FEASIBILITY STUDY

US 70
From SR 1347 in Smyrna to SR 1384 in Atlantic
Carteret County
Transportation Improvement Program R-2305

Prepared by the
Planning and Research Branch
Division of Highways
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TABLE OF CONTENTS

		Page
I.	NEED FOR THE PROPOSED PROJECT	1
	A. Location and Type of Facility	1
	B. Historical Background	2
	C. Characteristics of the Existing Facility	2
	1. Cross-Section Description	2
	2. Right-of-Way	2
	3. Horizontal and Vertical Alignment	2
	4. Speed Limits	2
	5. Degree of Roadside Development	2
	6. Public Facilities	3
	7. Access Control	3
	8. Intersecting Roads	3
	9. Structures	3
	(a). Drainage	3
	(b). Bridges	4
	D. Project Terminals	4
	E. Traffic Data and Capacity Analysis	5
	F. Accident Analysis	5
II.	DESCRIPTION OF THE SUGGESTED IMPROVEMENTS	6
	A. General Description	6
	B. Summary of the Recommended Action	6
	1. Length of the Subject Project	6
	2. Cross-Section Description	7
	3. Right-of-Way	7
	4. Access Control	7
	5. Intersection Treatment	7
	6. Terminal Treatment	7
	7. Design Speed	7
	8. New Structures Required	7
	(a). Drainage Structures	8
	(b). Bridge Structures	8
	C. Other Programmed US 70 Projects	8
	D. Cost Estimates	8
III.	ALTERNATIVES CONSIDERED	8
IV.	POTENTIAL SOCIAL AND ENVIRONMENTAL IMPACTS	10
	A. Social Impacts	10
	B. Environmental Impacts	11

TABLE OF CONTENTS, CONTINUED

Page

V. BASIS FOR FINDINGS..... 12

MAPS AND ILLUSTRATIONS

Figure 1 - Geographic Location
Figure 2 - Photos of Existing Conditions
Figure 3 - Current and Projected Average Daily Traffic Volumes

LIST OF TABLES

TABLE NO. PAGE

1 - CAPACITY ANALYSIS 5
2 - ACCIDENT DATA 6

US 70
From SR 1347 in Smyrna to SR 1384 in Atlantic
Carteret County
Transportation Improvement Program R-2305

The subject project is included in the 1988-1996 Transportation Improvement Program for feasibility study and/or right-of-way protection. This report provides a brief analysis of possible improvements. Presently, this project is not funded. The location of the project is shown on Figure 1.

The primary emphasis of this study was to evaluate the need for widening the existing pavement and shoulders, and correcting the roadside canal encroachment along the subject segment of US 70. The total length of this project is approximately 19.3 miles.

The suggested improvements outlined in this report are desirable in order to provide safer driving conditions along the subject segment of US 70. Due to the vast amount of roadside canals, there has been a great deal of erosion along the highway's shoulders. This erosion undermines the roadway base and thus causes the pavement to deteriorate and crack. Additionally, because of the proximity of the canals to the roadway (an average distance of 8 feet from the roadside), numerous accidents occurring along this section involve motorists running-off-the-road and into the canals. Consequently correcting the canal encroachment would be advantageous.

Also, increasing amounts of traffic, especially tourists, use this portion of US 70 to reach the Cedar Island Ferry in order to travel to Ocracoke Island and the Outer Banks. Therefore, widening this facility would help provide better and safer traffic flow.

The US 70 facility, from Raleigh to Morehead City, has been selected as a Strategic Corridor route in the 1988-1996 North Carolina Transportation Improvement Program.

I. NEED FOR THE PROPOSED PROJECT

A. Location and Type of Facility

US 70 traverses eastern Carteret County in a south - north direction. In the studied area, US 70 connects the community of Smyrna with the community of Atlantic. The subject section passes through the communities of Williston, Davis, Stacy, Masontown, and Sea Level.

The section of US 70 covered in this study begins at SR 1347 in Smyrna, and ends at SR 1384 in Atlantic. The project is located entirely within Carteret County (see Figure 1). The existing facility is a two-lane, 20-foot wide paved road with 4 to 8-foot shoulders. The length of the studied section is approximately 19.3 miles.

B. Historical Background

The subject section of US 70 was constructed in 1924. During the middle to late 1970's, a major bridge construction project was conducted during which time five bridges were constructed within the subject project's limits. With the exception of resurfacing and widening, no other major improvements have occurred since that time.

The subject section of US 70 is classified as a major collector route in the North Carolina Functional Classification System. In addition, this section of US 70 is a part of the Federal-Aid Primary System, designated FAP 56.

C. Characteristics of the Existing Facility

1. Cross-section Description

The subject facility consists of two lanes with 20 feet of pavement and 4 to 8-foot grassed shoulders.

2. Right-of-Way

The existing right-of-way width along the majority of this section of US 70 is claimed as 60 to 100 feet. However, within the 1.2 mile segment before reaching NC 12, the existing right-of-way varies from 100 to 315 feet (the 315 feet of right-of-way was acquired in 1982 when the Daniel Taylor Memorial Bridge over Salter's Creek was constructed).

3. Horizontal and Vertical Alignment

Level terrain exists along the subject section of US 70. However, the fact that this segment parallels the uneven coastline contributes to a poor horizontal alignment. There are numerous curves; ranging from 4 degrees to 15-degrees, and 28 of the curves are in excess of 6-degrees. Approximately 36% of the subject section affords adequate passing sight distances of 1500 feet or more (Figures 2-A through 2-E offer Photos of the Existing Conditions along the subject segment of US 70).

4. Speed Limits

The posted speed limit along the majority of the project is 55 mph. Within Smyrna, Williston, and Davis, the posted speed limit is 45 mph, and within Stacy, the posted speed limit ranges from 35 to 45 mph.

5. Degree of Roadside Development

Roadside development is heavy throughout the communities of Smyrna, Williston, Davis, Stacy, Masontown, Sea Level, and Atlantic. They have numerous residential and commercial driveway connections which have an overall negative impact upon through-traffic.

6. Public Facilities

A summary of the existing public facilities located within the study area and adjacent to the US 70 roadway can be found on the following page.

Within Smyrna:	U. S. Smyrna Post Office Smyrna Missionary Baptist Church Eastern Park of Carteret County Crissie Wright Lodge #741
Within Williston:	Unnamed cemetery near SR 1354 Williston United Methodist Unnamed cemetery near SR 1411 U. S. Post Office of Williston
Within Davis:	Davis Original Free Will Baptist Church Davis Fire Department
Within Stacy:	Stacy Free Will Baptist Church Stacy U. S. Post Office Stacy Volunteer Fire Department
Within Sea Level:	Nelson Bay Cemetery Sea Level Hospital Sea Level Fire Department Sea Level Branch, U. S. Post Office Unnamed church Down East Worship Center Sea Level Missionary Baptist Church
Within Atlantic:	Atlantic Baptist Church Atlantic Fire Department Atlantic Baptist Community Recreation Center

7. Access Control

No control of access exists along the subject project.

8. Intersecting Roads

Along the subject section, all of the existing roads intersect US 70 at-grade with stop sign control.

9. Structures

(a). Drainage

There is one major drainage structure located within the limits of the subject project. This structure consists of a series of three, 88-foot long corrugated metal pipes. Each of these pipes is 72 inches in diameter. This structure is located approximately 1.3 miles southwest of the junction of US 70 and NC 12.

(b). Bridges

There are five bridge structures located along the studied segment of US 70. The characteristics of these structures are given on the following page:

Bridge Number 37 over Williston Creek
Year Built: 1976 Estimated
Remaining Life: 28 years
Sufficiency Rating: 80.9
Clear Roadway Width: 40.1 feet
Structure Length: 163 feet

Bridge Number 38 over Smyrna Creek
Year Built: 1977 Estimated
Remaining Life: 28 years
Sufficiency Rating: 80.9
Clear Roadway Width: 40.1 feet
Structure Length: 174 feet

Bridge Number 39 over Oyster Creek
Year Built: 1977 Estimated
Remaining Life: 33 years
Sufficiency Rating: 80.9
Clear Roadway Width: 40.1 feet
Structure Length: 363 feet

Bridge Number 41 over Maria Creek
Year Built: 1976 Estimated
Remaining Life: 28 years
Sufficiency Rating: 83.1
Clear Roadway Width: 40.1 feet
Structure Length: 163 feet

Bridge Number 45 over Salter's Creek
Year Built: 1982 Estimated
Remaining Life: 46 years
Sufficiency Rating: 77.8
Clear Roadway Width: 32.2 feet
Structure Length: 1,480 feet

D. Project Terminals

Western Terminal: The subject project begins at SR 1347 in Smyrna (see Figure 1). From this point, the US 70 facility extends westward towards Beaufort and Morehead City. The roadway consists primarily of two, 10 to 12-foot lanes of travel with 6 to 12-foot shoulders. Access along this portion of US 70 is not controlled, and the right-of-way width is shown as 100 feet.

Eastern Terminal: The subject project ends at SR 1384 in Atlantic. At this point, the US 70 facility terminates; motorists can then take the Cedar Island Ferry to travel to Ocracoke and the Outer Banks.

E. Traffic Data and Capacity Analysis

Current average daily traffic (ADT) volumes within the project limits vary from a low of 2,100 to a high of 2,800 vehicles per day. Truck traffic semi-trailer (TTST) traffic accounts for 1% of the overall ADT along US 70. Additionally, dual-tired trucks (DTT) account for an average of 2% of the overall ADT along the subject segment of US 70. The year 2008 ADT volumes are projected to vary in range from 3,700 to 5,000 vehicles per day. The existing traffic volumes as well as the 2008 projected volumes for the subject section of US 70 are shown on Figure 3.

Table 1 provides a summary of the findings of a capacity analysis that was performed based on the existing US 70 roadway.

TABLE 1

CAPACITY ANALYSIS

YEAR	PEAK HOUR VOLUMES *	AVERAGE COMPUTED LEVEL OF SERVICE
1988	282	C
2008	501	D

* Measured in Vehicles Per Hour (VPH); Total, Both Directions, 60/40 Directional Distribution Assumed.

The results shown above indicate that the subject section of US 70 is currently operating in the level-of-service C range during daily peak periods. The level-of-service C is in the range of stable flow, but marks the beginning of flow in which the operation of individual motorists becomes significantly affected by interactions with other vehicles in the traffic stream. The selection of speed is affected by the presence of these other vehicles, and maneuvering within the stream requires substantial effort on the part of the user.

Further review of the results in Table 1 show that, by the year 2008, the subject section of US 70 will be operating in the level of service D range during daily peak periods. This level-of-service represents high-density, but stable flow. Speed and freedom to maneuver are severely restricted, and the driver experiences a generally poor level of comfort and convenience. Small increases in traffic flow will generally cause operational problems at this level.

F. Accident Analysis

An accident study of the subject segments of US 70 was conducted by the Traffic Engineering Branch of the Division of Highways for the period from January 1, 1984 to November 30, 1987. The results of the study are summarized in Table 2 on the following page.

TABLE 2

ACCIDENT DATA

	SUBJECT SECTION OF US 70	STATEWIDE AVERAGES FOR SIMILAR RURAL US ROUTES (1984-1987)
TOTAL ACCIDENTS	123	N/A
FATAL ACCIDENTS	3	N/A
NON-FATAL INJURY ACCIDENTS	53	N/A
TOTAL ACCIDENT RATE *	262.65	200.13
FATAL ACCIDENT RATE *	6.41	3.85
NON-FATAL INJURY ACCIDENT RATE *	113.18	92.75

* MEASURED IN ACCIDENTS/100 MILLION VEHICLE MILES

A review of the data reveals that approximately 60-percent (74) of the accidents involved vehicles running-off-the road. Additionally, approximately 40-percent (49) of the accidents involved vehicles running-off-the-road and into the adjacent canals. The recommended improvements should reduce the number of these types of accidents as well as improve the overall safety of the highway.

II. DESCRIPTION OF THE SUGGESTED IMPROVEMENTS

A. General Description

The primary purpose of this study was to investigate the feasibility of upgrading the subject section of US 70 to modern two-lane standards and reducing the encroachment of the nearby canals. The following is a brief summary of the suggested improvements for the subject section of US 70:

1) Along the majority of the subject section, the existing pavement is proposed to be widened to a modern two-lane, 28-foot wide pavement with 6 to 8-foot grassed shoulders. The existing pavement would be resurfaced and guardrail would be placed at various locations.

   Consideration should be given to redesigning the intersections of US 70 and SR 1347, US 70/SR 1353/SR 1368 in Davis, and US 70 and NC 12 in order to provide safer alignments at these locations. The scope of the improvements should include re-alignment, and additional signing, signalization, and channelization. However, further study would be needed to determine the exact improvements to be made at this location.

B. Summary of the Recommended Action

1. Length of the Subject Project

The project, as proposed, is 19.3 miles in length.

2. Cross-Section Description

A cross-section consisting of 28 feet of pavement with 6 to 8-foot grassed shoulders is proposed for the subject project.

3. Right-of-Way

In general, it is anticipated that a total of 100 feet of right-of-way width would be required to contain the proposed improvements. Additionally, approximately 12 acres of land would be required in order to perform the anticipated on-site wetland mitigation measures.

4. Access Control

No control of access is proposed for this project.

5. Intersection Treatment

All roads intersecting US 70 would remain at-grade with either stop sign or traffic signal control. Consideration should be given to including improvements to the following intersections located along the project:

INTERSECTION	SUGGESTED IMPROVEMENT
SR 1347 and US 70 (Smyrna, beginning of project)	Redesign the intersection and add a traffic signal.
US 70, SR 1353, and SR 1368 (community of Davis)	Redesign the intersection and add channelization and signing.
The junction of US 70 and NC 12	Redesign to provide better tie-in to US 70.

6. Terminal Treatment

Western Terminal: The subject project begins at SR 1347 in Smyrna. From this point, the US 70 facility extends westward towards Beaufort and Morehead City. There are no major improvements currently programmed for this portion of US 70.

Eastern Terminal: The subject project ends at SR 1384 in Atlantic. At this point, the US 70 facility terminates; motorists can then take the Cedar Island Ferry to travel to Ocracoke and the Outer Banks.

7. Design Speed

The utilization of a 60 mph design speed throughout the length of the subject project is proposed.

8. New Structures Required

(a). Drainage Structures

It is anticipated that the majority of the existing metal pipes used for cross-drainage would be replaced during project construction.

(b). Bridge Structures

The construction of new bridge structures would not be required for the subject project. Additionally, it is not anticipated that any existing structures would require rehabilitation in conjunction with the project.

C. Other Programmed US 70 Projects

Presently, there are no other programmed projects listed in the North Carolina Transportation Improvement Program for the subject section of US 70.

D. Cost Estimates

The estimated costs of the proposed improvements are as following:

Construction	$17,032,000
Right-of-Way	$ 8,390,000
Wetland Mitigation	$ 876,000
Total	$26,298,000

The right-of-way estimates are based on residential and business relocation costs, cost of land and damages, utility costs, and acquisition costs.

III. ALTERNATIVES CONSIDERED

Improving the existing highway corridor offers the most feasible and cost effective recommendation. The concept of relocating US 70 was considered; however, it was determined that the general area of the subject project does not afford a corridor that would be deemed conducive for relocating US 70. Thus, this measure was not given further consideration.

Coordination between the Planning and Research Branch and the 2nd Division Engineer revealed that the existing canals, which closely parallel US 70 throughout the majority of the subject project, cause erosion of the shoulders and undermine the pavement foundation. The Division Engineer is also very concerned about the high number of accidents involving motorist running into the nearby canals. Consequently, in light of these conditions, four alternatives for correcting the existing canal encroachment were investigated by the Hydraulics Unit of the NCDOT.

Widening the existing pavement to 28 feet and providing 6 to 8-foot minimum usable shoulders along the project would result in an impact to the roadside canals for approximately 8.5 miles of the project length (44% of the project). The extent of the impact varies with each design alternative. The following is a description of each alternative, the costs involved with each one, and the anticipated environmental impact each would have upon the adjacent wetlands.

Alternative 1

This alternative involves the placement of approximately 2 feet of fill material in the adjacent canals, constructing retaining walls (wooden piles with timber panels), and placing guardrail in front of the retaining walls. The estimated cost of constructing the retaining walls, installing the guardrail, and acquiring the borrow material for the required fill placement is $2,867,000, and the overall total estimated cost of the project would be $26,933,000 ($17,667,000 for construction, $8,390,000 for right-of-way, $876,000 for wetland mitigation). Of the four alternatives investigated, this alternative would result in the least amount of encroachment into the canals (approximately 2 feet), and total loss of surface water area (approximately 2 acres). With this alternative, none of the adjacent wetland areas would have to be relocated.

Alternative 2

This alternative involves the placement of "select" (Class I) fill material into the adjacent wetlands and installing guardrail. No retaining walls would be constructed with this option. This alternative would result in approximately 15 feet of encroachment into the adjacent wetlands which would necessitate an equivalent amount of widening of the canals. The estimated cost of the select fill material, guardrail installation, excavation for the canal widening, and seeding (including marsh grass) is $2,628,000, and the overall total estimated cost of the project would be $26,694,000 ($17,428,000 for construction, $8,390,000 for right-of-way, $876,000 for wetland mitigation). This alternative would result in the loss of approximately 15 acres of surface water area.

Alternative 3 (Preliminary Recommendation)

This alternative is identical to Alternative 2 except that rock fill material would be used instead of the select fill material. Encroachment into the existing canals, the corresponding excavation for channel widening, and the loss in water surface area are slightly reduced from Alternative 2. The total cost of this alternative (guard rail installation, rock fill, and channel excavation) is $2,232,000, and the overall total estimated cost of the project would be $26,298,000 ($17,032,000 for construction, $8,390,000 for right-of-way, $876,000 for wetland mitigation). This alternative would result in the loss of approximately 12 acres of surface water area.

Alternative 4

Alternative 4 involves placing Class I fill material into the canals but guardrail would not be installed. Based upon the minimum roadway design standards, this alternative would involve either:

(1). Constructing a minimum six-foot shoulder on a 1/2" per foot slope, a 14-foot usable shoulder on a 4 to 1 slope, and remaining fill on a 2 to 1 slope, or

(2). Constructing a minimum six-foot shoulder on a 1/2" per foot slope, a 10-foot section on a 2 1/2 to 1 slope, a 14-foot section on a 1/2" per foot slope, and the remaining fill on a 2 to 1 slope.

Both items 1 and 2 of Alternative 4 would result in greater encroachment into the adjacent canals, greater channel excavation to offset the encroachment, and a greater loss of surface water than with Alternatives 1, 2, or 3. The total construction cost for items 1 and 2 are $2,773,000 and $3,777,000 (excavation and fill material), respectively. Total estimated costs for Alternatives 4-1 and 4-2 would be $26,839,000 and $27,843,000, respectively. Constructing Alternative 4 in conjunction with item 1 would result in the loss of approximately 23 acres of surface water area, and constructing Alternative 4 in conjunction with item 2 would take approximately 30 acres of surface water area.

Recommended Action

A cost comparison of the four alternatives along with their anticipated future maintenance costs indicates that Alternatives 1 and 3 provide the most economically feasible and least environmentally damaging methods for correcting the canal encroachment. Both of these alternatives, however, have their advantages and disadvantages. Alternative 1 is more costly ($635,000), and, since it is not as maintenance-free as Alternative 3 (due to future deterioration of retaining walls) it would have a higher maintenance cost than Alternative 3. However, Alternative 1 would result in less environmental impact than Alternative 3. Alternative 3 is more economical, in terms of both construction and future maintenance (rock fill is relatively maintenance-free), but it would require canal relocation which results in approximately 12 acres of wetland takings. However, it is anticipated that this wetland loss can be mitigated at a lesser cost than the cost difference (including construction and maintenance) between the two alternatives. Therefore, the NCDOT recommends correcting the existing canal encroachment problems by utilizing Alternative 3.

Please note that if the project is to be implemented at a future date, all possible alternatives, and their associated impacts, will have to be evaluated in a planning/environmental document prior to that time. Then, a final decision can be made as to the most appropriate improvements.

IV. POTENTIAL SOCIAL AND ENVIRONMENTAL IMPACTS

A. Social Impacts

No adverse social impacts are foreseen as a result of the project. Minor amounts of right-of-way would be required in the more densely populated areas of the project, consequently some residents and/or businesses may be displaced. However, for any residents and businesses

that may have to relocate, the Relocation Assistance Program of the Division of Highways would be available for them. The suggested improvements should provide a safer US 70 facility.

B. Environmental Impacts

The subject project is projected to have a substantial impact upon the area's wetlands and wetland habitat. Approximately 12 acres of wetlands would be lost as a result of implementing the proposed improvements. These wetlands are of the highest quality found in North Carolina, and it is the NCDOT's opinion that the U. S. Fish and Wildlife Service (the agency responsible for monitoring the nation's wetlands) would ask for the preparation of an Environmental Impact Statement for the project, with provisions in the document for "on-site, 1 for 1 wetland creation" as minimum mitigation for the wetland takings and potential run-off into sensitive shellfish waters. The estimated cost of the land needed for the wetland mitigation would be approximately $600,000, and the cost of the actual creation work (i.e., land preparation, plantings, etc.) would cost approximately $276,000 ($23,000/acre). Therefore, the total estimated cost for wetland mitigation is $876,000. The cost of the on-site mitigation measures has been reflected in the cost estimates given earlier in this document.

The following watercourses, or their tributaries, can be found in the project study area:

Brett Bay
Broad Creek
Fork Creek
Fulchers' Creek
Howland Creek
Jarrett Bay
Lewis Creek
Maria Creek
Midden's Creek
Nelson Bay
Oyster Creek
Pasture Creek
Smyrna Creek
Wade Creek
Willis Creek
Williston Creek

All of these watercourses are designated shellfishing waters.

The terrain in the vicinity of the project is relatively flat with poor drainage characteristics. Most of the cross-drainage structures serve the canals and marsh lands located alongside the subject roadway. Existing drainage patterns along the project length and ground water in developed areas would not be significantly affected by the project. Due to the anticipated loss of wetlands, it is anticipated that environmental permits would have to be secured from various environmental agencies. Siltation into adjacent areas due to project construction would be kept to a minimum with the use and maintenance of standard erosion control devices and measures.

Carteret County is a participant in the National Flood Insurance Regular Program. The proposed widening would not have any significant effect on the 100-or 500-year floodplains. The floodplains in the area of the project are mostly rural and marshlands.

In order to implement the project, the NCDOT would have to obtain Section 404 (of the Clean Water Act) permits from the U. S. Army Corps of Engineers, as well as Coastal Area Management Act permits from the Office of Coastal Management.

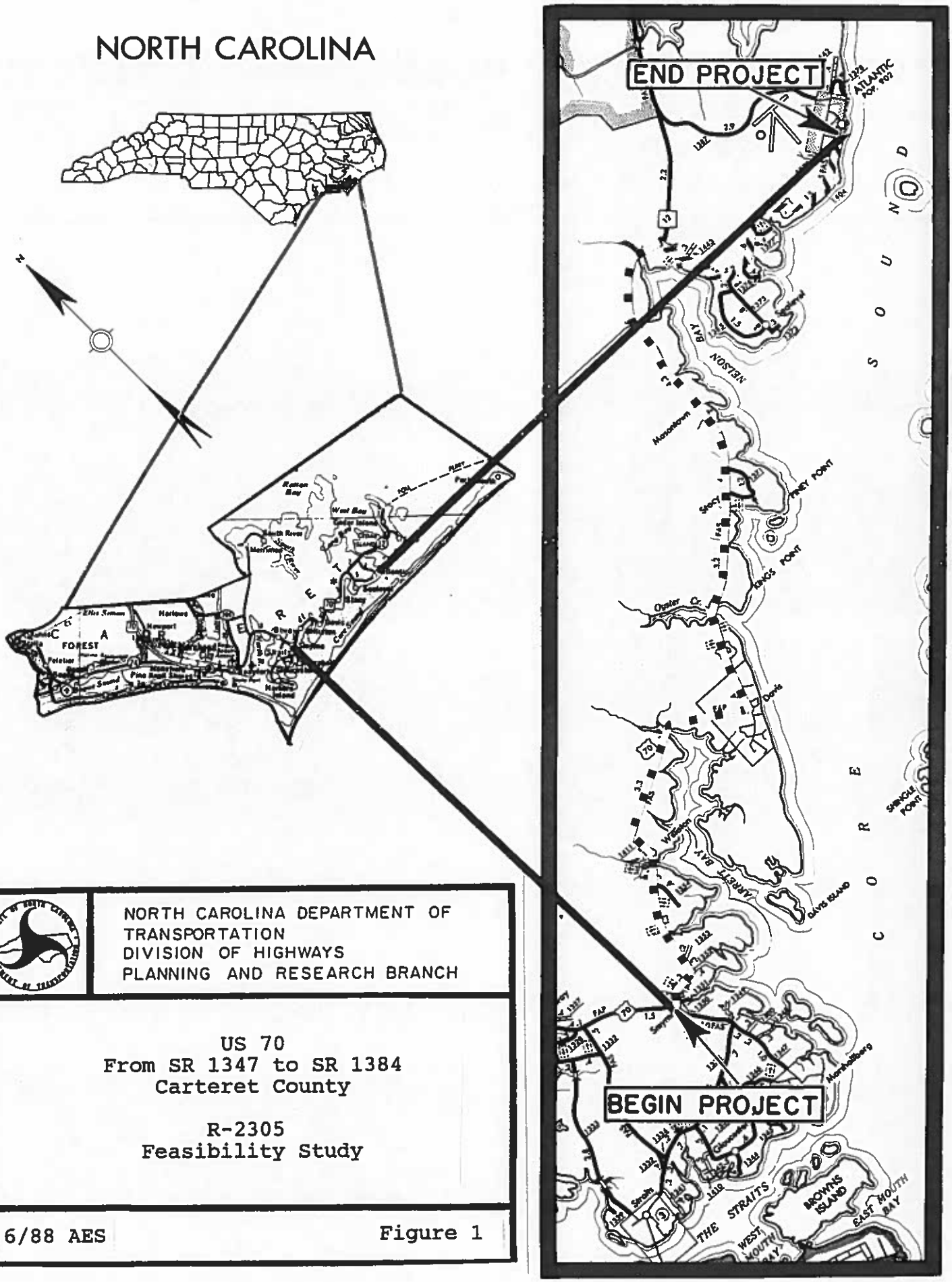
Additionally, the project is located within the known geographical ranges of the American alligator (Alligator mississippiiensis), and the rough-leaved loosestrife (Lysimachia asperulaefolia). The American alligator is listed as a threatened and/or endangered species by the U. S. Fish and Wildlife Service (USFWS). The rough-leaved loosestrife is proposed to be added to the USFWS's endangered species list.

V. BASIS FOR FINDINGS

The recommendations contained in this report were based on the following:

1. Field Investigations
2. Correspondences with the Board of Transportation Member
3. Correspondences with the Division Engineer
4. Aerial Mosaic dated June, 1988
5. Studies conducted by Mr. A. M. Rahmani of the NCDOT Hydraulics Unit
6. Cost estimates provided by the Right-of-Way Branch and the Design Services Unit

TVS/plr



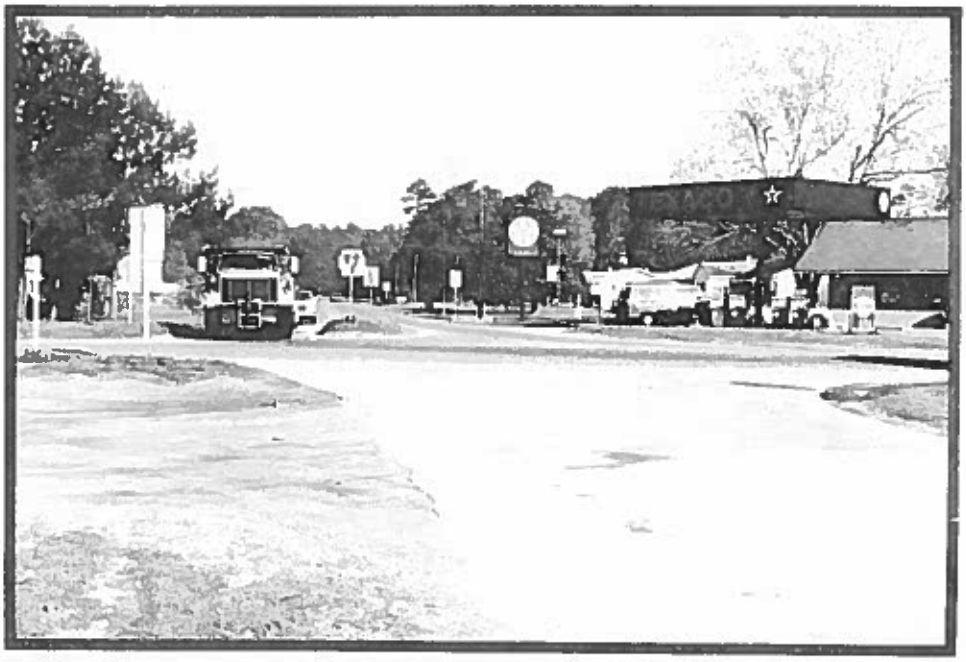
NORTH CAROLINA DEPARTMENT OF
TRANSPORTATION
DIVISION OF HIGHWAYS
PLANNING AND RESEARCH BRANCH

US 70
From SR 1347 to SR 1384
Carteret County

R-2305
Feasibility Study

6/88 AES

Figure 1



LOOKING WEST TOWARDS US 70\SR 1347\SR 1350 INTERSECTION (BEGINNING OF PROJECT)

LOOKING NORTH TOWARDS US 70\SR 1347\SR 1350 INTERSECTION

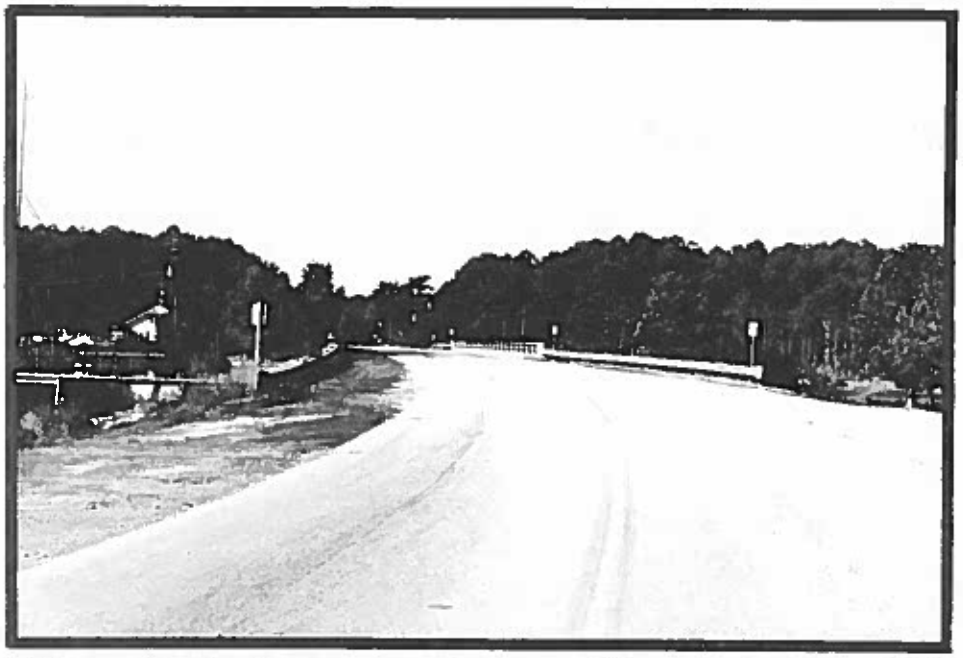
LOOKING SOUTH (WEST) NEAR SMYRNA

NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
DIVISION OF HIGHWAYS
PLANNING AND RESEARCH BRANCH

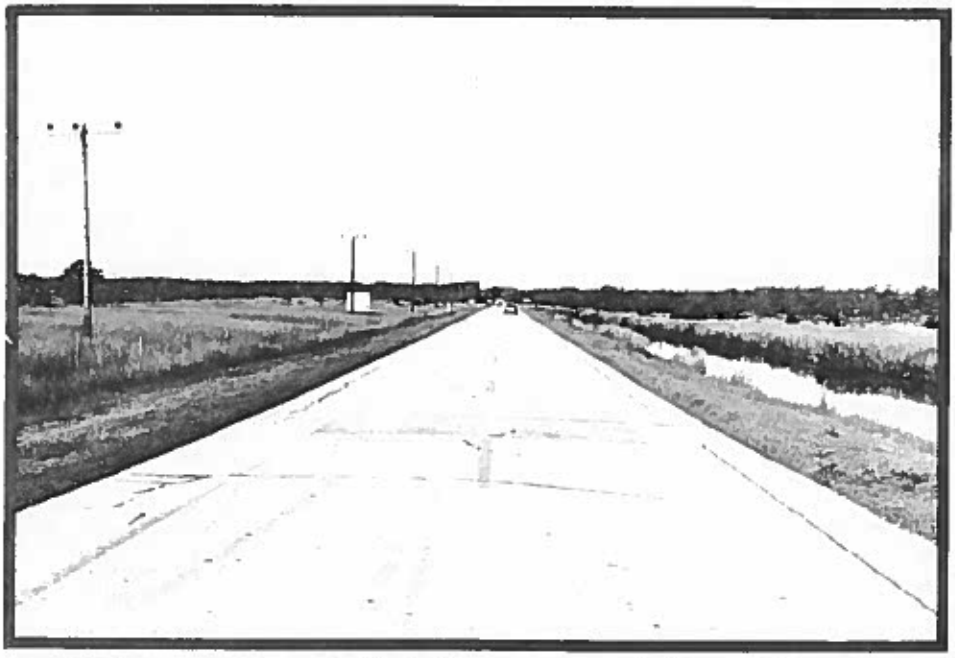
Photos of Existing Conditions
Along US 70

Project R-2305
Feasibility Study

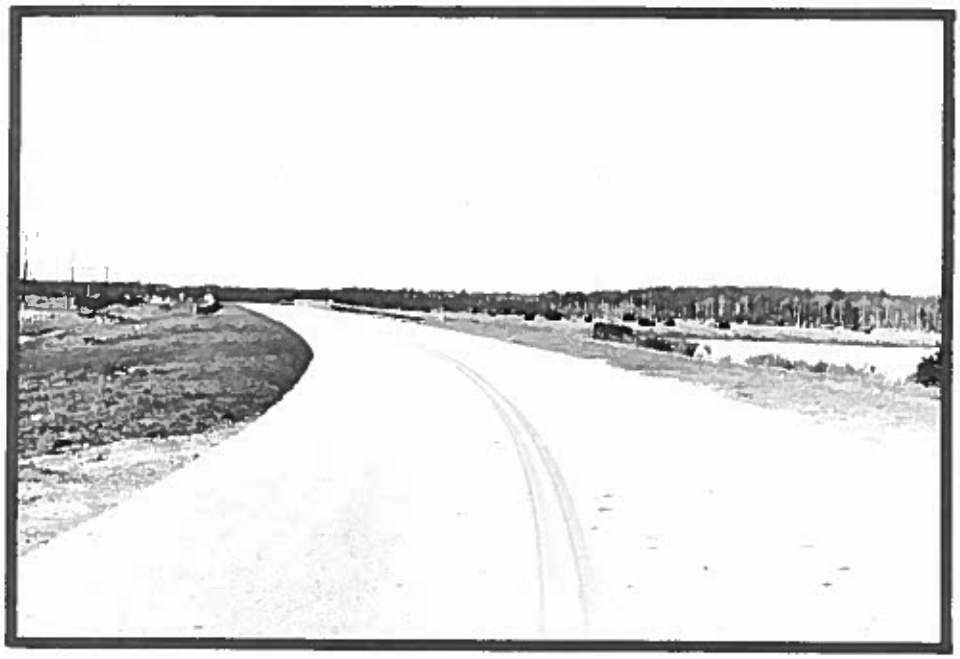
8/88 AES Figure 2-A



LOOKING SOUTH TOWARDS
WILLISTON CREEK BRIDGE



TYPICAL SECTION BETWEEN
WILLISTON CREEK AND
JARRETT BAY



LOOKING SOUTH TOWARDS
SMYRNA CREEK BRIDGE

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PLANNING AND RESEARCH BRANCH

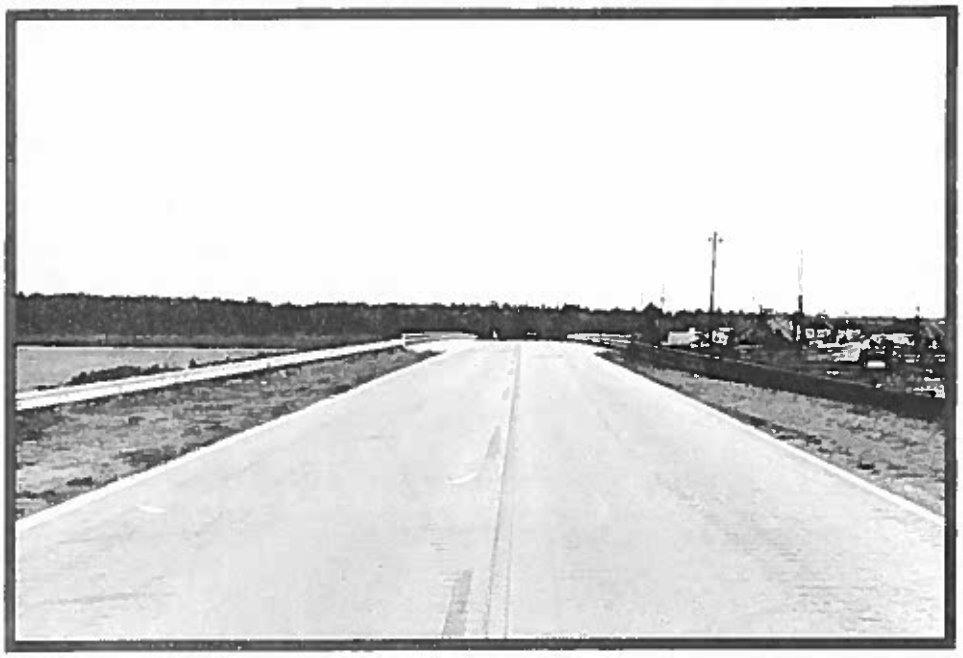
Photos of Existing Conditions
Along US 70

Project R-2305
Feasibility Study

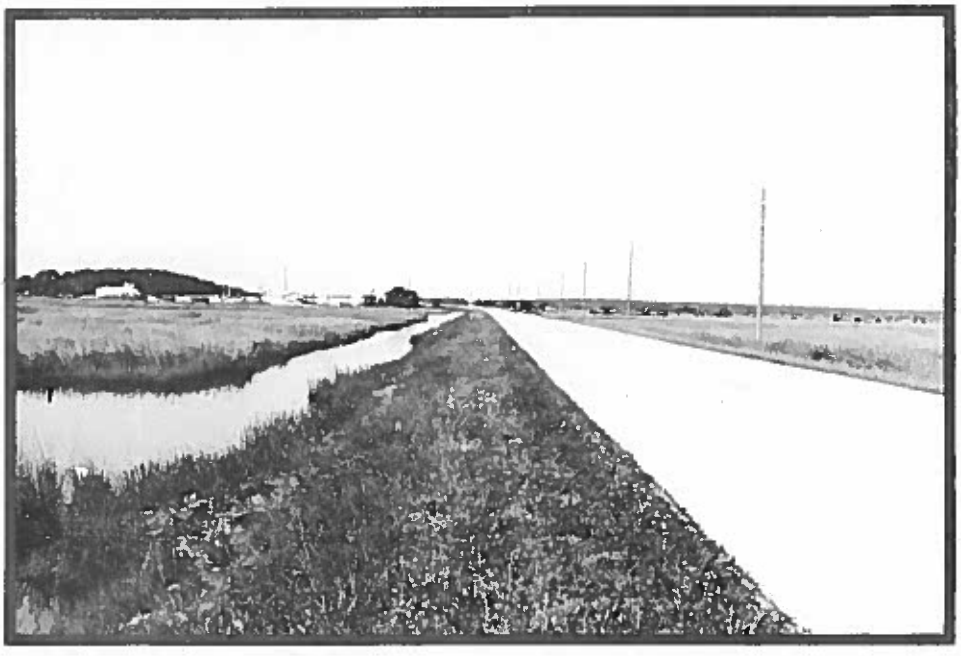
8/88 AES

Figure 2-8

LOOKING SOUTHWEST TOWARDS US 70\SR 1368\SR 1363 INTERSECTION



LOOKING NORTHEAST TOWARDS OYSTER CREEK BRIDGE



TYPICAL SECTION NORTHEAST OF OYSTER CREEK

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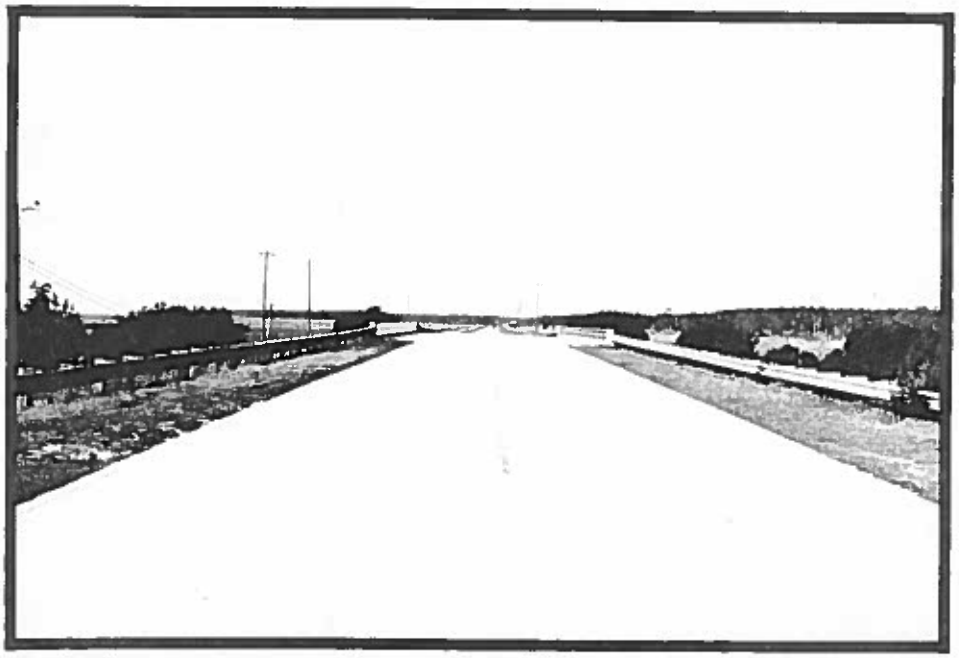
PLANNING AND RESEARCH BRANCH

Photos of Existing Conditions
Along US 70

Project R-2305
Feasibility Study

8/88 AES Figure 2-C

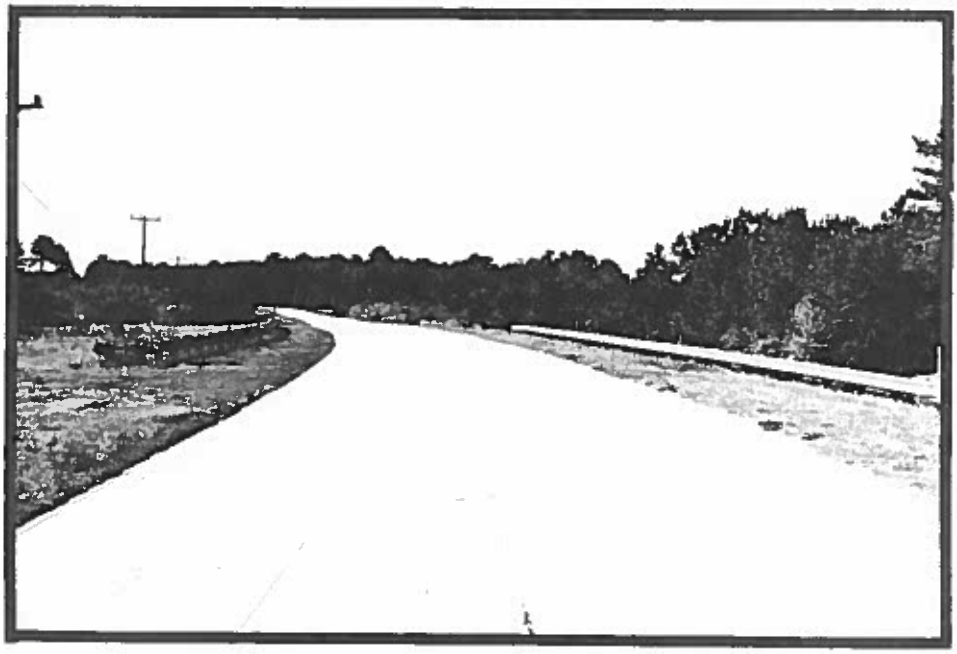


LOOKING SOUTHWEST

TOWARDS MARIA CREEK

LOOKING NORTHEAST

INSIDE STACY



LOOKING SOUTHWEST TOWARDS

CANAL CROSSING

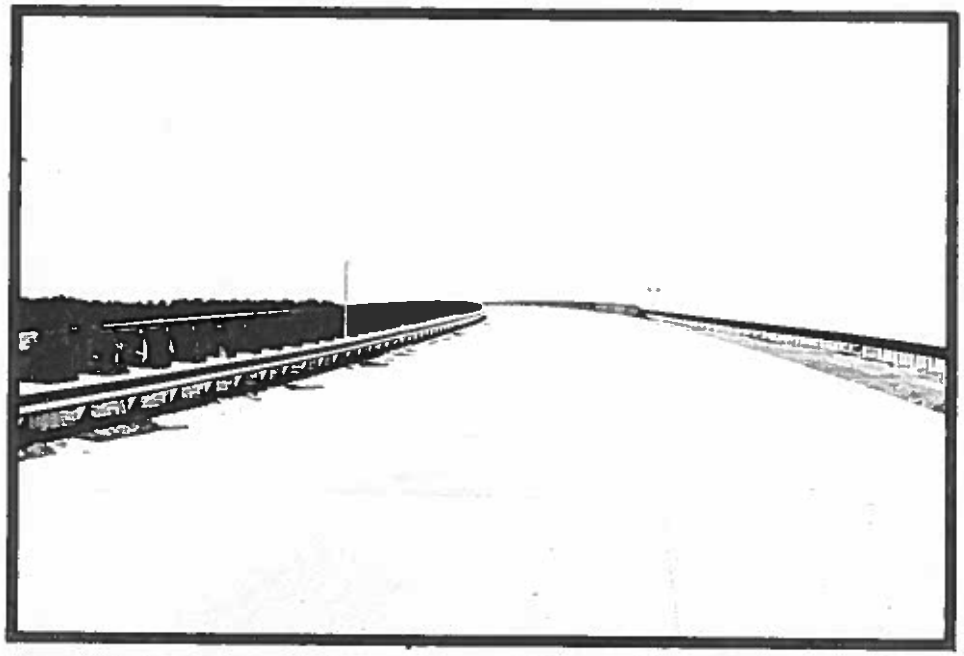
NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
DIVISION OF HIGHWAYS
PLANNING AND RESEARCH BRANCH

Photos of Existing Conditions
Along US 70

Project R-2305
Feasibility Study

8/88 AES

Figure 2-D



LOOKING SOUTH TOWARDS THE DANIEL TAYLOR BRIDGE OVER SALTERS CREEK

LOOKING EAST TOWARDS US 70\NC 12 JUNCTION

LOOKING NORTHEAST TOWARDS MORRIS DRIVE (SR 1384) INTERSECTION IN ATLANTIC (END OF PROJECT)

NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
DIVISION OF HIGHWAYS
PLANNING AND RESEARCH BRANCH

Photos of Existing Conditions
Along US 70

Project R-2305
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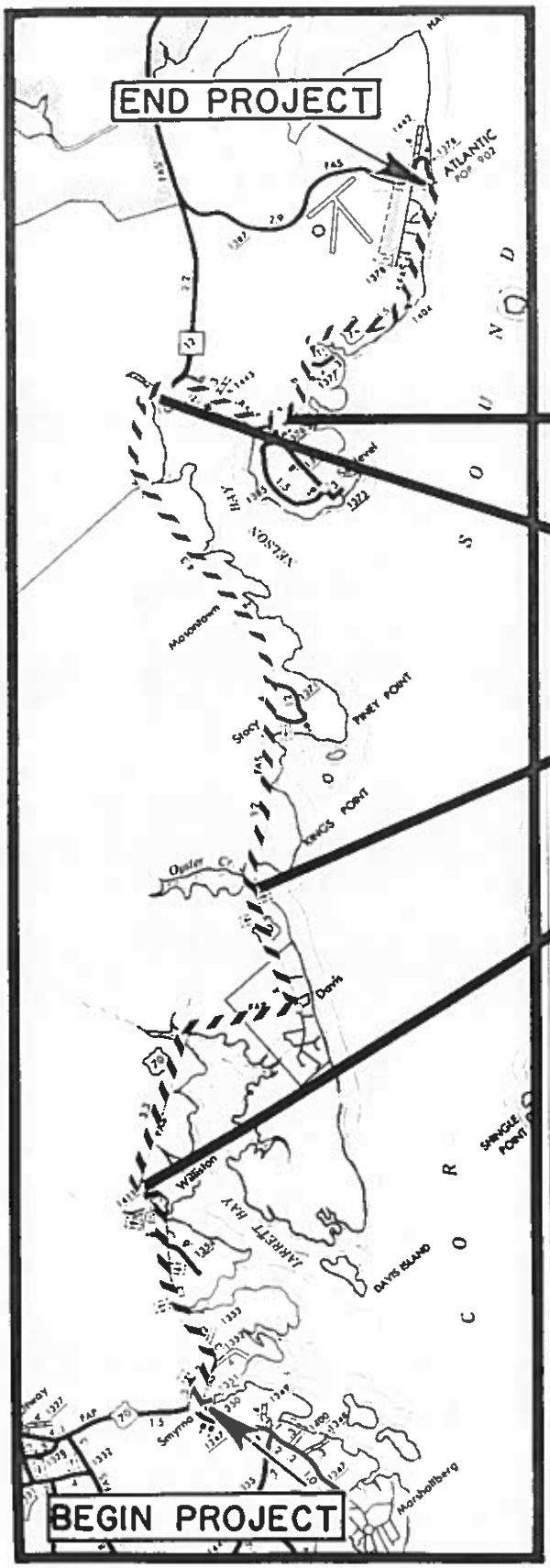
8/88 AES

Figure 2-E



Current and Projected Average Daily Traffic Volumes

LEGEND
1988 ADT
2008 ADT

2,100	3,700
2,100	3,700
2,800	5,000
2,400	4,300

TTST - 1%
DUAL - 2%
DHV - 12%

N

NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
DIVISION OF HIGHWAYS
PLANNING AND RESEARCH BRANCH

US 70
FROM SR 1347 TO SR 1384
CARTERET COUNTY

R-2305
FEASIBILITY STUDY

7/88 AES		FIGURE 3