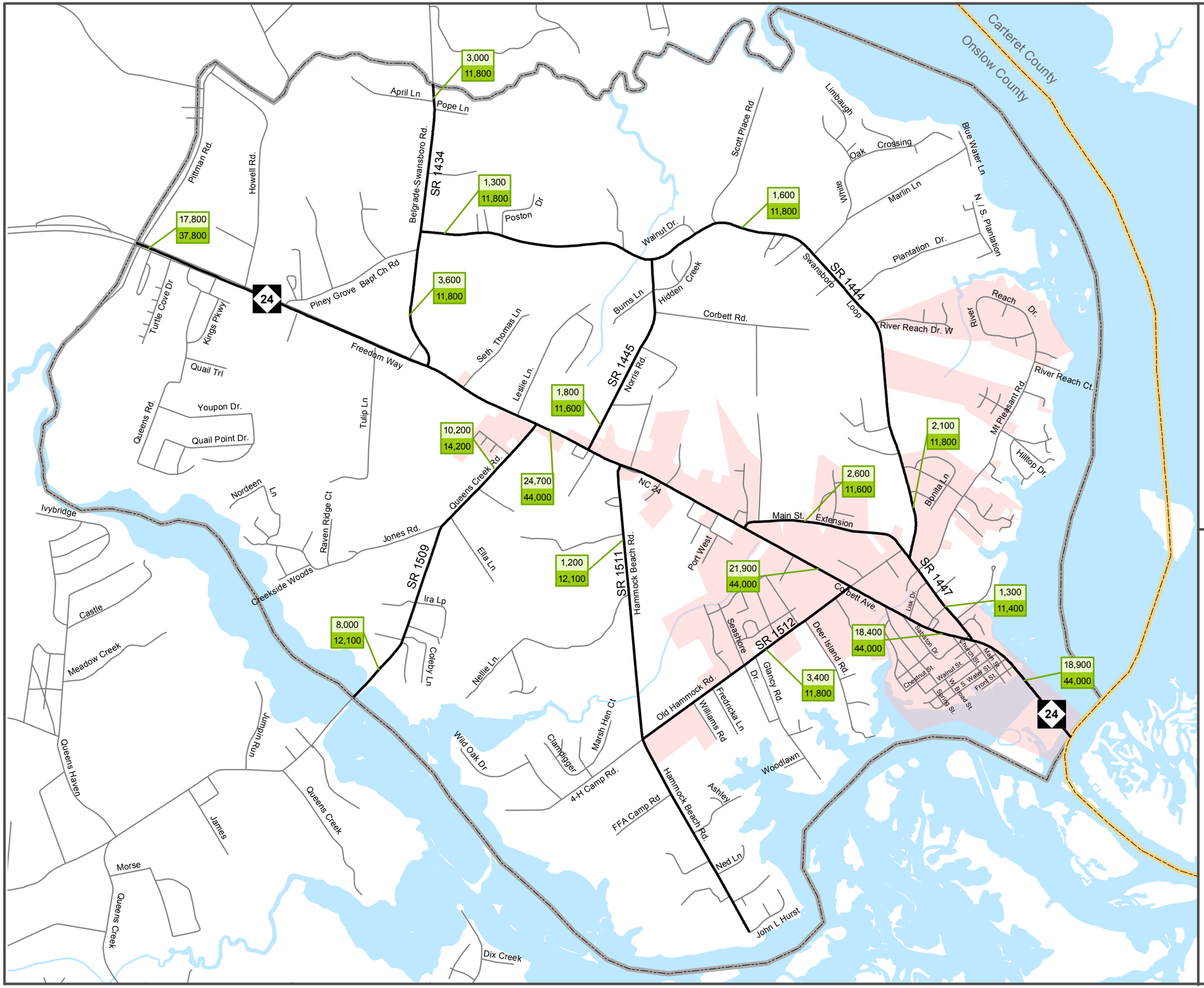

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Figure 8

2005 Volumes and Roadway Deficiencies

LEGEND

- OVER CAPACITY
- NEAR CAPACITY
- NETWORK ROADS
- COUNTY BOUNDARY
- WATER BODIES
- CITY BOUNDARY
- PLANNING AREA BOUNDARY
- 0000 2005 AADT
- 0000 CAPACITY

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Federal Highway Administration

N
W E
S

0 0.25 0.5 1
Miles

Base map date: February 7, 2005

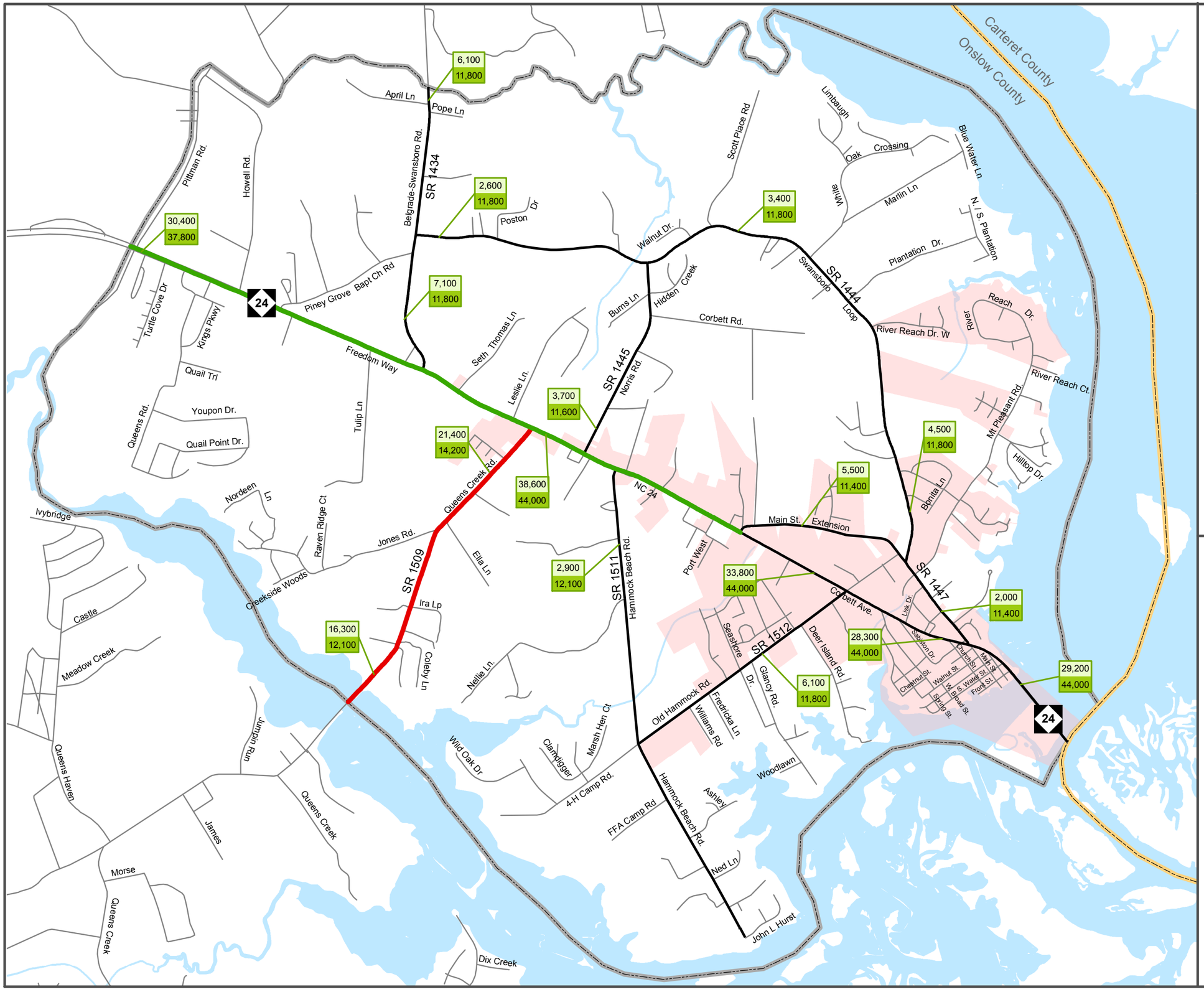

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Figure 9

2035 Volumes and Roadway Deficiencies

LEGEND

- NEAR CAPACITY
- OVER CAPACITY
- NETWORK ROADS
- COUNTY BOUNDARY
- WATER BODIES
- CITY BOUNDARY
- PLANNING AREA BOUNDARY
- 0000 2035 AADT
- 0000 CAPACITY

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0 0.25 0.5 1
Miles

Base map date: February 7, 2005

Level of Service (LOS)

The relationship of travel demand compared to the roadway capacity determines the level of service (LOS) of a roadway. Six levels of service identify the range of possible conditions. Designations range from LOS A, which represents the best operating conditions, to LOS F, which represents the worst operating conditions.

Design requirements for roadways vary according to the desired capacity and level of service. LOS D indicates "practical capacity" of a roadway, or the capacity at which the public begins to express dissatisfaction. Recommended improvements and overall design of the transportation plan were based upon achieving a minimum LOS D on existing facilities and a LOS C on new facilities. The six levels of service are described below and illustrated in Figure 10.

- **LOS A**: Describes primarily free flow conditions. The motorist experiences a high level of physical and psychological comfort. The effects of minor incidents of breakdown are easily absorbed. Even at the maximum density, the average spacing between vehicles is about 528 ft, or 26 car lengths.

- **LOS B**: Represents reasonably free flow conditions. The ability to maneuver within the traffic stream is only slightly restricted. The lowest average spacing between vehicles is about 330 ft, or 18 car lengths.

- **LOS C**: Provides for stable operations, but flows approach the range in which small increases will cause substantial deterioration in service. Freedom to maneuver is noticeably restricted. Minor incidents may still be absorbed, but the local decline in service will be great. Queues may be expected to form behind any significant blockage. Minimum average spacing is in the range of 220 ft, or 11 car lengths.

- **LOS D**: Borders on unstable flow. Density begins to deteriorate somewhat more quickly with increasing flow. Small increases in flow can cause substantial deterioration in service. Freedom to maneuver is severely limited, and the driver experiences drastically reduced comfort levels. Minor incidents can be expected to create substantial queuing. At the limit, vehicles are spaced at about 165 ft, or nine car lengths.

- **LOS E**: Describes operation at capacity. Operations at this level are extremely unstable, because there are virtually no usable gaps in the traffic stream. Any disruption to the traffic stream, such as a vehicle entering from a ramp, or changing lanes, requires the following vehicles to give way to admit the vehicle. This can establish a disruption wave that propagates through the upstream traffic flow. At capacity, the traffic stream has no ability to dissipate any disruption. Any incident can be expected to produce a serious breakdown with extensive queuing. Vehicles are spaced at approximately six car lengths, leaving little room to maneuver.

- **LOS F**: Describes forced or breakdown flow. Such conditions generally exist within queues forming behind breakdown points.

FIGURE 10 – LEVEL OF SERVICE ILLUSTRATIONS

Level of Service A

Driver Comfort: High

Maximum Density:

12 passenger cars per mile per lane

Level of Service B

Driver Comfort: High

Maximum Density:

20 passenger cars per mile per lane

Level of Service C

Driver Comfort: Some Tension

Maximum Density:

30 passenger cars per mile per lane

Level of Service D

Driver Comfort: Poor

Maximum Density:

42 passenger cars per mile per lane

Level of Service E

Driver Comfort: Extremely Poor

Maximum Density:

67 passenger cars per mile per lane

Level of Service F

Driver Comfort: The lowest

Maximum Density:

More than 67 passenger cars per mile per lane

Source: 2000 Highway Capacity Manual

V. Environmental Screening

In recent years, the environmental considerations associated with transportation construction have come to the forefront of the planning process. Section 102 of the National Environmental Policy Act (NEPA) requires the completion of an Environmental Impact Statement (EIS) for projects that have a significant impact on the environment. The EIS includes impacts on wetlands, wildlife, water quality, historic properties, and public lands. While this report does not cover the environmental concerns in as much detail as an EIS would, consideration for many of these factors was incorporated into the development of the transportation plan. These factors were also incorporated into the recommended improvements. Environmental features found in the area are shown in Figures 11 and 12.

Wetlands

Wetlands are those lands where saturation with water is the dominant factor in determining the nature of soil development and the types of plant and animal communities living in the soil and on its surface. Wetlands are crucial ecosystems in our environment. They help regulate and maintain the hydrology of our rivers, lakes, and streams by storing and slowly releasing floodwaters. Wetlands help maintain the quality of water by storing nutrients, reducing sediment loads, and reducing erosion. They are also critical to fish and wildlife populations by providing an important habitat for approximately one-third of the plant and animal species that are federally listed as threatened or endangered.

The National Wetland Inventory showed several wetlands throughout the study area. Wetland impacts have been avoided or minimized to the greatest extent possible while preserving the integrity of the transportation plan.

Threatened and Endangered Species

The Threatened and Endangered Species Act of 1973 allows the U.S. Fish and Wildlife Service to impose measures on the Department of Transportation to mitigate the environmental impacts of a transportation project on endangered animal and plant species, as well as critical wildlife habitats. Locating any rare species that exist within the planning area during this early planning stage will help to avoid or minimize impacts.

A preliminary review of the Federally Listed Threatened and Endangered Species in the area was completed to determine what effects, if any, the recommended improvements may have on wildlife. Mapping from the N.C. Department of Environment and Natural Resources revealed occurrences of threatened or endangered plant and/or animal species in the area. No threatened or endangered species are anticipated to be

adversely impacted by any of the transportation plan recommendations. However, a detailed field investigation is recommended prior to construction of any highway project in this area.

Historic Sites

Section 106 of the National Historic Preservation Act requires the Department of Transportation to identify historic properties listed in, as well as eligible for, the National Register of Historic Places (NRHP). The NCDOT must consider the impacts of transportation projects on these properties and consult with the Federal Advisory Council on Historic Preservation.

N.C. General Statute 121-12(a) requires the NCDOT to identify historic properties listed on the National Register, but not necessarily those that are eligible to be listed. The NCDOT must consider the impacts and consult with the State Historic Preservation Office (SHPO), but is not bound by their recommendations.

The location of historic sites within the planning area was investigated to determine any possible impacts resulting from the recommended improvements. This investigation identified one registered historic property (The William Edward Mattocks House) and one historic district located in downtown Swansboro. Neither the historic property nor the district will be impacted by the recommended improvements.

Educational Facilities

The locations of educational facilities in the study area were considered during the development of the transportation plan and are depicted in Figure 12. They include Swansboro Middle School located on NC 24, and Swansboro Elementary School and Swansboro High School both located on Queens Creek Road. The implementation of the transportation plan should result in positive effects on educational facilities in the study area by improving the safety and capacity of the roadways around educational facilities, and avoiding existing schools.

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Figure 11

Environmentally Sensitive Areas

Legend

- Network Roads
- Rivers and Streams (24K)
- EEP Targeted Watersheds
- National Wetlands Inventory
- High Quality/Outstanding Resource Water Zones
- Flood Plains
- Groundwater Recharge Discharge Areas
- Swansboro Planning Area Boundary

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Miles

Base map date: February 7, 2005

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Figure 12

Environmentally Sensitive Areas

Legend

- NPDES Minor Points
- Ambient Water Quality Monitoring Sites
- Water Distribution System Storage Tanks
- Ground Water Incidents Unverified
- Swansboro Schools
- Network Roads
- Anadromous Fish Spawning Areas
- Fish Nursery Areas
- Conditionally Approved Shellfish Harvesting Areas
- Water Bodies (24k)
- State Parks
- Swansboro Planning Area Boundary

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Base map date: February 7, 2005

VI. Public Involvement

Overview

Since the passage of the federal Intermodal Surface Transportation Efficiency Act of 1991 (ISTEA), the emphasis on public involvement in transportation has taken on a new role. Although public participation has been an element of long range transportation planning in the past, these regulations call for a much more proactive approach. The NCDOT's Transportation Planning Branch has a long history of making public involvement a key element in the development of any long-range transportation plan, regardless the size of the town. This chapter is designed to provide an overview of the public involvement elements implemented into the development of the transportation plan for the Town of Swansboro.

Plan Development

The Down East RPO requested the development of the Swansboro CTP through a prioritized list of needed plans for the region. A meeting was held with the Swansboro Town Commissioners on January 18, 2005 to formally initiate the study and to gather input on their transportation needs. A power point presentation was also made to provide general information about the transportation planning process.

Throughout the course of this study the Transportation Planning Branch met four times with Town Staff to provide plan information, to develop population and employment projections, and to evaluate the proposed recommendations. An additional meeting was held with the Planning Board to review project recommendations.

On June 5, 2006 a public drop-in session was held to present the proposed comprehensive transportation plan to the public. The meeting was held from 3:00 to 7:00 p.m. in the Town of Swansboro Town Hall. A public hearing was also held at the Town Hall on June 20, 2006 during the Commissioner's meeting. The purpose of these meetings was to present the plan recommendations and to solicit input from the public. Two comment forms were submitted during the public drop in session, while no concerns were voiced during the public hearing. Both public meetings were advertised in the local newspaper.

Due to conflicts concerning the recommendation for NC 24, the Transportation Planning Branch met with Town Commissioners three times before a resolution expressing their dissatisfaction with the NC 24 freeway designation was adopted. The CTP was adopted unanimously by the Swansboro Town Commissioners on August 15, 2006.

The Down East RPO voted unanimously to endorse the Plan on September 26, 2006. The North Carolina Board of Transportation voted to mutually adopt the Swansboro Comprehensive Transportation Plan on November 2, 2006.

APPENDICES

Appendix A
Resources and Contacts

North Carolina Department of Transportation

Customer Service Office
1-877-DOT4YOU
(1-877-368-4968)

Secretary of Transportation
1501 Mail Service Center
Raleigh, NC 27699-1501
(919) 733-2520

*Board of Transportation Member**
Current contact information for the Board of Transportation may be accessed from the NCDOT homepage (http://apps01.dot.state.nc.us/apps/directory/30.html)
Or by calling the Customer Service Office.

*Highway Division Engineers**
Division specific contact information can be found at
http://apps01.dot.state.nc.us/apps/directory/toc.html

Contact Whom, When?

Division Engineer
Contact the Division Engineer with general questions concerning NCDOT activities within each Division; information on Small Urban Funds.

Division Construction Engineer
Contact the Division Construction Engineer for information concerning major roadway improvements under construction.

Division Traffic Engineer
Contact the Division Traffic Engineer for information concerning high- collision locations.

District Engineer
Contact the District Engineer for information regarding Driveway Permits, Right of Way, Encroachments, and Development Reviews.

* *See page A4 for Division 3 contact information.*

County Maintenance Engineer
Contact the County Maintenance Engineer regarding any maintenance activities, such as drainage.

Transportation Planning Branch (TPB)
Contact the Transportation Planning Branch with long-range planning questions.
1554 Mail Service Center
Raleigh, NC 27699-1554
(919) 733-4705
http://apps01.dot.state.nc.us/apps/directory/3234.html

Secondary Roads Office
Contact the Secondary Roads Office for information regarding the Industrial Access Funds Program.
P.O. Box 25201
Raleigh, NC 27699
(919) 733-2039
http://apps01.dot.state.nc.us/apps/directory/135.html

Program Development Branch
Contact the Program Development Branch for information concerning Roadway Official Corridor Maps and the Transportation Improvement Program (TIP).
1534 Mail Service Center
Raleigh, NC 27699-1534
(919) 733-2039
http://apps01.dot.state.nc.us/apps/directory/632.html

Project Development & Environmental Branch (PDEA)
Contact PDEA for information on environmental studies for projects that are included in the TIP.
1548 Mail Service Center
Raleigh, NC 27699-1548
(919) 733-3141
http://apps01.dot.state.nc.us/apps/directory/3212.html

Highway Design Branch
Contact the Highway Design Branch for information regarding alignment for projects that are included in the TIP.
1584 Mail Service Center
Raleigh, NC 27699-1584
(919) 250-4001
http://apps01.dot.state.nc.us/apps/directory/659.html

Public Transportation Division
Contact the Public Transportation Division for information public transit systems.
1550 Mail Service Center
Raleigh, NC 27699-1550
(919) 733-4713
http://apps01.dot.state.nc.us/apps/directory/3366.html

Other NCDOT Departments
Contact information for other departments within the NCDOT not listed here are available by calling the Customer Service Office or by visiting the NCDOT homepage at http://apps01.dot.state.nc.us/apps/directory/toc.html.

Other State Government Offices
Division of Community Assistance
Contact the Division of Community Assistance for information regarding the Community Planning Program. You may find their contact information at:
http://www.dca.commerce.state.nc.us

Division 3, District 1 Contacts (Onslow County)

Board Member
Mr. Lanny T. Wilson
1442 Quadrant Circle
Wilmington, NC 28405
(828) 265-5380
lanny73763@aol.com

District Engineer
Mr. Robert Vause
295-A Wilmington Highway
Jacksonville, 28540
(910) 346-2040
rvause@dot.state.nc.us

Division Engineer
Mr. Allen Pope, PE
124 Division Dr.
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Division Project Manager
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priddle@dot.state.nc.us

Division Maintenance Engineer
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Secondary Roads Manager
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1535 Mail Service Center
Wilmington, NC 28401
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1554 Mail Service Center
Raleigh, NC 27699-1554
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Eastern Group Manager
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1554 Mail Service Center
Raleigh, NC 27699-1554
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New Bern, NC 28563-1717
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cemoya@dot.state.nc.us

Appendix B
Comprehensive Transportation Plan Definitions

Highway Map

- **Freeways**
  - Functional purpose – high mobility, high volume, high speed
  - Posted speed – 55 mph or greater
  - Cross section – minimum four lanes with continuous median
  - Multi-modal elements – High Occupancy Vehicles (HOV)/High Occupancy Transit (HOT) lanes, busways, truck lanes, park-and-ride facilities at/near interchanges, adjacent shared use paths (separate from roadway and outside ROW)
  - Type of access control – full control of access
  - Access management – interchange spacing (urban – one mile; non-urban – three miles); at interchanges on the intersecting roadway, full control of access for 1,000ft or for 350ft plus 650ft island or median; use of frontage roads, rear service roads
  - Intersecting facilities – interchange or grade separation (no signals or at-grade intersections)
  - Driveways – not allowed

- **Expressways**
  - Functional purpose – high mobility, high volume, medium-high speed
  - Posted speed – 45 to 60 mph
  - Cross section – minimum four lanes with median
  - Multi-modal elements – HOV lanes, busways, very wide paved shoulders (rural), shared use paths (separate from roadway but within ROW)
  - Type of access control – limited or partial control of access;
  - Access management – minimum interchange/intersection spacing 2,000ft; median breaks only at intersections with minor roadways or to permit U-turns; use of frontage roads, rear service roads; driveways limited in location and number; use of acceleration/deceleration or right turning lanes
  - Intersecting facilities – interchange; at-grade intersection for minor roadways; right-in/right-out and/or left-over or grade separation (no signalization for through traffic)
  - Driveways – right-in/right-out only; direct driveway access via service roads or other alternate connections

- **Boulevards**
  - Functional purpose – moderate mobility; moderate access, moderate volume, medium speed
  - Posted speed – 30 to 55 mph
  - Cross section – two or more lanes with median (median breaks allowed for U-turns per current NCDOT *Driveway Manual*

- Multi-modal elements – bus stops, bike lanes (urban) or wide paved shoulders (rural), sidewalks (urban - local government option)
- Type of access control – limited control of access, partial control of access, or no control of access
- Access management – two lane facilities may have medians with crossovers, medians with turning pockets or turning lanes; use of acceleration/deceleration or right turning lanes is optional; for abutting properties, use of shared driveways, internal out parcel access and cross-connectivity between adjacent properties is strongly encouraged
- Intersecting facilities – at grade intersections and driveways; interchanges at special locations with high volumes
- Driveways – primarily right-in/right-out, some right-in/right-out in combination with median leftovers; major driveways may be full movement when access is not possible using an alternate roadway

- **Other Major Thoroughfares**
  - Functional purpose – balanced mobility and access, moderate volume, low to medium speed
  - Posted speed – 25 to 55 mph
  - Cross section – four or more lanes without median
  - Multi-modal elements – bus stops, bike lanes/wide outer lane (urban) or wide paved shoulder (rural), sidewalks (urban)
  - Type of access control – no control of access
  - Access management – continuous left turn lanes; for abutting properties, use of shared driveways, internal out parcel access and cross-connectivity between adjacent properties is strongly encouraged
  - Intersecting facilities – intersections and driveways
  - Driveways – full movement on two lane roadway with center turn lane as permitted by the current NCDOT *Driveway Manual*

- **Minor Thoroughfares**
  - Functional purpose – balanced mobility and access, moderate volume, low to medium speed
  - Posted speed – 25 to 45 mph
  - Cross section – ultimately three lanes (no more than one lane per direction) or less without median
  - Multi-modal elements – bus stops, bike lanes/wide outer lane (urban) or wide paved shoulder (rural), sidewalks (urban)
  - ROW – no control of access
  - Access management – continuous left turn lanes; for abutting properties, use of shared driveways, internal out parcel access and cross-connectivity between adjacent properties is strongly encouraged
  - Intersecting facilities – intersections and driveways
  - Driveways – full movement on two lane with center turn lane as permitted by the current NCDOT *Driveway Manual*

- **Existing** – Roadway facilities that are not recommended to be improved.

- **Needs Improvement** – Roadway facilities that need to be improved for capacity, safety, or system continuity. The improvement to the facility may be widening, other operational strategies, increasing the level of access control along the facility, or a combination of improvements and strategies. *"Needs improvement" does not refer to the maintenance needs of existing facilities.*
- **Recommended** – Roadway facilities on new location that are needed in the future.
- **Interchange** – Through movement on intersecting roads is separated by a structure. Turning movement area accommodated by on/off ramps and loops.
- **Grade Separation** – Through movement on intersecting roads is separated by a structure. There is no direct access between the facilities.
- **Full Control of Access** – Connections to a facility provided only via ramps at interchanges. No private driveway connections allowed.
- **Limited Control of Access** – Connections to a facility provided only via ramps at interchanges (major crossings) and at-grade intersections (minor crossings and service roads). No private driveway connections allowed.
- **Partial Control of Access** – Connections to a facility provided via ramps at interchanges, at-grade intersections, and private driveways. Private driveway connections shall be defined as a maximum of one connection per parcel. One connection is defined as one ingress and one egress point. These may be combined to form a two-way driveway (most common) or separated to allow for better traffic flow through the parcel. The use of shared or consolidated connections is highly encouraged.
- **No Control of Access** – Connections to a facility provided via ramps at interchanges, at-grade intersections, and private driveways.

Public Transportation and Rail Map

- **Bus Routes** – The primary fixed route bus system for the area. Does not include demand response systems.
- **Fixed Guideway** – Any transit service that uses exclusive or controlled rights-of-way or rails, entirely or in part. The term includes heavy rail, commuter rail, light rail, monorail, trolleybus, aerial tramway, included plane, cable car, automated guideway transit, and ferryboats.
- **Operational Strategies** – Plans geared toward the non-single occupant vehicle. This includes but is not limited to HOV lanes or express bus service.
- **Rail Corridor** – Locations of railroad tracks that are either active or inactive tracks. These tracks were used for either freight or passenger service.
  - Active – rail service is currently provided in the corridor; may include freight and/or passenger service
  - Inactive – right of way exists; however, there is no service currently provided; tracks may or may not exist
  - Recommended – It is desirable for future rail to be considered to serve an area.

- **High Speed Rail Corridor** – Corridor designated by the U.S. Department of Transportation as a potential high speed rail corridor.
  - Existing – Corridor where high speed rail service is provided (there are currently no existing high speed corridor in North Carolina).
  - Recommended – Proposed corridor for high speed rail service.
- **Rail Stop** – A railroad station or stop along the railroad tracks.
- **Intermodal Connector** – A location where more than one mode of public transportation meet such as where light rail and a bus route come together in one location or a bus station.
- **Park and Ride Lot** – A strategically located parking lot that is free of charge to anyone who parks a vehicle and commutes by transit or in a carpool.

Bicycle Map

- **On Road-Existing** – Conditions for bicycling on the highway facility are adequate to safely accommodate cyclists.
- **On Road-Needs Improvement** – At the systems level, it is desirable for the highway facility to accommodate bicycle transportation; however, highway improvements are necessary to create safe travel conditions for the cyclists.
- **On Road-Recommended** – At the systems level, it is desirable for a recommended highway facility to accommodate bicycle transportation. The highway should be designed and built to safely accommodate cyclists.
- **Off Road-Existing** – A facility that accommodates bicycle transportation (may also accommodate pedestrians, eg. greenways) and is physically separated from a highway facility usually on a separate right-of-way.
- **Off Road-Needs Improvement** – A facility that accommodate bicycle transportation (may also accommodate pedestrians, e.g. greenways) and is physically separated from a highway facility usually on a separate right-of-way that will not adequately serve future bicycle needs. Improvements may include but are not limited to, widening, paving (not re-paving), improved horizontal or vertical alignment.
- **Off Road-Recommended** – A facility needed to accommodate bicycle transportation (may also accommodate pedestrians, eg. greenways) and is physically separated from a highway facility usually on a separate right-of-way. This may also include greenway segments that do not necessarily serve a transportation function but intersect recommended facilities on the highway map or public transportation and rail map.

Pedestrian Map

Format for the pedestrian map is under development.

Appendix C
Street Tabulation and Recommendations

This appendix includes a detailed tabulation of all streets identified as elements of the Swansboro Comprehensive Transportation Plan. The table includes a description of the roads by sections, as well as the length, cross section, and right-of-way for each section. Also included is the existing and projected average daily traffic volumes, roadway capacity, and the recommended ultimate lane configuration. Due to space constraints, these recommended cross sections are given in the form of an alphabetic code. A detailed description of each of these codes and an illustrative figure for each can be found in Appendix D.

Table C1

Street Tabulation and Recommendations

FACILITY & SECTION	EXISTING CONDITIONS					AADT			RECOMMENDATIONS		
	DIST. (mi)	RDWY (ft)	ROW (ft)	NO. OF LANES	CAPACITY (vpd)	2005 (vpd)	2015 (vpd)	2035 (vpd)	CROSS SECT.	ROW (ft)	CAPACITY (vpd)
NC 24 (Freedom Way / Corbett Dr)											
SR 1433 - SR 1434	1.37	60	150	4	37,800	18,000	22,000	30,400	F	150	50,000
SR 1434 - SR 1447	1.60	68	100	5	44,000	24,700	28,700	38,600	F	100	50,000
SR 1447 - Carteret County Line	1.70	68	100	5	44,000	21,900	25,900	33,800	B-1	100	50,000
SR 1434 (Belgrade-Swansboro Rd)											
NC 24 – SR 1444	.65	20	60	2	11,800	3,600	4,800	7,100	K	100	12,500
SR 1444 to NPB	.62	20	60	2	11,800	3,000	3,800	6,100	B-4	100	12,500
SR 1444 (Swansboro Loop)											
SR 1434 - SR 1447	3.30	20	60	2	11,800	2,100	2,900	4,500	B-4	100	12,500
SR 1447 (Main St. Extension)											
NC 24 W – SR 1444	.80	18	60	2	11,400	2,600	3,300	5,500	K	100	12,500
SR 1444 – NC 24E	.46	18	60	2	11,400	1,300	1,600	2,000	B-4	100	12,500
SR 1445 (Norris Rd)											
NC 24 - SR 1444	1.80	18	60	2	11,600	1,800	2,300	3,700	B-4	100	12,500
SR 1509 (Queens Creek Rd.)											
NC 24 - Old Carney Rd	0.40	31	60	3	14,200	10,200	13,900	21,400	F	110	41,700
Old Carney Rd - Queen Creek Bridge	1.10	24	60	2	12,100	8,000	10,100	16,300	F	110	41,700
SR 1511 (Hammock Beach Rd)											
NC 24 - ESM	2.20	18	60	2	12,100	1,200	1,800	2,900	B-4	100	12,500
SR 1512 (Old Hammock Rd)											
NC 24 – Fredericka Lane	0.80	24	60	2	11,800	3,400	4,300	6,100	B-4	100	12,500
Fredericka Lane – Hammock Beach Rd	0.30	20	60	2	11,600	3,400	4,300	6,100	B-4	100	12,500

The following index of terms may be helpful in interpreting the table:

ECL – Eastern Corporate Limits
NCL – Northern Corporate Limits
SCL – Southern Corporate Limits
WCL – Western Corporate Limits
EPB – Eastern Planning Boundary
NPB – Northern Planning Boundary
SPB – Southern Planning Boundary
WPB – Western Planning Boundary
ESM – End of State Maintenance
SR – Secondary Road
N/A – Not Available
RDWY – Roadway
ROW – Right-of-way

Appendix D
Typical Cross Sections

Cross section requirements for roadways vary according to the capacity and level of service to be provided. Universal standards in the design of roadways are not practical. Each roadway section must be individually analyzed and its cross section determined based on the volume and type of projected traffic, existing capacity, desired level of service, and available right-of-way. These cross sections are typical for facilities on new location and where right-of-way constraints are not critical. For widening projects and urban projects with limited right-of-way, special cross sections should be developed that meet the needs of the project.

On all existing and proposed roadways delineated on the CTP, adequate right-of-way should be protected or acquired for the recommended cross sections. In addition to cross section and right-of-way recommendations for improvements, Appendix C may recommend ultimate needed right-of-way for the following situations:

- roadways which may require widening after the current planning period,
- roadways which are borderline adequate and accelerated traffic growth could render them deficient, and
- roadways where an urban curb and gutter cross section may be locally desirable because of urban development or redevelopment.

Recommended design standards relating to grades, sight distances, degree of curve, superelevation, and other considerations for roadways are given in Appendix E. The typical cross sections are described below.

A: Four Lanes Divided with Median - Freeway

Cross section "A" is typical for four-lane divided highways in rural areas that may have only partial or no control of access. The minimum median width for this cross section is 46 feet, but a wider median is desirable.

B: Seven Lanes - Curb & Gutter

Cross section "B" is typically not recommended for new projects. When the conditions warrant six lanes, cross section “D” should be recommended. Cross section “B” should be used only in special situations such as when widening from a five-lane section where right-of-way is limited. Even in these situations, consideration should be given to converting the center turn lane to a median so that cross section “D” is the final cross section.

C: Five Lanes - Curb & Gutter

Typical for major thoroughfares, cross section "C" is desirable where frequent left turns are anticipated as a result of abutting development or frequent street intersections.

D: Six Lanes Divided with Raised Median - Curb & Gutter
E: Four Lanes Divided with Raised Median - Curb and Gutter

Cross sections "D" and "E" are typically used on major thoroughfares where left turns and intersection streets are not as frequent. Left turns would be restricted to a few selected intersections. The 16-ft median is the minimum recommended for an urban boulevard-type cross section. In most instances, monolithic construction should be utilized due to greater cost effectiveness, ease and speed of placement, and reduced future maintenance requirements. In certain cases, grass or landscaped medians result in greatly increased maintenance costs and an increase danger to maintenance personnel. Non-monolithic medians should only be recommended when the above concerns are addressed.

F: Four Lanes Divided - Boulevard, Grass Median

Cross section "F" is typically recommended for urban boulevards or parkways to enhance the urban environment and to improve the compatibility of major thoroughfares with residential areas. A minimum median width of 24 ft is recommended, with 30 ft being desirable.

G: Four Lanes - Curb and Gutter

Cross section "G" is recommended for major thoroughfares where projected travel indicates a need for four travel lanes but traffic is not excessively high, left turning movements are light, and right-of-way is restricted. An additional left turn lane would likely be required at major intersections. This cross section should be used only if the above criteria are met. If right-of-way is not restricted, future strip development could take place and the inner lanes could become de facto left turn lanes.

H: Three Lanes - Curb and Gutter

In urban environments, thoroughfares that are proposed to function as one-way traffic carriers would typically require cross section “H”.

I: Two Lanes – Curb and Gutter, Parking both sides
J: Two Lanes – Curb and Gutter, Parking one side

Cross section “I” and “J” are usually recommended for urban minor thoroughfares since these facilities usually serve both land service and traffic service functions. Cross-section “I” would be used on those minor thoroughfares where parking on both sides is needed as a result of more intense development.

K: Two Lanes - Paved Shoulder

Cross section "K" is used in rural areas or for staged construction of a wider multilane cross section. On some thoroughfares, projected traffic volumes may indicate that two travel lanes will adequately serve travel for a considerable period of time. For areas that are growing and future widening will be necessary, the full right-of-way of 100 ft should be required. In some instances, local ordinances may not allow the full 100-ft. In those cases, 70 ft should be preserved with the understanding that the full 70-ft will be preserved by use of building setbacks and future street line ordinances.

L: Six Lanes Divided with Grass Median - Freeway

Cross section “L” is typical for controlled access freeways. The 46-ft grass median is the minimum desirable width, but variation from this may be permissible depending upon design considerations. Right-of-way requirements are typically 228 ft or greater, depending upon cut and fill requirements.

M: Eight Lanes Divided with Raised Median - Curb and Gutter

Also used for controlled access freeways, cross section "M" may be recommended for freeways going through major urban areas or for routes projected to carry very high volumes of traffic.

N: Five Lanes with Curb & Gutter, Widened Curb Lanes
O: Two Lanes/Shoulder Section
P: Four Lanes Divided with Raised Median – Curb & Gutter, Widened Curb Lanes

If there is sufficient bicycle travel along the thoroughfare to justify a bicycle lane or bikeway, additional right-of-way may be required to contain the bicycle facilities. The North Carolina Bicycle Facilities Planning and Design Guidelines should be consulted for design standards for bicycle facilities. Cross sections “N”, “O” and “P” are typically used to accommodate bicycle travel.

General

The urban curb and gutter cross sections all illustrate the sidewalk adjacent to the curb with a buffer or utility strip between the sidewalk and the minimum right-of-way line. This permits adequate setback for utility poles. If it is desired to move the sidewalk farther away from the street to provide additional separation for pedestrians or for aesthetic reasons, additional right-of-way must be provided to insure adequate setback for utility poles.

The right-of-way shown for each typical cross section is the minimum amount required encompassing the street, sidewalks, utilities, and drainage facilities. Cut and fill requirements may require either additional right-of-way or construction easements. Obtaining construction easements is becoming the more common practice for urban roadway construction.

Bicycle Cross Sections

Cross sections B-1, B-2, B-3, B-4, and B-5 are typical bicycle cross sections. Contact the NCDOT Division of Bicycle and Pedestrian Transportation for more information regarding these cross-sections.

B-1: Four Lanes Divided with Wide Outside Lanes
B-2: Five Lanes with Wide Outside Lanes

A widened outside lane is an effective way to accommodate bicyclists riding in the same lane with motor vehicles. With a wide outside lane, motorists do not have to change lanes to pass a bicyclist. The additional width in the outside lane also improves sight

distance and provides more room for vehicles to turn onto the roadway. Therefore, on roadways with bicycle traffic, widening the outside lane can improve the capacity of that roadway. Also, by widening the outside lane by a few extra feet both motorists and bicyclists have more space in which to maneuver. This facility type is generally considered for use in urban, suburban, and occasionally rural conditions on roadways where there is a curb and gutter. Wide outside lanes can be applied to several different roadway cross sections.

B-3: Bicycle Lanes on Collector Streets

Bicycle lanes may be considered when it is desirable to delineate road space for preferential use by cyclists. Streets striped with bicycle lanes should be part of a connected bikeway system rather than being an isolated feature. Bicycle lanes function most effectively in mid-block situations by separating bicyclists from overtaking motor vehicles. Integrating bicyclists into complicated intersection traffic patterns can sometimes be problematic. Strip development areas, or roadways with a high number of commercial driveways, tend to be less suitable for bicycle lanes due to frequent and unpredictable motorist turning movements across the path of straight-through cyclists. Striped bike lanes can be effective as a safety treatment, especially for less experienced bicyclists. Two-lane residential/collector streets with lower traffic volume, low-posted speed limit, adequate roadway width for both bike lanes and motor vehicle travel lanes, and an absence of complicated intersections. A median-divided multi-lane roadway with lower traffic volumes and a low volume of right and left turning traffic would be a more appropriate location for bicycle lanes than a high traffic volume undivided multi-lane roadway with a continuous center turn lane. Most bicyclists will choose a route that combines direct access with lower traffic volumes. An origin and destination of less than 4 miles is desirable to generate usage on a facility.

B-4: Wide Paved Shoulders

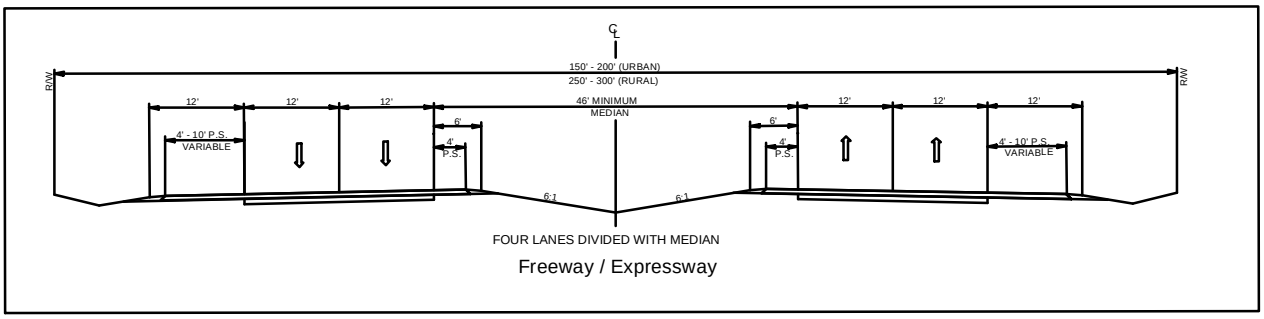
On urban streets with curb and gutter, wide outside lanes and bicycle lanes are usually the preferred facilities. Shoulders for bicycle use are not typically provided on roadways with curb and gutter. On rural roadways where bicycle travel is common, such as roads in coastal resort areas, wide paved shoulders are highly desirable. On secondary roadways without curb and gutter where there are few commercial driveways and intersections with other roadways, many bicyclists prefer riding on wide, smoothly paved shoulders.

B-5: Multi-use Pathway

When properly located, multi-use pathway can be a safer type of facility for novice and child bicyclists because they do not have to share the path with motor vehicles. The design standards used for this cross section provides adequate width for two-directional use by both cyclists and pedestrians, provisions of good sight distance, avoidance of steep grades and tight curves, and minimal cross-flow by motor vehicles. A multi-use pathway can serve a variety of purposes, including recreation and transportation. This pathway should not be located immediately adjacent to a roadway because of safety considerations at intersections with driveways and roads. Sidewalks should never be used as a multi-use pathway.

TYPICAL HIGHWAY CROSS SECTIONS

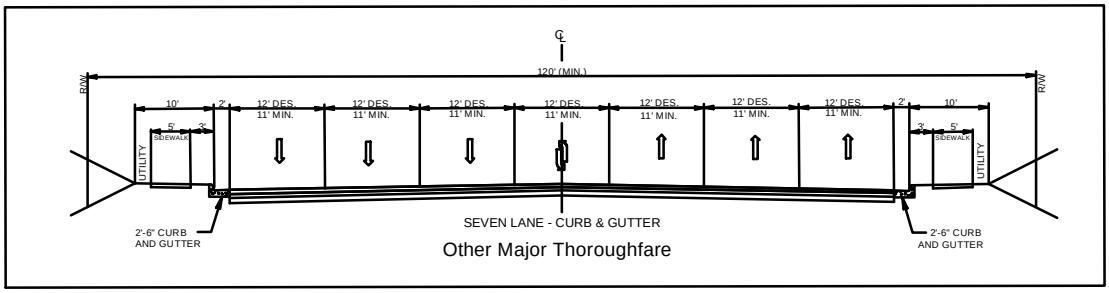
A



FOUR LANES DIVIDED WITH MEDIAN

Freeway / Expressway

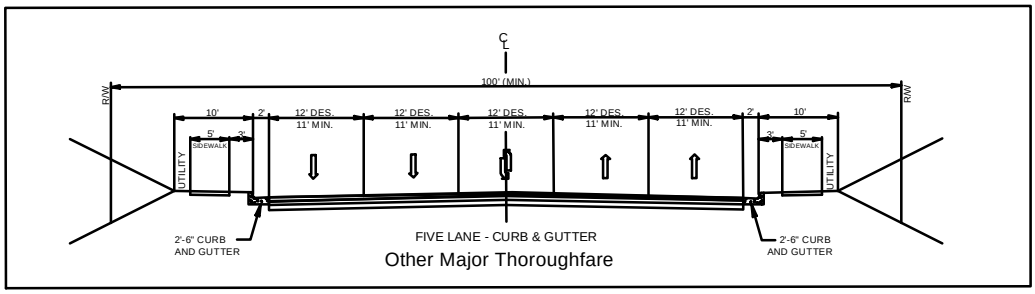
B



SEVEN LANE - CURB & GUTTER

Other Major Thoroughfare

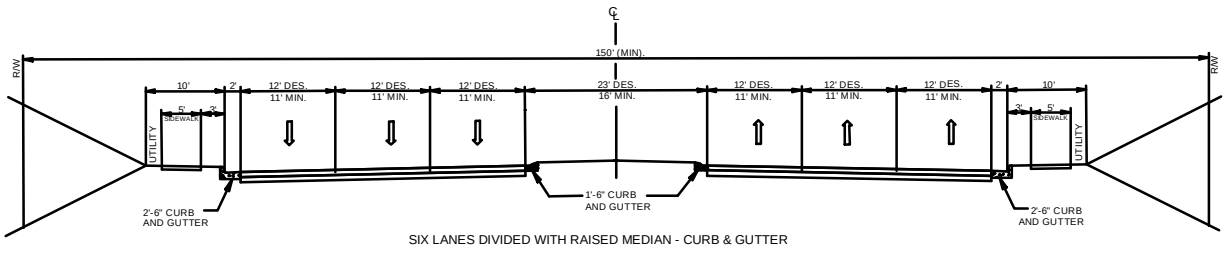
C



FIVE LANE - CURB & GUTTER

Other Major Thoroughfare

D



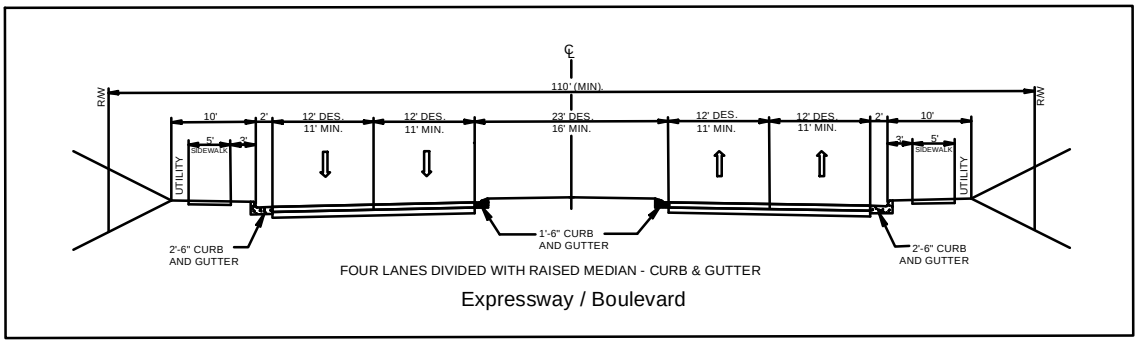
SIX LANES DIVIDED WITH RAISED MEDIAN - CURB & GUTTER

Expressway / Boulevard

revised 04-01-05

TYPICAL HIGHWAY CROSS SECTIONS

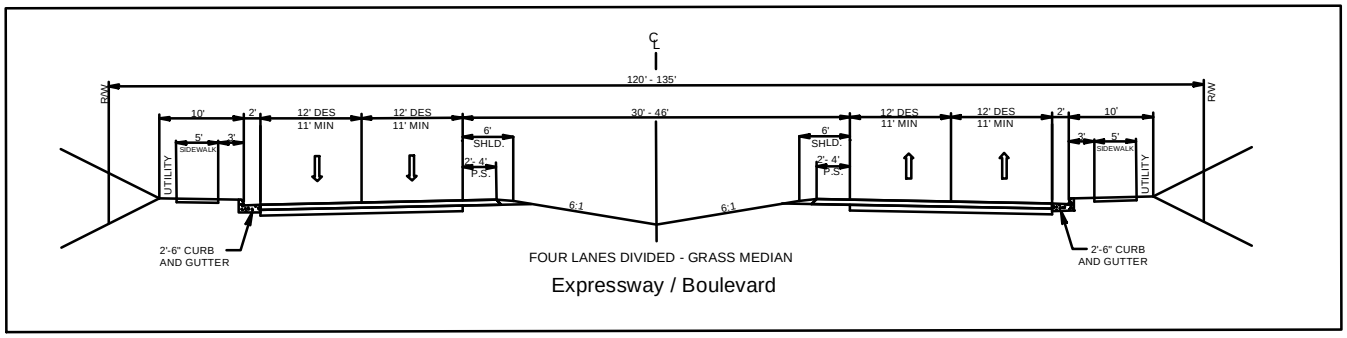
E



FOUR LANES DIVIDED WITH RAISED MEDIAN - CURB & GUTTER

Expressway / Boulevard

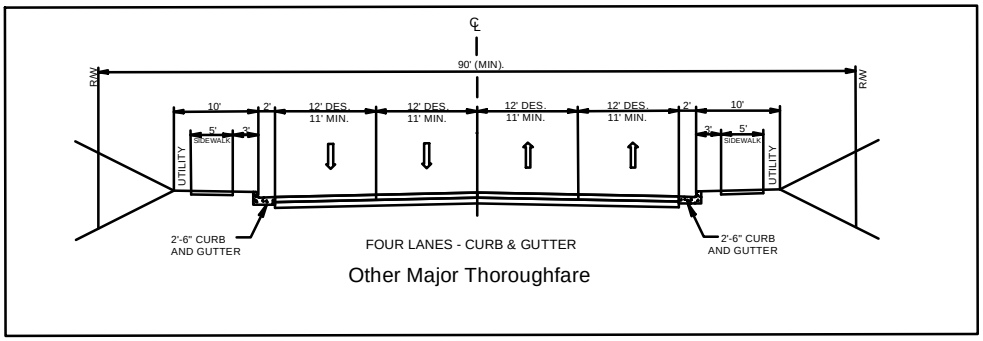
F



FOUR LANES DIVIDED - GRASS MEDIAN

Expressway / Boulevard

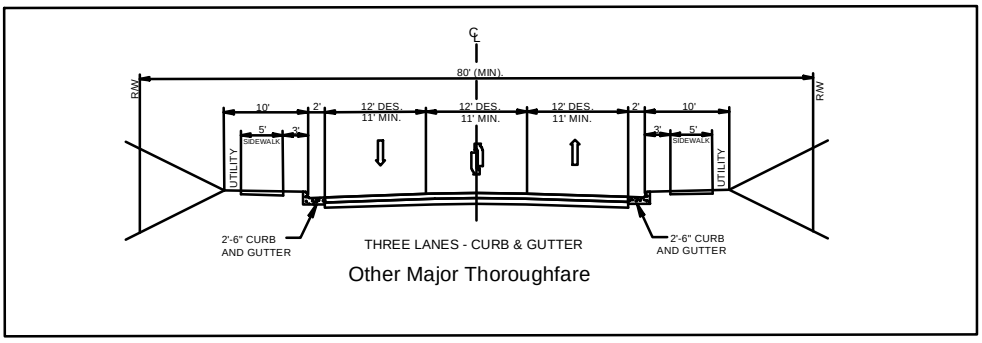
G



FOUR LANES - CURB & GUTTER

Other Major Thoroughfare

H

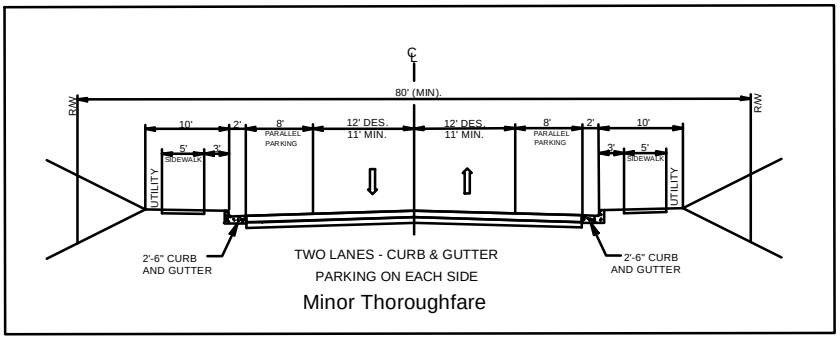


THREE LANES - CURB & GUTTER

Other Major Thoroughfare

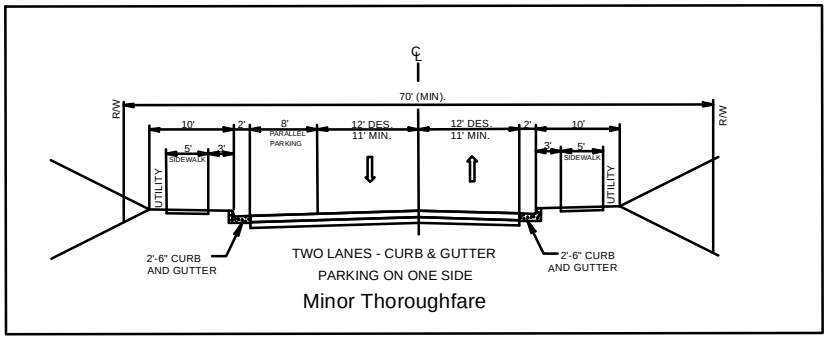
TYPICAL HIGHWAY CROSS SECTIONS

I



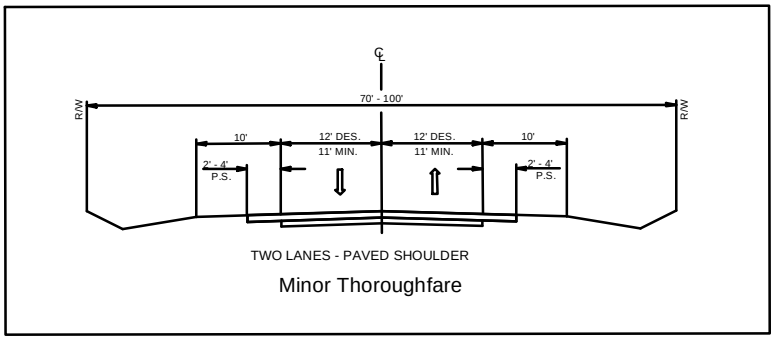
TWO LANES - CURB & GUTTER
PARKING ON EACH SIDE
Minor Thoroughfare

J



TWO LANES - CURB & GUTTER
PARKING ON ONE SIDE
Minor Thoroughfare

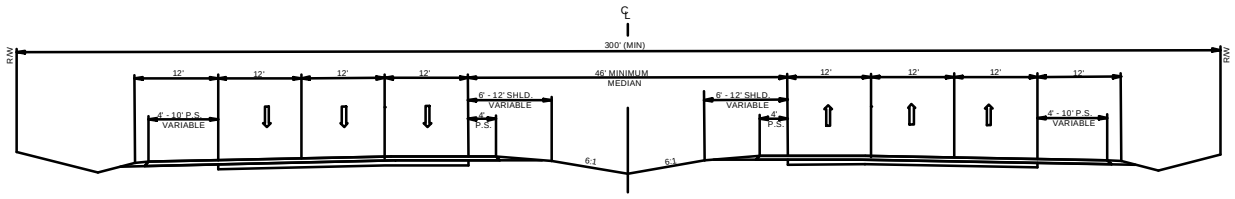
K



TWO LANES - PAVED SHOULDER
Minor Thoroughfare

TYPICAL HIGHWAY CROSS SECTIONS

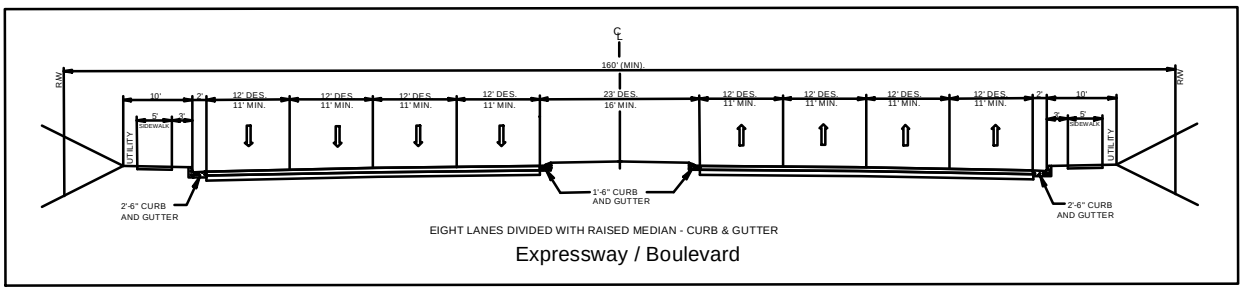
L



SIX LANES DIVIDED WITH GRASS MEDIAN

Freeway / Expressway

M



EIGHT LANES DIVIDED WITH RAISED MEDIAN - CURB & GUTTER

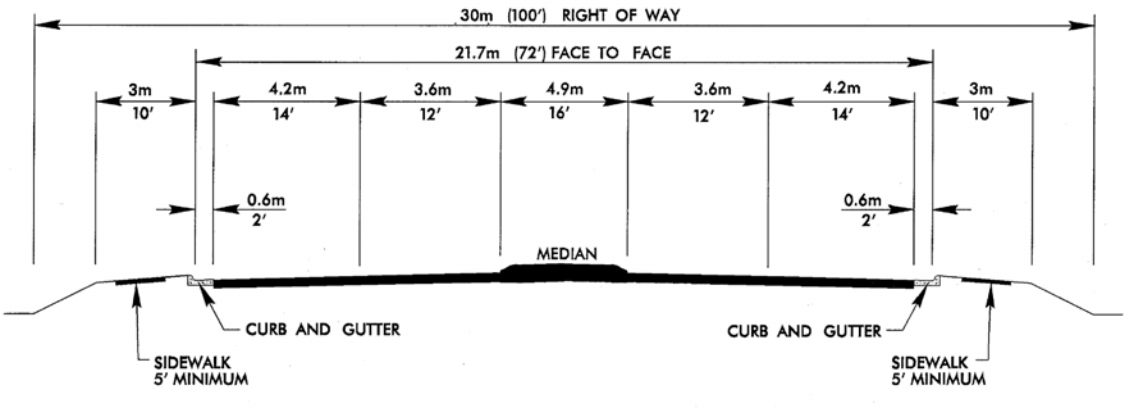
Expressway / Boulevard

Typical Bicycle Cross Sections

WIDE CURB LANES

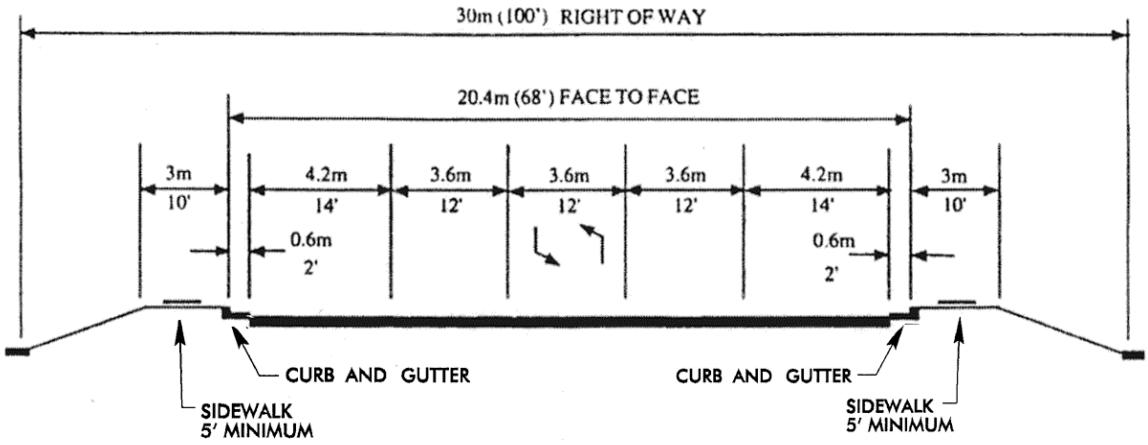
B –1 4-LANE MEDIAN DIVIDED TYPICAL SECTION

With Wide Outside Lanes



B-2 5-LANE TYPICAL SECTION

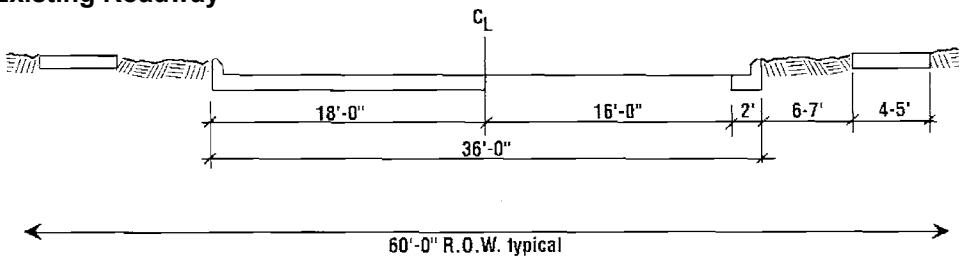
With Wide Outside Lanes



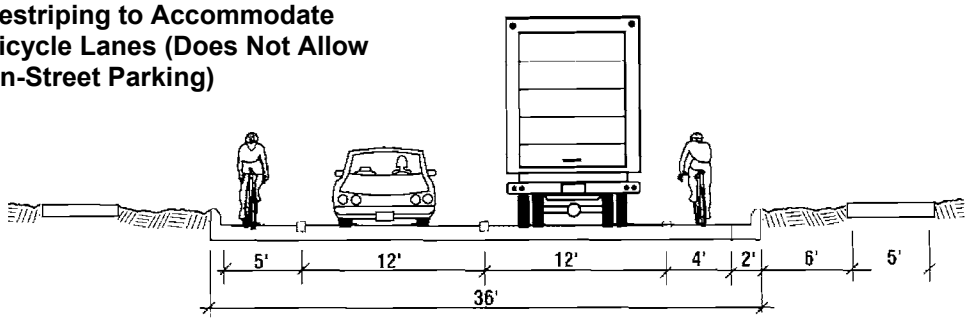
Typical Bicycle Cross Sections

B-3 BICYCLE LANES ON COLLECTOR STREETS

Existing Roadway



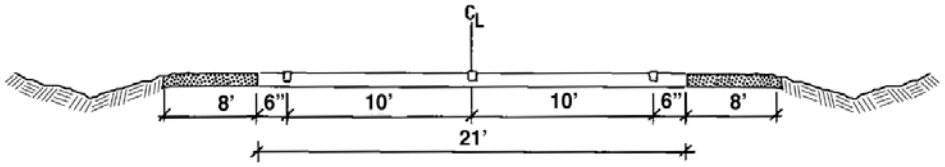
Restriping to Accommodate Bicycle Lanes (Does Not Allow On-Street Parking)



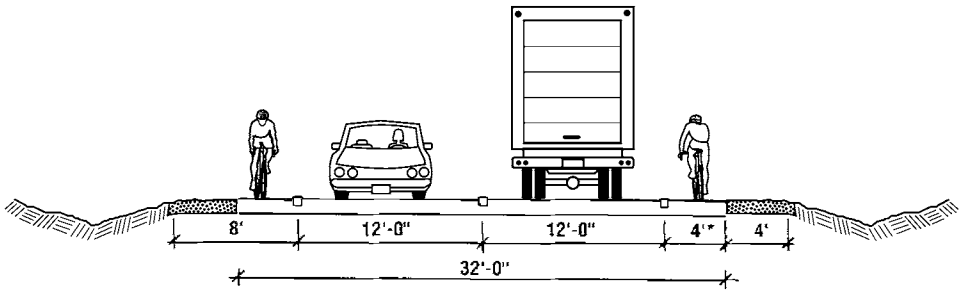
Typical Bicycle Cross Sections

B-4 WIDE PAVED SHOULDERS

Existing Roadway



Roadway Retrofitted with 4-Ft Paved Shoulders



* If speeds are higher than 40 mph, shoulder widths greater than 4' are recommended.

Appendix E
Recommended Subdivision Ordinances

Definitions

Rural Roads

- *Principal Arterial* - A rural link in a highway system serving travel, and having characteristics indicative of substantial statewide or interstate travel and existing solely to serve traffic. This network would consist of Interstate routes and other routes designated as principal arterials.
- *Minor Arterial* - A rural roadway joining cities and larger towns and providing intra-state and inter-county service at relatively high overall travel speeds with minimum interference to through movement.
- *Major Collector* - A road that serves major intra-county travel corridors and traffic generators and provides access to the arterial system.
- *Minor Collector* - A road that provides service to small local communities and traffic generators and provides access to the major collector system.
- *Local Road* - A road that serves primarily to provide access to adjacent land over relatively short distances.

Urban Streets

- *Major Thoroughfares* - Major thoroughfares consist of inter-state, other freeway, expressway, or parkway roads, and major streets that provide for the expeditious movement of high volumes of traffic within and through urban areas.
- *Minor Thoroughfares* - Minor thoroughfares perform the function of collecting traffic from local access streets and carrying it to the major thoroughfare system. Minor thoroughfares may be used to supplement the major thoroughfare system by facilitating minor through traffic movements and may also serve abutting property.
- *Local Street* - A local street is any street not on a higher order urban system and serves primarily to provide direct access to abutting land.

Specific Type Rural or Urban Streets

- *Freeway, expressway, or parkway* - Divided multilane roadways designed to carry large volumes of traffic at high speeds. A *freeway* provides for continuous flow of vehicles with no direct access to abutting property and with access to selected crossroads only by way of interchanges. An *expressway* is a facility with full or partial control of access and generally with grade separations at major intersections. A *parkway* is for non-commercial traffic, with full or partial control of access.

- *Residential Collector Street* - A local street which serves as a connector street between local residential streets and the thoroughfare system. Residential collector streets typically collect traffic from 100 to 400 dwelling units.
- *Local Residential Street* - Cul-de-sacs, loop streets less than 2,500 feet in length, or streets less than 1.0 mile in length that do not connect thoroughfares, or serve major traffic generators, and do not collect traffic from more than 100 dwelling units.
- *Cul-de-sac* - A short street having only one end open to traffic and the other end being permanently terminated and a vehicular turn-around provided.
- *Frontage Road* - A road that is parallel to a partial or full access controlled facility and provides access to adjacent land.
- *Alley* - A strip of land, owned publicly or privately, set aside primarily for vehicular service access to the backside of properties otherwise abutting on a street.

Property

- *Building Setback Line* - A line parallel to the street in front of which no structure shall be erected.
- *Easement* - A grant by the property owner for use by the public, a corporation, or person(s), of a strip of land for a specific purpose.
- *Lot* - A portion of a subdivision, or any other parcel of land, which is intended as a unit for transfer of ownership or for development or both. The word “lot” includes the words “plat” and “parcel”.

Subdivision

- *Subdivider* - Any person, firm, corporation or official agent thereof, who subdivides or develops any land deemed to be a subdivision.
- *Subdivision* - All divisions of a tract or parcel of land into two or more lots, building sites, or other divisions for the purpose, immediate or future, of sale or building development and all divisions of land involving the dedication of a new street or change in existing streets. The following shall not be included within this definition nor subject to these regulations:
    - the combination or re-combination of portions of previously platted lots where the total number of lots is not increased and the resultant lots are equal to or exceed the standards contained herein
    - the division of land into parcels greater than 10 acres where no street right-of-way dedication is involved
    - the public acquisition, by purchase, of strips of land for the widening or the opening of streets
    - the division of a tract in single ownership whose entire area is no greater than 2 acres into not more than three lots, where no street right-of-way dedication is involved and where the resultant lots are equal to or exceed the standards contained herein.

- *Dedication* - A gift, by the owner, of his property to another party without any consideration being given for the transfer. The dedication is made by written instrument and is completed with an acceptance.
- *Reservation* - Reservation of land does not involve any transfer of property rights. It constitutes an obligation to keep property free from development for a stated period of time.

Design Standards

The design of all roads within the Planning Area shall be in accordance with the accepted policies of the North Carolina Department of Transportation, Division of Highways, as taken or modified from the American Association of State Highway and Transportation Officials (AASHTO) manual.

The provision of street rights-of-way shall conform and meet the recommendations of the transportation plan, as adopted by the municipality. The proposed street layout shall be coordinated with the existing street system of the surrounding area. Normally the proposed streets should be the extension of existing streets if possible.

Right-of-way Widths

Right-of-way widths shall not be less than the following and shall apply except in those cases where right-of-way requirements have been specifically set out in the transportation plan.

The subdivider will only be required to dedicate a maximum of 100 feet of right-of-way. In cases where over 100 feet of right-of-way is desired, the subdivider will be required only to reserve the amount in excess of 100 feet. On all cases in which right-of-way is sought for a fully controlled access facility, the subdivider will only be required to make a reservation. It is strongly recommended that subdivisions provide access to properties from internal streets, and that direct property access to major thoroughfares, principle and minor arterials, and major collectors be avoided. Direct property access to minor thoroughfares is also undesirable.

A partial width right-of-way, not less than 60 feet in width, may be dedicated when adjoining undeveloped property that is owned or controlled by the subdivider; provided that the width of a partial dedication be such as to permit the installation of such facilities as may be necessary to serve abutting lots. When the said adjoining property is sub-divided, the remainder of the full required right-of-way shall be dedicated. Minimum right-of-way requirements are shown in Table E-1.

Table E1

Minimum Right-of-way Requirements

Area Classification	Functional Classification	Minimum ROW
Rural	Principal Arterial (Freeway)	350 feet
	Principal Arterial (Other)	200 feet
	Minor Arterial	100 feet
	Major Collector	100 feet
	Minor Collector	80 feet
	Local Road (see note #1)	60 feet
Urban	Major Thoroughfare	90 feet
	Minor Thoroughfare	70 feet
	Local Street	60 feet
	Cul-de-sac (See note #2)	varies

1) The desireable miinimum right-of-ways is 60 feet. If curb and gutter is provided, 50 feet of ROW is adequate on local residential streets.

2) The ROW dimension will depend on the radius used for vehicle turn-a-around. Distance from edge of pavement of turn-a-around to ROW should not be less than distance from edge of pavement to ROW on street approaching turn-a-round.

Street Widths

Widths for street and road classifications other than local shall be as recommended by the transportation plan. Width of local roads and streets shall be as follows:

- *Local Residential*
  - Curb and Gutter section - 26 feet, face to face curb
  - Shoulder section - 20 feet to edge of pavement, 4 feet for shoulders
- *Residential Collector*
  - Curb and Gutter section - 34 feet, face to face of curb
  - Shoulder section - 20 feet to edge of pavement, 6 feet for shoulders

Geometric Characteristics

The standards outlined below shall apply to all subdivision streets proposed for addition to the State Highway System or Municipal Street System. In cases where a subdivision is sought adjacent to a proposed thoroughfare corridor, the requirements of dedication and reservation discussed under right-of-way shall apply.

- *Design Speed* - The design speed for a roadway should be a minimum of 5 mph greater than the posted speed limit. The design speeds for subdivision type streets are shown in Table E-2.
- *Minimum Sight Distance* - In the interest of public safety, no less than the minimum sight distance applicable shall be provided. Vertical curves that connect each change in grade shall be provided and calculated using the parameters set forth in Table E-3.
- *Superelevation* - Table E-4 shows the minimum radius and the related maximum superelevation for design speeds. The maximum rate of roadway superelevation (e) for rural roads with no curb and gutter is 0.08. The maximum rate of superelevation for urban streets with curb and gutter is 0.06, with 0.04 being desirable.
- *Maximum and Minimum Grades* - The maximum grades in percent are shown in Table E-5. Minimum grade should not be less than 0.5%. Grades for 100 feet each way from intersections (measured from edge of pavement) should not exceed 5%.

Table E-2

Design Speeds

Facility Type	Design Speed (mph) Desirable	Minimum Level	Minimum Rolling
Rural			
Minor Collector Roads (AADT Over 2000)	60	50	40
Local Roads[1] (AADT Over 400)	50	*50	*40
Urban			
Major Thoroughfares[2]	60	50	40
Minor Thoroughfares	40	30	30
Local Streets	30	**30	**20

*Based on AADT of 400-750. Where roads serve limited area and small number of units, reduce minimum design speed. **Based on projected ADT of 50-250. (Refer to NCDOT Roadway Design Manual page 1-1B)

[1] Local Roads including Residential Collectors and Local Residential.

[2] Major Thoroughfares other than Freeways or Expressways.

Table E-3

Sight Distance

Design Speed (mph)	Stopping Sight Distance (feet)		Minimum K[1] Values (feet)		Passing Sight Distance (feet)
	Desirable	Minimum	Crest Curve	Sag Curve	For 2-lanes
30	200	200	30	40	1100
40	325	275	60	60	1500
50	475	400	110	90	1800
60	650	525	190	120	2100

Note: General practice calls for vertical curves to be multiples of 50 feet. Calculated lengths shall be rounded up in each case. (Reference NCDOT Roadway Design Manual page 1-12 T-1)

[1]K is a coefficient by which the algebraic difference in grade may be multiplied to determine the length of the vertical curve, which will provide the desired sight distance. Sight distance provided for stopped vehicles at intersections should be in accordance with "A Policy on Geometric Design of Highways and Streets, 1990".

Table E-4

Superelevation

Design Speed (mph)	Minimum Radius of Maximum e[1]			Maximum Degree of Curve		
	e=0.04	e=0.06	e=0.08	e=0.04	e=0.06	e=0.08
30	302	273	260	19 00'	21 00'	22 45'
60	573	521	477	10 00'	11 15'	12 15'
80	955	955	819	6 00'	6 45'	7 30'
100	1,637	1,432	1,146	3 45'	4 15'	4 45'

[1] e = rate of roadway superelevation, foot per foot

Note: (Reference NCDOT Roadway Design Manual page 1-12 T-6 thru T-8)

Table E-5

Maximum Vertical Grade

Facility Type and Design Speed (mph)		Minimum Grade in Percent Flat	Rolling	Mountainous
RURAL				
Minor Collector Roads*				
	20	7	10	12
	30	7	9	10
	40	7	8	10
	50	6	7	9
	60	5	6	8
	70	4	5	6
Local Roads*[1]				
	20	-	11	16
	30	7	10	14
	40	7	9	12
	50	6	8	10
	60	5	6	-
URBAN				
Major Thoroughfares[2]				
	30	8	9	11
	40	7	8	10
	50	6	7	9
	60	5	6	8
Minor Thoroughfares*				
	20	9	12	14
	30	9	11	12
	40	9	10	12
	50	7	8	10
	60	6	7	9
	70	5	6	7
Local Streets*				
	20	-	11	16
	30	7	10	14
	40	7	9	12
	50	6	8	10
	60	5	6	-

Note: *For streets and roads with projected annual average daily traffic less than 250 or short grades less than 500 ft long, grades may be 2% steeper than the values in the above table. (Reference NCDOT Roadway Metric Design Manual page 1-12 T-3)

[1] Local Roads including Residential Collectors and Local Residential.

[2] Major Thoroughfares other than Freeways or Expressways.

Intersections

1. Streets shall be laid out so as to interest as nearly as possible at right angles, and no street should intersect any other street at an angle less than sixty-five (65) degrees.

2. Property lines at intersections should be set so that the distance from the edge of pavement, of the street turnout, to the property line will be at least as great as the distance from the edge of pavement to the property line along the intersecting streets. This property line can be established as a radius or as a sight triangle. Greater offsets from the edge of pavement to the property lines will be required, if necessary, to provide sight distance for the stopped vehicle on the side street.

3. Offset intersections are to be avoided. Intersections that cannot be aligned should be separated by a minimum length of 200 feet between survey centerlines.

Cul-de-sacs

Cul-de-sacs shall not be more than 500 feet in length. The distance from the edge of pavement on the vehicular turn around to the right-of-way line should not be less than the distance from the edge of pavement to right-of-way line on the street approaching the turn around. Cul-de-sacs should not be used to avoid connection with an existing street or to avoid the extension of an important street.

Alleys

1. Alleys shall be required to serve lots used for commercial and industrial purposes except that this requirement may be waived where other definite and assured provisions are made for service access. Alleys shall not be provided in residential subdivisions unless necessitated by unusual circumstances.

2. The width of an alley shall be at least 20 feet.

3. Dead-end alleys shall be avoided where possible, but if unavoidable, shall be provided with adequate turn around as may be required by the planning board.

Permits for Connection to State Roads

An approved permit is required for connection to any existing state system road. This permit is required prior to any construction on the street or road. The application is available at the office of the District Engineer of the Division of Highways.

Offsets To Utility Poles

Poles for overhead utilities should be located clear of roadway shoulders, preferably a minimum of at least 30 feet form the edge of pavement. On streets with curb and gutter, utility poles shall be set back a minimum distance of 6 feet from the face of curb.

Wheel Chair Ramps

All street curbs being constructed or reconstructed for maintenance purposes, traffic operations, repairs, correction of utilities, or altered for any reason, shall provide wheelchair ramps for the physically handicapped at intersections where both curb and gutter and sidewalks are provided and at other major points of pedestrian flow.

Horizontal Width on Bridge Deck

The clear roadway widths for new and reconstructed bridges serving two-lane, two-way traffic should be as follows:

- shoulder section approach:
  * under 800 ADT design year - minimum 28 feet width face to face of parapets, rails, or pavement width plus 10 feet, whichever is greater,
  * 800 - 2000 ADT design year - minimum 34 feet width face to face of parapets, rails, or pavement width plus 12 feet, whichever is greater,
  * over 2000 ADT design year - minimum width of 40 feet, desirable width of 44 feet width face to face of parapets or rails;

- curb and gutter approach:
  * under 800 ADT design year - minimum 24 feet face to face of curbs,
  * over 800 ADT design year - width of approach pavement measured face to face of curbs,
  * where curb and gutter sections are used on roadway approaches, curbs on bridges shall match the curbs on approaches in height, in width of face to face curbs, and in crown drop; the distance from face of curb to face of parapet or rail shall be a minimum of 1.5 feet, or greater if sidewalks are required.

The clear roadway widths for new and reconstructed bridges having 4 or more lanes serving undivided two-way traffic should be as follows:

- shoulder section approach - width of approach pavement plus width of usable shoulders on the approach left and right. (shoulder width 8 feet minimum, 10 feet desirable)
- curb and gutter approach - width of approach pavement measured face to face of curbs.

Appendix F
Planning Area Housing and Employment Data

	2005 Population	2035 Forecast	2005 Households	2035 Forecast	2005 Employees	2035 Forecast
TAZ #1	435	772	189	364	16	28
TAZ #2	106	188	46	89	4	7
TAZ #3	526	833	204	393	8	14
TAZ #4	179	294	72	139	54	93
TAZ #5	435	760	186	358	346	597
TAZ #6	694	1,074	263	507	8	14
TAZ #7	856	1,360	333	642	16	28
TAZ #8	568	1,017	249	480	627	1081
TAZ #9	1,067	1,871	458	882	94	162
TAZ #10	614	1,278	313	603	620	1069
Total	5,480	9,447	2,313	4,456	1,793	3091

Appendix G
Transportation Improvement Program Project Process

The process for requesting projects to be included in the Transportation Improvement Program (TIP) is described briefly in this appendix.

The local representatives should first decide which projects from the thoroughfare plan they would like funded in the TIP. A TIP request for a few carefully selected projects is likely to be more effective than requesting all the projects proposed in the thoroughfare plan. These projects should be prioritized by the local representatives and summarized briefly, as shown on Appendix Page G-3.

After determining which projects are the highest priority for the area, a TIP project request should be sent to the Board of Transportation Member from the municipality's or county's respective district. The TIP project request should include a letter with a prioritized summary of requested projects, as well as a TIP candidate project request form and a project location map for each project. An example of each of these items is included in this appendix.

Example

* *Note: This is not an official request submitted to the Board of Transportation. This is intended to be an example of a Transportation Improvement Program (TIP) Request.*

Month ##, Year

North Carolina Board Member
N. C. Board of Transportation
N. C. Department of Transportation
P. O. Box 25201
Raleigh, NC 27611-5201

Dear Board Member:

SUBJECT: 2002-2008 TIP Project Requests for *Generic Town*

Enclosed find the projects requested by *Generic Town* for consideration in the next TIP update. The list is presented by priority, as approved by the *Generic Town* Council at their *Month* meeting.

Generic Town also endorsed the existing schedule of projects contained in the current TIP for the city, with one request. The City requests that TIP Project R-*XXXX* remain as a high priority and kept on the existing schedule.

We thank you for the opportunity to participate in development of the State TIP. Please contact us immediately if additional information is needed concerning any of the enclosed project requests.

Sincerely,

John Q. Public

cc: Division Engineer
Enclosure

Generic Town
Town Council
2008 Proposed Highway Projects (Final)

1) SR 1111 (Town Street) & SR 1112 (Industry Drive) TIP Project R-XXXX
   - From SR 1113 (Country Road) to NC 11
   - Widen roadway to a multilane facility, with some new location

2) US 11
   - From SR 1112 (Industry Drive) to SR 1113 (Country Road)
   - Widen roadway to a multilane facility

3) NC 11
   - From SR 1114 (Any Road) to the existing four lane section just south of I-85
   - Widen roadway to a multilane facility

4) US 11 Business (Business Road)
   - From SR 1115 (Some Road) to NC 12
   - Widen facility to a five lane cross section

5) New Connector
   - From US 11 to US 112 Business (City Street)
   - New Facility

Highway Program
TIP Candidate Project Request

(Please Provide Information if Available)

Date ##/##/## Priority No. #

County *Generic* City/Town *Generic*

Requesting Agency *Generic Town Council* NCTIP No. *R-####* (if available)

Route (US, NC, SR/Local Name) *SR 1111(Town Street) and SR 1112 (Industry Drive)*

Project Location (From/To/Length) *From SR 1113 (Country Road) to NC 11, #.# miles*

Type of Project (Widening, New Facility, Bridge Replacement, Signing, Safety, Rail Crossing, Bicycle, Enhancement, etc.)
Widen roadway to a multi-lane facility, with some new location.

Existing Cross Section *24* Feet, Type

Existing Row *60 to 80* Feet Existing ADT *8,000 (2006)*

Estimated Cost, ROW $ *900,000* Construction $ *4,000,000*

Brief Justification for Project *As a major thoroughfare, this facility carries increasing traffic volumes between the industial sites along this route to NC 11 and the I-85 corridor. In the adopted thoroughfare plan for Generic Town, it is recommended that this facility should be widened to a multi-lane cross section due to the increasing volume and the potential for more development in this area. The Town requests that this project continue to be funded.*

Project Supported By (Agency/Group)

Other Information/ Justification

- ☒ Part of Comprehensive Transportation Plan
- ☐ Serves School
- ☐ Serves Hospital
- ☐ Serves Park
- ☐ Obsolete Facility
- ☐ High Accident (#_____)
- ☐ Other _____

(Please Attach Map Showing Project Location)