

**THOROUGHFARE PLAN
FOR THE
TOWN OF SWANSBORO**

Prepared by the:

Thoroughfare Planning Unit B
Statewide Planning Branch
Division of Highways
North Carolina Department of Transportation

In Cooperation with:

The Town of Swansboro
The Federal Highway Administration
U.S. Department of Transportation

November, 1993

Gerald R. Dudeck P.E.
Thoroughfare Planning Engineer

ACKNOWLEDGEMENTS

Persons Responsible For This Report

Project Engineer:	T. H. Shaw
Thoroughfare Planning Engineer:	G. R. Dudeck, P.E.
Manager, Statewide Planning Branch:	M. R. Poole, Ph.D., P.E.
Project Technician:	C. E. Tew

30 copies of this document were printed at a cost of \$77.85
or \$2.59 per copy (G.S. 143-170.1)

TABLE OF CONTENTS

	PAGE
I. INTRODUCTION	1
II. THOROUGHFARE PLANNING PRINCIPLES	5
Objectives	5
Operational Efficiency	6
System Efficiency	8
Functional Classification	8
Local Access Streets	8
Minor Thoroughfares	11
Major Thoroughfares	11
Idealized Major Thoroughfare System	11
Radial Streets	11
Loop System Streets	11
Bypass	12
Application of Thoroughfare Planning Principles	12
III. EXISTING FACILITIES	13
Land Use - Existing Conditions	13
Land Use - Future	13
Population Trends	21
Transportation - Existing	22
Transportation - Future	23
IV. THOROUGHFARE PLAN	27
Major Thoroughfares	27
Minor Thoroughfares	29
V. CONSTRUCTION PRIORITIES	37
Thoroughfare Improvement Needs	39
Recommended Construction Priorities	40
VI. IMPLEMENTATION	45
State Municipal Adoption of the Thoroughfare Plan ...	45
Subdivision Controls	45
Roadway Official Map	46
Zoning	47
Urban Renewal	47
Capital Improvement Program	47
Development Reviews	48
Other Funding Sources	48

APPENDIX A:	Level Of Service Definitions	A-1
APPENDIX B:	Typical Cross Sections	B-1
APPENDIX C:	Thoroughfare Plan Street Tabulation And Recommendations	C-1
APPENDIX D:	Recommended Subdivision Ordinances	D-1

LIST OF TABLES

TABLE		PAGE
1	Existing Land Use In Extraterritorial Area	14
2	Onslow County Population Trends And Projections.....	21
3	Traffic Projections And Capacities For Critical Links.	24
4	Environmental Considerations	38
5	Swansboro Thoroughfare Plan Cost Estimates - Benefits - and Probable Impacts	43

LIST OF FIGURES

FIGURE		PAGE
1	Geographic Location Map	3
2	Idealized Thoroughfare Plan	9
3	Existing Land Use	15
4	Community Facilities	17
5	Future Growth Areas	19
6	Existing And Projected Average Daily Traffic Volumes	25
7	Recommended Swansboro Thoroughfare Plan	33
8	Proposed NC 24 Bypass	35
9	Levels of Service	A-3
10	Typical Thoroughfare Cross Sections	B-3

I. INTRODUCTION

Swansboro is located at the northeastern edge of Onslow County at the White Oak River approximately 20 miles east of Jacksonville, as shown in Figure 1. Highway service to the area is provided mainly by NC 24, which runs east-west and is designated on the Intrastate System. Several secondary roads, including SR 1509, SR 1511, and SR 1512 provide access from NC 24 to destinations in and around Swansboro.

On October, 1988, the Town of Swansboro requested North Carolina Department of Transportation assistance in development of a Thoroughfare Plan. They have never had a Thoroughfare Plan and believe it would be a valuable tool for guiding future development in and around Swansboro. Emphasis has also been placed on development of a Swansboro Thoroughfare Plan by the Governor's Coastal Initiative for five coastal communities, which includes Swansboro.

The purpose of this report is to document the study findings and recommendations. Included are recommendations for thoroughfare cross-sections, cost estimates for recommended improvements, benefits evaluations of recommended improvements, and plan implementation recommendations.

A draft Thoroughfare Plan was presented at the July 25th, 1989 Town Board Meeting. Additional information was requested regarding the proposed NC 24 Bypass and some proposed alternatives. This information was presented at the next Town Planning Board Meeting on August 22, 1989. At this meeting, the Planning Board Members decided they should discuss the proposed NC 24 Bypass at a joint meeting with Cedar Point and Cape Carteret Planning Boards since the proposed bypass crossed the White Oak River and impacted their Towns. This joint meeting was held on May 30th, 1990; however, only one representative from Cedar Point and Cape Carteret appeared for the meeting.

Subsequently, The Town of Cape Carteret wrote NCDOT Secretary James Harrington requesting that the Swansboro Thoroughfare Plan not be adopted until a Thoroughfare Plan was completed for Cape Carteret assessing the impacts of the proposed NC 24 Bypass on Cape Carteret. A thoroughfare plan study was completed for Cape Carteret/Cedar Point, but has yet to be adopted.

Efforts were made by the Statewide Planning Branch to pursue completion of the Swansboro Thoroughfare Plan since the Cape Carteret/Cedar Point thoroughfare study had assessed the impacts of the proposed NC 24 Bypass. Verbal requests to the Town Administrator for assistance were repeatedly made, but no action was ever taken by the Town. A letter was written by Tamra Shaw of the Statewide Planning Branch on

**GEOGRAPHIC LOCATION
FOR
SWANSBORO
NORTH CAROLINA**

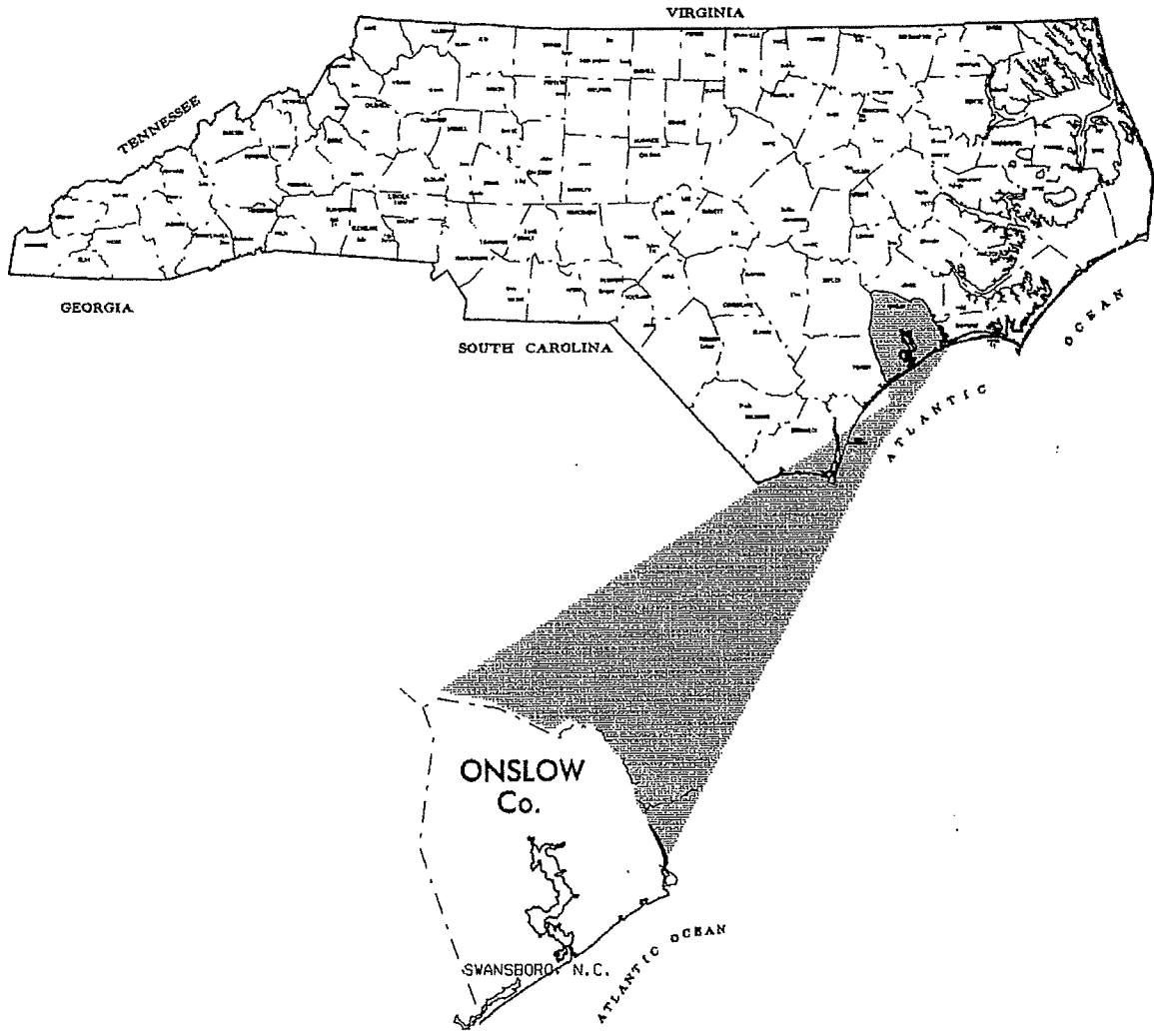


FIGURE 1

II. THOROUGHFARE PLANNING PRINCIPLES

Objectives

Typically, the urban street system occupies 25 to 30 percent of the total developed land in an urban area. Since the system is permanent and expensive to build and maintain, much care and foresight are needed in its development. Thoroughfare planning is the process public officials use to assure the development of the most appropriate street system that will meet existing and future travel desires within the urban area.

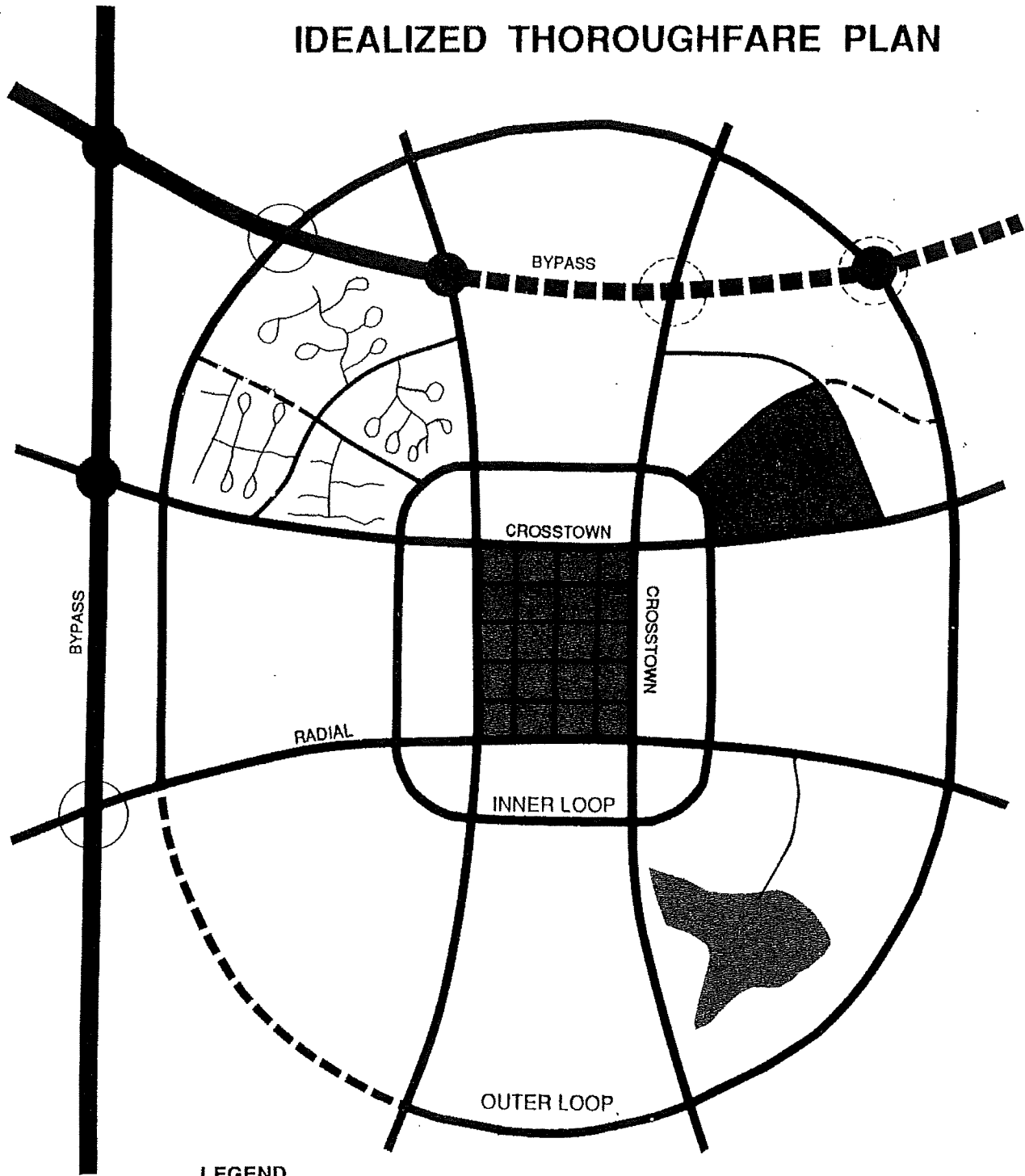
The primary aim of a thoroughfare plan is to guide the development of the urban street system in a manner consistent with the changing traffic patterns. A thoroughfare plan will enable street improvements to be made as traffic demands increase, and it helps eliminate unnecessary improvements, so needless expense can be averted. By developing the urban street system to keep pace with increasing traffic demands, a maximum utilization of the system can be attained, requiring a minimum amount of land for street purposes. In addition to providing for traffic needs the thoroughfare plan should embody those details of good urban planning necessary to present a pleasing and efficient urban community. The location of present and future population, commercial, and industrial development affects major street and highway locations. Conversely, the location of major streets and highways within the urban area will influence the urban development pattern.

Other objectives of a thoroughfare plan include:

1. providing for the orderly development of an adequate major street system as land development occurs,
2. reducing travel and transportation costs,
3. reducing the cost of major street improvements to the public through the coordination of the street system with private action,
4. enabling private interests to plan their actions, improvements, and development with full knowledge of public intent,
5. minimizing disruption and displacement of people and businesses through long range advance planning for major street improvements,
6. reducing environmental impacts, such as air pollution, resulting from transportation, and
7. increasing travel safety.

6. Intelligent Vehicle Highway System (IVHS) - This involves applying advanced concepts and technology in the area of communications, navigation, and information systems to provide solutions to traffic congestion and at the same time improve highway safety and reduce environmental effects. It covers passengers, freight, and public transit vehicles and fleets. The IVHS Program is structured according to five major systems areas. They are:
 - a. Advanced Traffic Management System - Provides real-time adjustment of traffic control systems and real-time means for transportation operators to effectively monitor traffic conditions and communicate to devices, quickly adjust traffic operations, and promptly respond to incidents.
 - b. Advanced Traveler Information System - Provides continuous advice regarding traffic conditions, alternate routes, and warnings regarding road safety.
 - c. Commercial Vehicle Operations - Improves operations efficiency and productivity of trucks, buses, and other fleets of vehicles and improves the efficiency of necessary regulatory activities.
 - d. Advanced Vehicle Control - Vehicle and/or roadway based electromechanical and communication devices that enhance the control of vehicles by facilitating and augmenting driver performance and ultimately relieving the driver of most tasks on designated instrumented roadways.
 - e. Advanced Public Transportation System - Providing mass transport users and operators (e.g. buses, vanpoolers, high-occupancy vehicle lanes, carpools, taxicabs) with up-to-date information on status, schedules, and availability of public transit systems including automatic vehicle location and monitoring systems to improve fleet management as well as electronic free media.
7. High-Occupancy Vehicle Lanes (HOV Lanes) - This involves designating existing traffic lanes for exclusive use by high occupancy vehicles like carpools, vanpools, and buses. These can be altered according to demand to increase capacity. For example, some HOV lanes can be designated HOV only during peak hours and/or HOV lanes can be reversible between the morning and afternoon peak hours to reflect the shift in directional flow of traffic.

IDEALIZED THOROUGHFARE PLAN



LEGEND

	EXISTING	PROPOSED	LAND USES	
MAJOR THOROUGHFARE FREEWAY				COMMERCIAL/BUSINESS
MAJOR OTHER				INDUSTRIAL
MINOR THOROUGHFARE				PUBLIC/INSTITUTIONAL
LOCAL ROAD				
INTERCHANGE				
GRADE SEPERATION				

FIGURE 2

Minor Thoroughfares are more important streets on the city system. They collect traffic from local access streets and carry it to the major thoroughfares. They may in some instances supplement the major thoroughfare system by facilitating minor through traffic movements. A third function that may be performed is that of providing access to abutting property. They should be designed to serve limited areas so that their development as major thoroughfares will be prevented.

Major Thoroughfares are the primary traffic arteries of the city. Their function is to move intra-city and inter-city traffic. The streets which comprise the major thoroughfare system may also serve abutting property, however, their principle function is to carry traffic. They should not be bordered by uncontrolled strip development because such development significantly lowers the capacity of the thoroughfare to carry traffic and each driveway is a danger and an impediment to traffic flow. Major thoroughfares may range from a two-lane street carrying minor traffic volumes to major expressways with four or more traffic lanes. Parking normally should not be permitted on major thoroughfares.

Idealized Major Thoroughfare System

A coordinated system of major thoroughfares forms the basic framework of the urban street system. A major thoroughfare system which is most adaptable to desired lines of travel within an urban area is the radial-loop system. It permits movement between various areas of the city within maximum directness. This system consists of several functional elements--radial streets, crosstown streets, loop system streets, and bypasses (Figure 2).

Radial streets provide for traffic movement between points located on the outskirts of the city and the central area. This is a major traffic movement in most cities, and the economic strength of the central business district depends upon the adequacy of this type of thoroughfare.

If all radial streets crossed in the central area, an intolerable congestion problem would result. To avoid this problem, it is very important to have a system of crosstown streets which form a loop around the central business district. This system allows traffic moving from origins on one side of the central area to destinations on the other side to follow the area's border. It also allows central area traffic to circle and then enter the area near a given destination. The effect of a good crosstown system is to free the central area of crosstown traffic, thus permitting the central area to function more adequately in its role as a business or pedestrian shopping area.

Loop system streets move traffic between suburban areas of the city. Although a loop may completely encircle the city, a typical trip may be from an origin near a radial thoroughfare to a destination near another radial thoroughfare. Loop streets do not

III. EXISTING AND PROJECTED CONDITIONS

Land Use - Existing Conditions

Largely residential in nature, the Town of Swansboro is also characterized by the historic downtown area and Hammocks Beach State Park. Existing land uses in Swansboro are shown on Figure 3 and Figure 4 shows the location of community facilities. Table 1 lists the acreage and percentage of each land use within the Swansboro extraterritorial jurisdictional boundaries. As can be seen from Table 1, the two categories of residential and agricultural/forested/vacant account for 93.8% of the total land use.

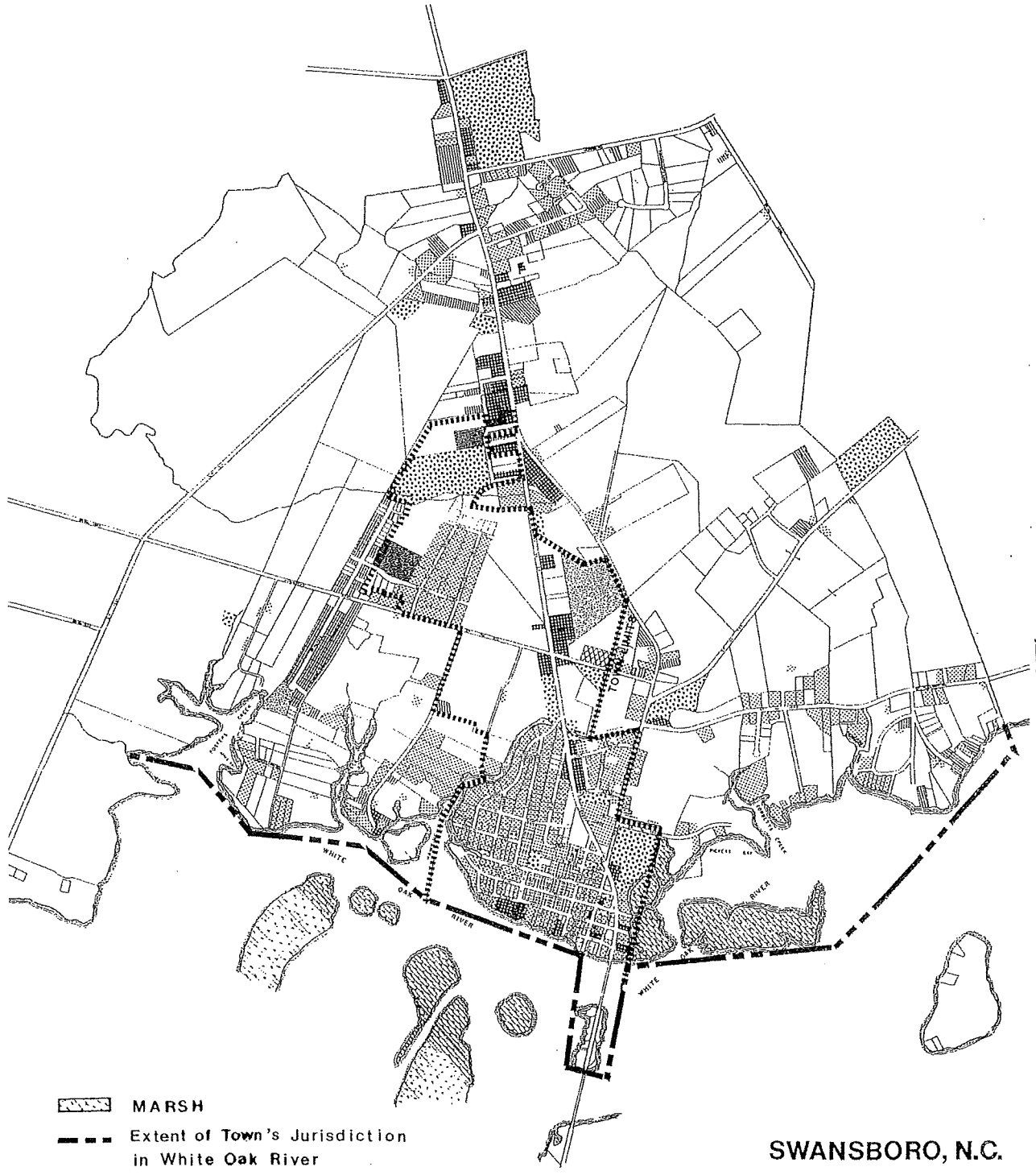
Commercial development is concentrated along NC 24 and includes restaurants, automobile and mobile home sales, small retail businesses, grocery store, drugstore, and tire sales. Also, an ABC store and marine commercial uses are located on the causeway crossing the White Oak River toward Carteret County. The only industrial development is the 1.8 acre site of the Swansboro Garment Company.

Land Use - Future

In the future, the Town of Swansboro will construct a new high school on a site off SR 1509 on the south side of NC 24, as shown in Figure 5. This will enable the Town to move the Elementary School to the Middle School site, the Middle School to the Junior High School site, and the Junior High School to the existing High School site.

The current and anticipated future development pressure is in the form of subdivisions within Swansboro and the surrounding rural area. Subdivisions already under development are Oyster Bay Estates (40 lots on about 25 acres on Mt. Pleasant Road) and River Reach Subdivision (151 units planned for 104 acres off Mt. Pleasant Road). Construction of more than 850 single family units is planned during the next 15 to 20 years on the 475 acres adjacent to the mainland side of Hammocks Beach State Park. These residential developments are depicted on Figure 5.

FROM: 1986 LAND USE PLAN UPDATE
 TOWN OF SWANSBORO, N.C.
 BY SATILLA PLANNING



MARSH
 Extent of Town's Jurisdiction
 in White Oak River

SWANSBORO, N.C.

LEGEND:



- | | |
|---------------|-------------------------|
| SINGLE FAMILY | INDUSTRIAL |
| MOBILE HOME | PUBLIC & INSTITUTIONAL |
| MULTI-FAMILY | RECREATION & OPEN SPACE |
| COMMERCIAL | AGRICULTURE OR VACANT |

EXISTING LAND USE

FIGURE 3









FROM: 1986 LAND USE PLAN UPDATE
 TOWN OF SWANSBORO, N.C.
 BY SATILLA PLANNING



 MARSH
 Extent of Town's Jurisdiction
 in White Oak River

SWANSBORO, N.C.

LEGEND:



- | | |
|---|---|
|  SINGLE FAMILY |  INDUSTRIAL |
|  MOBILE HOME |  PUBLIC & INSTITUTIONAL |
|  MULTI-FAMILY |  RECREATION & OPEN SPACE |
|  COMMERCIAL |  AGRICULTURE OR VACANT |

EXISTING LAND USE

FIGURE 3



FROM: 1986 LAND USE PLAN UPDATE
 TOWN OF SWANSBORO, N.C.
 BY SATILLA PLANNING



 MARSH
 Extent of Town's Jurisdiction
 in White Oak River

SWANSBORO, N.C.

LEGEND:

 AREAS SERVED BY SEWER LINES
 AREAS SERVED BY TOWN OR COUNTY WATER

- | | |
|--------------------------------|--------------------------------|
| 1 SWANSBORO HIGH & JUNIOR HIGH | 9 FIRE STATION |
| 2 SWANSBORO MIDDLE SCHOOL | 10 TOWN HALL & POLICE STATION |
| 3 SWANSBORO TOWN PARK | 11 ONSLOW COUNTY LIBRARY |
| 4 SANDERS PARK | 12 U.S. POST OFFICE |
| 5 EDGEWATER HEIGHTS PARK | 13 WARDS SHORE RECREATION AREA |
| 6 SWANSBORO RESCUE SQUAD | 14 BICENTENNIAL PARK |
| 7 SWANSBORO ELEMENTARY | 15 SEWAGE TREATMENT PLANT |
| 8 TOWN WELL | ★ WATER ACCESS POINTS |

COMMUNITY FACILITIES

FIGURE 4

FROM: 1986 LAND USE PLAN UPDATE
 TOWN OF SWANSBORO, N.C.
 BY SATILLA PLANNING



SWANSBORO, N.C.

LEGEND:

- AREAS SERVED BY SEWER LINES
- AREAS SERVED BY TOWN OR COUNTY WATER

- | | |
|--------------------------------|--------------------------------|
| 1 SWANSBORO HIGH & JUNIOR HIGH | 9 FIRE STATION |
| 2 SWANSBORO MIDDLE SCHOOL | 10 TOWN HALL & POLICE STATION |
| 3 SWANSBORO TOWN PARK | 11 ONSLOW COUNTY LIBRARY |
| 4 SANDERS PARK | 12 U.S. POST OFFICE |
| 5 EDGEWATER HEIGHTS PARK | 13 WARDS SHORE RECREATION AREA |
| 6 SWANSBORO RESCUE SQUAD | 14 BICENTENNIAL PARK |
| 7 SWANSBORO ELEMENTARY | 15 SEWAGE TREATMENT PLANT |
| 8 TOWN WELL | ★ WATER ACCESS POINTS |

COMMUNITY FACILITIES

FIGURE 4

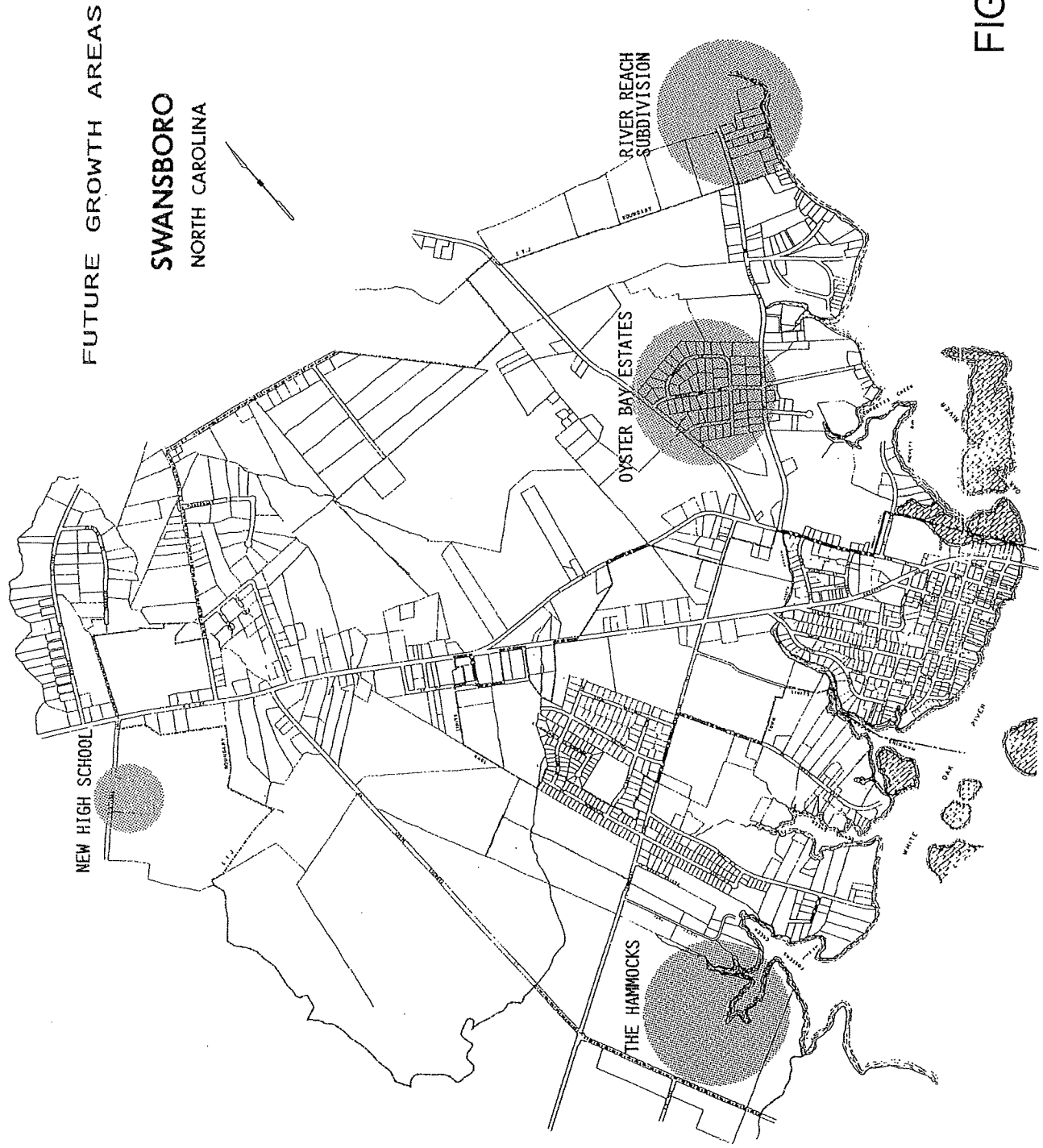


FIGURE 5

Population Trends

Travel is directly related to population and the volume of traffic on any section of roadway is closely related to the size and distribution of the population which it serves. One of the basic steps in planning a transportation system is a population study to forecast a reasonable and logical future population and its distribution. A close look at the past will give some indication as to what might be expected in the future.

Population within the Town of Swansboro declined 19.1% between 1970 and 1980 from 1,207 persons to 976 persons. However, the NC Office of Budget and Management estimates the 1988 population of the Town of Swansboro at 1,353 persons. This represents a 38.6% increase over the 1980 census count and a growth rate of about 4% per year since 1980.

The Swansboro Township increased 12.4% from 20,800 persons in 1970 to 23,380 persons in 1980. In addition, the Onslow County population increased 9.4% during this same time period. Population projections for Onslow County prepared by the NC Office of State Budget and Management are shown in Table 2 below:

TABLE 2 - ONSLOW COUNTY POPULATION TRENDS AND PROJECTIONS

<u>Census Year</u>	<u>Population</u>	<u>% Increase</u>
1970	103,126	
1980	112,784	9.4%
1990	130,520	15.7%
2000	147,086	12.7%
2010	161,255	9.6%

Population projections for the Town of Swansboro can be calculated by using the four percent compound annual growth rate based on the State Budget and Management estimates. This will result in projecting a 2005 population for Swansboro of 2,602 persons and a 2015 population of 3,851 persons. However, this increase will require improvements to the existing sewage treatment plant. The current discharge permit allows a maximum of 300,000 gallons per day. This capacity will only accommodate an additional 400 to 500 dwelling units. If the total "buildout" of around 800 units is multiplied by the 1980 census occupancy rate of 2.6 persons per dwelling unit, this would limit the total future population of Swansboro to 2,080 persons. For the purposes of this study, optimum projections were assumed.

The intersection of Main Street and Main Street Extension with NC 24 is the intersection of most concern to Swansboro residents. This intersection is a problem because it is offset by approximately 25 feet, it is skewed at a 40 degree angle for left turns, it is located just over the crest of a hill, and it has school traffic associated with the Elementary School located off Main Street Extension.

The NCDOT Division Office was requested to study the feasibility of installing a traffic signal at this intersection. However, the study concluded the intersection did not meet warrants for a traffic signal. The intersection did not meet the minimum vehicular volume, accident experience, or pedestrian volume warrants.

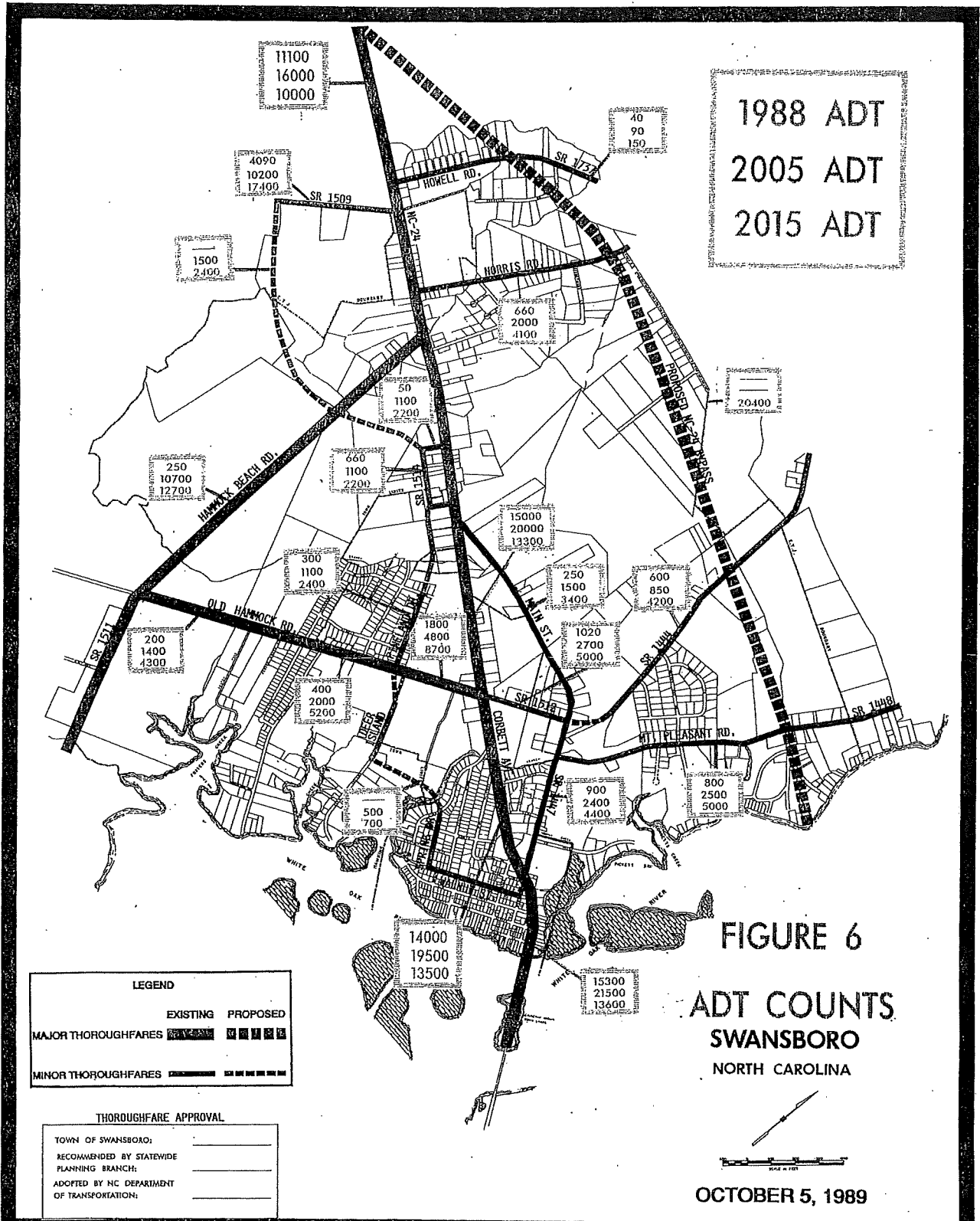
The last problem intersection is Front Street and NC 24. This intersection is less than 200 feet from the bridge over the White Oak River and along a stretch of NC 24 which is only two lanes wide. This "bottleneck" condition appears to contribute to the traffic accidents.

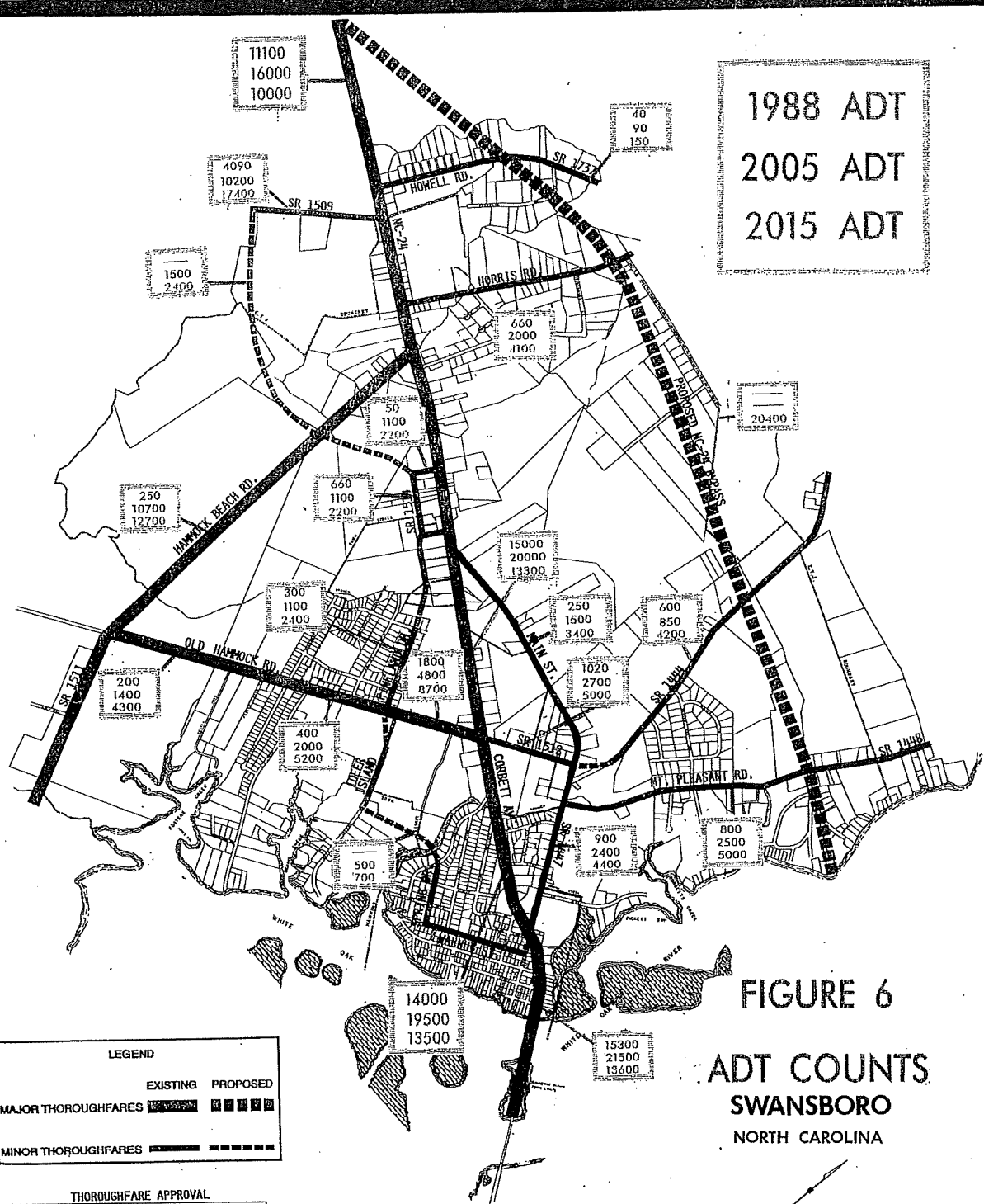
Suggestions to improve each of these problem areas are discussed in Chapter 4.

Transportation - Future

The Thoroughfare Plan is designed to serve travel between the year 2010 and the year 2015. Therefore, traffic projections were developed on the basis of historical traffic growth trends and anticipated future land use patterns. These projections, shown on Figure 6, were then analyzed to determine what future problems will be encountered by Swansboro in addition to the previously identified existing problems.

The analysis revealed that three roads, NC 24, SR 1509, and SR 1512 will be at or exceed level-of-service D in the future (see previous section for discussion of level of service). Table 2 details the traffic projections and capacities for these roads. To increase their capacity, these roads will need to be widened with additional lanes or new routes proposed to carry additional traffic.





1988 ADT
 2005 ADT
 2015 ADT

LEGEND

EXISTING PROPOSED

MAJOR THOROUGHFARES [Symbol] [Symbol]

MINOR THOROUGHFARES [Symbol] [Symbol]

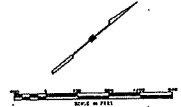
THOROUGHFARE APPROVAL

TOWN OF SWANSBORO: _____

RECOMMENDED BY STATEWIDE PLANNING BRANCH: _____

ADOPTED BY NC DEPARTMENT OF TRANSPORTATION: _____

FIGURE 6
ADT COUNTS
SWANSBORO
NORTH CAROLINA



OCTOBER 5, 1989

IV. THOROUGHFARE PLAN

Major Thoroughfare System

The Swansboro major thoroughfare system includes a NC 24 Bypass, NC 24 through Swansboro, SR 1511 (Hammock Beach Road), and SR 1512 (Old Hammocks Road). These roads are shown on Figure 7. The function of each of these roads and recommended improvements will be discussed in this section. Typical thoroughfare cross-sections are shown in Appendix B and Appendix C summarizes the thoroughfare plan street tabulation and recommendations.

NC 24 Bypass - The proposed NC 24 Bypass will accommodate through traffic destined for beach locations to the east and the Camp LeJeune/Jacksonville area to the west. The Bypass will provide a loop thoroughfare around Swansboro which will alleviate capacity problems on the stretch of NC 24 through Swansboro.

The proposed Bypass will begin at SR 1434 where NC 24 changes from a four lane divided cross-section to a five lane cross-section. From this point it will continue east and cross SR 1445 approximately 2600 feet north of existing NC 24 and cross SR 1444 approximately 4300 feet north of SR 1447. After crossing SR 1448 approximately 3800 feet north of SR 1447, it will continue across the White Oak River to Jones Island and then continue across into Carteret County merging back into the existing NC 24 approximately 1600 feet west of NC 58. The proposed Bypass is approximately five and two-tenths miles long. Figure 8 shows the entire NC 24 corridor in both Onslow and Carteret Counties and reflects study and coordination done in Carteret County.

It is estimated that approximately 60% of the traffic projected on NC 24 through Swansboro will be diverted onto the Bypass. This will result in a 2005 traffic volume of 15,200 vehicles per day (vpd) and a 2015 traffic volume of 20,400 vpd on the Bypass. During the peak summer months the traffic volumes increase by about 20% above the average annual daily traffic. Thus, 2005 volumes could reach 18,200 vpd and 2015 volumes could reach 24,500 vpd. These volumes warrant construction of the NC 24 Bypass as a four lane divided facility and require 100 feet of right-of-way. Landscaping would be provided in the median and access from abutting property to the Bypass should be restricted in order to ensure a high level of service is maintained.

NC 24 - This portion of NC 24 is a major thoroughfare serving as a radial route carrying east and westbound traffic through Swansboro. It is also a cross-town thoroughfare being the only existing continuous east-west route in Town. The four public schools in Swansboro are all located off NC 24 and the

SR 1512 Old Hammock Road - This major thoroughfare serves as a north-south cross-town connector. It also funnels local traffic onto NC 24 since it is only one of two signalized intersections on NC 24. Traffic is projected to approach 8,700 vpd near the intersection of NC 24 by the year 2015. Widening this road to a three lane urban cross-section will increase the capacity to around 14,000 vpd. This improvement should not necessitate any additional right-of-way since it already has the required 60 feet of right-of-way. This cross-section will provide for left-turn lanes at major intersections and should improve traffic flow and safety.

The unpaved portion of SR 1512 from around Seashore Drive to SR 1511 is scheduled to be paved within six years. The Division Office of the Department of Transportation maintains a list of roads on the rural system to be paved. Currently, this portion of SR 1512 is number 27 on the rural paving priority list and should be paved within 6 years.

Minor Thoroughfare System

Minor thoroughfares included in the recommended Swansboro Thoroughfare Plan include SR 1737, SR 1445 (Norris Road), SR 1509, SR 1514 (Phillips Loop Road), SR 1447 (Main Street), SR 1444 (Swansboro Loop Road), SR 1448 (Mr. Pleasant Road), SR 1512 between NC 24 and SR 1447, and the proposed Deer Island Crosstown Connector. The minor thoroughfare system is shown on Figure 7.

SR 1737 Howell Road - This road is a minor thoroughfare connecting residential areas with NC 24. The existing 28 feet of pavement should be adequate to handle anticipated future traffic.

SR 1509 - This minor thoroughfare functions as a radial to the south. It is one of two signalized intersections on NC 24 and provides access to the Swansboro High School. This road will increase in functional significance and traffic volumes with the construction of a new Swansboro High School. The 2015 traffic volumes are projected to exceed 16,000 vpd. Serving as the major access road to both the Swansboro High School and Swansboro Junior High School (which will be at the site of the existing High School), this road will need to be widened from two to four lanes. This urban four lane cross-section will require 70 feet of right-of-way.

SR 1445 Norris Road - This facility provides access to the Swansboro Junior High School and also connects residential areas with NC 24. This road should be widened from 18 feet of pavement to two twelve foot lanes plus four foot paved shoulders. This improvement can be accomplished within the existing 60 feet of right-of-way. A third center turn lane should be considered at the school entrance and exit points.

residential traffic as Oyster Bay Estates becomes fully developed. Traffic volumes are projected to exceed 4,000 vpd by the year 2015. Thus, widening the road to two twelve foot lanes plus four foot paved shoulders is recommended.

SR 1448 Mt. Pleasant Road - This minor thoroughfare parallels SR 1444 and also serves the Oyster Bay Estates as well as River Reach Subdivision. Traffic volumes on this road are projected to be around 4,500 vpd by the year 2015. Due to intense subdivision development occurring along this road, it should be improved to two twelve foot lanes plus four foot paved shoulders. This improvement can be accomplished within the existing 60 feet of right-of-way.

SR 1512 Old Hammock Road - The 1400 foot stretch of SR 1512 between NC 24 and SR 1447 is designated as a minor thoroughfare serving the function of funneling residential traffic onto NC 24. With traffic volumes approaching 5,000 vpd by the year 2015, this stretch of road needs to be widened to two twelve foot lanes plus four foot paved shoulders. This improvement can be accomplished with 60 feet of right-of-way.

This road is also one of two signalized intersections with NC 24. Thus, larger volumes of turning movements tend to concentrate at this intersection resulting in increased total traffic volumes on SR 1512. This road will also serve an important role by providing a continuous north-south crosstown route when combined with SR 1444.

Deer Island Crosstown Connector (SR 1509, SR 1514, Swansboro Middle School Loop Road, SR 1513, Spring Drive, Walnut Street, and Main Street) -The Deer Island Crosstown Connector consists of a series of existing secondary roads and local roads interconnected by sections of proposed new roads between NC 24 at SR 1509 and NC 24 at Main Street. The new High School will be built at the northern edge of the Connector and the Swansboro Middle School is located at the middle of the Connector. At the southern end of the Connector is the historic downtown area.

The function of the Deer Island Crosstown Connector will be to provide local access between the downtown area, residential developments, and the four public schools in Swansboro. The Main Street extension on the eastern side of NC 24 serves a similar purpose. Providing local residents an alternate route will reduce the volume of traffic on NC 24 as well as the amount of turning conflicts, thus increasing traffic flow and decreasing accident potential. This is particularly critical with regard to the four public schools and their traffic patterns. The Connector also provides access to the two signalized intersections on NC 24 at SR 1509 and SR 1512.

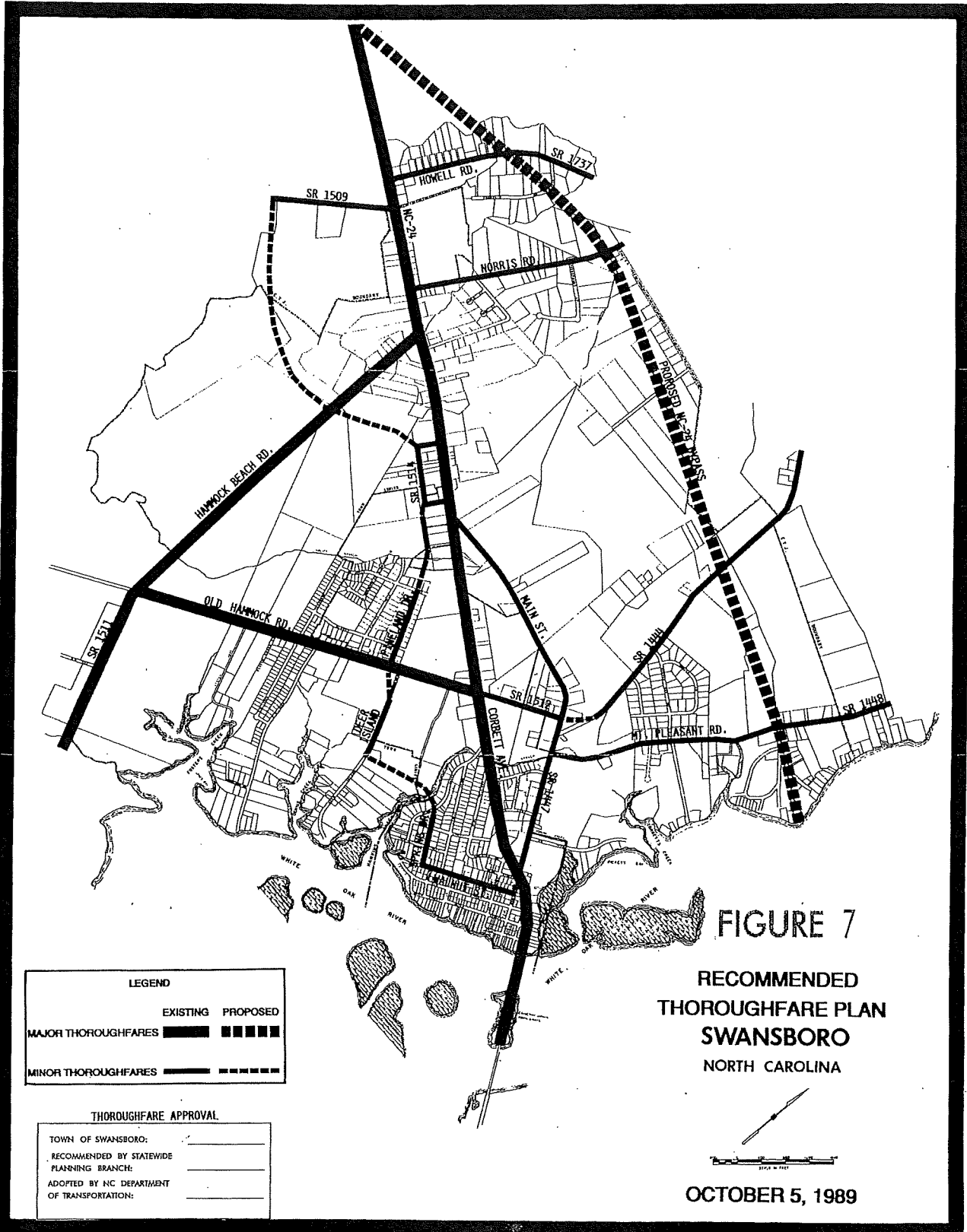
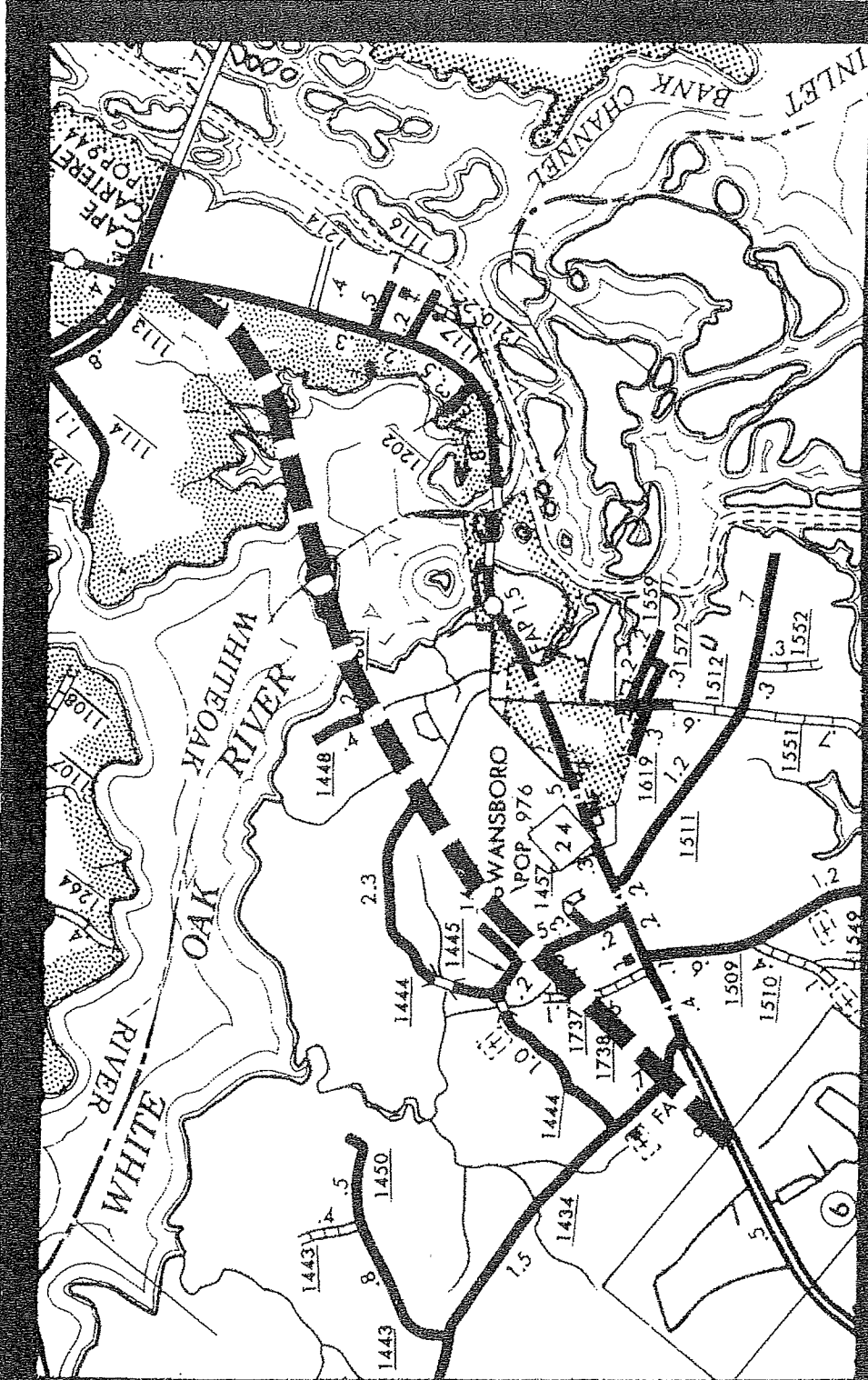


FIGURE 7
RECOMMENDED
THOROUGHFARE PLAN
SWANSBORO
NORTH CAROLINA

LEGEND	
	EXISTING PROPOSED
MAJOR THOROUGHFARES	
MINOR THOROUGHFARES	

THOROUGHFARE APPROVAL	
TOWN OF SWANSBORO:	_____
RECOMMENDED BY STATEWIDE PLANNING BRANCH:	_____
ADOPTED BY NC DEPARTMENT OF TRANSPORTATION:	_____

OCTOBER 5, 1989



PROPOSED NC-24 BYPASS

FIGURE 8

V. CONSTRUCTION PRIORITIES

An evaluation of the North Carolina highway program from administrative, historical, and financial perspectives indicates the following objectives are of greatest importance:

- To improve the North Carolina arterial system to reduce travel costs and improve travel service between urban centers.
- To improve the level of service and safety of all roads and highways on the State system in a cost effective manner.
- To encourage economic development.
- To preserve the natural and human environment.
- To allocate funds to projects in a fair and equitable manner.

(1) User benefits, (2) cost, (3) probability that a project will stimulate economic development, (4) quantification of environmental impacts, and (5) relationship of a project to the State Intrastate System provide a basis for evaluating projects as to how well they meet the objectives.

User benefits include cost savings resulting from an improvement project through reduction in vehicle operating costs, travel time costs, and accident costs. Estimation of environmental impacts of a project is one of the more difficult evaluations. Environmental factors usually considered in highway project evaluation can be divided into three major categories--physical, social and/or cultural, and economic environmental considerations. These are detailed in Table 4. Many of these are accounted for when a project is evaluated with respect to user benefits, cost, and economic development potential.

However, thirteen environmental factors are generally not considered in these evaluations. They are the environmental impacts of a project on (1) air quality, (2) water resources, (3) soils and geology, (4) wildlife, (5) vegetation, (6) neighborhoods, (7) noise, (8) educational facilities, (9) churches, (10) park and recreational facilities, (11) historic sites and landmarks, (12) public health and safety, and (13) aesthetics. The summation of both positive and negative impact probabilities with respect to these factors provides a measure of the relative environmental impact of a project.

Thoroughfare Improvement Needs

Thoroughfare improvement needs identified in the Swansboro thoroughfare plan and evaluated are:

- Widening of NC 24 to five lanes between Church Street and the White Oak River Bridge.
- Widening of SR 1509 to four lanes between NC 24 and the extraterritorial jurisdictional boundary.
- Widening of SR 1511 (Hammock Beach Road) to four lanes between NC 24 and Hammock Beach State Park.
- A proposed NC 24 Bypass.
- Construction of the Deer Island Crosstown Connector between Spring Drive and SR 1509.
- Widening of SR 1512 (Old Hammock Road) to a three lane urban section between SR 1511 and NC 24.
- Widening of SR 1512 to two twelve foot lanes between NC 24 and SR 1447.
- Widening of SR 1448 to two twelve foot lanes between SR 1447 and the extraterritorial jurisdictional boundary.
- Widening of SR 1447 to two twelve foot lanes between both termini points at NC 24.
- Widening of SR 1445 to two twelve foot lanes between NC 24 and the extraterritorial jurisdictional boundary.
- Widening of SR 1444 (Swansboro Loop Road) to two twelve foot lanes between between SR 1447 and the extraterritorial jurisdictional boundary.

over capacity in the future even with the programmed widening improvements. It is critical that a high level of service be maintained on NC 24 which is designated as part of the State Intrastate System. However, construction of the NC 24 Bypass will be problematic in light of it's severe environmental and social impacts. The corridor crosses wetlands, National Forest territory, and several neighborhoods including River Reach Subdivision. Efforts should be undertaken now to protect this corridor from future development and to work with development already in place within the corridor.

Estimated Cost - \$29,009,000

5. **Deer Island Crosstown Connector** - Construction of this proposed facility will provide a much needed alternate east-west route for local traffic which now is concentrated on NC 24. The Connector will improve access between the downtown area and the public schools in Swansboro and improve safety by reducing the amount of school oriented traffic on NC 24. This facility will also connect two major thoroughfares, SR 1511 and SR 1512.

Estimated Cost -\$2,250,000

6. **SR 1512 widening to three lanes between SR 1511 and NC 24** - Future traffic volumes will be almost at the capacity of this two lane facility. Improving SR 1512 to a three lane facility (and paving a portion of the road) will provide better accessibility to the commercial areas along NC 24 and the State Park as well as residential development on SR 1511. This road will continue to function as a major north-south link in Swansboro.

Estimated Cost - \$678,000

7. **SR 1512 widening to two twelve foot lanes between NC 24 and SR 1447** - The widening of SR 1512 will continue improvements to the major north-south link in Swansboro. A large amount of residential traffic destined for NC 24 is funneled onto this road from SR 1444, SR 1448, and SR 1447.

Estimated Cost - \$108,000

8. **SR 1448 widening to two twelve foot lanes between SR 1447 and the extraterritorial jurisdictional boundary** - Widening this facility will improve safety and accessibility for residents of Oyster Bay and River Reach Subdivision to NC 24. This road will increase in importance as these subdivisions continue to develop.

Estimated Cost - \$440,000

TABLE 5 Swansboro Thoroughfare Plan Cost Estimates - Benefits - and Probable Impacts									
DESCRIPTION	CONST. COST \$1000	ROW COST \$1000	TOTAL COST \$1000	USER BENEFITS \$1000	ECONOMIC DEVELOPMENT	ENVIRONMENTAL IMPACTS POSITIVE	ENVIRONMENTAL IMPACTS NEGATIVE		
NC 24 Widening (Church-Elm) *	244	-0-	244	3,395	0.30	0.00	0.10		
SR 1509 4-Laning	285	80	365	17,228	0.50	0.00	0.00		
SR 1511 4-Laning	1,350	-0-	1,350	53,622	0.60	0.00	0.00		
NC 24 Bypass	28,209	800	29,009	695,464	0.35	0.00	1.00		
Deer Island Crosstown Conn.*	2,000	250	2,250	7,384	0.40	0.00	0.35		
SR 1512 3-Laning (1511-NC 24)	678	-0-	678	1,380	0.75	0.00	0.00		
SR 1512 Widening (NC 24-1447)	108	-0-	108	227	0.25	0.00	0.00		
SR 1448 Widening	440	-0-	440	878	0.10	0.00	0.00		
SR 1447 Widening	560	10	570	746	0.30	0.00	0.00		
SR 1445 Widening	260	-0-	260	317	0.10	0.00	0.00		
SR 1444 Widening	1,320	-0-	1,320	1,603	0.10	0.00	0.00		

*The costs/benefits of these projects were calculated assuming the completion of the NC 24 Bypass.

NOTE: The benefits are a summation of estimated operating, user time and accident cost saving 1988-2015. Estimated construction and right-of-way costs are in 1989 dollars.

VI. IMPLEMENTATION

There are several tools which are available for implementation of the thoroughfare plan. They are as follows:

State and Municipal Adoption of the Thoroughfare Plan

Chapter 136, Article 3A, Section 136-66.2 of the General Statutes of North Carolina provides that after development of a thoroughfare plan, the plan may be adopted by the governing body of the municipality and the Department of Transportation to serve as the basis for future street and highway improvements. The General Statutes also require that, as part of the plan, the governing body of the municipality and Department of Transportation shall reach agreement on responsibilities for existing and proposed streets and highways included in the plan. 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.

After mutual plan adoption, the Department of Transportation will initiate negotiations leading to determining which of the existing and proposed thoroughfares will be a Department responsibility and which will be a municipal responsibility. Chapter 136, Article 3A, Section 136-66.1 of the General Statutes provides guidance in the delineation of responsibilities. In summary, these statutes provide that the Department of Transportation shall be responsible for those facilities which serve volumes of through traffic and traffic from outside the area to major business, industrial, governmental, and institutional destinations located inside the municipality. The municipality is responsible for those facilities which serve primarily internal travel.

Thoroughfare plan adoption enables other planning tools such as the subdivision ordinance, zoning ordinance, official street map, and capital improvement program to be used to assist in plan implementation and thus minimize public cost and land use disruption.

Subdivision Control

A subdivision ordinance requires that every subdivider submit to the Town Planning Commission a plot of his or her proposed subdivision. Certain standards must be met by the developer before he can be issued a building permit to construct his development. Through this process, it is possible to reserve or protect the necessary rights of way for projected streets which are a part of the thoroughfare plan and to require street construction in accordance with the plan.

Zoning

A zoning ordinance can be beneficial to thoroughfare planning in that planned locations of various land uses and planned densities of dwellings can be realized. This provides a degree of stability on which to make future traffic projections and to plan streets and highways.

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

The zoning ordinance should be structured to control strip development along the major traffic-carrying thoroughfares. NC 24 through Swansboro already has some strip development and continuing to allow this type of development in the future without strict zoning controls will exacerbate traffic congestion on this facility.

Urban Renewal

Urban renewal is defined as the rehabilitation of city areas by demolishing, remodeling, or repairing existing structures in accordance with comprehensive plans. This process allows for corrections to basic problems in the street system layout and design.

To qualify for community development funds or discretionary funds for urban renewal, a city must first prepare a community development program. Urban areas compete throughout the state on the bases of demographic points which consider such conditions as percent of substandard housing, people per square feet of housing, dwelling age, etc.

An effort should be made to ensure that community development and transportation plans are compatible.

Capital Improvements Program

One of the tools which makes it easier to build a planned thoroughfare system is a capital improvements program. This is a long range plan for the spending of money on street improvements, acquisition of right-of-way, and other capital improvements within the bounds of projected revenues. Municipal funds should be available for construction of street improvements which are a municipal responsibility, right-of-way cost sharing on facilities designated a Division of Highways responsibility, and advance purchase of right-of-way where such action is required.

The section of the capital improvements program which deals with the thoroughfare plan requires a fairly detailed knowledge of the costs of various projects.

APPENDIX A

LEVEL OF SERVICE DEFINITIONS

A good indication of the adequacy of the existing major street system is a comparison of the traffic volumes with the ability of the streets to move traffic freely at a desirable speed. The ability of a street to move traffic freely, safely, and efficiently with a minimum delay is controlled principally by the spacing of major devices utilized. Thus, the ability of a street to move traffic can be increased by restricting parking and turning movements, using proper sign and signal devices, and by the application of other traffic engineering techniques.

Capacity is defined as the maximum number of vehicles which has a reasonable expectation of passing over a given section of a roadway in one direction, or in both directions, during a given time period under prevailing roadway and traffic conditions.¹ The relationship of traffic volumes to the capacity of the roadway will determine level of service being provided. Six levels of service have been selected to identify the conditions existing under various speed and volume conditions on a highway or street. The six levels of service, as shown in Figure 9, are:

1. Level-of-service A represents free flow. Individual users are virtually unaffected by the presence of others in the traffic stream. Freedom to select desired speeds and to maneuver within the traffic stream is extremely high. The general level of comfort and convenience provided to the motorist, passenger, or pedestrian is excellent.
2. Level-of-service B is in the range of stable flow, but the presence of other users in the traffic stream begins to be noticeable. Freedom to select desired speeds is relatively unaffected, but there is a slight decline in the freedom to maneuver within the traffic stream from LOS A, because the presence of others in the traffic stream begins to affect individual behavior.
3. Level-of-service C is in the range of stable flow, but marks the beginning of the range of flow in which the operation of individual users becomes significantly affected by interactions with others in the traffic stream. The selection of speed is now affected by the presence of others. Driver and

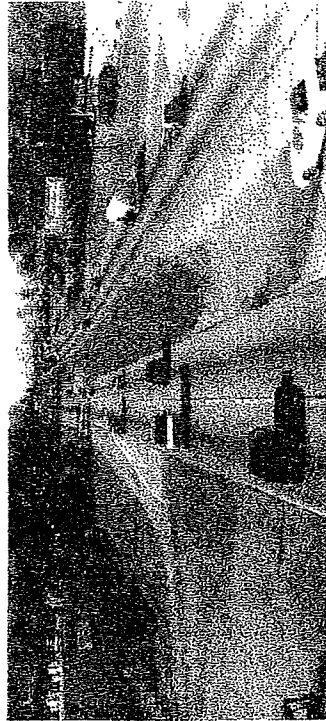
¹ Highway Capacity Manual, Special Report 209, 1985, pp. 1-3.



LEVEL OF SERVICE - A



LEVEL OF SERVICE - D



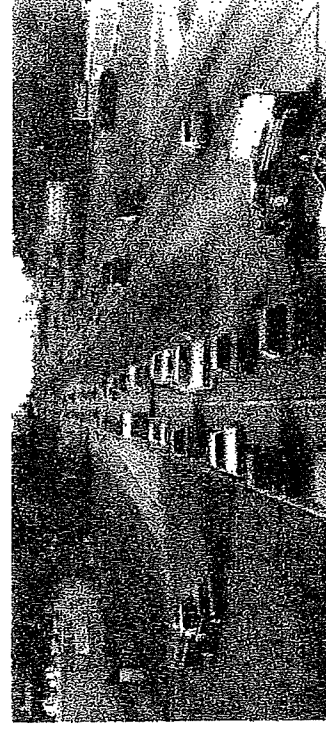
LEVEL OF SERVICE - B



LEVEL OF SERVICE - E



LEVEL OF SERVICE - C



LEVEL OF SERVICE - F

LEVELS OF SERVICE

FIGURE 9

APPENDIX B

TYPICAL CROSS SECTIONS

Typical cross sections recommended by the Statewide Planning Branch are shown in the following diagrams of Figure 10.

Cross section "A" is illustrative for controlled access freeways. The 46 foot grassed median is the least desirable median width, but there could be some variation from this depending upon design considerations. Slopes of 8:1 into 3 foot drainage ditches are desirable for traffic safety. Right-of-way requirements would typically vary upward from 250 feet depending upon cut and fill requirements.

Cross section "B" is typical for four lane divided highways in rural areas which may have only partial or no control of access. The minimum median width for this cross section is 30 feet, but a wider median is desirable. Design requirements for slopes and drainage would be similar to cross section "A", but there may be some variation from this depending upon right-of-way constraints.

Cross section "C", seven lane urban, and cross section "D", five lane urban, are typical for major thoroughfares where frequent left turns are anticipated as a result of abutting development or frequent street intersections.

Cross sections "E" and "F" are used on major thoroughfares where left turns and intersecting streets are not as frequent. Left turns would be restricted to a few selected intersections.

Cross section "G" is 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 feet is recommended with 30 feet being desirable.

Typical cross section "H" 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 probably be required at major intersections.

Thoroughfares which are proposed to function as one-way traffic carriers would typically require cross section "I". Cross section "J" and "K" are usually recommended for minor thoroughfares since these facilities usually serve both land service and traffic service functions. Cross section "J" would be used on those minor thoroughfares where parking on both sides is needed as a result of more concentrated development.

TYPICAL THOROUGHFARE CROSS SECTIONS

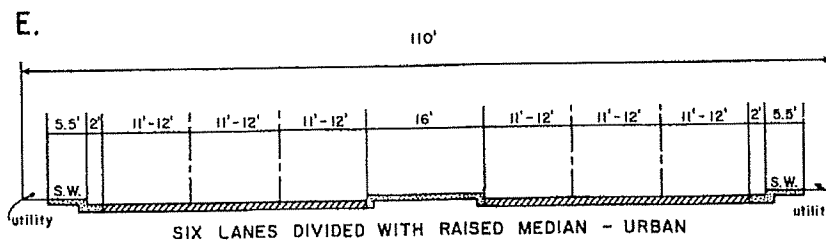
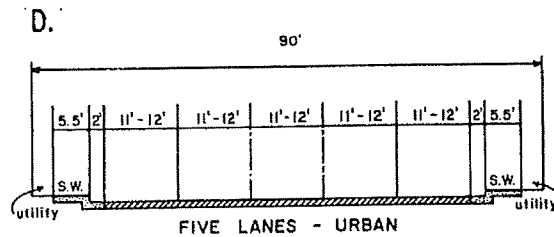
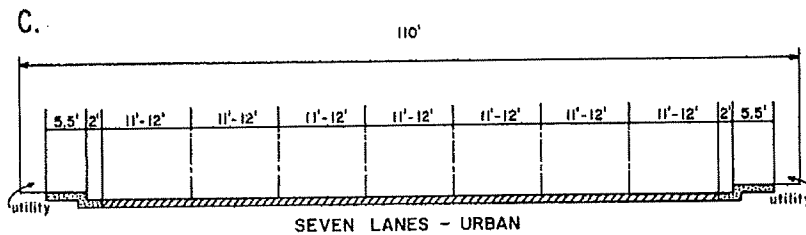
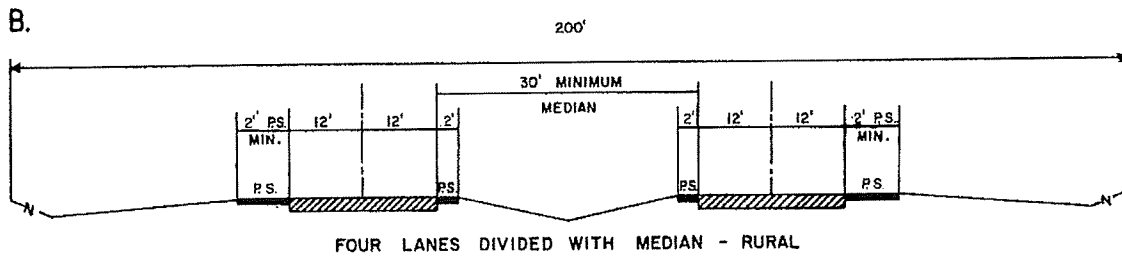
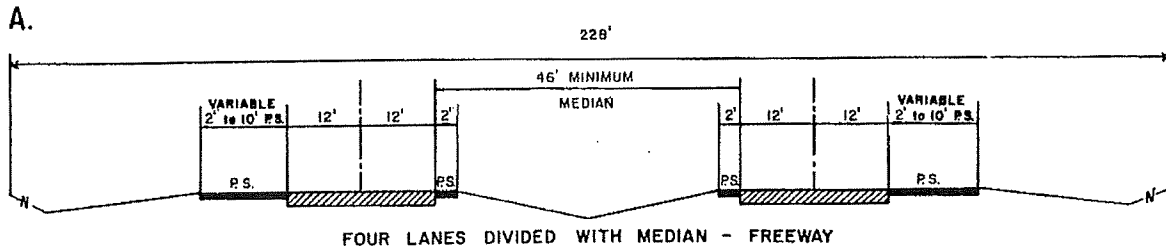
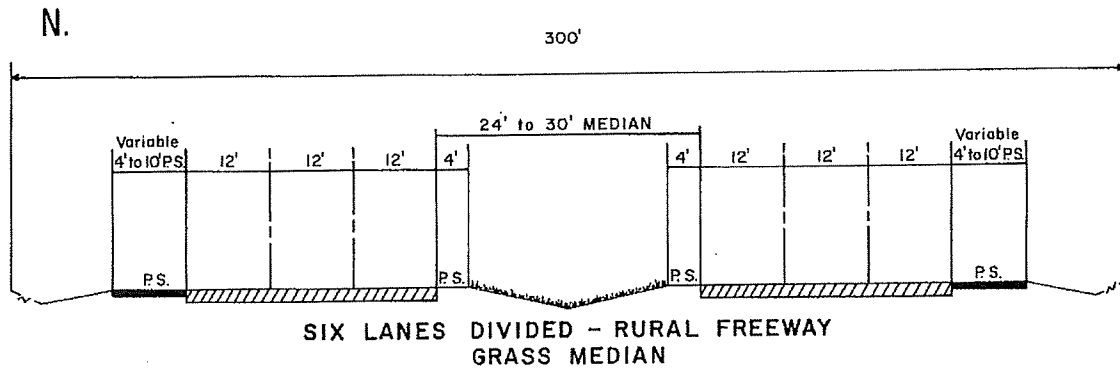
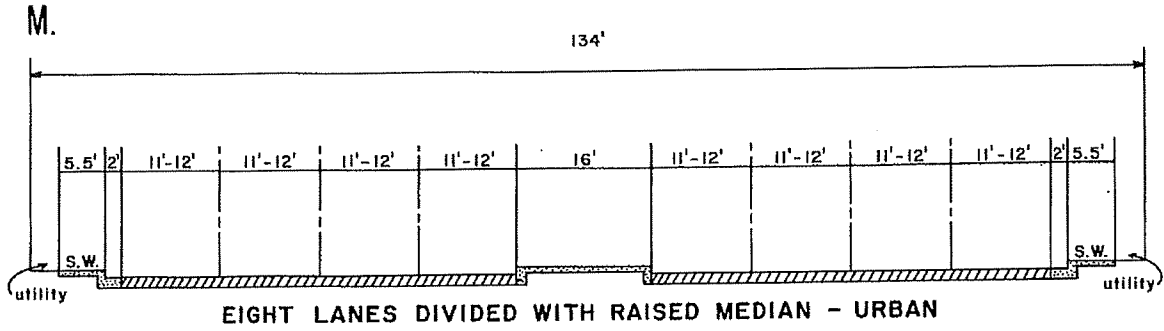


FIGURE 10

FIGURE 10

TYPICAL THOROUGHFARE CROSS SECTIONS

(CONTINUED)



APPENDIX C
THOROUGHFARE PLAN STREET TABULATION AND RECOMMENDATIONS

FACILITY & SECTION	EXISTING X - SECTION			CAPACITY CURRENT (FUTURE)	1988 ADT	2005 ADT	2015 ADT	RECOMMENDED X - SECTION	
	DIST MI	RDWY FT	ROW FT					RDWY (ULT)	ROW (ULT)
DEER ISLAND CROSSTOWN CONN.									
SR 1509 - SR 1514	1.00	-	-	(12,000)	-	1,500	2,400	(L)	(60)
SR 1514 - SR 1570	0.32	24	60	12,000	660	1,100	2,200	ADQ	ADQ
SR 1570 - W. Pineland Dr.	0.13	-	-	(12,000)	-	1,200	2,000	(L)	(60)
W. Pineland Dr. - SR 1513	0.23	22	NA	10,000	300	1,100	2,400	ADQ	ADQ
SR 1513 - Spring Drive	0.61	-	-	(12,000)	-	500	700	(L)	(60)
Spring Drive - Walnut St.	0.17	29	NA	12,000	NA	500	700	ADQ	ADQ
Walnut St. - Main St.	0.30	20	NA	7,000	NA	500	700	ADQ	ADQ
HAMMOCK BEACH RD. (SR 1511)									
From NC 24 - SR 1512	0:10	24	60	(20,000)	250	10,700	12,700	(H)	(70)
- Hammock Beach State Park	1.70	18	60	(20,000)	250	10,700	12,700	(H)	(70)
Howell Road (SR 1737)									
NC 24 - ETJ Boundary	0.61	28	60	12,000	40	90	150	ADQ	ADQ
Main Street Ext. (SR 1447)									
From NC 24 -	0.10	20	NA	(12,000)	100	1,200	3,200	(L)	(60)
- SR 1512	0.70	28	NA	(12,000)	250	1,500	3,400	(L)	(60)
SR 1512 - NC 24	0.60	16	NA	(12,000)	900	2,400	4,400	(L)	(60)
MT. PLEASANT RD. (SR 1448)									
SR 1447 - ETJ Boundary	1.10	18	60	(12,000)	800	2,500	5,000	(L)	(60)
NC 24									
SR 1434 - WCL	1.90	68	100	26,000	11,100	16,000	10,000	ADQ	ADQ
WCL - SR 1512	0.63	68	100	26,000	15,000	20,000	13,300	ADQ	ADQ
SR 1512 - Church St.	0.50	68	100	26,000	14,000	19,500	13,500	ADQ	ADQ
Church St. - Elm St.	0.22	44	100	(26,000)	15,300	19,500	13,600	(D)	(100)
Elm Street - Bridge	0.13	24	100	(26,000)	NA	NA	NA	(D)	(100)
NC 24 BYPASS	5.20	-	-	(45,000)	-	----	20,400	(G)	(100)
NORRIS ROAD (SR 1445)									
NC 24 - ETJ Boundary	0.65	18	60	(12,000)	660	2,000	4,100	(L)	ADQ
OLD HAMMOCK ROAD (SR 1512)									
SR 1447 - NC 24	0.27	16	NA	(12,000)	1,020	2,700	5,000	(L)	(60)
NC 24 -	0.15	18	NA	(14,000)	1,800	4,800	8,700	(I)	(60)
- SR 1513	0.10	18	NA	(14,000)	1,450	3,900	7,000	(I)	(60)
SR 1513 - SR 1559	0.27	18	NA	(14,000)	400	2,000	5,200	(I)	(60)
SR 1559 - SR 1511	0.61	18	NA	(14,000)	200	1,400	4,300	(I)	(60)
ADQ - ADEQUATE NA - NOT AVAILABLE									

APPENDIX D
RECOMMENDED SUBDIVISION ORDINANCES
DEFINITIONS

I. Streets and Roads:

A. Rural Roads

1. 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.
2. 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.
3. Major Collector - A road which serves major intra-county travel corridors and traffic generators and provides access to the Arterial system.
4. Minor Collector - A road which provides service to small local communities and traffic generators and provides access to the Major Collector system.
5. Local Road - A road which serves primarily to provide access to adjacent land, over relatively short distances.

B. Urban Streets

1. Major Thoroughfares - Major thoroughfares consist of Interstate, 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.
2. 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.
3. 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.

10. Frontage Road - A road that is parallel to a partial or full access controlled facility and provides access to adjacent land.
11. Alley - A strip of land, owned publicly or privately, set aside primarily for vehicular service access to the back side of properties otherwise abutting on a street.

II. Property

- A. Building Setback Line - A line parallel to the street in front of which no structure shall be erected.
- B. 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.
- C. 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".

III. Subdivision

- A. Subdivider - Any person, firm, corporation or official agent thereof, who subdivides or develops any land deemed to be a subdivision.
- B. 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; provided, however, that the following shall not be included within this definition nor subject to these regulations: (1) the combination or recombination 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; (2) the division of land into parcels greater than ten acres where no street right-of-way dedication is involved, (3) widening of opening of streets; (4) the division of a tract in single ownership whose entire area is no greater than two 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.
- C. 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.
- D. 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.

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 sixty 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 subdivided, the remainder of the full required right-of-way shall be dedicated.

B. Street Widths - Widths for street and road classifications other than local shall be as recommended by the Thoroughfare Plan. Width of local roads and streets shall be as follows:

1. Local Residential

Curb and Gutter section: 26 feet, face to face of curb
Shoulder section: 20 feet to edge of pavement, 4 foot
shoulders

2. Residential Collector

Curb and Gutter section: 34 feet, face to face of curb
Shoulder section: 20 feet to edge of pavement, 6 foot
shoulders

C. 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.

1. 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 shall be:

3. 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 following parameters:

SIGHT DISTANCE				
Design Speed	30	40	50	60
Stopping Sight Distance Minimum (ft.)	200	275	400	525
Desirable Minimum (ft.)	200	325	475	650
Minimum K* Value for:				
Crest Curve	30	80	160	310
Sag Curve	40	70	110	160

(General practice calls for vertical curves to be multiples of 50 feet. Calculated lengths shall be rounded up in each case.)

- * K is a coefficient by which the algebraic difference in grade may be multiplied to determine the length in feet 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, 1984".

4. The "Superelevation Table" below shows the maximum degree of curve and related maximum superelevation for design speeds. The maximum rate of roadway superelevation (e) for rural roads with no curb and gutter of 0.08. The maximum rate of superelevation for urban streets with curb and gutter is 0.06, with 0.04 being desirable.

of an important street.

F. 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 provision is 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 twenty (20) feet.
3. Deadend alleys shall be avoided where possible, but if unavoidable, shall be provided with adequate turnaround facilities at the deadend as may be required by the Planning Board.

G. 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.

H. Offsets To Utility Poles

Poles for overhead utilities should be located clear of roadway shoulders, preferably a minimum of at least 30 feet from 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.

I. 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.

J. Horizontal Width on Bridge Deck

1. The clear roadway widths for new and reconstructed bridges serving 2 lane, 2 way traffic should be as follows:

a. Shoulder section approach

- i. Under 800 ADT design year

Minimum 28 feet width face to face of parapets of rails or pavement width plus 10 feet, whichever is greater.