

CRAVEN COUNTY

CRAVEN COUNTY, NORTH CAROLINA

HURRICANE EVACUATION, HAZARD MITIGATION

AND

POST-DISASTER RECONSTRUCTION PLAN

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North Carolina Coastal Zone Management Program*

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prepared by

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I. INTRODUCTION

The North Carolina Coastal Resources Commission has adopted rules for "Storm Hazard Planning" which require the incorporation of such a planning program into the land use plans that local coastal communities are required to prepare.

The Commission's rules are designed to implement a storm hazard planning process that is outlined in Before the Storm: Managing Development to Reduce Hurricane Damages. That publication was prepared for the Office of Coastal Management of the Department of Natural Resources and Community Development. The main components of a storm hazard planning process are evacuation, hazard mitigation and post disaster reconstruction.

The objective of this report is to present storm hazard evacuation, mitigation and post disaster reconstruction plans for Craven County which 1) meet the specific needs of the County, and 2) conform with the State rules for storm hazard planning.

Craven County is a coastal county that is located inland with no direct ocean frontage. The County is bordered by Beaufort, Pitt and Lenoir Counties to the north and west, Jones and Carteret Counties to the south, and Pamlico County to the east. Elevation within the County ranges from sea level to about 50 feet and the topography tends to be flat to gently sloping or undulating. The county encompasses approximately 725 square miles and is roughly divided into two sections, a northern portion on both sides of the Neuse River northwest of New Bern and a southern portion south of the Trent River that includes the shore of the Neuse River estuary and the Croatan National Forest. The county has a total population of over 72,000. The two major population centers are New Bern with about 30,000 and the Havelock-Cherry Point area with about 15,000. Most of the remaining population is distributed in and around small towns in the northern portion of the county. These include Vanceboro, Dover, Cove City and Fort Barnwell.

The remainder of this report describes Craven County's storm hazard planning program. Chapter II presents the County's Storm Hazard Mitigation Plan. Chapter III presents Craven County's Post Disaster Reconstruction Plan. Finally, in Chapter IV, ways in which the County can improve and strengthen its Hurricane Evacuation Plan are presented.

II. CRAVEN COUNTY HURRICANE HAZARD MITIGATION PLAN

A. EXISTING DEVELOPMENT

Craven County is sparsely populated. The 1980 census population was 71,043, with the majority (about 80%) concentrated in a narrow corridor between River Bend and Havelock. This corridor varies between 1 and 4 miles in width. The County's population increased by 13.6% between 1970 and 1980. The Craven County Land Use Plan forecasts that the County's population will increase by another 11 to 12% by 1990. Table 1 summarizes projected County growth by County township. Township locations are shown in Figure 1.

As can be seen from Table 1, the County's population is and will continue to be concentrated in Township #6 (Havelock) and in Township #8 (New Bern, Trent Woods and River Bend). The two other townships likely to experience significant growth are Township #2 (primarily attributable to the Fairfield Harbour development) and Township #7 because of its location between Havelock and New Bern, and the anticipated installation of central public water and sewer systems by Craven County).

Table 1
CRAVEN COUNTY POPULATION GROWTH

TOWNSHIP	POPULATION			
	1970	1980	1990 (PROJECTED)	% INCREASE 1970-1990
#1	4946	5359	6018	22
#2	3257	4414	4830	48
#3	3837	3803	3167	(21)
#5	2047	2551	3009	47
#6	20798	21963	25495	23
#7	4757	6149	7601	60
#8	21125	24645	27237	29
#9	1787	2159	2375	33
COUNTY TOTAL	62554	71043	79178	27

Table 2 presents a summary of Craven County housing data based on 1980 census information. A number of important observations can be made based on the information shown in Table 2.

- o Mobile homes are scattered throughout all areas of the County and constitute about 15% of the County's total housing stock.

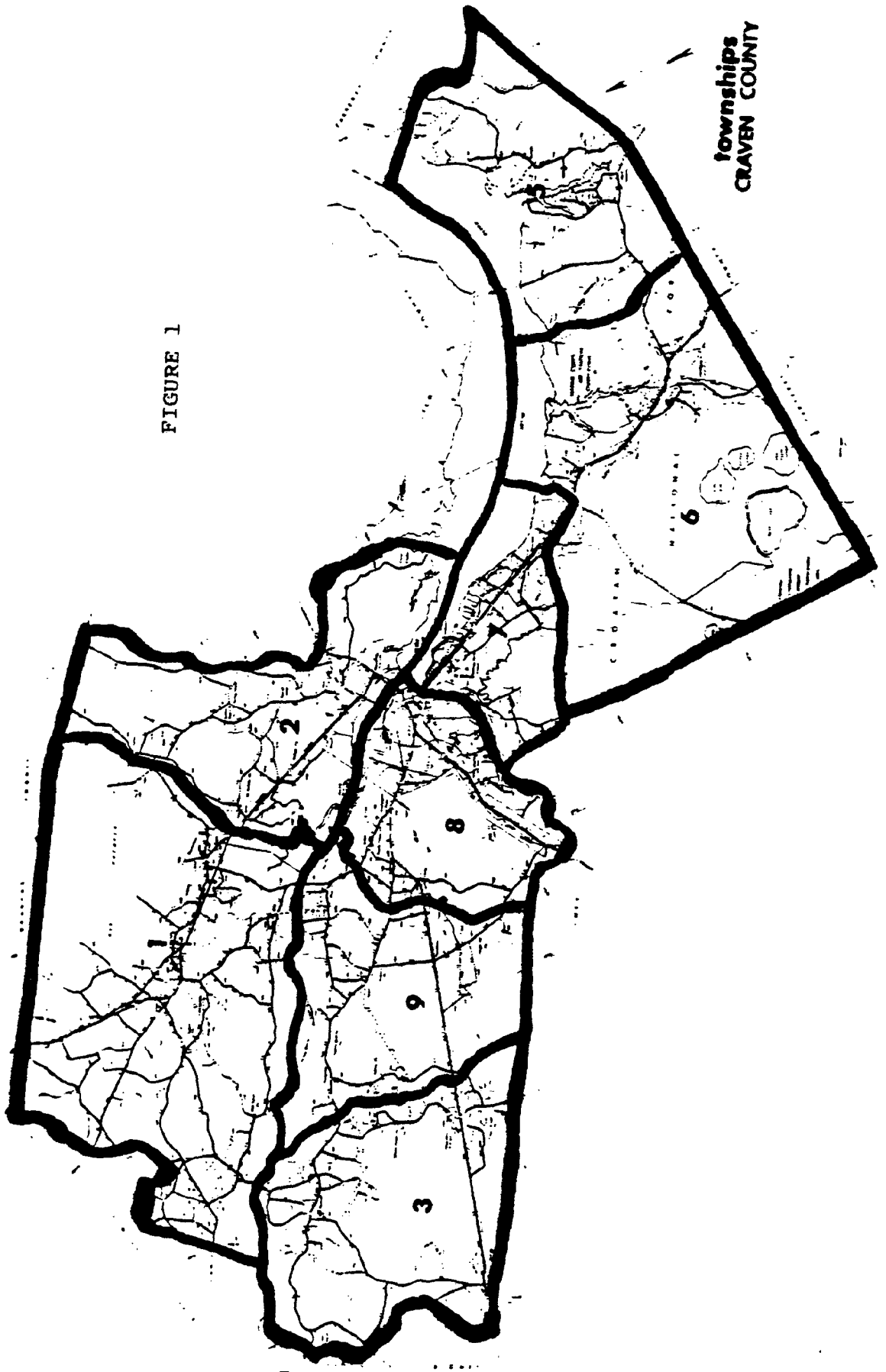


FIGURE 1

- o Outside of the urban concentrations in Townships 6 and 8, mobile homes constitute about 28% of the County's housing stock. Such housing is more susceptible to storm damage than is conventional housing.
- o Township #6 is the only township with a significant percentage of rental housing. This can be attributed to the large number of military personnel stationed at Cherry Point.

Figure 2 illustrates the location of recent residential developments (over the last 2 to 3 years) within the County. It should be noted that the vast majority of this new development is occurring in areas immediately adjacent to the Neuse and Trent Rivers in areas potentially susceptible to flooding.

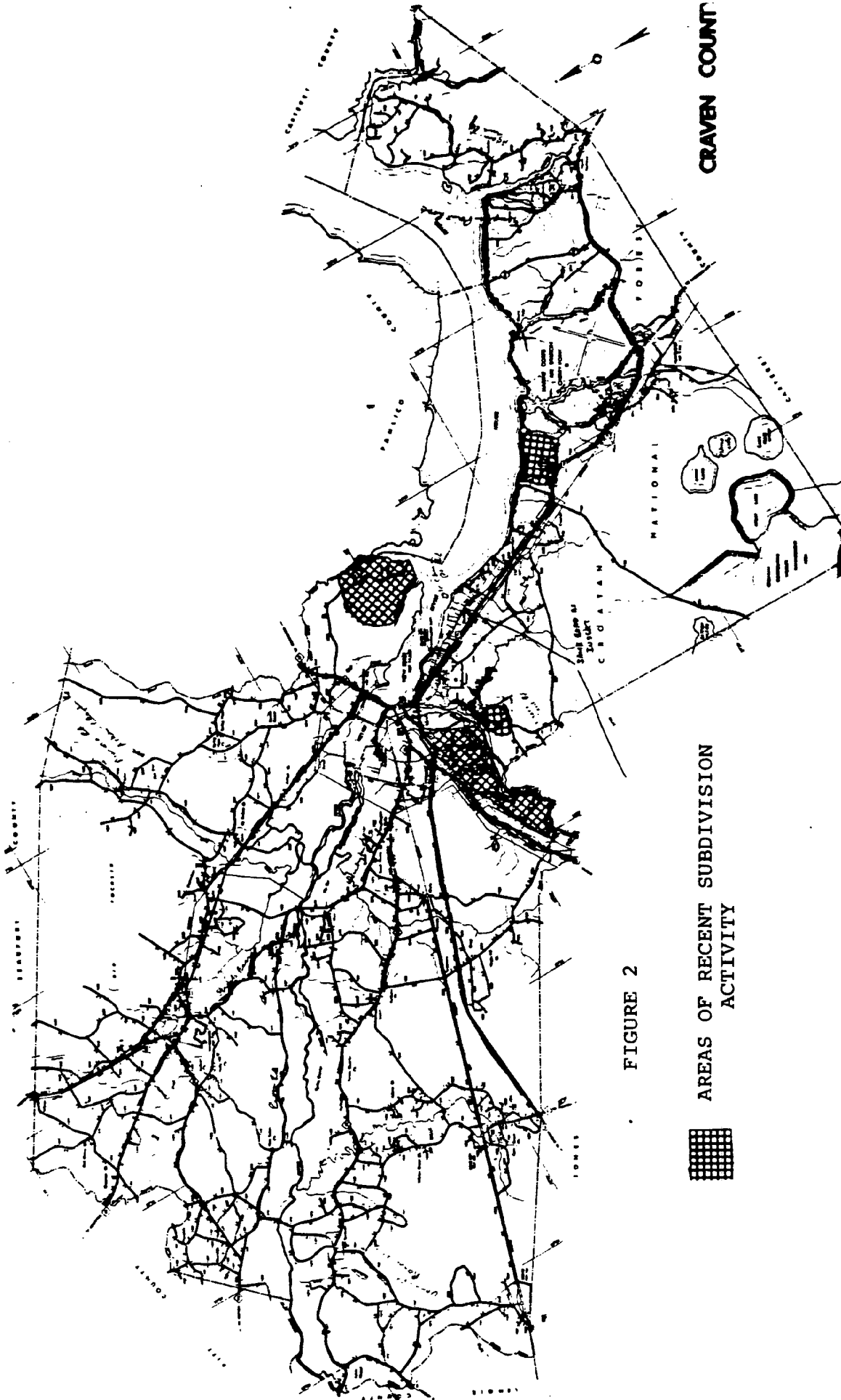
Commercial establishments within the County are concentrated in the City of New Bern and in Havelock. Based on the latest available census information, about 74% of the total retail establishments in the County were located in these two municipalities (60% in New Bern and 14% in Havelock). Other retail establishments are located in Bridgeton, Vanceboro, Trent Woods and on major highways in unincorporated areas of the County.

TABLE 2
CRAVEN COUNTY HOUSING - 1980

TOWNSHIP	OCCUPIED UNITS	% RENTER OCCUPIED	MOBILE HOME UNITS	% MOBILE HOMES	MEDIAN VALUE
1	1851	21	384	21	25800
2	1671	24	520	32	31300
3	1310	28	215	16	23000
5	712	21	187	26	21400
6	5829	61	782	15	43900
7	2219	23	548	25	38000
8	9952	34	706	7	40900
9	705	19	189	27	32600

B. HAZARD AREAS IN CRAVEN COUNTY

Craven County's major population concentrations are located 20 to 30 miles inland from the ocean shoreline. Consequently, hurricane related damages are likely to be primarily of two types -- flooding associated with various storm events and wind damage. Following is a discussion of the specific hazard areas located within the County.



1. Areas of Environmental Concern (AEC)

The Coastal Resources Commission has identified four categories of AECs: the estuarine system; ocean hazard areas; public water supplies; and natural and cultural resource areas. Within these critical areas, a state/local permit system is utilized to control development that is potentially damaging to property, the public health and/or the natural environment.

Within Craven County, the primary AEC is the estuarine system which consists of coastal wetlands, estuarine waters, public trust areas and estuarine shorelines.

Coastal wetlands are defined as any salt marsh subject to regular or occasional flooding by tides, including wind tides but not hurricane or tropical storm tides. Estuarine waters are defined as commercial fishing waters and in Craven County are composed of major parts of the Neuse and Trent Rivers and their tributaries. Public Trust waters are defined as all navigable waterways to which the public has access. Public trust waters overlap estuarine waters but also extend upstream to the limits of navigation.

Only water dependent uses are permitted within coastal wetlands, estuarine waters and public trust waters. These uses include channels, erosion control structures, boat docks, marinas, piers, and wharfs. Non-water dependent uses such as residences, commercial structures, trailer parks and parking areas are prohibited.

Estuarine shorelines are defined as non-ocean shorelines which are especially vulnerable to erosion, flooding, or other adverse effects of wind and water and are intimately connected to the estuary. The estuarine shoreline encompasses the area landward along the estuaries, bays, sounds and other brackish waters for a distance of 75 feet from the mean high water level. There are no specific use restrictions within estuarine shoreline areas. The prime requirement is that all development substantially preserve natural barriers to erosion.

2. Flood Hazard Areas

Significant portions of Craven County are contained within the 100 year flood plains of the Neuse and Trent rivers. There are no 'V' zones (flood prone areas that are also susceptible to high velocity wave surges) within Craven County.

The Federal Emergency Management Agency (FEMA) is responsible for preparing flood insurance rate maps that show the 100 year flood plain. Unfortunately, updated rate maps for

Craven County are not yet available from FEMA and will not be until after this project is completed.

Data from existing flood insurance rate maps has been transposed onto a Craven County Highway map in order to provide a graphic illustration of the areas of the County which are located within the 100 year flood plain. It must be reiterated that this map which is included as Figure 3, will have to be revised as new maps are made available by FEMA.

3. Areas Susceptible to Wind Damage

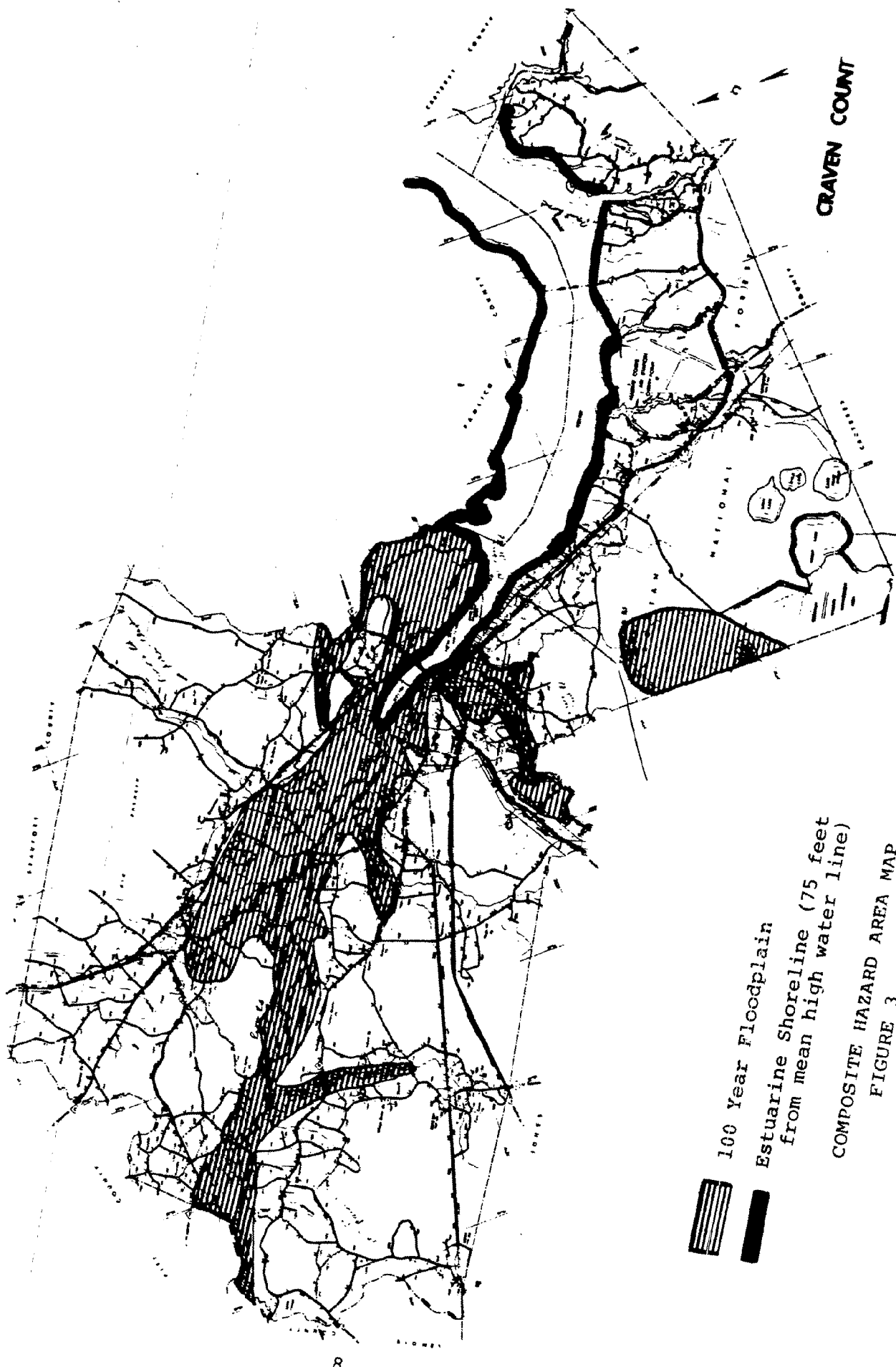
The major damage from future hurricanes on Craven County development will likely be attributable to flooding and to high winds. The identification of areas particularly susceptible to wind damage cannot be mapped. However, the Trent River Bridge serves as the dividing line with regard to wind related building construction requirements and mobile home tie-down requirements. East of the Trent River Bridge, buildings must be constructed to withstand winds of up to 110 miles per hour, while west of the bridge, the requirement is reduced to 100 miles per hour.

Figure 3 is a composite hazard area map depicting the areas within Craven County that are potentially susceptible to hurricane damage. The scale of this map makes the exact delineation of hazard area boundaries imprecise. For more exact locations of specific hazard areas the following references should be consulted: the actual FEMA flood insurance rate maps; and AEC descriptions available from the State or County. Other special areas which are located within the composite hazard area, are described and located in "Natural Areas Inventory the County; of Craven County, North Carolina" (Office of Coastal Management, December 1981) .

C. EXISTING DEVELOPMENT LOCATED IN HAZARD AREAS

With the exception of Havelock, which has grown primarily due to its proximity to Cherry Point, development in Craven County has historically been located in proximity to the Neuse River. Consequently, a significant portion of New Bern and its surrounding areas are located within the 100 year flood plain of the Neuse River. Following is a summary of the estimated existing development located within the 100 year Neuse and Trent River flood plains.

- o City of New Bern. According to the available flood insurance rate maps and the 100 year flood plain map included in the New Bern Land Use Plan, approximately 50 percent of the land within the City is susceptible to flooding. The major exceptions are the westernmost portion of the City which is relatively undeveloped, and the N.C.55/U.S.17/U.S.70 commercial



corridor running from the downtown bridge to the west.

- o Bridgeton. The entire municipality of Bridgeton, with 480 residents, approximately 200 residences and industrial and commercial developments along U.S. 17 is located in the 100 year floodplain of the Neuse River.
- o Trent Woods. All of that portion of Trent Woods located along and to the south of S.R.1200/1213 is located in the 100 year flood plain of the Trent River. It is estimated that this area encompasses about 60% of the developed area of the town. This means that approximately 700 residents and over 200 residences are located in areas susceptible to flooding.
- o River Bend. River Bend is a planned residential community which has recently been incorporated. The entire town, which is growing rapidly, is located within the 100 year flood plain of the Trent River.
- o Fairfield Harbour. Fairfield Harbour is a rapidly growing second home/vacation community located on the north side of the Neuse River to the east of N.C.55. The entire development which currently consists of 343 units is located in the 100 year flood plain. Other new subdivision developments located in proximity to Fairfield Harbour are also located in the Neuse River floodplain.
- o Unincorporated Craven County. Scattered development throughout the County is located in areas potentially susceptible to flooding. The primary areas susceptible to flooding that contain some significant population concentrations are:
 - The areas between Clubfoot Creek and the Intra-coastal Waterway in Township #5. It is estimated that there are about 500 residences housing about 1800 persons located in this area.
 - The area along the Trent River between the municipalities of New Bern and Trent Woods. The primary development in this area is Old Town which contains about 55 residential units.
 - The Brice Creek drainage area south of U.S.70. This area is just beginning to experience some significant development.
- o Industrial Developments. Two major industrial areas within the County are located in the 100 year flood

plain. These are: the Weyerhaeuser Company development located off Streets Ferry Road on the north side of Neuse River; and the industrial complexes located on the Neuse River to the north of Broad Street in the City of New Bern.

- o Hazardous Waste Storage and Disposal Sites. Table 3 contains a listing of the hazardous waste facilities located in Craven County. As indicated, a number of these facilities are located in flood prone areas.
- o Public and Private Utilities and Facilities. The municipalities of New Bern, Bridgeton, Trent Woods and River Bend all operate public water and sewer systems which are susceptible to flooding. Private systems subject to flooding are operated by Fairfield Harbour and Weyerhaeuser. Susceptibility to flooding refers strictly to location of facilities in flood prone areas. The actual possibility of system infiltration, contamination, etc. cannot be determined without detailed engineering field investigations.

Craven County has purchased the Neuse River Water and Sewer Association located in Township #7, and is planning to: 1) add 26 miles of water lines throughout the Township, and 2) construct a new sewer system which will tie existing septic systems into a new collection system with treatment provided at an 80 acre land disposal site near the airport. Significant portions of both the water and sewer systems will be located in flood prone areas along the Trent River and Brices Creek. The availability of these facilities will also stimulate future development in these areas.

Additionally, many public and private roads and electric transmission lines are also located within flood hazard area throughout the county. Storm damages to these facilities could require significant public expenditures after a major storm.

D. ESTIMATED SEVERITY OF POSSIBLE HAZARD AREA DAMAGES

Table 4 contains a summary of Craven County real property values and the taxes generated by Township. Table 5 shows what the real property values would be for each township if 1980 census data on housing and median housing values is used to generate real property estimates. (The values of commercial and industrial properties are not accounted for in Table 5 but are reflected in the total real property values shown in Table 4.)

Although a comparison of tax generation potential based on 1980 census data and the real property values obtained from County tax records is flawed in that the census data does not

TABLE 3

CRAVEN COUNTY HAZARDOUS WASTE FACILITIES

<u>FACILITY NAME</u>	<u>PRIMARY USE</u>	<u>LOCATION</u>	<u>IN FLOOD HAZARD AREA</u>
AMF HATTERAS YACHT	generator transporter	N.Glenbourne Road	yes
AGRICO CHEMICAL COMPANY	generator	Neuse Blvd. H'way 55W	no
B&H CONSTRUCTION COMPANY	transporter	H'way 70 East	no
BAYLINER MARINE CORPORATION	generator transporter	H'way 17 East	no
CLARK BOAT CO., INC.	small generator	H'way 17 East	no
ENCEE CHEMICAL SALES	small generator transporter	Bridgeton	yes
FUEL OIL SERVICE CO.	transporter	Windly Street	yes
MARINE CORPS AIR STATION AT CHERRY POINT	generator storer	Cherry Point	no
PHILLIPS PLATING CO.	generator	Bridgeton	yes
ROBERT BOSCH POWER TOOL	small generator	H'way 55 West	no
SALT WOOD PRODUCTS INC.	small generator	Cove City	no
STANADYNE MOEN DIV.	generator	Craven Industrial Pk.	no
WEYERHAEUSER CO.	generator transporter	Streets Ferry Road	yes

use appraised values, the magnitude of differences in the more urbanized portions of the County as shown in Table 5 is startling, especially when the potential values were developed without consideration of industrial and commercial properties which are concentrated in Townships 6 and 8.

In Townships 1, 2, 3, 5, and 9, the estimated potential property values and the actual property values obtained from the County are relatively close. This indicates that it is appropriate to use the median housing unit value obtained from the census. The median census values for townships 6, 7, and 8 were also used because they tend to be substantiated by current real estate listings. However, the discrepancies between these values and those obtained from the County tax records should be of concern to Craven County and warrants some special analysis by the County.

Values of commercial and industrial properties and businesses cannot be estimated or generalized. County tax records for each individual property must be utilized for this purpose. Unfortunately, the County does not currently have the capability of breaking the total real property values of each township into values contributed by different types of uses (i.e. percentage or totals attributable to residential, commercial, industrial or other properties). Thus, estimates of property value in Table 4 represent minimum "values at risk" and reflect overall property values.

Table 6 presents a summary of the estimate value of residential properties within the County that are potentially susceptible to flood damage. This analysis is intended to identify the order of magnitude of the problem based on the best available information. The following assumptions/estimates had to be made to conduct the analysis.

- 1) The percentage of the housing units in each township that is located in the 100 year floodplain had to be estimated. The 1980 census counted over 26,000 housing units (occupied and vacant) in the County. (This total has grown by about 1000 units in the past 4 years.) It was beyond the scope of this project to conduct a field count of these units in order to determine the specific number that are actually located in flood prone areas. Instead, a general field survey was undertaken and supplemented with the review of available county maps, flood insurance rate maps, land use data, census data, and aerial photos in order to make an estimate of the percentage of the housing stock in each township that is located in areas susceptible to flooding.

- 2) The full market value of the housing was utilized. Obviously flooding, depending on its magnitude, would only partially damage most of these units. The potential real property damage should thus be viewed as a theoretical worst case condition.

The potential damage to commercial properties cannot be estimated because of the lack of available data. However, almost all of the commercial properties susceptible to flood damage are located in the City of New Bern and in Bridgeton. Only a small number of such properties would be expected to be found in unincorporated Craven County.

TABLE 4
CRAVEN COUNTY TAXATION

<u>Township</u>	<u>Real Property Value for All Properties(1)</u>	<u>Taxes Generated</u>	<u>% of Total</u>
1	51,847,177	435,510	8.5
2	50,827,847	426,960	8.3
3	27,958,167	234,850	4.6
5	10,296,430	86,490	1.7
6	104,816,243	880,450	17.1
7	47,751,747	401,120	7.8
8	302,618,789	2,542,000	49.3
9	17,574,504	147,630	2.9
TOTAL	613,107,140	5,155,010	100.0

TABLE 5
ESTIMATED TAX GENERATION POTENTIAL
BASED ON 1980 CENSUS DATA

<u>Township</u>	<u>No. of Housing Units</u>	<u>Median Value</u>	<u>Potential Est. Real Property Value</u>	<u>Real Property Value From County Tax Records (2)</u>
1	1851	25,800	47,755,800	51,847,177
2	1617	31,300	50,612,100	50,827,847
3	1310	23,000	30,130,000	27,958,167
5	712	21,400	15,236,800	10,296,430
6	5829	43,900	255,893,100	104,816,243
7	2219	38,000	84,322,000	47,751,747
8	9952	40,900	407,036,800	302,618,789
9	705	32,600	22,983,000	17,574,504
TOTAL			949,696,600	613,107,140

NOTES: (1) Includes residential properties only
(2) Includes all properties

TABLE 6
ESTIMATE OF POTENTIAL RESIDENTIAL PROPERTY DAMAGE
UNDER WORST CASE CONDITIONS

Township	# of Housing Units	% of housing in Flood- plain		Median Value	Potential Real Property Damage
1	1916	10	192	25,800	4,953,600
2	1949	75	1462	31,300	45,760,600
3	1338	1	13	23,000	299,000
5	720	75	540	21,400	11,556,000
6	6059	0	-	43,900	-
7	2292	10	229	38,000	8,702,000
8	10284	50	5142	40,900	210,307,800
9	<u>733</u>	<u>5</u>	<u>37</u>	32,600	<u>1,206,200</u>
total	25291	30%	7615		282,785,200

NOTE: The number of housing units represent occupied units in 1980 plus units added in the past 4 years.

E. ANTICIPATED DEVELOPMENT IN HAZARD AREAS.

Figure 4 consists of the land classification map for Craven County as contained within the County Land Use Plan. As shown in this map and in Figure 2, which depicts the areas in which recent subdivision activity has occurred, almost all recent major development activity within the County is occurring in areas susceptible to flooding (as shown in Figure 3). These areas include:

- o Fairfield Harbour and adjacent areas
- o River Bend
- o Trent Woods
- o The area between Trent Woods and New Bern in unincorporated Craven County.
- o The area between Brices Creek and the Trent River in Township #7. (The development of this area will be stimulated by the development of the County water and sewer system.)

Based on current development activity within the County and on existing County policies, the question is not whether development will continue to occur in flood prone areas, but how will the County control this development so as to minimize future damages attributable to high winds and flooding. A review of the existing County policies and ordinances related to this issue is contained in the next section. The concluding section of this chapter contains recommended mitigation policies.

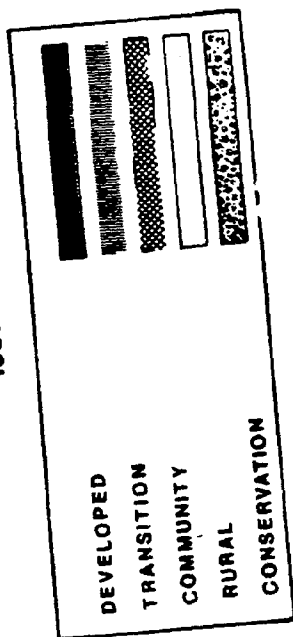
F. EXISTING COUNTY MITIGATION POLICIES AND REGULATIONS

The following reports and regulations were reviewed in order to assess existing Craven County policies related to hazard area mitigation.

- o Craven County Land Use Plan
- o Craven County Flood Damage Prevention Ordinance
- o Craven County Subdivision Ordinance
- o Craven County Mobile Home Ordinance
- o County FEMA maps
- o North Carolina Guidelines for Areas of Environmental Concern
- o North Carolina Residential Building Code

Based on a review of these regulations and reports it is clear that development is and will continue to occur in hazard areas (i.e. in Craven County, all hazard areas are encompassed within the area that will be inundated by the 100 year flood).

LAND CLASSIFICATION MAP **Craven County, N.C.** **1981**



This map was prepared in part with funds from the National Domestic and International Development Administration and the State of North Carolina through the Office of General Services, Department of Natural Resources and Community Development.

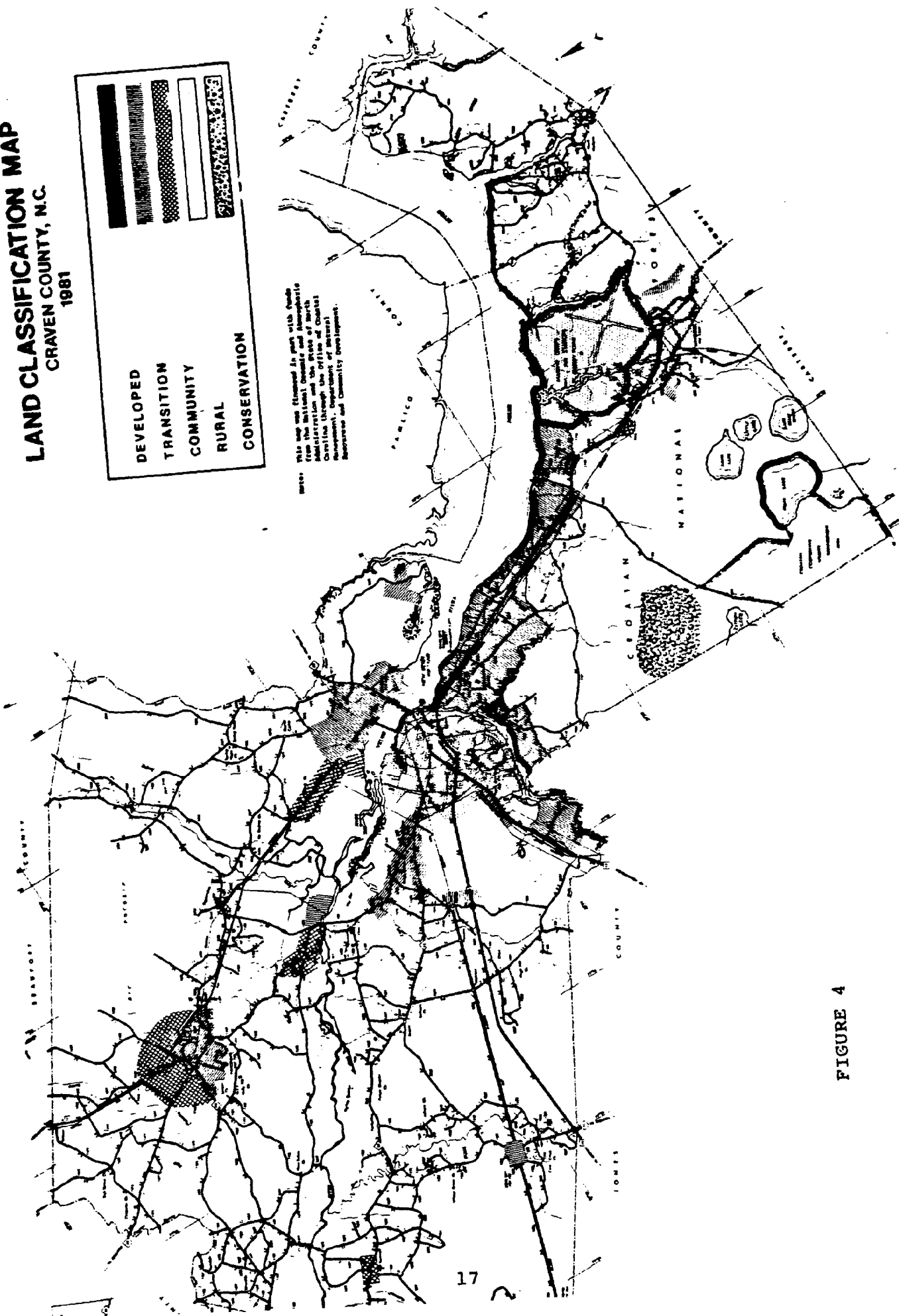


FIGURE 4

The main issue, therefore, is how the County's land use and development regulations can be used to control potential flood damages to development that has already and will continue to be located in floodplain areas. This is the prime issue regardless of what the 100 year storm elevations are determined to be after the new FEMA maps are completed. This same concern is true for public and community water and sewer systems which are located to serve population concentrations wherever they are permitted.

Following is a summary of the specific findings relating to the ability of existing Craven County ordinances and policies to control development in hazard areas in a desirable and effective manner.

1. The lack of County zoning clearly presents a problem in that Craven County does not possess the prime means available to a local community for controlling the location of future land developments. Because there is no zoning, there are obviously no non-conforming uses within the County. Additionally the lack of zoning precludes this mechanism from being used to establish a reconstruction program that permits the rebuilding of an individual structure based on the percent of damage received and its susceptibility to future damages if rebuilt in the same location.
2. The Craven County Subdivision Ordinance is generally weak and vague with respect to floodplain development. Its strongest statement is that "all subdivision proposals shall be consistent with the need to minimize flood damage." Likewise, the County Flood Damage Prevention Ordinance does not contain specific standards for development occurring in designated flood hazard areas (the 100 year flood plain). The emphasis of both ordinances is on "minimizing" flood damage and not on the development of strong standards to prevent flood damage in flood prone areas. Additionally, neither ordinance specifies what "minimizing flood damage" means.
3. The Craven County Mobile Home Ordinance includes a potentially strong provision that could prohibit the development of new mobile home parks in areas subject to flooding. However, the provisions of the ordinance pertain only to new mobile home parks, not to existing parks or to mobile homes located outside of mobile home parks. This ordinance could be an excellent mitigation tool if its scope is expanded.
4. With regard to potential wind damage, the County's regulatory powers are governed by the North Carolina

Uniform Residential Building Code. Major provisions are:

- o On the east side of the Trent River Bridge, structures must be constructed to withstand winds of up to 110 m.p.h.
- o On the west side of the Trent River Bridge, structures must be constructed to withstand winds up to 100 m.p.h.
- o Tie-down standards for mobile homes require between 6 to 11 tie-downs depending on the size of the unit.

These provisions appear adequate and there is little the County can realistically do to modify them even if desired. It is expected that the major wind related problem that needs to be addressed is continued compliance by mobile homes with tie-down requirements after the initial permits are issued. Periodic random inspections by the County Building Inspector should be considered as a means for enforcing mobile home tie-down regulations.

5. The Craven County Land Use Plan includes the following provision related to development in Areas of Environmental Concern:

"To continue the local permitting process of allowing minor development forms in all estuarine and public trust waters, coastal wetlands and estuarine shorelines. These development forms shall consist of activities requiring water access and use which cannot function elsewhere. Examples are simple access channels; structures to prevent erosion; navigation channels; boat docks; marinas, piers, wharfs and mooring pillings, in conformance with the management objectives of 15 NCAS 7H, .0203.

This policy statement appears adequate. However, the only mention made regarding controlling development within the 100 year floodplain is the following

"The floodplain policy of Craven County is: TO CONTINUE TO PARTICIPATE IN THE NATIONAL FLOOD INSURANCE PROGRAM AS A MEANS TO PROMOTE GOOD LAND DEVELOPMENT PRACTICES AND TO PROTECT THE CITIZENS OF THE COUNTY."

It appears that the biggest need with regard to storm mitigation that needs to be addressed in the development of strong standards for controlling the location and construction of developments, and the installation of

utilities within the designated storm hazard area (100 year floodplain). The development of such regulations can proceed without knowing what FEMA's final flood hazard elevations will be for various sectors of the County.

G. RECOMMENDED HAZARD MITIGATION POLICIES

Existing Craven County policies and ordinances permit development to occur in hazard areas. All hazard areas in Craven County are encompassed within the 100 year floodplain boundary. As discussed in Section E, it is expected that development within the floodplain will continue to occur because in many coastal communities floodplains are not generally considered to be an impediment to development. It is even stated in Before the Storm that "Safe reconstruction can occur on hazardous parcels of land if buildings are designed to withstand flood waters, high winds and wave action."

However, the fact that flooding represents a potentially serious hazard to both the public health and safety and to property must remain the major consideration in permitting development to occur in floodplain areas. In addition to inundating homes and business, flooding can pollute water supplies, cause sewers to back-up and overflow, cause septic tanks to be exposed or destroyed, and undermine structures of various types. Despite these problems, the basic issue in developing the Craven County Hazard Mitigation Plan and accompanying policies is not where future development should or should not locate (e.g. in flood hazard areas), but how should this development be constructed so as to minimize damages in the event of a major storm.

There are two issues that must be addressed regarding development in flood hazard areas - the control of new development, and reconstruction in floodplain areas after a storm.

1. MITIGATION POLICIES RELATED TO NEW DEVELOPMENT.

Craven County does not have a zoning ordinance but does have three other ordinances that can be utilized to control development in flood prone areas: the Craven County Subdivision Ordinance; the Craven County Flood Damage Prevention Ordinance (this is referred to as an ordinance, but has never been formally adopted by the Craven County Board of Commissioners); and the Craven County Mobile Home Ordinance. The major flood hazard provisions of these ordinances related to new development, and recommended policy changes are discussed below.

Craven County Subdivision Ordinance

Section 402 of the subdivision regulations deals with the suitability of land for development. Section 402.1 states that:

"Land which has been determined by Craven County Planning Board on the basis of engineering or other expert surveys to pose an ascertain-

able danger to life or property by reason of its unsuitability for the use proposed shall not be platted for that purpose, unless and until the subdivider has taken the necessary measures to correct said conditions and to eliminate said dangers."

Section 402.3 states: "All subdivision proposals shall be consistent with the need to minimize flood damage..." Both of these provisions are vague and need to be strengthened.

Recommended Policy: It is recommended that Section 402 be revised to include the following provisions:

- o The 100 year floodplain shall be clearly indicated on all subdivision plats and on deeds and plats for all individual building sites.
- o A portion of each building lot shall be filled to provide a safe building site above the 100 year floodplain elevation.
- o All water lines, sewers and other public facilities shall be erosion proofed, and either floodproofed with the flood proofing measured designed by and certified by a registered professional engineer or such facilities shall be elevated above the 100 year floodplain elevation.
- o All streets in new subdivisions or access roads to such subdivisions shall be elevated above the 100 year flood plain elevation. This shall be certified on the plat by a registered professional engineer.

Craven County Flood Damage Prevention Ordinance

Section A of Article 5 contains the general standards related to flood hazard reduction. The six general standards included in the section are:

1. All new construction and substantial improvements shall be anchored to prevent flotation, collapse or lateral movement of the structure.
2. All new construction and substantial improvements shall be constructed with materials and utility equipment resistant to flood damage.
3. All new construction or substantial improve-

ments shall be constructed by methods and practices that minimize flood damage.

4. All new and replacement water supply systems shall be designed to minimize or eliminate infiltration of flood waters into the system.
5. New and replacement sanitary sewage systems shall be designed to minimize or eliminate infiltration of flood waters into the systems and discharges from the systems into flood waters; and
6. Onsite waste disposal systems shall be located to avoid impairment to them or contamination from them during flooding.

These six standards represent good general principals. However, in some cases they should be made more specific and/or expanded.

Recommended Policies

1. The Craven County Board of Commissioners should formally adopt a Flood Damage Prevention Ordinance. The existing "ordinance" has never been adopted. It appears that developers are complying with flood plain development standards primarily because local lending institutions are requiring finished floor elevations to be higher than 12.1 feet. An adopted ordinance will be required if the County is to participate in the regular phase of the flood insurance program.
2. The special flood hazard area should be defined as the 100 year floodplain as delineated in the most recent FEMA flood insurance rate maps that have been adopted by Craven County. In this way, the ordinance would not have to be revised to reflect updated maps nor would the County find itself involved in issues regarding the most appropriate elevation to utilize in the ordinance.
3. Article 5, Section A should be revised to include the following provisions:
 - o All residential structures shall be elevated so that the lowest floor level (including the basement level) is elevated to or above the 100 year flood elevation.
 - o All non-residential structures shall have

the lowest floor (including basement) elevated to or above the 100 year flood elevation or shall be floodproofed. Where floodproofing is used in lieu of elevation it should be required that a registered professional engineer or architect certify that the floodproofing methods used are adequate to withstand the forces associated with the 100 year flood and submit such certification as part of a building permit application.

- o All new and replacement water supply and waste disposal systems shall be designed to minimize or eliminate infiltration of flood waters into the system either by elevating the system above the 100 year flood elevation or by floodproofing the system. The adequacy of a flood proofed system shall be certified by a registered professional engineer.

Craven County Mobile Home Ordinance

The County ordinance includes the following general provision: "Any land within the jurisdiction of the ordinance deemed by the Planning Board to be subject to flooding or unsuitable for residential occupancy can be prohibited for residential development, but such land may be set aside for such uses (e.g. such as recreation areas) as will not be endangered by periodic or occasional inundation. The Planning Board in making its determination shall be guided by an analysis of available data on topography, soils, flood plains, drainage, or ground and surface water information." It also contains a provision which states that each new mobile home shall be anchored to meet the requirements of the North Carolina Building Code unless manufactured to meet the National Mobile Home Construction and Safety Standards Act of 1974.

Recommended Policy

- o The Craven County Mobile Homes Ordinance is a very good tool for controlling mobile home developments in flood prone areas. It can be strengthened by 1) clearly stating that "areas subject to flooding" refers to all areas located within the 100 year floodplain, and 2) specifically requiring that all mobile homes in all new mobile home parks and subdivisions be elevated above the 100 year floodplain elevation.

2. MITIGATION POLICIES RELATED TO REDEVELOPMENT OF HAZARD AREAS AFTER A STORM

Craven County does not have provisions in any of its local ordinances requiring damaged properties to conform with requirements for new development if they are reconstructed after a storm. However, this intent can still be satisfied as follows:

- o The North Carolina Building Code requires any building damaged in excess of 50 percent of its value to conform with code requirements for new buildings. (This will be particularly beneficial in the event of wind damage.)
- o To be accepted into the regular Flood Insurance Program, Craven County will be required to include in its Flood Damage Prevention Ordinance a provision that all existing structures must comply with requirements related to elevation above the 100 year flood plain elevation and floodproofing if they are substantially improved. A substantial improvement is defined as "any repair, reconstruction, or improvement of a building, the cost of which equals or exceeds 50 percent of the market value of the building either before the improvement or repair is started or before damage occurred if the building has been damaged." Such a provision should be incorporated into the County ordinance when it is revised.

A final recommendation is that the Craven County Mobile Home Ordinance be revised to require that all "old" mobile home parks (those constructed prior to the adoption of the Ordinance) comply with the provisions of the Mobile Home Ordinance if either 1) more than 50% of the homes in the park suffer wind or flooding damage (this would not require that each of the mobile homes sustain damages amounting to 50% of their value), or 2) damage is such that either the water system, sewer system, or the on-site disposal system serving the park is damaged to the extent that more than 50% of any of the systems has to be repaired or replaced.

III. POST-DISASTER RECONSTRUCTION PLAN

A. INTRODUCTION

A post-disaster reconstruction plan provides a program that will permit a local government to deal with the aftermath of a storm in an organized and efficient manner. The Plan provides the mechanisms, procedures, and policies that will enable a local community to learn from the problems resulting from its past land use decisions and its storm experiences and to rebuild the community in a wise and practical manner.

A post-disaster reconstruction plan encompasses three distinct reconstruction periods:

- o The emergency period which encompasses the period immediately after the storm. The emphasis is on restoring public health and safety as outlined in the County Emergency Management Plan, assessing the nature and extent of storm damage, and qualifying for and obtaining whatever federal and state assistance might be available.
- o The restoration period covers the weeks and months following a storm disaster. The emphasis during this period is on restoring community facilities, utilities, essential businesses, etc. so that the community can once again function in a normal manner.
- o The replacement reconstruction period is the period during which the community is rebuilt. The period could last from months to years depending on the nature and extent of the damages incurred.

It is important that local officials clearly understand the joint federal-state-local procedures for providing assistance to rebuild after a storm so that local damage assessment and reconstruction efforts are carried out in an efficient manner that qualifies the community for the different types of assistance that are available. The requirements are generally delineated in the Disaster Relief Act of 1974 (P.L. 93-288) which authorizes a wide range of financial and direct assistance to both local communities and individuals. The sequence of procedures to be followed after a major storm is as follows.

1. Local damage assessment teams survey storm damage within the community.
2. Damage information is compiled and summarized, and the nature and extent of damage is reported to the North Carolina Division of Emergency Management (DEM).

3. DEM compiles local data and makes recommendations to the Governor concerning state actions.
4. The Governor may request a Presidential declaration of "emergency" or "major disaster." A Presidential declaration makes a variety of federal resources available to local communities and individuals.
5. Federal relief assistance provided a community when an "emergency" has been declared typically ends one month after the initial Presidential declaration. Where a "major disaster" has been declared, federal assistance for "emergency" work typically ends six months after the declaration and federal assistance for "permanent" work ends after 18 months.

Federal disaster assistance programs previously provided aid for communities to rebuild in the same way as existed before the disaster occurred. This policy tended to foster reoccurring mistakes. However, recent federal policy has started to change the emphasis of disaster assistance programs. Specifically,

- o Executive Order 1198 (Floodplain Management) directs all federal agencies to avoid either directly or indirectly supporting future unwise development in flood plains (e.g. through sewer grants in locations that foster floodplain development).
- o Section 406 of the Disaster Relief Act can require communities, as a prerequisite for federal disaster assistance, to take specific actions to mitigate future flood losses.

The remainder of this chapter concerns recommendations regarding 1) procedures that Craven County should follow in carrying out its damage assessment program so as to meet all federal and state requirements, and 2) reconstruction policies that Craven County should adopt to insure that future development that does occur in local hazard areas is constructed in a manner consistent with sound land use planning, public safety considerations and evolving federal policy.

B. ORGANIZATION OF DAMAGE ASSESSMENT TEAMS

The existing Craven County Damage Assessment Plan contains organizational charts for a Damage Assessment Section which includes: a Public Property Survey Team, a Business and Industry Survey Team, and a Private Dwellings Survey Team. For a County the geographical size of Craven, more than one Private Dwelling Survey Team will obviously be needed if a major storm disaster occurs. This issue is not specifically addressed in the Plan. Additionally, while the organiza-

tional structure is patterned after the "Carolina County Prototype Plan," specific personnel assignments are not made and a review of the County's personnel roster indicates that in some areas the County does not have the full-time personnel resources necessary to man each team in the manner desired. For example, the County only has four (4) inspectors in the Building Inspection Department and very few other personnel skilled in property appraisal, rehabilitation, engineering or construction related work.

Each damage assessment team should include individuals who are qualified to give reliable estimates of the original value of structures, an estimated value of sustained damages and a description of the repairs (and costs) that will be needed to rebuild the structure. Craven County will have to rely on volunteer assistance in order to carry out these responsibilities.

It is recommended that five County damage assessment teams be established as follows (it is assumed that the larger municipalities in the County would have their own damage assessment teams).

Public Property Survey Team

Assistant County Manager
Recreation Department Director
County Engineer *
Sanitary Engineer (the County's Consulting Engineer)
Architect *
Sheriff's Deputy (driver)

Business and Industry Survey Team

Tax Appraiser
Building Inspector
Commercial Realtor *
Architect *
Chamber of Commerce Representative *
Sheriff's Deputy (Driver)

Private Dwelling Survey Teams (3 teams to be assigned to various sectors of the County)

Tax Department Employer
Building Inspector
Residential Realtor *
Building Contractor *
Sheriff's Deputy (Driver)

* Community Volunteer

The Director of Emergency Services should immediately undertake a recruitment effort to secure the necessary volunteers and to establish a training program to familiarize the members of the various teams with required damage classification procedures and reporting requirements. In doing so, it must

be recognized the it will be very difficult to fill certain positions, such as the building contractor positions on the Private Dwelling Survey Teams, because the services of individuals with such skills will likely be in a great demand after a storm disaster. A commitment from an organization such as a Homebuilders Association to provide such assistance might be the best approach.

C. DAMAGE ASSESSMENT PROCEDURES AND REQUIREMENTS

Damage assessment is defined as a rapid means of determining a realistic estimate of the amount of damage caused by a natural or man-made disaster. For a storm disaster, it is expressed in terms of 1) number of structures damaged, 2) magnitudes of damage by structure type, 3) estimated total dollar loss, and 4) estimated total dollar loss covered by insurance.

After a major storm event, members of the Damage Assessment Teams should report to the Emergency Operations Center for a briefing from the Emergency Services Director prior to deployment. In order to efficiently deploy these teams, it is recommended that the Emergency Services Director have a prearranged agreement with the U.S. Marine Corps at Cherry Point for the Corps to provide a helicopter tour of the County for the Director and the Damage Assessment Officer. Such an initial reconnaissance is needed in order to 1) identify specific areas in the County where damage appears to be concentrated and where the various damage assessment teams should initially be deployed and 2) determine a rough order of magnitude of the damages sustained in the various sectors of the County.

Because of the geographic size of Craven County and the limited personnel resources available to conduct the assessments, a two-phase assessment program is recommended. The first phase would be carried out during the emergency period and would consist of documenting and classifying the damaged structures. Because of time requirements and the fact that the prime concern is structural damage, external visual surveys of damaged structures should be conducted and the cause of the damage to each structure identified. Damaged structures should be classified in accordance with the provisions of the County's Damage Assessment Plan as follows:

- o Destroyed (repairs would cost more than 80 percent of value)
- o Major (repairs would cost more than 30 percent of the value)
- o Minor (repairs would cost less than 30 percent of the value, but the structure is currently uninhabitable).

- o Habitable (some minor damage, with repairs less than 15 percent of the value),

It will be necessary to thoroughly document each assessment. In many cases, mail boxes and other information typically used to identify specific structures will not be found. Consequently, each damage assessment team must be provided with tax maps, other maps and photographic equipment in order to record and document their field observations. Enough information to complete the Damage Assessment Worksheet must be obtained on each damaged structure. More detailed assessments of damaged structures should be undertaken immediately after the initial reconnaissance survey has been completed and reports are filed with the Damage Assessment Officer.

The second phase of the damage assessment operation will be to estimate the value of the damages sustained. This operation should be carried out in the Emergency Operations Center under the direct supervision of the designated Damage Assessment Officer (the County Tax Supervisor). A special team consisting of county accounting clerks, tax office personnel and other qualified personnel should be organized by the Damage Assessment Officer. This team should be incorporated into the organizational structure contained within the County's Damage Assessment Plan.

In order to estimate total damage values it will be necessary to have the following information available for use at the Emergency Operations Center:

- o Property tax maps identical to those utilized by the damage assessment field teams.
- o Copies of all County property tax records should be permanently maintained in the Center. This information should indicate the estimated value of all commercial and residential structures within the County. Assessed values taken from tax digests and market values frequently differ. Consequently, with time being of the essence, the County should consider using the median township housing values taken from the 1980 census and shown in Table 2 as an average housing value for each township. A new 2 bedroom mobile home costs about \$16,000+. An average value of \$18,000 would be conservative estimate to use for estimating mobile home damages.

Additionally, a survey of local Craven County lending institutions should now be undertaken (and updated periodically) in order to determine how many Craven County homeowners participate in the Flood Insurance Program, and the average value of such coverage. This information should be kept

available in the Emergency Operations Center for estimating the value of sustained damages covered by hazard insurance. In order to produce the damage value information required, the following methodology is recommended.

1. The number of damage businesses, mobile homes and permanent residences that have been damaged within each township should be summarized by damage classification category.
2. The number in each category should be multiplied by
1) the median housing unit value from Table 2 or \$18,000 for a mobile home or the value of a business structure as obtained from County tax records; and
2) an average percentage of value for each damage classification category as follows:
 - o Destroyed - 100%
 - o Major Damage - 50%
 - o Minor Damage - (uninhabitable) - 25%
 - o Habitable - 10%
3. The total value of damages for each township and for the County as a whole should then be determined. Damages sustained within municipalities should be obtained from the appropriate local officials.
4. The estimated value loss covered by insurance should then be determined by 1) multiplying the values determined above by a percentage which represents the number of homes with flood insurance coverage as a percent of the total number of homes located in flood prone areas (estimated to be about 7600) and 2) multiplying the estimated number of damaged homes and businesses with flood insurance by the average value of such coverage.

The Damage Assessment Plan is intended to be the mechanism for estimating overall County property damage in the event of a civil disaster. After such an occurrence, there will probably not be enough time or resources to research property values from County tax records. The procedure recommended above represents an approach for making a relatively quick, realistic "order of magnitude" damage estimate after a disaster occurs. However, using the median value of a residence in relatively large and diverse townships will in some situations provide only a rough estimate. As an alternative, the County Planning Department could divide the County into logical geographical sectors based on factors such as natural boundaries (e.g. water bodies), man-made boundaries (e.g. highways), areas of recent subdivision

activity, identifiable neighborhoods concentrations, etc. After this is accomplished, the Tax Assessor's Office could estimate the average (or typical) value of a residence within each sector. This could then be used as an alternative to the median housing value approach based on values shown in Table 2.

D. ESTABLISHMENT OF A RECOVERY TASK FORCE

Damage assessment operations are oriented to take place during the emergency period. After the emergency operations to restore public health and safety and the initial damage assessments are completed, it will be necessary for Craven County to establish a Recovery Task Force to guide restoration and reconstruction activities during a post-emergency phase which could last from weeks to months and possibly in excess of a year depending on the nature and extent of the damages sustained. The responsibilities of such a Task Force could include:

1. Establishing an overall restoration schedule.
2. Setting restoration priorities.
3. Determining requirements for outside assistance and requesting such assistance when beyond local capabilities.
4. Keeping the appropriate state officials informed using Situation and Damage Reports.
5. Keeping the public informed.
6. Assembling and maintaining records of actions taken and expenditures and obligations incurred.
7. Proclaiming a local "state of emergency" if warranted.
8. Commencing cleanup, debris removal and utility restoration which would include coordination of restoration activities undertaken by private utility companies.
9. Undertaking repair and restoration of essential public facilities and services in accordance with priorities developed through the situation evaluation.
10. Assisting private businesses and individual property owners in: 1) obtaining information on the various types of assistance that might be available to them from federal and state agencies; 2) in understanding the various assistance programs; and 3) actually ap-

plying for such assistance. If a major storm does hit Craven County and major damages occur, consideration should be given to establishing a Community Assistance Team within the Department of Social Services to carry out the above functions until such time as the need abates.

In Before the Storm, a sequence and schedule for undertaking local reconstruction and restoration activities is presented. (Figure 7.15 on page 7-35). This schedule was left deliberately vague because specific reconstruction needs will not be known until after a storm hits and the magnitude of the damage can be assessed. The following sequence of activities and schedule is submitted as a guide which should be reconsidered by the Recovery Task Force and revised as necessary after the damage assessment activities are completed.

<u>ACTIVITY</u>	<u>START DATE/COMPLETION/DURATION</u>
1. Complete Damage Assessment	Completed by second week after the storm
2. Prepare Summary of Reconstruction Needs	Completed one week after damage assessment is completed
3. Set Reconstruction Priorities and Prepare Master Reconstruction Schedule	Completed one week after damage assessment is complete
4. Begin Repairs to Critical Utilities and Facilities	As soon as possible after disaster
5. Decision with Regard to Imposition of Temporary Development Moratorium	One week after damage assessment is completed
6. Permitting of Reconstruction Activities for all Damaged Structures (major and minor) not Included in Development Moratorium Area	One week after damage assessment is complete
7. Complete Re-evaluation of Hazard Areas and Mitigation Policies in Areas Subjected to Development Moratorium	One month after Temporary Development Moratorium is Imposed

- | | |
|---|--|
| 8. Revise Mitigation Policies and Development Standards for Areas Subjected to Development Moratorium and Lift Development Moratorium | Two months after Temporary Development Moratorium is Imposed |
| 9. Permit New Development | Upon suspension of any temporary development moratorium |

It is recommended that the Craven County Recovery Task Force consist of:

- o Craven County Manager
- o Assistant County Manager
- o County Tax Assessor
- o Emergency Services Coordinator
- o County Finance Officer
- o County Planning Director

E. RECOMMENDED RECONSTRUCTION POLICIES

The following policies have been designed to be 1) considered and adopted by the Craven County Board of Commissioners prior to a storm, and 2) implemented, as appropriate, after a storm occurs.

PERMITTING

1. Building permits to repair structures previously built in conformance with existing local codes and standards and with the North Carolina Building Code shall be issued automatically.
2. All structures suffering major damages as defined in the Craven County Damage Assessment Plan shall be repaired or rebuilt to conform with the provisions of the North Carolina Building Code and Craven County Flood Hazard Ordinance.
3. All structures suffering minor damage as defined in the Craven County Damage Assessment Plan shall be permitted to be rebuilt to their original condition before the storm but (not expanded or otherwise improved).
4. Permits shall not be issued in areas subject to a Temporary Development Moratorium until such moratorium is lifted by Craven County.
5. All individual mobile homes located in mobile home parks sustaining damage such that at least 50% of the homes in the park receive some damage, shall be required to conform with the provisions of the Craven County Mobile Home Ordinance and the Craven County Flood Hazard Ordinance regardless of whether the park is currently required to conform with the provisions of the Craven County Mobile Home Ordinance.

UTILITY AND FACILITY RECONSTRUCTION

1. All damaged water and sewer systems (both public and private) shall be relocated or repaired so as to be elevated above the 100 year flood plain or shall be floodproofed, with the methods employed and the construction being certified by a registered professional engineer.
2. All damaged roads used as major evacuation routes in flood hazard areas shall be repaired so as to be elevated at least one foot above the 100 year flood plain elevation.
3. All local roads that have to be completely rebuilt

shall be elevated so as to be above the 100 year flood plain elevation.

TEMPORARY DEVELOPMENT MORATORIUMS

Under certain circumstances, interim development moratoriums can be used in order to give a local government time to assess damages, to make sound decisions that avoid past mistakes, and to learn from its storm experiences. Such a moratorium must be temporary and reasonable.

It is not possible to determine prior to a storm whether a temporary development moratorium will be needed. Such a measure should only be used if damage in a particular area is very serious and if redevelopment of the area in the same manner as previously existed would submit the residents of the area to similar public health and safety problems. The Craven County policy regarding such moratoriums should be to:

1. Require that the Craven County Recovery Task Force assess whether a Temporary Development Moratorium is needed within one week after the Damage Assessment process is completed. Such an assessment should clearly document why such a moratorium is needed, delineate the specific uses that would be affected by the moratorium, propose a specific schedule of activities and actions that will be taken during the moratorium period, and establish a specific time period during which the moratorium will be in effect.

WIND DAMAGE

It is assumed that many structures constructed to conform with the provisions of the North Carolina Building Code will not be able to withstand the accompanying winds if a major hurricane hits the North Carolina coast. It is stated in Before the Storm that "the State Building Code, as it now stands, falls short in adequately protecting buildings from the damaging forces of hurricanes and other coastal storms. The Building Code Council, in seeking to maintain uniformity of regulation across the state, has been resistant in the past to allowing more stringent local standards. Another problem small coastal communities are likely to face is a lack of fiscal and staff resources to sponsor the engineering and architectural studies that the Building Code Council requires to justify any local variations to the code."

This is the case in Craven County. While the County has no technical studies to indicate that the provisions of the Code are inadequate as they effect Craven County, the County should have some flexibility in imposing stricter standards if it desires. This is a problem that the Coastal Resources Commission must face if it expects local communities to take the initiative in developing effective storm mitigation pro-

grams. The County policy should be to request the Coastal Resources Commission to carefully assess this problem which is common to all coastal communities.

IV. CRAVEN COUNTY HURRICANE EVACUATION PLAN

A. INTRODUCTION

The Craven County Hurricane Evacuation Plan provides the overall framework for conducting evacuation operations in the event of a major storm disaster.

The County's Hurricane Evacuation Plan was updated by Craven County in 1983 to meet minimum criteria for evacuation plans. The stated objective of the Plan is "to provide for an orderly and coordinated evacuation to minimize the effects of hurricanes on residents and visitors in Craven County." The Plan includes provisions for 1) alerting and organizing local officials who will be responsible for carrying out evacuation operations; 2) evacuating the public from areas particularly susceptible to storm damage; and 3) designating evacuation shelters to serve different sectors of the county.

The existing Craven County Hurricane Evacuation Plan has been critically reviewed for conformance and compatability with the new CAMA requirements for storm mitigation planning as part of its land use planning regulations. The objective in conducting this review is not to re-write the Plan, but to identify areas where improvements are needed. Overall, the organization of the Evacuation Plan is good and conforms with the State requirements. However, the need for improvements in the following areas has been identified: 1) designation of shelters; 2) identification of evacuation routes; and 3) the refinement of assignments and procedures.

B. DESIGNATED EVACUATION SHELTERS

The Craven County Hurricane Evacuation Plans lists nineteen (19) potential shelters, all of which are public schools operated by the Craven County Board of Education. Each of these nineteen shelters has been evaluated with respect to: geographical area served; capacity; whether the building appears to be susceptible to flooding; and whether adjacent areas are susceptible to flooding. Table 7 presents a summary of the results of this analysis.

Based on the information summarized in Table 7, five (5) schools should be eliminated from consideration as shelters because of their potential susceptibility to flooding. These schools are:

1. Barber Elementary
2. Danyers Elementary
3. Oaks Road Elementary
4. West Craven Middle School
5. West Craven High School

TABLE 7

POTENTIAL CRAVEN COUNTY HURRICANE EVACUATION SHELTERS

<u>School Building</u>	<u>Township Served</u>	<u>Student Capacity</u>	<u>Located in Flood Plan Area</u>	<u>Adjacent Area Flood Prone</u>
Bangert	8	600	no	yes
Barber	8	600	possibly	yes
Barden	6	800	no	no
Bridgeton	2	600	no	yes
Brinson	7	850	no	yes
Danyers	8	425	possibly	yes
Farm Life/ Vanceboro	1	800	no	yes
Ft. Barnwell	3	423	no	no
Havelock	6	750	no	no
Havelock, Jr.	6	1000	no	no
Havelock H. S.	6	1000	no	no
Jasper	9/8	600	no	minor amt.
McDonald	8	1300	no	no
New Bern H.S.	8	1300	no	no
Oaks Road	8	600	yes	yes
Trent Park	8	600	no	yes
West Craven, Jr.	1/9	800	yes	yes
West Craven.H.S.	1	1000	yes	yes
West Havelock	6	1050	no	no

Three other schools are located in areas where either the need is not expected to be significant because of sparse population or small amounts of flood prone areas; or where there are other nearby schools more suitable for shelters because of locational and capacity factors. Schools that are not recommended as primary shelters for these reasons are:

1. Ft. Barnwell Elementary
2. Barden Elementary
3. Havelock Elementary

Two other schools should be considered as secondary shelters to be opened only if capacities at nearby primary shelters are exceeded. The schools that should be designated as secondary shelters are:

1. Havelock Middle School should be a secondary or support shelter for Havelock Senior High School
2. Trent Park Elementary should be a secondary or support shelter for McDonald Middle School.

The following nine (9) schools should be designated as the primary Craven County shelters:

1. Bridgeton Elementary
2. Brinson Elementary
3. Farm Life/Vanceboro Elementary
4. Jasper Elementary
5. West Havelock Elementary
6. Bangert Elementary
7. McDonald Middle School
8. New Bern High School
9. Havelock High School

Following is a discussion of how these shelters would serve the various townships in the County in the event of a storm disaster.

Township #1

The southeastern sector of this township is susceptible to flooding. Both West Craven High School and West Craven Middle School are located within the 100 year flood plain. The new Farm Life/Vanceboro school located in Vanceboro should be the designated shelter for the entire township.

Township #2

The lower half of this township is susceptible to flooding. Fairfield Harbour and Bridgeton are the major population centers. Evacuees from these areas should be sheltered at the Bridgeton Elementary School. Residents of the far western portion of the township could use the Farm Life/

Vanceboro Elementary school as a shelter should sectors of U.S. 17 experience flooding problems.

Township #3

This township is located in the extreme western portion of the County. With minor exceptions, there is little developed area susceptible to flooding. The Jasper Elementary School located in Township #9 would be the primary shelter for the residents of the township.

Township #5

This township is sparsely developed. The area adjacent to and west of Clubfoot Creek along Adams Creek Road is located in the 100 year floodplain. There is no public school located in the township. Havelock High School located off N.C. 101 would be the primary shelter for evacuees from this area.

Township #6

Development in this township is concentrated along U.S. 70 in the vicinity of Havelock and the Marine Corp Air Station at Cherry Point. Populated areas in the township are not located in the 100 year flood plain, but a significant amount of trailers that would be susceptible to wind damage are located in the area. Havelock High School and West Havelock Elementary School should be the primary shelters that would serve the residents of this township as well as Township #5 which is located to the east. Havelock Middle School would serve as a secondary shelter to be opened as needed in order to meet the needs of County residents or of evacuees from Carteret County.

Township #7

The needs of the residents of this township would be met at one of three primary shelters - West Havelock Elementary School, Brinson Elementary School or at New Bern High School located to the west across the Trent River.

Township #8

This is the most heavily populated township in the County. Significant population concentrations are located in areas susceptible to inundation by the 100 year flood in New Bern, Trent Woods, River Bend and in unincorporated Craven County. Three primary shelters would serve this township. The McDonald Middle School and New Bern High School have large capacities and are located along major highways with good accessibility from all areas of the township. Bangert Elementary School would be the primary shelter from the Town of Trent Park and for other areas along the Trent River. The

Trent Park Elementary school would be designated as a secondary shelter to be opened as needs dictate.

Township #9

This township is sparsely developed and contains little developed area that is susceptible to flooding. The Jasper school would serve as the primary shelter for this township as well as for Township #3.

C. IDENTIFICATION OF PRIMARY COUNTY EVACUATION ROUTES

Of primary concern is the susceptibility to flooding of the primary County evacuation routes. The identification of major roads which are expected to be used for evacuation purposes has been determined by the Craven County Director of Emergency Services. These routes are:

1. Adams Creek Road (S.R. 1700)
2. N.C. 101
3. U.S. 70
4. Brice Creek Road (S.R. 1004)
5. U.S. 17
6. U.S. 55
7. Aurora Road (S.R. 1003)
8. Street Ferry-Washington Post Road
9. River Road (S.R. 1400)
10. Dover-Ft. Barnwell Rd. (S.R. 1262)
11. N.C. 118
12. N.C. 43
13. Old Cherry Point Road
14. S.R. 1600 (to Fairfield Harbour)

The evacuation routes were reviewed and a request was made to the Field Services Division of the North Carolina Department of Natural Resources and Community Development to provide elevation data along these routes in order to determine their susceptibility to flooding under different storm events.

The original intent was to attempt to computerize the evacuation route elevation data as a component of a County Storm warning system. This did not prove to be feasible primarily because detailed elevation data is not available for most routes. Additionally, the data that is available can be more appropriately and effectively used to identify potential problem areas that, in turn, can be specifically addressed in the development of evacuation policies and procedures.

Following is an assessment of the various evacuation routes based on available data.

1. Routes Located in the 100 Year Flood Plain

Four of the evacuation routes are located almost entirely within the 100 year flood plain and should be considered especially vulnerable to flooding. These routes are:

- o Adams Creek Road
- o Streets-Ferry - Washington Post Road
- o S.R. 1600 (to Fairfield Harbour)
- o Brice Creek Road (S.R. 1004)

2. Routes Adjacent to the 100-Year Flood Plain

River Road (S.R. 1400) runs parallel to the Neuse River in the western part of the County. Most of the road is not actually in the 100 year flood plain based on available data. However, this data can be imprecise and the road should be viewed as being potentially susceptible to flooding.

Aurora Road runs parallel to Little Swift Creek in the north central part of the County. Elevation data for this roadway is not available. It should be viewed as being susceptible to isolated flooding. However based on population distribution within the County, it is not expected that this road would see much use as an evacuation route.

3. Routes With Isolated Problem Areas

a. U.S. 17

There are a number of potential problem areas on U.S. 17 between Bridgeton and Vanceboro. These problem areas are:

- o The roadway elevation is between 11.7 and 12.2 feet (which generally corresponds with the 100 year flood elevation) in the vicinity of Little Swift Creek. The roadway is built-up as it crosses the creek, but flooding problems can still be anticipated in this area.
- o The roadway is below the 100 year flood elevations from Antioch to the Neuse River. The railroad, which parallels the roadway through this area, was constructed to be out of the floodplain and is about 3 to 4 feet above the roadway elevation. Localized flooding along U.S. 17 can be expected during significant storm events.

b. N.C. 55

The elevation of N.C. 55 is only slightly above the 100 year flood plain elevation as it crosses Bachelors Creek. Potential flooding problems at this location should be anticipated.

4. Routes with No Apparent Flooding Problems

The following routes have no apparent flooding problems based on a review of available elevation data:

- o N.C. 101
- o U.S. 70
- o N.C. 118
- o N.C. 43
- o Old Cherry Point Road
- o Dover-Ft. Barnwell Road

Figure 5 identifies all locations along the designated evacuation routes that are potentially susceptible to inundation during heavy flooding. Based on this analysis, Figure 5 also depicts recommendations concerning evacuation routes that should be used to access each of the designated shelters. It should be noted that some of the routes that are susceptible to flooding will, due to the lack of realistic alternatives, continue to be used as evacuation routes. Recommendations regarding how these problem areas should be handled as part of an evacuation effort are contained in Section D-1.

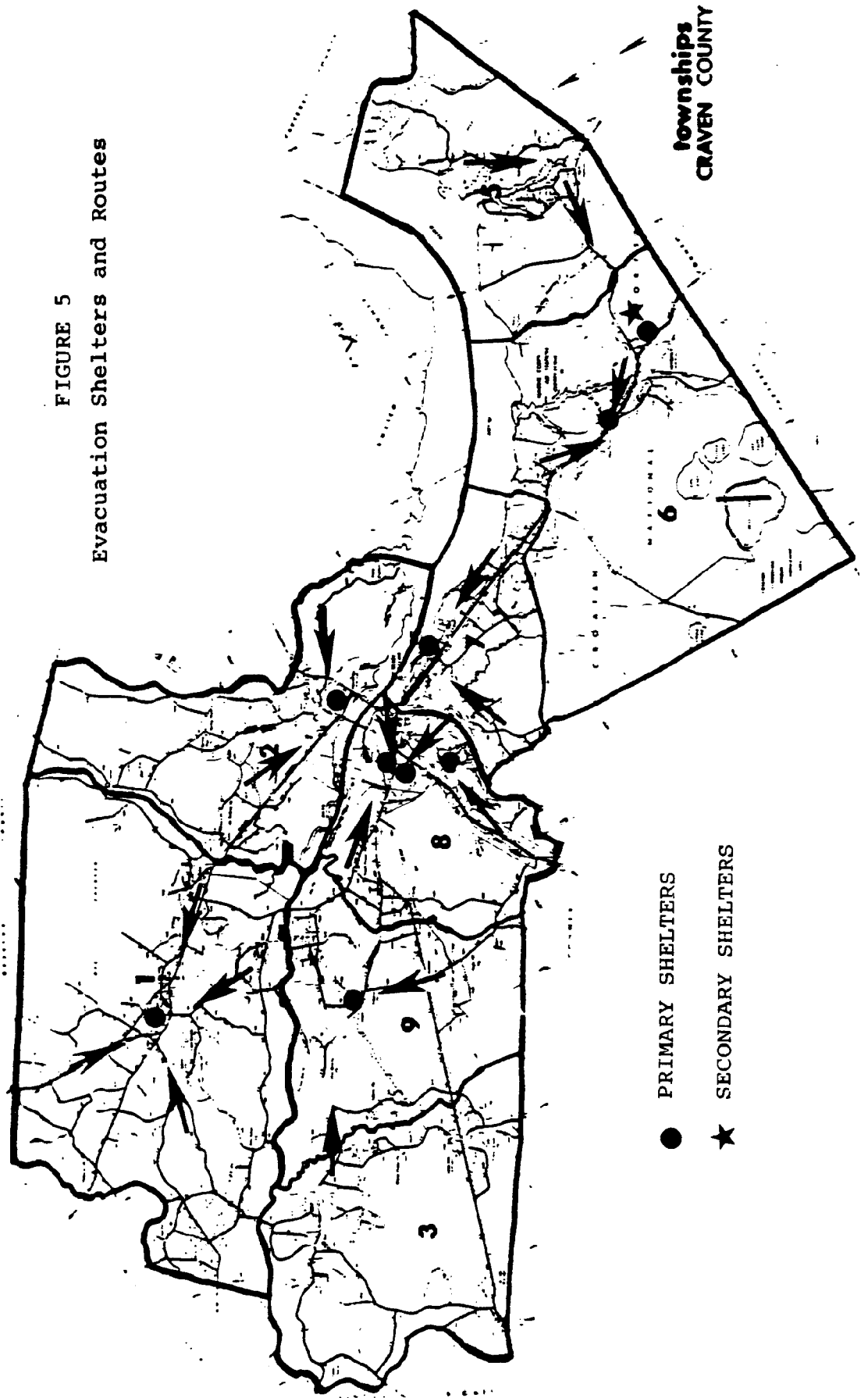
D. PROCEDURAL AND ORGANIZATIONAL RESPONSIBILITIES

1. Evacuation Route Monitoring

The evacuation of residents in mobile homes and in areas susceptible to flooding is stressed in the Craven County Evacuation Plan. Mobile homes are scattered throughout the County and it is unlikely that many residents of these homes will leave prior to the issuance of a hurricane warning. However, depending on weather conditions, flooding could easily occur prior to the issuance of such a warning. Consequently, County personnel should be prepared to monitor flooding conditions along the evacuation routes even prior to the issuance of a hurricane warning.

The Craven County Hurricane Evacuation Plan states that the State Highway Patrol will be responsible for traffic control on the state highway system. The County Emergency Services Director should determine if this will include surveillance monitoring for potential flooding problems along the designated evacuation routes prior to the issuance of a Hurricane Warning.

FIGURE 5
Evacuation Shelters and Routes



The Craven County Sheriff's Department has 42 staff members (exclusive of jailers). Assignments should be made so that Sheriff deputies (or other qualified personnel) are assigned to monitor the following roadways for indications of flooding problems, prior to the initiation of evacuation orders.

- o River Road and Streets Ferry Road
- o Washington Post Road and the N.C. 55 crossing of Bachelors Creek
- o U.S. 17 between Antioch and Bridgeton
- o Brice Creek Road
- o Adams Creek Road
- o S.R. 1600 to Fairfield Harbour

Direct communications should be maintained with the Emergency Services Director and evacuation orders should be issued as appropriate in response to observed or anticipated flooding problems.

It is estimated that at least 6 officers with vehicles and communications equipment should be assigned this monitoring task. Supplemental staff assistance should be provided as necessary in order to carry out the evacuation orders and to establish road blocks, as appropriate, in flooded areas.

2. Shelter Operations

A minimum of nine designated primary shelters should be operated during a major storm. According to the Hurricane Evacuation Plan, each shelter will be manned by representatives of the Red Cross, the Craven County Health Department and the County Social Services Department. However, the Evacuation Plan indicates that Social Service and Health Department personnel will not be assigned to shelters until Condition 2 (24 hour warning). This appears to be too short a notice given the inevitable confusion and hectic pace of activity that is likely to occur during this period. Permanent assignments, at least to key designated shelters, should be made with provisions made to revise these assignments should the opening of additional secondary shelters at Havelock Middle School and Trent Park Elementary School be required. This would necessitate initially assigning additional personnel to Havelock High School and McDonald Middle School.

The County Health Department has over 50 personnel in

various job classifications, while the Social Services Department has over 110 personnel in various positions. There are four relatively large shelters that must be manned. (West Havelock Elementary, McDonal Middle and New Bern and Havelock High Schools). It is recommended that up to 10 persons be assigned to each of the large shelters and 5 to each of the smaller shelters. Five additional personnel should be assigned to New Bern High School and Havelock High School in the event it is necessary to open the secondary shelters and man them with personnel from these primary shelters. Additionally it is recommended that one person from the Recreation Department and one from the Sheriff's Department be assigned to each shelter.

Shelter assignments should be made based on available skills, shelter needs and the location of the residences of each shelter team member. These assignments should be continuously updated to reflect personnel changes. Additionally, the County should move to implement the provision in its Evacuation Plan which calls for an annual training exercise.

3. Public Awareness and Issuance of Warnings

A major concern with all evacuation plans is public awareness regarding storm threats, potential safety problems in different sectors, and the location of designated shelters and evacuation routes.

For a county the size of Craven, County personnel must rely primarily on the mass media (i.e. radio and television) for the dissemination of information regarding hurricane watches, hurricane warnings, warnings regarding flooding conditions, and the issuance of evacuation orders. In some concentrated but sparsely populated flood prone areas such as Adams Creek, it might be possible to issue evacuation orders and alert residents with county personnel, but this will be the exception rather than the rule. Consequently, in addition to mass media information, the County's efforts should be placed on public awareness so that residents of the County know what to look for and what to do as a storm approaches the coast. Specifically, it is recommended that the County consider:

1. Mailing summary copies of the Evacuation Plan to each property owner in the County as part of the mailing of the annual tax bills.
2. Including summary copies of the Evacuation Plan as a supplement with the local Sunday newspaper at the beginning of each hurricane season.

3. Preparing special flyers for mobile home residents that describe the particular danger of remaining in mobile homes during major storm events. Such flyers should also identify the location of the designated shelters. This flyer could be mailed to mobile home owners with the annual personal property assessments. This information should also be required to be posted at all mobile home parks.
4. Publishing a one page generalized summary map showing all areas susceptible to inundation by the 100 year storm. This map could also be mailed with the annual tax bills. The back side of the map could include information related to the flood insurance program, the dangers of waiting too long to evacuate and being isolated by flooded roadways, and a number to call for further information.

The above recommendations are merely illustrative of the types of effort that the County should consider undertaking. All such efforts will require the use of County resources, and some financial expenditures. However, it is difficult to see how the County can make its residences aware of the potential dangers to be faced during a major storm unless it is willing to undertake expenditures of this nature. The cost would be relatively minimal in comparison to the savings that could be realized as a result of such an effort if, unfortunately, a major storm does occur.

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