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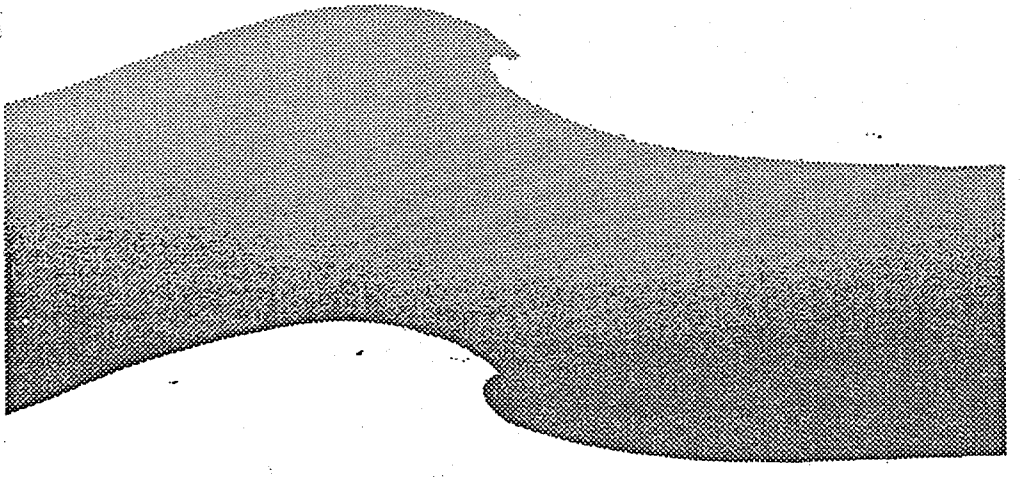
HURRICANE EVACUATION STUDY UPDATE 1987



Southwest Florida Regional Planning Council

DECEMBER 1987

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HURRICANE EVACUATION STUDY
UPDATE 1987

Introduction

The purpose of this update is to refine and improve upon the work initially performed in the Regional Hurricane Evacuation Plan, SWFRPC, 1982, and the Hurricane Evacuation Plan, Update 82, SWFRPC, 1984. The major change in this update is a reorganization of salient information on a county-by-county basis, to be more useful to local emergency management officials and to assist local governments in meeting their mandates in accordance with Rule 9J-5, Florida Administrative Code.

The Plan is organized in the following manner

PART I. Threat and Methodologies

A Hurricane is a regional threat; as such, it will affect more than one locality. This section will update the work analyzing hurricanes performed in 1981. This section will also summarize the methodologies in use for each step of the evacuation study, with emphasis on their application to local government.

PART II. County Studies

Each of the six counties will be assessed as to the degree the hurricane threat affect them. Vulnerability zone will be reassessed, population data will be updated and forecasted to 1991, behavioral information will be applied, shelter data updated, evacuation routes reassessed, and clearance times will be calculated.

PART III. Regional Summary

The County data will be summarized for their relevance to inter-county action. Specific analysis will be performed on inter-county travel volume and routes.

PART IV. Critique

Various shortcomings or variations in current planning activity will be assessed. Alternatives in priorities will be examined as to whether different approaches, assumptions, or actions will improve evacuation times.

In addition to the four parts above, these will be a technical appendix containing analyses on:

(1) public safety policies and concepts of operations.

(2) assessment of potential highway improvements to improve clearance times, including traffic control points and debris removal resource storage points

(3) assessment of relatively low cost shelter improvements, and

(4) the impact on evacuation of drawbridge openings

(a) drawbridge openings,
(b) high profile, trailer hauling, and RV vehicles, and
(c) tourists,
(d) route control.

There are certain high interest aspects of evacuations which the different county chapters and regional summary assume as actions. These include the response of tourists, the impact on highways of "truck" traffic, which includes high profile and recreational vehicles, and the impact of rainfall and hurricane wind and flood waters on road capacities. The county sections, regional summary, and critique sections also address the subject of mobilization times, background traffic, and "daylight" versus "midnight" highway activity. Future updates will examine further salient alternatives affecting successful evacuation.

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COLLIER COUNTY
NATURAL DISASTER PLAN (Hurricanes)
[9J-5.012(2)(e)(i)]

HURRICANE VULNERABILITY

The hurricane vulnerability of Collier County has been analyzed using a numerical storm surge prediction model known as SLOSH, short for Sea, Lake, and Overland Surges from Hurricanes. This model is described in detail in the Regional Hurricane Evacuation Plan, 1981-82, prepared by the Southwest Florida Regional Planning Council; as well as A Storm Surge Atlas for Southwest Florida, prepared by the National Oceanic and Atmospheric Administration, Undated, @ 1983). These reports analyzed some 187 separate storms for their potential impact on Southwest Florida, including Collier County. Both reports provide an assessment of methodologies and provide assumptions that can act towards increasing or decreasing forecast flood and wind conditions. However, in summary, the following assumptions can be made.

(1) Landfalling storms provide the worst flooding potential

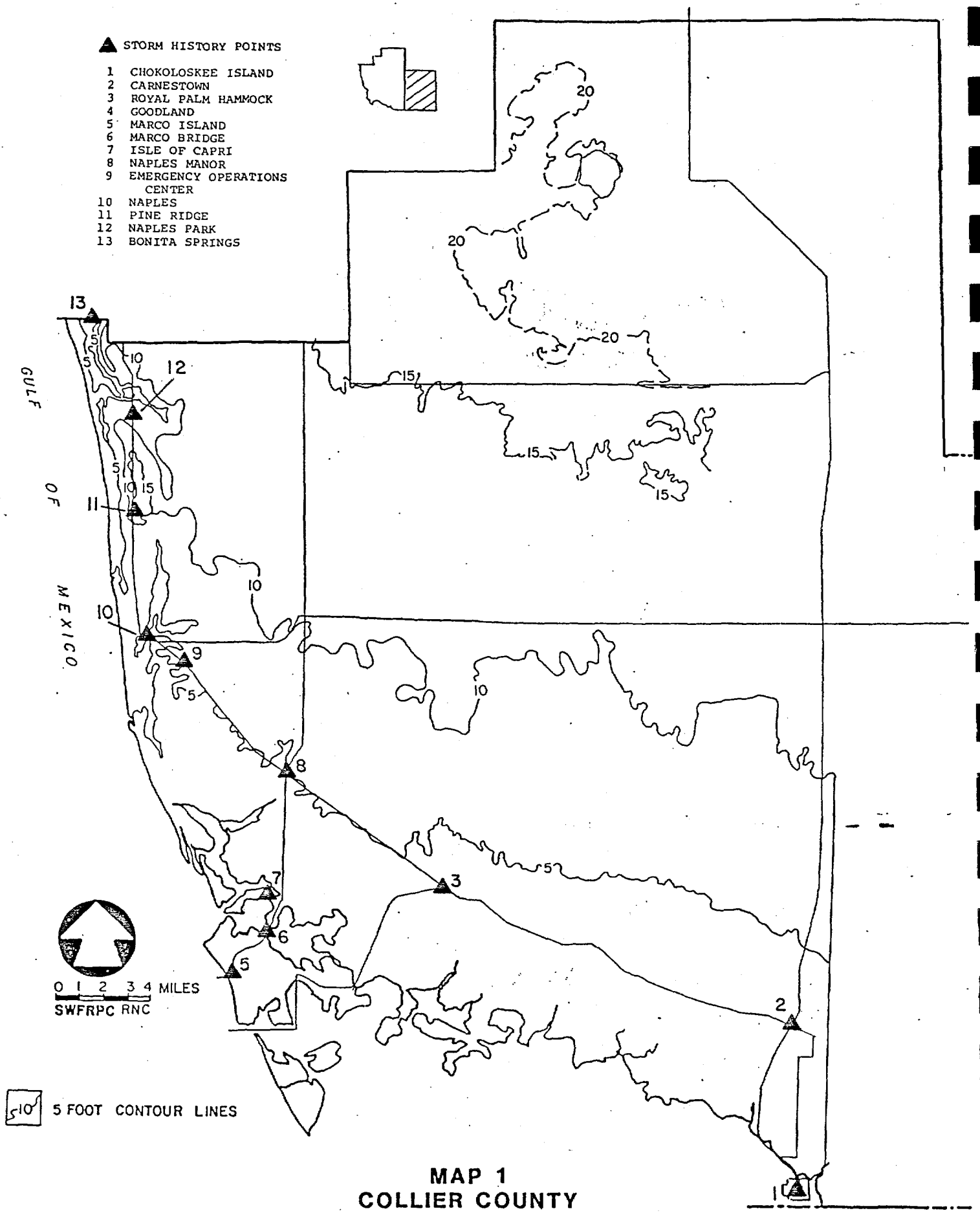
(2) Flooding will be worse south of the eye of the hurricane

(3) Wind conditions making roads unsafe for travel will arrive well before the eye of the hurricane, and usually before flood waters inundate evacuation routes

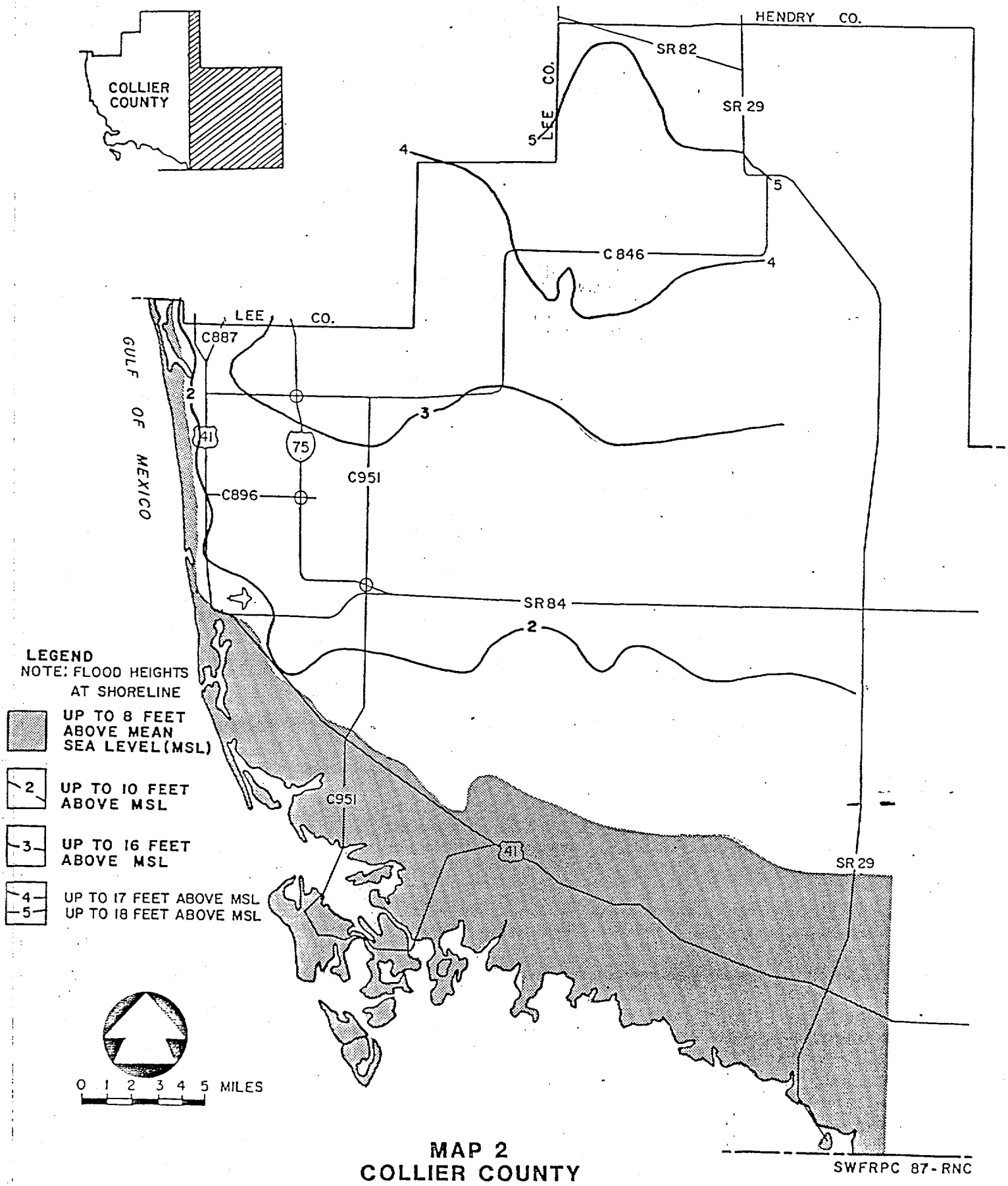
(4) Storm landfall prediction is not an exact science. Any approaching storm has the capacity to strengthen or veer, decreasing or increasing the flooding and surge potential of the storm.

The SLOSH model used thirteen points in Collier County for time history analysis. These points are depicted on Map 1. The greatest height of stormwaters for each category storm for each point are summarized in Table 1.

The SLOSH model also provided maps of the flooding that may be expected in Collier County. The 187 different simulations have been summarized by flood category, and a zone for each category has been created depicting the maximum extent of flooding resulting from all of the storms of that category. The five zones thus created are depicted on Map 2.



MAP 1
COLLIER COUNTY
SLOSH MODEL STORM HISTORY POINTS



MAP 2
COLLIER COUNTY
MAXIMUM AREAS SUBJECT TO FLOODING BY STORM CATEGORY

TABLE 1
PREDICTED COASTAL STORM SURGES SIMULATED BY SLOSH MODEL, LANDFALLING STORMS

(If a point is over water, surge is reported in feet of flooding above msl; if a point is on land, surge is reported in feet above land at that point)*

GRID POINT	ELEVATION OF POINT	STORM CATEGORY 1	2	3	4	5
Chokoloskee Island	4	6	8	14	15	15
Carnestown	5	4	6	11	15	15
Royal Palm	4	6	6	11	14	16
Goodland	3	6	8	10	13	15
Marco Island	3	5	5	8	10	10
Marco Bridge	4	–	4	7	9.5	9
Isle of Capri	3	2	5	9	11	11
Naples Manor	5	–	4	9	11	12
EOC	5	–	3	7	10	11
Naples	8	–	–	4	7	7
Pine Ridge	8	–	–	5	8	8
Naples Park	10	–	–	3	6.5	5
Bonita Shores	2	6	8	12	15	15

Although storms cannot be accurately forecast in regard to storm behavior, the 187 simulations did provide insights into the differences in pre-landfall flooding for landfalling, paralleling, and crossing storms. These differences are summarized in Table 2 for hurricane eye location and points of worst impact. Table 3 summarizes the nature of flood and wind variation based on whether the storm is landfalling, crossing, or paralleling. Appendix 1 summarizes the pre-eye landfall hazard times that the County may experience.

Recent Storm History

Hurricane Donna was the last hurricane to affect Collier County to any significant degree. At the time the hurricane hit, the County's population was 12,000, concentrated primarily in Naples, Immokalee and Everglades City. Except for the Immokalee area, the greater part of the County's inhabited areas were inundated by flood waters. Damage in Everglades City was so great that plans to relocate the County seat were finalized, and relocation was completed in the following year.

Hurricane Alberto was a near miss for the County. This storm formed off the Southwest Florida Coast in 1982, but decreased in intensity to such a degree that it was a tropical depression when it made landfall. However, its actions mimicked those predicted by a hurricane by the SLOSH model to the extent that high waters again inundated the Southeast Collier Shoreline, submerging Everglades City below approximately three feet of seawater for several hours. There was, however, no surge force resulting in significant damage to property.

TABLE 2
HURRICANES SIMULATED BY NUMERICAL STORM SURGE PREDICTION MODEL

MODEL	TYPE	LOCATION	CATEGORY	LANDFALL/EXITING POINT OR CLOSEST APPROACH	AREA RECEIVING MAXIMUM SURGE/WINDS
SL	L	5SS	1	North end, Ft. Myers Beach (Lee County)	Naples/Bonita Shores
SL	L	5SS	2	North end, Ft. Myers Beach (Lee County)	Naples/Bonita Shores
SR	L	5SS	3	North end, Ft. Myers Beach (Lee County)	Naples/Bonita Shores
SR	L	5SS	4	North end, Ft. Myers Beach (Lee County)	Naples/Bonita Shores
SR	L	5SS	5	North end, Ft. Myers Beach (Lee County)	Naples/Bonita Shores
SL	L	10SS	1	South end, Ft. Myers Beach (Lee County)	Marco Island/ Isles of Capri
SL	L	10SS	2	South end, Ft. Myers Beach (Lee County)	Marco Island/ Isles of Capri
SL	L	10SS	3	South end, Ft. Myers Beach (Lee County)	Marco Island/ Isles of Capri
SL	L	10SS	4	South end, Ft. Myers Beach (Lee County)	Marco Island/ Isles of Capri
SL	L	10SS	5	South end, Ft. Myers Beach (Lee County)	Marco Island/ Isles of Capri
SL	L	15SS	1	Bonita Beach (Lee County)	Goodland
SL	L	15SS	2	Bonita Beach (Lee County)	Goodland
SL	L	15SS	3	Bonita Beach (Lee County)	Goodland
SL	L	15SS	4	Bonita Beach (Lee County)	Goodland
SL	L	15SS	5	Bonita Beach (Lee County)	Goodland
SL	L	20SS	1	Bonita Springs (Lee County)	Goodland
SL	L	20SS	2	Bonita Springs (Lee County)	Goodland
SL	L	20SS	3	Bonita Springs (Lee County)	Goodland
SL	L	20SS	4	Bonita Springs (Lee County)	Goodland
SL	L	20SS	5	Bonita Springs (Lee County)	Goodland

KEY:
- SL - SLOSH (Sea, Lake, and Overland Surges from Hurricanes) Model
- L - Landfalling Hurricane
- C - Crossing Hurricane (Exiting Hurricane)
- P - Paralleling Hurricane
- SS - South of Sanibel Island
- NS - North of Sanibel Island

TABLE 2 (Continued)
HURRICANES SIMULATED BY NUMERICAL STORM SURGE PREDICTION MODEL

MODEL	TYPE	LOCATION	CATEGORY	LANDFALL/EXITING POINT OR CLOSEST APPROACH	AREA RECEIVING MAXIMUM SURGE/WINDS
SL	L	25SS	1	Bonita Shores	Royal Palm
SL	L	25SS	2	Bonita Shores	Royal Palm
SL	L	25SS	3	Bonita Shores	Royal Palm
SL	L	25SS	4	Bonita Shores	Royal Palm
SL	L	25SS	5	Bonita Shores	Royal Palm
SL	L	30SS	1	Naples	Royal Palm
SL	L	30SS	2	Naples	Royal Palm
SL	L	30SS	3	Naples	Royal Palm
SL	L	30SS	4	Naples	Royal Palm
SL	L	30SS	5	Naples	Royal Palm
SL	L	35SS	1	Naples Manor	Chokoloskee Island
SL	L	35SS	2	Naples Manor	Chokoloskee Island
SL	L	35SS	3	Naples Manor	Chokoloskee Island
SL	L	35SS	4	Naples Manor	Chokoloskee Island
SL	L	35SS	5	Naples Manor	Chokoloskee Island
SL	L	40SS	1	Hurricane Pass	Carnestown
SL	L	40SS	2	Hurricane Pass	Carnestown
SL	L	40SS	3	Hurricane Pass	Carnestown
SL	L	40SS	4	Hurricane Pass	Carnestown
SL	L	40SS	5	Hurricane Pass	Carnestown
SL	L	45SS	1	Marco Island	Chokoloskee Island
SL	L	45SS	2	Marco Island	Chokoloskee Island
SL	L	45SS	3	Marco Island	Chokoloskee Island
SL	L	45SS	4	Marco Island	Chokoloskee Island
SL	L	45SS	5	Marco Island	Chokoloskee Island

KEY:
- SL - SLOSH (Sea, Lake, and Overland Surges from
- L - Landfalling Hurricane
- C - Crossing Hurricane (Exiting Hurricane)
- P - Paralleling Hurricane
- SS - South of Sanibel Island
- NS - North of Sanibel Island

TABLE 2 (Continued)
HURRICANES SIMULATED BY NUMERICAL STORM SURGE PREDICTION MODEL

MODEL	TYPE	LOCATION	CATEGORY	LANDFALL/EXITING POINT OR CLOSEST APPROACH	AREA RECEIVING MAXIMUM SURGE/WINDS
SL	L	0 S	1	Sanibel Island	Bonita Shores
SL	L	0 S	2	Sanibel Island	Bonita Shores
SL	L	0 S	3	Sanibel Island	Bonita Shores
SL	L	0 S	4	Sanibel Island	Bonita Shores
SL	L	0 S	5	Sanibel Island	Bonita Shores
SL	P	15ES	1	Everglades City	Chokoloskee Island
SL	P	15ES	2	Everglades City	Chokoloskee Island
SL	P	15ES	3	Everglades City	Chokoloskee Island
SL	P	0 S	1	15 mi. west of Sanibel	Goodland
SL	P	0 S	2	15 mi. west of Sanibel	Goodland
SL	P	0 S	3	15 mi. west of Sanibel	Goodland

KEY:
- SL - SLOSH (Sea, Lake, and Overland Surges from
- L - Landfalling Hurricane
- C - Crossing Hurricane (Exiting Hurricane)
- P - Paralleling Hurricane
- ES - East of Sanibel Island
- WS - West of Sanibel Island

TABLE 3
SELECTED STORM TRACTS BY CATEGORY AND TYPE

STORM TRACK	STORM CHARACTERISTICS	STORM TRACK	STORM CHARACTERISICS
45SS-L-1	S(3) W(1)	15ES-P-1	S(2)
25SS-L-1	S(3) W(1)	0 S-P-1	S(2) W(1)
5SS-L-1	S(2) W(1)	30WS-P-1	S(2) W(1)
15NS-L-1	S(2)		
35NS-L-1	S(2)	15ES-P-2	S(3) W(1)
55NS-L-1	S(1)	0 S-P-2	S(3) W(2)
		30WS-P-2	S(3) W(1)
		60WS-P-2	S(1)
45SS-L-2	S(3) W(2)	15ES-P-3	S(3) W(2)
25SS-L-2	S(3) W(2)	0 S-P-3	S(4) W(3)
5SS-L-2	S(3) W(2)	30WS-P-3	S(3) W(2)
15NS-L-2	S(2) W(1)	50WS-P-3	S(2) W(1)
35NS-L-2	S(2) W(1)		
55NS-L-2	S(2)	45SS-C-1	S(1)
		15SS-C-1	S(1)
		15NS-C-1	S(1)
45SS-L-3	S(4) W(3)	45SS-C-2	S(2) W(1)
25SS-L-3	S(4) W(3)	15SS-C-2	S(2) W(1)
5SS-L-3	S(3) W(2)	15NS-C-2	S(1)
15NS-L-3	S(3) W(2)	45SS-C-3	S(2) W(2)
35NS-L-3	S(3) W(1)	15SS-C-3	S(3) W(2)
55NS-L-3	S(3) W(1)	15NS-C-3	S(2) W(1)
75NS-L-3	S(2)		

KEY:

SS - South of Sanibel
NS - North of Sanibel
ES - East of Sanibel
WS - West of Sanibel
S - Storm Surge
W - Wind (over 40 mph)

L - Landfalling
P - Parallel
C - Crossing

(1) - Category 1
(2) - Category 2
(3) - Category 3

Hurricane Floyd provided the area a scare on October 16, 1987. However, it veered due east before the County received any impacts beyond gale force wind gusts and somewhat higher tides. A voluntary evacuation order put approximately 600 persons in public shelters and an unknown number in area hotels, homes, and out of region locations.

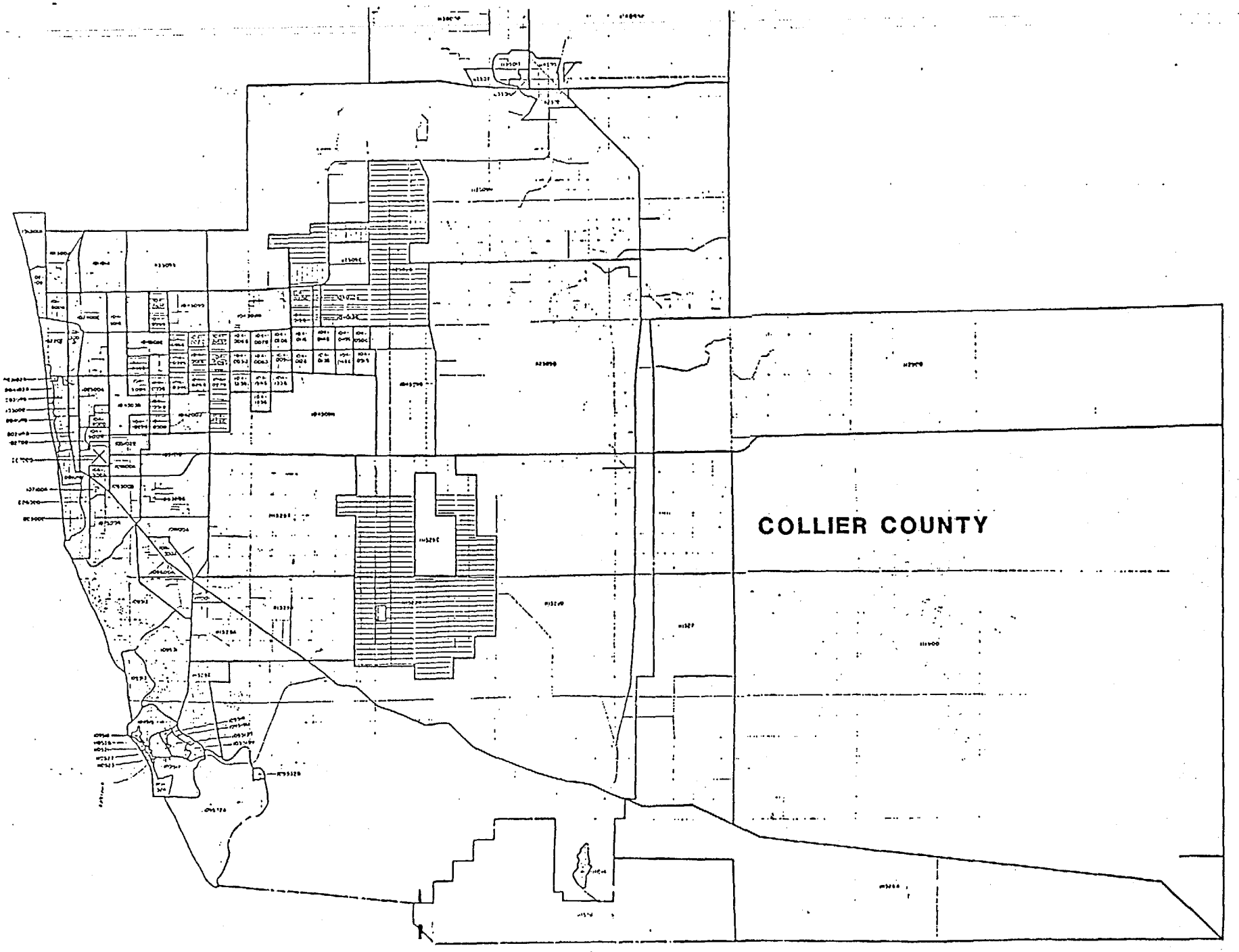
Affected Population

Each zone depicted on Map 2 encompasses large segments of the County population. Each one has a certain degree of vulnerability to the threat of hurricane induced flooding. Category 1 zones have the most repeated threat potential, whereas it is highly unlikely (but the potential exists) that category 5 areas will need to evacuate during the comprehensive plan horizon.

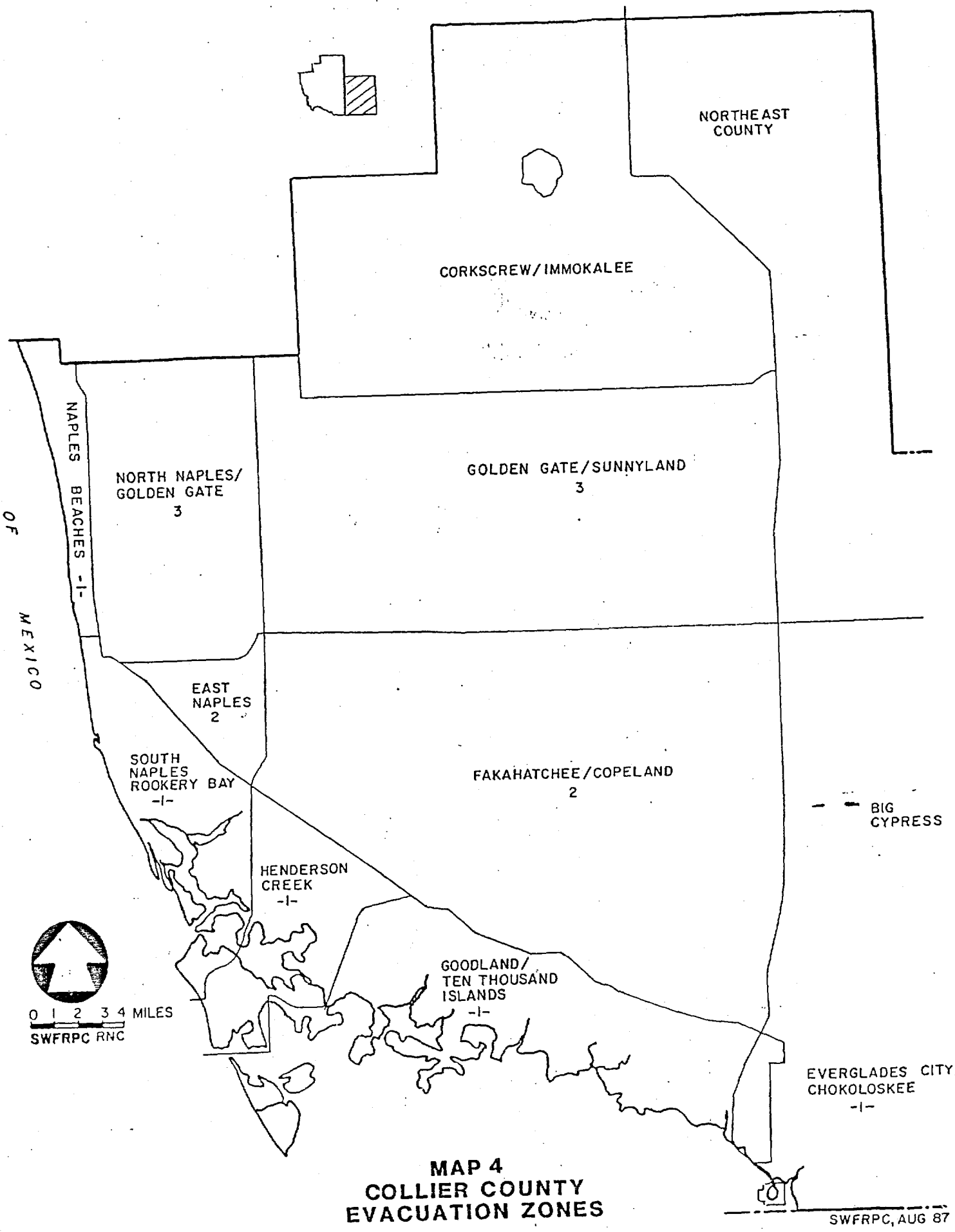
Each zone as drafted mimics the coastline. Geographically, however, these zones are too cumbersome to assess the timing and shelter needs of the population. Consequently, in association with the Collier County Planning Department, new subzones were created consistent with the socio-economic blocks used by the Department. These are depicted in Map 3. These sub-zones, however, are not particularly associated with neighborhood or community identities. Consequently, for identification purposes, sub-zones are reaggregated into communities which have commonly understood names. These communities are depicted on Map 4.

The first element in preparing an estimate of County population is to estimate dwelling units, and dwelling unit types. Using Planning Department information of the County and the City of Naples, supplemented by information on RV Parks from the Department of Health and Rehabilitative Services, it is estimated that there are 84,871 dwellings in the county. This estimate includes conventional housing, mobile homes, and transitional housing such as inhabited travel trailers, and hotel and motel units. The greatest concentration of these, 55.1% are located in the Category 1 Zone. Table 4 provides the estimate of dwelling units in the County by Flood zone and by community name.

Using the housing unit estimate, a population estimate is then made. Two additional factors, however, are needed: persons per household, and vacancy rate. Persons per household were estimated to be a standard 2.4 in Collier County, regardless of unit. Whereas this assumption has inaccuracies, the end result probably does not differ significantly from a more detailed analysis. More detailed analysis, however, is required to assess the impact of vacancy rates for unit types, since different unit types have different vulnerability to flood or wind hazards. Using a survey estimate prepared by telephone survey in October 1987, two estimates of seasonal vacancy for Southwest Florida were prepared. These are as follows:



MAP 3
SOCIO ECONOMIC ZONES



MAP 4
COLLIER COUNTY
EVACUATION ZONES

TABLE 4
COLLIER COUNTY - 1987 HOUSING UNITS

Storm Category	Zone	Residential Single-Family	Mobile Home/ Rec. Vehicle	Multi-Family	Duplex	Hotel/ Motel	Total
1	Everglades City/Chokoloskee	235	221	15	8	29	508
1	Goodland/Ten Thousand Islands	124	290	45	44	197	700
1	Henderson Creek	2,217	1,852	5,416	36	2,046	11,567
1	South Naples/Rookery Bay	3,936	1,590	5,861	613	325	12,325
1	Naples Beaches	7,439	947	9,543	723	3,004	21,656
	TOTAL ZONE 1	13,951	4,900	20,880	1,424	5,601	46,756
2	East Naples	3,080	960	4,952	882	269	10,143
2	Fakahatchee/Copeland	291	771	186	0	0	1,248
	TOTAL ZONE 2	3,371	1,731	5,138	882	269	11,391
	TOTALS CATEGORY 1 + 2	17,322	6,631	26,018	2,306	5,870	58,147
3	North Naples/Golden Gate	9,069	1,277	6,742	1,334	125	18,547
3	Golden Gate/Sunnyland	1,550	100	7	0	0	1,657
	TOTAL ZONE 3	10,619	1,377	6,749	1,334	125	20,204
	TOTALS CATEGORY 1 - 3	27,941	8,008	32,767	3,640	5,995	78,351
4	Corkscrew/Immokalee	1,293	1,727	1,924	132	60	5,136
	TOTAL ZONE 4	1,293	1,727	1,924	132	60	5,136
	TOTALS CATEGORY 1 - 4	29,234	9,735	34,691	3,772	6,055	83,487
5	Northeast County	564	168	282	61	41	1,116
5	Big Cypress	109	84	75	0	0	268
	TOTAL ZONE 5	673	252	357	61	41	1,384
	TOTALS CATEGORY 1 - 5	29,907	9,987	35,048	3,833	6,096	84,871

Unit Type	Seasonal Occupancy Rates July	November
Single-Family Unit	100%	100%
Apartment	70.0	78.0
Condominium (Conventional)	51.0	64.0
Mobile Home	43.0	75.0
Travel Trailer	18.0	41.0
Motel/Hotel	54.0	63.0

From these estimates, Collier County is estimated in 1987 to contain an average 136,599 persons in July and 160,154 persons at the start of November. This is summarized by community in Table 5. Numerically, the greatest seasonality occurs in Hurricane Category Zone 1, which has 76,013 persons in July and 89,699 in November, an increase of 18.0%.

TABLE 5
COLLIER COUNTY POPULATION ESTIMATES
FOR EVACUATION ZONES

Storm Category	Zone	Population Estimate July	November
1	Everglades City/ Chokoloskee	799	1,020
	Goodland/Ten Thousand Islands	937	1,265
	Henderson Creek	16,749	20,976
	South Naples/ Rookery Bay	20,511	24,177
	Naples Beaches	37,017	42,261
	Mobile Homes, not otherwise included in the above flood prone areas (Category 2-5 Areas)	3,968	8,425
	SUBTOTAL	79,981	98,124
2	East Naples	17,309	20,069
	Fakahatchee/Copeland	1,551	2,296
	Mobile Homes, not otherwise included in the above flood prone areas (Category 3-5 Areas)	2,618	5,558
	NEW EVACUEES	17,510	19,498
	TOTAL 1 - 2	97,491	117,622
3	North Naples/Golden Gate	35,262	38,925
	Golden Gate/Sunnyland	3,808	3,898
	Mobile Homes, not otherwise included in the above flood prone areas (Category 4-5 Areas)	1,544	3,277
	NEW EVACUEES	37,996	40,542
	TOTAL 1 - 3	135,487	158,164

TABLE 5 (Continued)
COLLIER COUNTY POPULATION ESTIMATES
FOR EVACUATION ZONES

Storm Category	Zone	Population Estimate July	November
4	Corkscrew/Immokalee	7,451	9,697
	Mobile Homes, not otherwise included in the above flood prone areas (Category 5 Area)	197	417
	NEW EVACUEES	6,194	6,837
	TOTAL 1-4	141,681	165,001
5	Northeast County	2,064	2,328
	Big Cypress	430	531
	NEW EVACUEES	2,297	2,442
	TOTAL	143,978	167,443

Motor Vehicles

Nearly all of the population affected by an oncoming hurricane will evacuate by private vehicle. The question arises as to how many vehicles will be used in the evacuation. Issues relevant to this include the number of vehicles owned, whether owners would be willing to leave any vehicles behind (since next to the home, vehicles are the most expensive possession), whether all drivers feel confident to operate a vehicle in storm conditions, and whether evacuating families wish to be separated in different motor vehicles. Based on surveys, respondents indicated approximately 75% of available vehicles would be used in an evacuation. (Hurricane Evacuation Plan, 1981-82, SWFRPC). This averaged out to 1.1 vehicles per occupied unit.

Using this ratio of cars and the occupancy ratio used previously, the county potential total of vehicles used in an evacuation in July would be 65,955, and in November would be 76,745. Category 1 Zones again have the greatest number of vehicles, 34,846 (36,665 with mobile homes outside the area) in July and 41,114 (44,976 with mobile homes) in November. Table 6 summarizes the vehicle generation by each community.

TABLE 6
COLLIER COUNTY VEHICLE ESTIMATES FOR EVACUATION

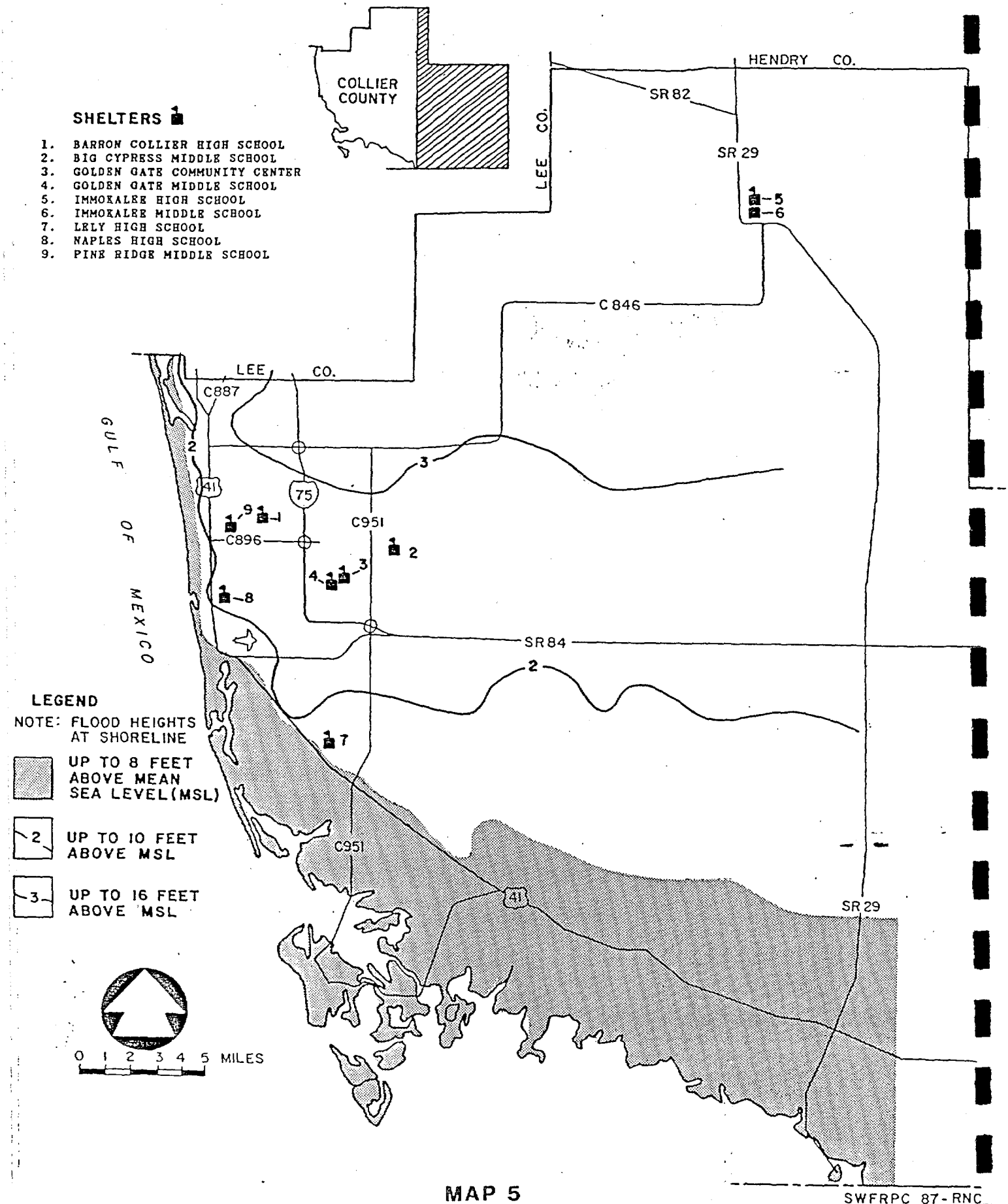
CATEGORY	ZONE	SEASON JULY	(MOBILE HOMES) TRAVEL TRAILER	NOVEMBER	(MOBILE HOMES) TRAVEL TRAILER
1	Everglades City/ Chokoloskee	373	(79)	468	(168)
1	Goodland	429	(104)	579	(220)
1	Henderson Creek	7,677	(662)	9,615	(1,406)
1	South Naples	9,401	(568)	11,082	(1,207)
1	Naples Beaches	16,966	(339)	19,370	(719)
2	East Naples	7,933	(343)	9,198	(729)
2	Fakahatchee	712	(276)	1,052	(585)
3	North Naples	16,162	(457)	17,840	(969)
3	Golden Gate	1,745	(36)	1,787	(76)
4	Corkscrew	3,414	(617)	4,444	(1,311)
5	Northeast County	946	(60)	1,067	(128)
5	Big Cypress	197	(30)	243	(64)
		65,955	(3,571)	76,745	(7,582)

Shelters

Evacuees must have a place to go. The SWFRPC undertook surveys in 1979 and 1981 to determine evacuee preferences. This data is summarized as follows: public shelters (24%), leaving the County (34%), visit friends or go to hotel or stay home or "other" (21%), "don't know" (21%). Those are preference declarations; other studies indicate there is a significant variation from preference to actual behavior. Additionally, the severity of impending storms may also change decisions, as increased community-wide evacuation limits or eliminates the hotel/friends/ public shelter/stay home prediction.

At this time, the County has nine public shelters, with a capacity (at 20 square feet per person) of 12,200 persons. These shelters are summarized in Table 7, by vulnerability zone. They are depicted on Map 5.

Based upon the evacuees forecast in Table 5, the county has limited public shelter capacity. For example, the county can accommodate 15.2% of the evacuees of Category 1 storm in July, but only 12.4% in November. Table 8 summarizes the County's public shelter capacities for storms.



MAP 5
COLLIER COUNTY
RED CROSS MANAGED PUBLIC SHELTER LOCATIONS

TABLE 7
COLLIER COUNTY SHELTERS

Red Cross Managed Shelter	Address	Capacity at 20 sq. ft. per person	Zone Vulner-ability
Barron Collier High School	Cougar Drive	2,500	2
Big Cypress Middle School*	Golden Gate Blvd., N.	700	3
Golden Gate Community Ctr.	Golden Gate Pkwy.	400	3
Golden Gate Middle School	48th Terrace SW	1,700	3
Immokalee High School	9th St. & Immokalee Rd.	600	Beyond 5
Immokalee Middle School	N. 9th Street	1,200	Beyond 5
Lely High School	Lely Blvd.	2,500	2
Naples High School	22nd Avenue N.	1,800	3
Pine Ridge Middle School**	Pine Ridge Rd.	800	3
TOTAL: 9 shelters		CAPACITY:	12,200 persons

* Designated shelter for handicapped persons.
** Designated shelter for nursing homes.

TABLE 8
PUBLIC SHELTER CAPACITY

STORM CATEGORY	SPACE	EVACUEES JULY	EVACUEES NOVEMBER	PERCENT MET JULY	PERCENT MET NOVEMBER
1	12,200	79,981	98,124	15.2	12.4
2	7,200	97,491	117,622	7.4	6.1
3	1,800 (7,200)*	135,487	158,164	<1 (5.3)	<1 (4.6)
4	1,800	141,681	165,001	1.3	1.1
5	1,800	143,978	167,443	<1	<1

*The potential exists for shelters in Category 3 storms to remain open.

Public shelters within the County are not the only means of meeting evacuee shelter needs. Regretfully, they seem to be the largest. Other options for evacuees include "friends," hotels and one's own home (refusal to leave). Of these, only the commercial (hotel) option can be assessed. In Collier County, there is an estimated 6,096 hotel/motel rooms. The greatest portion (91.9%) are along the shoreline or are in the category 1 flood zone. This leaves 495 units for category 1 storms, 226 units for category 2 storms, 101 units for category 3 storms, and 41 units for 4/5 category storms. The 495 units (at 100% vacancy) would satisfy 1.5% of demand in July and 1.2% of demand in November, for a category 1 storm. In Category 2 storms, less than 1% of demand would be met, while the greater storms eliminate virtually all capacity of commercial space being available.

In summary, public and commercial shelter space meets this much of county evacuee needs:

Storm Category 1 = 16.7% July, 13.6% November
Storm Category 2 = 8.0% July, 6.4% November
Storm Category 3 = 5.5% July, 4.7% November
Categories 4/5 = <1%

Without public or private commercial space available evacuees have only the options of using friends within the County, or leaving the County for less affected areas such as areas outside of the storm's probable impact. The shelter capacity of "friends" is limited. This capacity diminishes as the ratio of evacuees to those not affected increases. This problem is depicted in Table 9.

TABLE 9
POPULATION DISPLACEMENT RATIO

STORM CATEGORY	POPULATION					
	DISPLACED		NOT DISPLACED		RATIO	
	July	November	July	November	July	November
1	79,981	98,124	63,997	69,319	1.25:1	1.4:1
2	97,491	117,622	46,487	49,821	2.1:1	2.4:1
3	135,487	158,164	8,491	9,279	16:1	18.6:1
4	141,681	165,001	2,297	2,442	61.6:1	67.6:1
5	143,978	167,443	0	0		

It is an assumption that ratios of 1:1 or better (0.8:1, 0.6:1) will enable those seeking shelter with friends will find them. Ratios of worse than 1:1 (2:1, for example), will diminish that likelihood in proportion to the ratio. Given that assumption, only 80% of those evacuees from a category 1 storm wishing to stay with friends will be able to do so (80% in July and 70% in

November). Since 13% of evacuees have that desire (SWFRPC, 1981), only 10.4% (July) and 9.2% (November) will be able to do so. This worsens for each stronger category, with only 6.5% (July) and 5.4 (November) for Category 2 storms; for Category 3, this becomes 0.8% in July and 0.7% in November; and for greater storms, it becomes insignificant.

These percentages added to the shelter populations absorb the remainder of "in county" shelter demand satisfaction. This is summarized in Table 10.

TABLE 10
SHELTER SATISFACTION IN COLLIER COUNTY

CATEGORY	PERCENT MET JULY	NOVEMBER
1	27.1	22.8
2	14.5	11.8
3	6.3	6.1
4	<1	<1
5	<1	<1

If shelter needs cannot be met within the County, they must be met outside of the County. For this reason, a knowledge of routes and route capacities becomes important.

Routes

Arterial roadways form the backbone of any hurricane evacuation effort. Collier County's roadway system provides relatively few options for evacuees coming from the coast. Those that do exist are depicted on Map 6, "Evacuation Routes." Identification of routes is the first step in assessing the roadway system. The next step is assessing roadway capacities. The capacities of these roadways have been developed based on their characteristics, tied to the assessment methodologies of the Highway Capacity Manual, 1985. These capacities are contained in Table 11, and show that the roadways (at the 90/10 split) vary from a high hourly capacity at service level D of 2,410 trips for I-75, to a low of 756 trips at the Hendry County line for SR 29.

An important aspect of any route is its condition. Many routes along the shore are low lying. Their propensity to flood due to surge or tidal action causes their reliability to operate as a route to cease several hours before storm landfall. Map 6 depicts these possibilities. In most cases, however, winds, not shoreline flooding, will initially make roads unsafe for travel. The exception seems to be the Bonita Shores area for landfalling storms of category 1 or 2 strength.

Rainfall flooding, however, may constitute a greater hazard to evacuation route operation than either early shoreline flooding or early winds. This is because roadways may flood and become partially or totally impassible early in an evacuation. Such

TABLE 11
EVACUATION ROUTE CAPACITY CALCULATIONS
COLLIER COUNTY

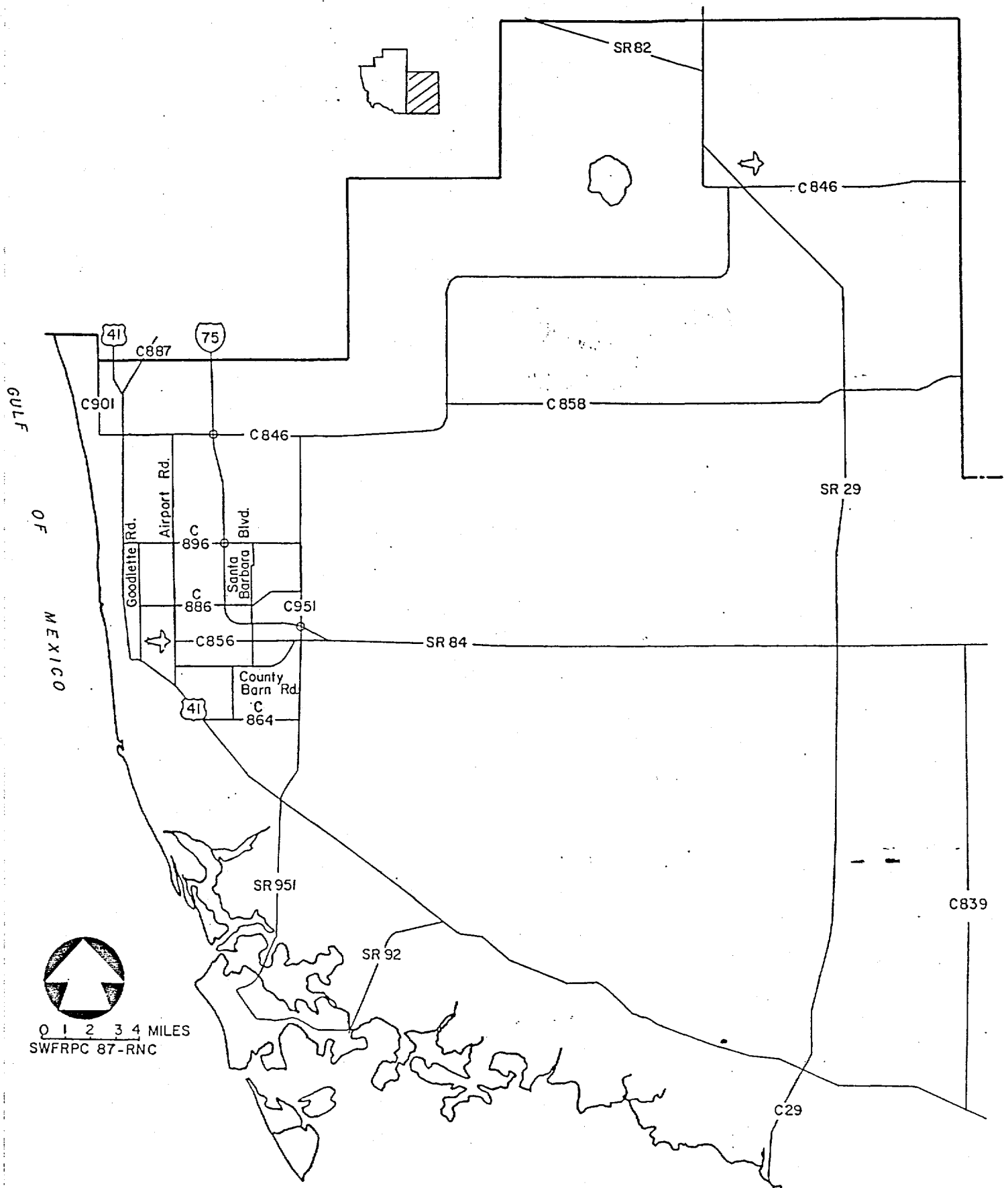
ROUTE	# OF LANES	LANE WIDTH (FT.)	DESIGN SPEED (MPH)	HIGHWAY TYPE	PER-CENT NO PASSING ZONES	MAXIMUM HRLY. FLOW/ FLOW RATE (LOS D)	TRAFFIC FLOW SPLIT 50/50	70/30	90/10
I-75									
Lee County To SR 84	4	12	70	Freeway	--	2,410			
US 41									
Lee County to Solana Rd.	4	12	70	Rur.Div.	--	2,302			
Solana Rd. to SR 84	6	12	60	Sub.Div.	--	2,801			
SR 84 to Rattlesnake Hammock Road	4	12	60	Sub.Div.	--	1,886			
Rattlesnake Hammock Road to SR 951	4	12	60	Rur.Div.	--	2,117			
SR 951 to SR 29	2	12	60	--	90	1,202	724	902	977
SR 29 to Dade County	2	12	60	--	90	1,202	724	902	977
SR 951									
US 41 to Marco Bridge	2	12	60	--	100	1,151	769	958	1,036
SR 84									
US 41 to Airport Road	6	11	60	Sub.Div.	--	2,661			
Airport Road to CR 951	2	12	60	--	80	1,089	726	904	980
CR 951 to Broward Co.	2	12	60	--	80	1,089	726	904	980
SR 29									
Hendry Co. to Immokalee	2	10	60	--	80	840	560	698	756
Immokalee to SR 84	2	12	60	--	80	1,050	700	872	945
SR 84 to US 41	2	10	60	--	80	902	601	749	812
SR 82									
Hendry County to SR 29	2	12	60	--	80	1,080	650	810	878

TABLE 11 (Continued)
EVACUATION ROUTE CAPACITY CALCULATIONS
COLLIER COUNTY

ROUTE	# OF LANES	LANE WIDTH (FT.)	DESIGN SPEED (MPH)	HIGHWAY TYPE	PER-CENT NO PASSING ZONES	MAXIMUM HRLY. FLOW/ FLOW RATE (LOS D)	TRAFFIC FLOW SPLIT 50/50	70/30	90/10
CR 846									
CR 901 to I-75	2	12	60	Rur.Div.	90	1,371	770	960	1,040
I-75 to SR 29	2	12	60	Rur.Div.	90	1,057	706	880	954
SR 29 to Hendry County	2	9	50	Rur.Div.	90	914			
CR 858									
CR 846 to Hendry County	2	12	60	Rur.Div.	80	1,183	713	888	962
CR 891									
CR 846 to Green Blvd.	2	12	60	Rur.Div.	90	1,109	740	921	998
CR 951									
Green Blvd. to Radio Rd.	4	12	60	Sub.Div.	--	1,924			
Radio Rd. to US 41	2	12	60	Rur.Div.	100	1,136	757	944	1,022
CR 864									
Rattlesnake Hammock Rd.	2	12	60	Rur.Div.	90	1,291	777	969	1,049
Country Barn Road	2	12	60	Rur.Div.	90	1,440	766	954	1,034
CR 856 (Radio Road)	4	12	60	Sub.Div.	90	1,064	640	799	865
CR 31 (Airport Road)									
SR 846 to US 41	4	12	60	Sub.Div.	--	1,924			
CR 896 (Pine Ridge Road)									
US 41 to CR 951	4	12	60	Sub.Div.	--	1,912			
CR 886 (Golden Gate Pkwy.)									
US 41 to CR 951	4	12	60	Sub.Div.	--	1,913			

TABLE 11 (Continued)
EVACUATION ROUTE CAPACITY CALCULATIONS
COLLIER COUNTY

ROUTE	# OF LANES	LANE WIDTH (FT.)	DESIGN SPEED (MPH)	HIGHWAY TYPE	PER-CENT NO PASSING ZONES	MAXIMUM HRLY. FLOW/ FLOW RATE (LOS D)	TRAFFIC FLOW SPLIT 50/50	70/30	90/10
CR 851 (Goodlette Rd.) CR 896 to US 41	4	12	60	Sub.Div.	--	1,924			
Santa Barbara Blvd. Green Blvd. to SR 84	4	12	60	Sub.Div.	--	1,964			
CR 901 Lee County to CR 846	2	10	60	Rur.Div.	90	1,064	640	799	865
CR 839 (Birdon Rd.) SR 84 to US 41	2	9	50	Rur.Div.	80	678	452	563	610
CR 850 Lee County to SR 82	2	10	50	Rur.Div.	90	895	597	743	805



MAP 6
COLLIER COUNTY
EVACUATION ROUTES

areas have been documented for different storms and are depicted on Map 7. These are areas that must be passed before the presupposed onset of heavy rains, which is eight hours before eye landfall. This is relevant for Category 1 storms for most areas of Collier County and for fewer areas for Category 2 or greater storms.

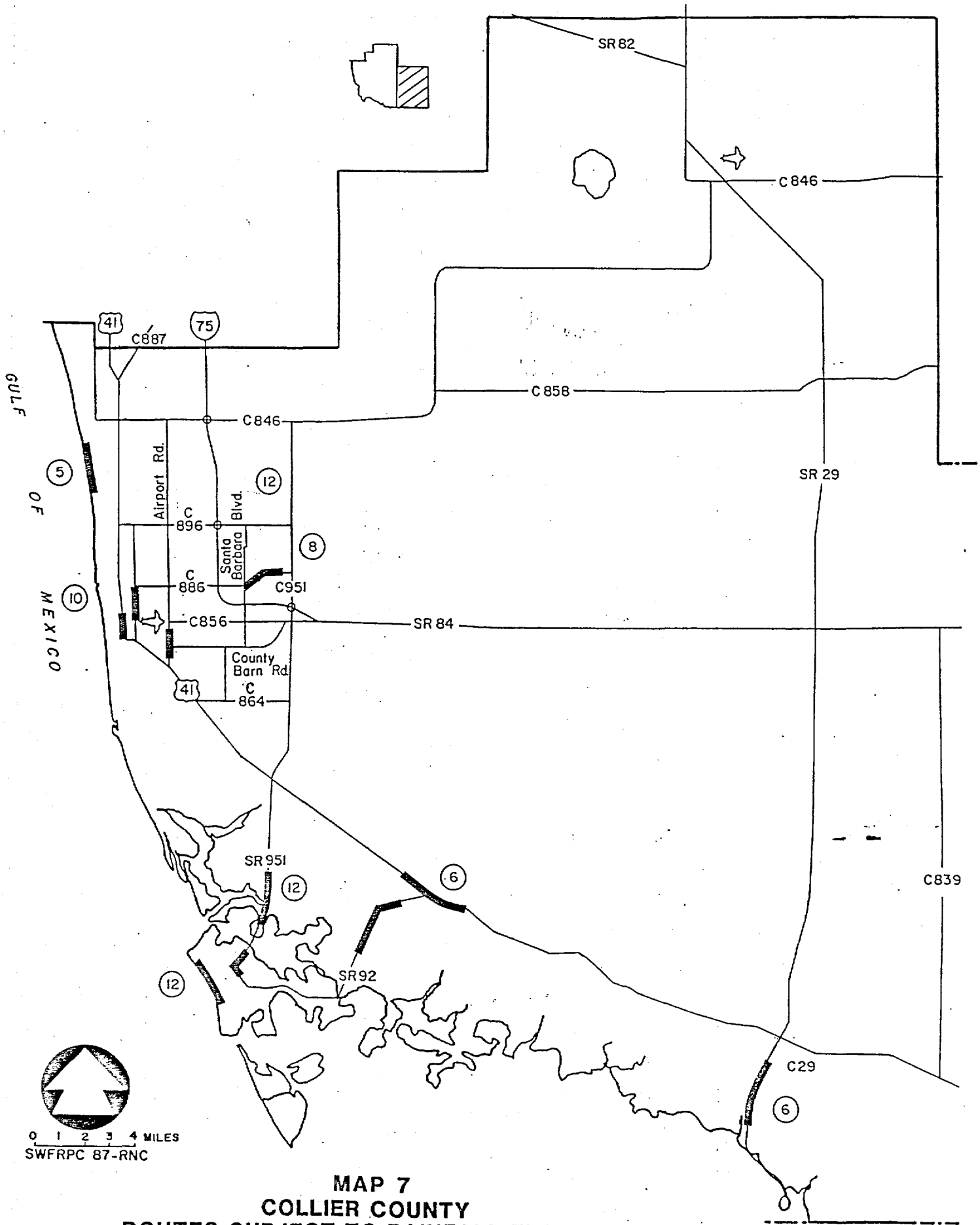
Clearance Times

There are several factors taken into account when calculating community clearance time. The first is the nature of the threat. Although there are no assurances that the County cannot be struck by Category 4 and 5 storms, the probabilities of this are low. The County does, however, lie subject to Storms of Category 1, 2, and 3 strength in decreasing probability. With each storm of increasing strength, the number of persons and vehicles also increases.

Other factors contributing to clearance time are the number of vehicles evacuating and the capacity of roadways to carry evacuees. This translates into a number of hours it will take to move persons past any given point.

The final factors include the number and distance of "stopping" opportunities offered evacuees, and the distance to these opportunities. If stopping opportunities needed are only ten miles inland, the time is much less for an evacuation than if they are 100 miles distant.

These factors compose the evacuation time. For certain communities within the County, times are less than for others. This variation is because pre-landfall flood conditions are not as bad, shelter locations are closer, and better quality evacuation routes are available. Table 12 summarizes pre-landfall flood conditions, Table 13 summarizes shelter distances and options, and Table 14 summarizes the time it takes to clear the most restrictive point on the route for each community for each of the slow, intermediate, and quick responses.



MAP 7
COLLIER COUNTY
ROUTES SUBJECT TO RAINFALL FLOODING

TABLE 12
PRE-LANDFALL FLOOD CONDITIONS

COMMUNITY	CATEGORY	TIME TO COASTAL FLOOD	TIME TO RAINFALL	TIME TO WIND
Everglades	1	--	8	5.5
	2	0.5	8	6.5
	3	1.5	8	8.5
Goodland	1	1.5	8	6.5
	2	2.5	8	8
	3	5.0	8	10.5
Henderson Crk.	1	1.5	8	6.5
	2	2.5	8	8
	3	5.0	8	10.5
Rookery Bay	1	--	8	5
	2	1.5	8	7
	3	3.0	8	9.5
Naples Beach	1	7	8	5.5
	2	7.5	8	7
	3	9.0	8	9.5
East Naples	2	1.2	8	7
	3	3.0	8	9.5
Fakahatchee	2	1.5	8	7
	3	3.0	8	9
North Naples	3	2.5	8	9
Golden Gate	3	1.5	8	9

TABLE 13
SHELTER DESIGNATIONS AND OPTIONS

CATEGORY	ZONE	PUBLIC SHELTERS NAME	ESTIMATED TRAVEL TIME
1	Everglades	Immokalee Middle School Immokalee High School	1 hr.
1	Goodland	Immokalee Middle School Immokalee High School	1 hr.
1	Henderson Creek	Lely High School	.25 hr.
1	So. Naples	Lely High School Pine Ridge Middle Golden Gate Middle Barron Collier High School Golden Gate Comm. Naples High School	.5 hr.
1	Naples Beaches	Lely High School Pine Ridge Middle Golden Gate Middle Barron Collier High School Golden Gate Comm. Naples High	.25 hr.
1	Mobile Homes (2-5)		.5 hr.

TABLE 13 (Continued)
SHELTER DESIGNATIONS AND OPTIONS

CATEGORY	ZONE	PUBLIC SHELTERS NAME	ESTIMATED TRAVEL TIME
2	All 1 Zones	Immokalee Middle School Immokalee High School Pine Ridge Middle Golden Gate Middle Golden Gate Comm. Naples High	
2	East Naples	Immokalee Middle School Immokalee High School Pine Ridge Middle Golden Gate Middle Golden Gate Comm. Naples High	.25 hr.
	Fakahatchee	Immokalee Schools	.5 hr.
3	All 1 and 2 Zones	Only Immokalee Schools*	
	North Naples	Only Immokalee Schools	
	Golden Gate	Only Immokalee Schools	

*Possibility exists that Golden Gate Schools would only flood from extremely bad Category 3 storm conditions. However, careful examination of past heavy rainfall conditions on the areas of these shelters, particularly the functioning of the canals, should be taken into effect.

As can be seen from this table, some routes end up being ultimate constricting points for more than 1 zone. That being the case, it may be expected that these times will become cumulative. This creates a "greatest time to clear" for the county as a whole. Table 15 depicts the "greatest time to clear" calculation for each category storm.

TABLE 14
TIME TO CLEAR

CATEGORY	ZONE	RESTRICTING POINT	JULY SLOW	JULY INTER-MEDIATE	JULY QUICK	NOVEMBER SLOW	NOVEMBER INTER-MEDIATE	NOVEMBER QUICK	TO COUNTY LINE
1	Everglades	SR 29	0.6	0.5	0.5	0.8	0.6	0.6	1.0
1	Goodland	SR 29	0.7	0.6	0.5	1.0	0.8	0.7	1.0
1	Henderson Crk.	SR 951	10.0	8.0	7.4	12.5	10.0	9.3	1.0
1	South Naples	US 41	5.0	5.0	5.0	5.9	5.9	5.9	0.6
1	Naples Beaches	CR 896 & CR 846	6.3	6.0	5.7	7.2	6.7	6.2	0.5
2	East Naples	CR 951 & CR 31	3.0	2.8	2.6	3.4	3.2	3.0	0.5
2	Fakahatchee	SR 29	1.2	1.0	0.8	1.8	1.4	1.3	0.6
3	North Naples	CR 846 & CR 896	6.0	5.6	5.2	6.7	6.2	5.8	0.5
3*	Golden Gate	CR 951	2.3	1.8	1.7	2.4	1.9	1.7	0.5

*Only extreme Category 3 conditions would induce flooding in this zone

TABLE 15
ULTIMATE CONSTRICTING ROUTE

CATEGORY	CONSTRICTING ROUTE	TIME					
		JULY			NOVEMBER		
		SLOW	INTER-MEDIATE	QUICK	SLOW	INTER-MEDIATE	QUICK
1	SR 951	10.0	8.0	7.4	12.5	10.0	9.3
2	CR 951	13.0	10.8	10.0	15.9	13.2	12.3
3	CR 951*	13.0	10.8	10.0	15.9	13.2	12.3

*Reflects traffic dispersion to I-75

Clearly, route constriction becomes a concern when it is unevenly distributed between different parts of the County. The relative isolation of the shoreline south of Naples and the limited routes south of SR 84 limits evacuation capacity causing the large times. The possibility exists that increased traffic control can better distribute loadings. If that is the case, the ultimate constricting points move to the sum of the routes exiting the County. Table 16 depicts the times that may occur, given different routing scenarios.

The last factor to be incorporated into calculating the County clearance time is the response of potential evacuees to an evacuation order. The original 1981-82 Regional Hurricane Evacuation Plan discussed this topic on page 125, and concluded that seven hours would be the minimum time needed to clear a zone, because some evacuees would dawdle more than others. More recent history indicates that sudden or dramatic changes in hurricanes can heighten the evacuees response into a "quick" evacuation, limited basically by road capacity. Consequently, in evaluating the final criteria that determines a slow, intermediate, or quick evacuation, both slow and intermediate zones will have a minimum response time of seven hours; "quick" times, however, will be limited only by roadway capacity. All of these factors combine into creating a countywide clearance time. This time will vary depending upon the routes available for out of county evacuation, the time of season, and whether it is a slow, intermediate, or quick response. Table 17 summarizes the contribution to the greatest clearance time for the County for each category storm.

The clearance time for the County as a whole for Category 3 storms will increase if out-of-county evacuation is limited solely to I-75 (north or east) and SR 29 (north). If more routes are provided, the time may lessen. This, of course depends upon the impact of the other evacuating counties.

TABLE 16
COUNTY EXITING ROUTES

CATEGORY	TOTAL VEHICLES LEAVING CO.	% OF TOTAL COUNTY VEHICLES	ROUTES	COMBINED CAPACITIES			TIMES					
							JULY			NOVEMBER		
				SLOW	INTER-MEDIATE	QUICK	SLOW	INTER-MEDIATE	QUICK	SLOW	INTER-MEDIATE	QUICK
1(a)	26,729(J) 34,721(N)	72.9 77.2	I-75 (N & E) AND SR 29	3,696	4,012	4,146	7.2	6.7	6.4	9.4	8.7	8.4
2(a)	39,066(J) 47,550(N)	85.5 88.2	same as 1(a)				10.5	9.7	9.4	12.9	11.9	11.5
(b)			I-75 (N & E) AND SR 29, AND US 41(N)	5,998	6,314	6,448	6.5	6.2	6.1	8.0	7.5	7.4
3(a)	58,192(J)	93.7	same as 1(a)				15.7	14.5	14.0	18.4	17.0	16.4
(b)	68,072(N)	93.9	same as 2(b)				9.7	9.2	9.0	11.3	10.8	10.6
(c)			I-75 (N and E) AND SR 29, AND US 41 (N AND E)	6,722	7,216	7,425	8.6	8.1	7.8	10.1	9.4	9.2

TABLE 17
TOTAL EVACUATION TIME

CATEGORY	DESTINATION(1)	WEATHER(2)	CLEARANCE TIME						TOTAL EVACUATION TIME					
			SLOW		INTERMEDIATE		QUICK		SLOW		INTERMEDIATE		QUICK	
			J	N	J	N	J	N	J	N	J	N	J	N
1	1.0	8	10.0	12.5	8.0	10.0	7.4	9.3	19.0	21.5	17.0	19.0	16.4	18.3
2	1.0	8	13.0	15.9	10.8	13.2	10.0	12.3	22.0	24.9	19.8	22.2	19.0	21.3
3	1.0	10.5	13.0 (15.7)	15.9 (18.4)	10.8 (14.5)	13.2 (17.0)	10.0 (14.0)	12.3 (16.4)	24.5 (24.7)	27.4 (27.4)	22.3 (23.5)	24.7 (26.0)	21.5 (23.0)	23.8 (25.4)

(1) From Table 13 or 14, whichever is greater

(2) From Table 12

Numbers in parenthesis reflect "County Exiting Time" restrictions if too few roadways can be accessed. The weather restricting factor is rainfall in such an event.

PART II - 1991 FORECASTS

Part of hurricane preparedness involves understanding and evaluating the growth that may be expected in the forthcoming years. This element discusses short ranged growth (4 years) the area may undergo, and the facilities that are expected to be added to serve it.

The growth predicted follows a single straight-lined forecast technique. Applied uniformly, increases by category and community for housing, persons, and vehicles for 1991 are depicted in Tables 18, 19, and 20.

Table 18 forecasts a total of 95,225 dwelling units for 1991.

Table 19 forecasts a total of 161,442 persons in July; and 187,871 in November.

Table 20 forecasts a total of 74,002 vehicles in July; and 86,108 in November.

TABLE 19
COLLIER COUNTY POPULATION ESTIMATES FOR 1991

Zone	Name	July	(Mobile Home/TT)	November	(Mobile Home/TT)
1	Everglades City	896	(193)	1,144	(411)
	Goodland	1,051	(254)	1,419	(539)
	Henderson Creek	18,792	(1,621)	23,535	(3,441)
	South Naples	23,013	(1,391)	27,127	(2,954)
	Naples Beaches	41,533	(829)	47,417	(1,759)
2	East Naples	19,421	(840)	22,517	(1,784)
	Fakahatchee	1,740	(674)	2,576	(1,433)
3	North Naples	39,564	(1,118)	43,674	(2,373)
	Golden Gate	4,273	(88)	4,374	(186)
4	Corkscrew	8,360	(1,511)	10,880	(3,209)
5	Northeast County	2,316	(147)	2,612	(312)
	Big Cypress	482	(74)	596	(156)
	TOTAL	161,442	(8,740)	187,871	(18,557)

TABLE 18
COLLIER COUNTY - HOUSING ESTIMATE FOR 1991
(Based on projected housing units of 95,225)

Storm Category	Zone	Residential Single-Family	Mobile Home/ Rec. Vehicle	Multi-Family	Duplex	Hotel-Motel	Total
1	Everglades City	264	248	17	9	33	570
1	Chokoloskee Goodland	139	325	50	49	221	785
1	Ten Thousand Islands Henderson Creek	2,487	2,078	6,077	40	2,296	12,978
1	South Naples	4,416	1,784	6,576	688	365	13,829
1	Rookery Bay Naples Beaches	8,347	1,063	10,707	811	3,370	24,298
TOTAL	ZONE 1	15,653	5,498	23,427	1,598	6,284	52,460
2	East Naples	3,456	1,077	5,556	990	302	11,380
2	Fakahatchee Copeland	327	865	209	0	0	1,400
TOTAL	ZONE 2	3,782	1,942	5,765	990	302	12,781
TOTALS	ZONES 1 & 2	19,435	7,440	29,192	2,587	6,586	65,241
3	North Naples	10,175	1,433	7,565	1,497	140	20,810
3	Golden Gate Golden Gate Sunnyland	1,739	112	8	0	0	1,859
TOTAL	ZONE 3	11,915	1,545	7,572	1,497	140	22,669
TOTALS	ZONES 1 - 3	31,350	8,985	36,765	4,084	6,726	87,910
4	Corkscrew/ Immokalee	1,451	1,938	2,159	148	67	5,763
TOTAL	ZONE 4	1,451	1,938	2,159	148	67	5,763
TOTALS	ZONES 1 - 4	32,801	10,923	38,923	4,232	6,794	93,672
5	Northeast County	633	188	316	68	46	1,252
5	Big Cypress	122	94	84	0	0	301
TOTAL	ZONE 5	755	283	401	68	46	1,553
TOTALS	ZONES 1 - 5	33,556	11,205	39,324	4,301	6,840	95,225

TABLE 20
MOTOR VEHICLE ESTIMATES FOR 1991

Zone	Name	July	(Mobile Home/TT)	November	(Mobile Home/TT)
1	Everglades City	419	(89)	525	(188)
	Goodland	481	(117)	650	(247)
	Henderson Creek	8,614	(743)	10,788	(1,578)
	South Naples	10,548	(637)	12,434	(1,354)
	Naples Beaches	19,036	(380)	21,733	(807)
2	East Naples	8,901	(385)	10,320	(818)
	Fakahatchee	799	(310)	1,180	(656)
3	North Naples	18,134	(513)	20,016	(1,087)
	Golden Gate	1,958	(40)	2,005	(85)
4	Corkscrew	3,831	(692)	4,986	(1,471)
5	Northeast County	1,061	(67)	1,197	(144)
	Big Cypress	221	(34)	273	(72)
	TOTAL	74,002	(4,007)	86,108	(8,507)

The additional facilities expected can be categorized as "shelters" and "routes." Regretfully, future shelter site and capacity information has not yet been exactly determined. Route improvements, however, are better known.

There are three new schools forecast for Collier County, one middle and two elementary schools. In addition, Pine Ridge Middle is expected to undergo an expansion as well as is the Exceptional Student Education Program.

Currently, the County is only designating middle or high schools as shelters. This policy, if continued, would only have the new middle school and the Pine Ridge additions as new shelter space. Neither proposed facility has been assessed for its capacity. However, for short term purposes, the new Middle School will be assessed to have 800 spaces, and the Pine Ridge expansion will add 400 spaces. The new middle school is assumed to be in a Category 2 zone area south of SR 84. These 1200 new spaces increase the County shelter capacity by 10% during a period when the County is expected to increase demand by 12.2%.

Route improvements for the next five-year period indicate substantial improvements will be made to routes exiting the Category 1 zone. Using the 1988-1992 TIP of the Naples/Collier County Metropolitan Planning Organization as a guide, the following significant improvements are forecasted:

(a) Adding two lanes to SR 90 (Tamiami Trail) for 2.1 miles
(b) Adding two lanes to SR 951 for 6.6 miles (Marco Island to US 41) (unfunded)

(c) Improving I-75 (Alligator Alley) for 29.2 miles eastward toward Broward County
(d) Adding two laes to CR 951 for 6.2 miles
(e) Extending Vanderbilt Beach Road as a 4-lane four to CR 951 (two lanes) for 2.9 miles
(f) Adding two lanes to Airport Pulling Road for 2.4 miles
(g) Extending Livingston Road as a 4-lane road for 6.2 miles
(h) Adding two lanes to Immokalee Road (C 846) for 3.5 miles
(i) Adding two lanes to Pine Ridge Road for 2 miles

Even though the exact capacities of these new improvements cannot be calculated at this time, an estimate can be made. Table 21 provides a revision of the previously provided Table 11 to represent 1991 conditions.

TABLE 21
REVISED CAPACITIES

ROUTE	NEW CAPACITY	OLD CAPACITY
US 41 from 5 Ave. S to CR 31	2,801	1,886
SR 951 from Marco to US 41*	1,886	1,036 (quick)
I-75 from current segment to Broward Co.	2,410	980 (quick)
CR 987 from US 41 to CR 864	1,886	1,022 (quick)
Vanderbilt Beach Road from existing to CR 951	865 (quick)	0
CR 31 from US 41 to Golden Gate	2,801	1,924
Livingston from CR 846 to Imperial	1,886	0
Immokalee from US 41 to I-75	1,886	1,040 (quick)
Pine Ridge Road from US 41 to CR 31	2,801	1,921

*Currently listed as an "unfunded" project

Assuming that these improvements are in place, new shelter satisfaction capacities (Table 10), time to clear (Table 14), exiting route assessments (Table 16), and total evacuation time calculations (Table 17) can be made.

Shelter capacities do not improve with the facilities projected because growth is outstripping the capacity added. Since the methodology used was a single straight-line process, the only factors changing were the population (up 12.2%) and shelter space (up 9.8%). As a result, shelter satisfaction within the County will demonstrate a decline. Table 22 depicts this decline.

TABLE 22
SHELTER SATISFACTION, 1991

CATEGORY	PERCENT MET JULY	PERCENT MET NOVEMBER
1	26.8	21.4
2	14.2	11.9
3	6.4	5.5
4	<1	<1
5	<1	<1

This decline can only worsen evacuation and clearance times unless comparable out-of-county route improvements are made. Using the improvements listed, there are route improvements forecast that improve in-county movement capacities. The most effective improvements are SR 951 to US 41 (unfunded) and Immokalee Road. Table 23 depicts these changes.

TABLE 23
REVISED TIME TO CLEAR 1991

CATEGORY	ZONE	RESTRICTING POINT	JULY SLOW	JULY INTER-MEDIATE	JULY QUICK	NOVEMBER SLOW	NOVEMBER INTER-MEDIATE	NOVEMBER QUICK
1	Everglades	SR 29	0.7	0.6	0.6	0.9	0.7	0.6
1	Goodland	SR 29	0.8	0.7	0.6	1.1	0.9	0.8
1	Henderson Crk.	SR 951	4.6	4.6	4.6	5.7	5.7	5.7
1	South Naples	US 41	5.6	5.6	5.6	6.6	6.6	6.6
1	Naples Beaches	CR 896 & CR 846	5.0	5.0	5.0	5.7	5.7	5.7
2	East Naples	CR 951 & CR 31	2.3	2.3	2.3	2.7	2.7	2.7
2	Fakahatchee	SR 29	1.3	1.1	0.9	2.0	1.5	1.4
3	North Naples	CR 846 & CR 896	4.8	4.8	4.8	5.3	5.3	5.3
3	Golden Gate	CR 951	1.0	1.0	1.0	1.1	1.1	1.1

S = Slow I = Intermediate Q = Quick

Regretfully, none of the out-of-county routes have improvements slated, with the exception of I-75 (east). Consequently, traffic growth combined with a reduced ability to provide shelter means increased out of county times. This is depicted in Table 24.

The improvement to critical coastal routes improves the evacuation times of coastal zones. Consequently, behavior response time (assumed 7 hours) or county exiting route times may become the constraining time factor. This is shown in Table 25.

Depending upon the number and capacity of county exiting routes available, either these routes or behavioral response will be the constraint for category 1 or 2 storms. However, for category 3 storms, the constraining factor will be the coastal routes capacities in the county's highly developed western shore, west of I-75.

TABLE 24
COUNTY EXITING ROUTES 1991

CATEGORY	TOTAL VEHICLES LEAVING CO.	% OF TOTAL COUNTY VEHICLES	ROUTES	COMBINED CAPACITIES			TIMES					
							JULY			NOVEMBER		
				SLOW	INTER-MEDIATE	QUICK	SLOW	INTER-MEDIATE	QUICK	SLOW	INTER-MEDIATE	QUICK
1(a)	30,113(J) 39,664(N)	73.2 78.6	I-75 (N & E) AND SR 29	5,380	5,518	5,576	5.6	5.5	5.4	7.4	7.2	7.1
2(a)	49,923(J) 53,290(N)	85.6 88.1	same as 1(a)				8.0	7.8	7.7	9.9	9.7	9.6
(b)			I-75 (N & E) AND SR 29, AND US 41(N)	7,682	7,820	7,878	5.6	5.5	5.4	6.9	6.8	6.7
3(a)	65,223(J)	93.6	same as 1(a)				12.1	11.8	11.7	14.3	13.9	13.8
(b)	76,864(N)	94.5	same as 2(b)				8.5	8.4	8.3	10.0	9.8	9.7
(c)			I-75 (N and E) AND SR 29, AND US 41 (N AND E)	8,406	8,714	8,885	7.8	7.5	7.3	9.1	8.8	8.7

TABLE 25
TOTAL EVACUATION TIME

CATEGORY	SEASON	DESTINATION	WEATHER	ALT*	CONSTRAINING FACTOR	CLEARANCE TIME SLOW	CLEARANCE TIME INTER-MEDIATE	CLEARANCE TIME QUICK	TOTAL-EVACUATION TIME SLOW	TOTAL-EVACUATION TIME INTER-MEDIATE	TOTAL-EVACUATION TIME QUICK
1	J	1.0	8	A	B	7.0	7.0	7.0	16.0	16.0	16.0
	N	1.0	8	A	E	7.4	7.2	7.1	16.4	16.2	16.1
2	J	1.0	8	A	E	8.0	7.8	7.7	17.0	16.8	16.7
	J			B	B	7.0	7.0	7.0	16.0	16.0	16.0
	N	1.0	8	A	E	9.9	9.7	9.6	18.9	18.7	18.6
	N			B	B	7.0	7.0	7.0	16.0	16.0	16.0
3	J	1.0	10.5	A	E	12.1	11.8	11.7	23.6	23.3	23.2
	J			B	Z	9.8	9.8	9.8	21.3	21.3	21.3
	N	1.0	10.5	A	E	14.3	13.9	13.8	25.8	25.4	25.3
	N			B/C	Z	9.8	9.8	9.8	21.3	21.3	21.3

J = July N = November B = Behavior E = Exiting Route; Z = Zone Volume and Route Constraint

* From Table 24

Depending upon the number and capacity of county exiting routes available, either these routes or behavorial response will be the constraint for category 1 or 2 storms. However, for category 3 storms, the constraining factor will be the coastal routes capacities in the county's highly developed western shore, west of I-75.

APPENDIX 1

LANDFALLING

PRE-EYE LANDFALL HAZARD TIMES - CATEGORY 1

GRID STORM POINTS	HOURS BEFORE EYE LANDFALL-FLOODING(1)	STORM TRACK	TOTAL DURATION IN HOURS	HOURS BEFORE EYE LANDFALL-SUSTAINED GALE FORCE WINDS(2)	STORM TRACK	TOTAL DURATION IN HOURS
Chokoloskee Island	2.5	(15 SS)	14.5	4.5	(30 SS)	8
Carnestown	-1	(25 SS)	13	5.5	(20 SS)	8
Royal Palm	-1.5	(20 SS)	11.5	6	(15 SS)	8.5
Goodland	2	(20 SS)	15	6.5	(15 SS)	8.5
Marco Island	1.5	(10 SS)	13.5	6.5	(45 SS)	10
Marco Island Bridge				6.5	(10 SS)	9
Isle of Capri	1.5	(25 NS)	4.5	6.5	(10 SS)	9
Naples Manor				5.5	(10 SS)	8.5
Collier County EOC				6	(5 SS)	8.5
Naples				5.5	(5 SS)	8.5
Pine Ridge				5.5	(0 SS)	9
Naples Park				5	(0 SS)	8.5
Bonita Shores	7	(70 NS)	8	5.5	(35 NS)	7

LANDFALLING

PRE-EYE LANDFALL HAZARD TIMES - CATEGORY 2

GRID STORM POINTS	HOURS BEFORE EYE LANDFALL-FLOODING(1)	STORM TRACK	TOTAL DURATION IN HOURS	HOURS BEFORE EYE LANDFALL-SUSTAINED GALE FORCE WINDS(2)	STORM TRACK	TOTAL DURATION IN HOURS
Chokoloskee Island	3	(15 SS)	15	7	(25 SS)	10.5
Carnestown	.5	(25 SS)	13.5	6.5	(20 SS)	10
Royal Palm	.5	(20 SS)	13.5	7	(15 SS)	10.5
Goodland	3	(10 SS)	15	7.5	(15 SS)	10.5
Marco Island	2.5	(10 SS)	14.5	8	(10 SS)	10.5
Marco Island Bridge	2	(10 SS)	14	7.5	(10 SS)	10.5
Isle of Capri	3	(30 NS)	6.5	7.5	(10 SS)	10.5
Naples Manor	1	(10 SS)	13	7	(10 SS)	10.5
Collier County EOC	1.5	(5 SS)	13.5	7	(10 SS)	10.5
Naples				7	(10 SS)	11
Pine Ridge	- .5	(10 NS)	1	6.5	(0 S)	10.5
Naples Park				7	(40 NS)	9
Bonita Shores	7.5	(60 NS)	10	6.5	(25 NS)	10

APPENDIX 1

LANDFALLING

PRE-EYE LANDFALL HAZARD TIMES - CATEGORY 3

GRID STORM POINTS	HOURS BEFORE EYE LANDFALL-FLOODING(1)	STORM TRACK	TOTAL DURATION IN HOURS	HOURS BEFORE EYE LANDFALL-SUSTAINED GALE FORCE WINDS(2)	STORM TRACK	TOTAL DURATION IN HOURS
Chokoloskee Island	4	(10 SS)	16	9.5	(10 SS)	13
Carnestown	1.5	(20 SS)	14.5	8.5	(20 SS)	13.5
Royal Palm	2	(15 SS)	14	9	(10 SS)	13.5
Goodland	4	(10 SS)	16	9.5	(10 SS)	14
Marco Island	5	(35 NS)	15	10.5	(30 NS)	12.5
Marco Island Bridge	4	(40 NS)	14	10	(30 NS)	12
Isle of Capri	5	(45 NS)	9	10	(30 NS)	12.5
Naples Manor	2.5	(25 NS)	13.5	9.5	(35 NS)	11.5
Collier County EOC	3	(40 NS)	13	9.5	(35 NS)	12.5
Naples	1	(0 S)	13	9.5	(35 NS)	12.5
Pine Ridge	2.5	(30 NS)	4	9	(25 NS)	13.5
Naples Park	1.5	(25 NS)	3	9	(35 NS)	12.5
Bonita Shores	9	(75 NS)	13	9	(40 NS)	13

LANDFALLING

PRE-EYE LANDFALL HAZARD TIMES - CATEGORY 4

GRID STORM POINTS	HOURS BEFORE EYE LANDFALL-FLOODING(1)	STORM TRACK	TOTAL DURATION IN HOURS	HOURS BEFORE EYE LANDFALL-SUSTAINED GALE FORCE WINDS(2)	STORM TRACK	TOTAL DURATION IN HOURS
Chokoloskee Island	4.5	(25 NS)	15.5	11	(10 SS)	15
Carnestown	2.5	(15 SS)	14.5	10	(20 SS)	15
Royal Palm	2.5	(15 SS)	14.5	11	(35 NS)	14
Goodland	5.5	(40 NS)	16.5	11.5	(35 NS)	14
Marco Island	6.5	(50 NS)	16.5	12	(40 NS)	14
Marco Island Bridge	5	(40 NS)	16	11.5	(25 NS)	15
Isle of Capri	6.5	(70 NS)	9.5	11.5	(35 NS)	14.5
Naples Manor	4	(40 NS)	15	11	(25 NS)	14.5
Collier County EOC	4.5	(50 NS)	14.5	11.5	(50 NS)	14
Naples	2.5	(25 NS)	13.5	11.5	(50 NS)	14
Pine Ridge	3.5	(35 NS)	5.5	11	(50 NS)	14
Naples Park	3	(35 NS)	4.5	10.5	(35 NS)	15
Bonita Shores	9.5	(75 NS)	14	10.5	(45 NS)	14.5

APPENDIX 1

LANDFALLING

PRE-EYE LANDFALL HAZARD TIMES - CATEGORY 5

GRID STORM POINTS	HOURS BEFORE EYE LANDFALL-FLOODING(1)	STORM TRACK	TOTAL DURATION IN HOURS	HOURS BEFORE EYE LANDFALL-SUSTAINED GALE FORCE WINDS(2)	STORM TRACK	TOTAL DURATION IN HOURS
Chokoloskee Island	4	(5 SS)	16	10.5	(20 SS)	13.5
Carnestown	2	(15 SS)	14	10.5	(10 SS)	13.5
Royal Palm	2.5	(10 SS)	14.5	10	(35 NS)	11
Goodland	4.5	(35 NS)	15.5	10.5	(35 NS)	11
Marco Island	5.5	(35 NS)	16.5	11	(30 NS)	12.5
Marco Island Bridge	4.5	(40 NS)	14.5	10.5	(30 NS)	12
Isle of Capri	5.5	(60 NS)	7	10.5	(30 NS)	12.5
Naples Manor	3	(45 NS)	9.5	10	(25 NS)	13
Collier County EOC	4.5	(30 NS)	14.5	10.5	(45 NS)	11.5
Naples	2	(0 S)	14	10.5	(45 NS)	11.5
Pine Ridge	3	(45 NS)	2.5	10	(35 NS)	13
Naples Park	2	(35 NS)	2	10	(45 NS)	12.5
Bonita Shores	9	(75 NS)	13	9.5	(35 NS)	13

PARALLEL

PRE-EYE LANDFALL HAZARD TIMES - CATEGORY 1

GRID STORM POINTS	HOURS BEFORE EYE LANDFALL-FLOODING(1)	STORM TRACK	TOTAL DURATION IN HOURS	HOURS BEFORE EYE LANDFALL-SUSTAINED GALE FORCE WINDS(2)	STORM TRACK	TOTAL DURATION IN HOURS
Chokoloskee Island	3.5	(0 S)	15.5	10	(15 ES)	9.5
Carnestown	1	(0 S)	13	10	(15 ES)	10
Royal Palm	-5.5	(0 S)	6.5	8.5	(-0 -S)	9.5
Goodland	2.5	(0 S)	14.5	8.5	(0 S)	9.5
Marco Island	1.5	(0 S)	13.5	8.5	(15 WS)	9.5
Marco Island Bridge				8	(15 WS)	9
Isle of Capri	1	(0 S)	3.5	8.5	(0 S)	9.5
Naples Manor				8	(0 S)	9
Collier County EOC				7	(15 ES)	8
Naples				7	(0 S)	9
Pine Ridge				6.5	(15 WS)	8.5
Naples Park				6	(15 WS)	6
Bonita Shores	.5	(30 WS)	5	6	(0 S)	9

APPENDIX 1

PARALLEL

PRE-EYE LANDFALL HAZARD TIMES - CATEGORY 2

GRID STORM POINTS	HOURS BEFORE EYE LANDFALL-FLOODING(1)	STORM TRACK	TOTAL DURATION IN HOURS	HOURS BEFORE EYE LANDFALL-SUSTAINED GALE FORCE WINDS(2)	STORM TRACK	TOTAL DURAT IN HOURS
Chokoloskee Island	4	(0 S)	16	12	(0 S)	12.5
Carnestown	2.5	(0 S)	14.5	11.5	(0 S)	12.5
Royal Palm	1.5	(0 S)	13.5	10.5	(0 S)	11.5
Goodland	3	(15 WS)	15	10.5	(15 WS)	12
Marco Island	2.5	(0 S)	14.5	10.5	(0 S)	12
Marco Island Bridge	2	(0 S)	14	10.5	(15 WS)	12
Isle of Capri	2	(0 S)	14	10	(15 WS)	11.5
Naples Manor	.5	(0 S)	12.5	10	(15 WS)	12
Collier County EOC	-1	(0 S)	3	9	(15 WS)	11.5
Naples				9	(15 WS)	11.5
Pine Ridge				8.5	(0 S)	11.5
Naples Park				8	(0 S)	11.5
Bonita Shores	1	(30 WS)	8.5	7.5	(0 S)	11.5

PARALLEL

PRE-EYE LANDFALL HAZARD TIMES - CATEGORY 3

GRID STORM POINTS	HOURS BEFORE EYE LANDFALL-FLOODING(1)	STORM TRACK	TOTAL DURATION IN HOURS	HOURS BEFORE EYE LANDFALL-SUSTAINED GALE FORCE WINDS(2)	STORM TRACK	TOTAL DURATI IN HOURS
Chokoloskee Island	4	(0 S)	16	14.5	(15 WS)	15
Carnestown	3	(0 S)	15	13	(0 S)	15
Royal Palm	2.5	(15 WS)	14.5	12	(0 S)	15
Goodland	3.5	(15 WS)	15.5	12	(0 S)	14.5
Marco Island	3.5	(15 WS)	15.5	12	(15 WS)	15
Marco Island Bridge	2.5	(15 WS)	14.5	11.5	(0 S)	14.5
Isle of Capri	2.5	(15 WS)	14.5	11.5	(0 S)	14.5
Naples Manor	2	(15 WS)	14	11	(0 S)	14.5
Collier County EOC	1	(15 WS)	13	11	(15 WS)	15
Naples	0	(0 S)	12	10.5	(0 S)	14.5
Pine Ridge	0	(0 S)	1	10	(0 S)	14
Naples Park				9.5	(0 S)	14
Bonita Shores	1.5	(15 WS)	9	9.5	(0 S)	14

APPENDIX 1

PARALLEL

PRE-EYE LANDFALL HAZARD TIMES - CATEGORY 4

GRID STORM POINTS	HOURS BEFORE EYE LANDFALL-FLOODING(1)	STORM TRACK	TOTAL DURATION IN HOURS	HOURS BEFORE EYE LANDFALL-SUSTAINED GALE FORCE WINDS(2)	STORM TRACK	TOTAL DURATION IN HOURS
Chokoloskee Island	3.5	(30 WS)	15.5	13	(30 WS)	15
Carnestown	2	(30 WS)	14	12.5	(30 WS)	15
Royal Palm	2	(30 WS)	14	12	(45 WS)	15.5
Goodland	3	(30 WS)	15	12	(30 WS)	16
Marco Island	3	(30 WS)	15	12	(30 WS)	16
Marco Island Bridge	2	(30 WS)	14	12	(45 WS)	16
Isle of Capri	2	(30 WS)	14	12	(45 WS)	16
Naples Manor	1	(30 WS)	13	11.5	(30 WS)	16
Collier County EOC	.5	(30 WS)	12.5	11	(45 WS)	15.5
Naples				10.5	(30 WS)	16
Pine Ridge				10	(30 WS)	16
Naples Park				10	(30 WS)	16
Bonita Shores	1.5	(60 WS)	13.5	9.5	(30 WS)	16

PARALLEL - 60 WS ONLY

PRE-EYE LANDFALL HAZARD TIMES - CATEGORY 5

GRID STORM POINTS	HOURS BEFORE EYE LANDFALL-FLOODING(1)	STORM TRACK	TOTAL DURATION IN HOURS	HOURS BEFORE EYE LANDFALL-SUSTAINED GALE FORCE WINDS(2)	STORM TRACK	TOTAL DURATION IN HOURS
Chokoloskee Island	2		14	11		10.5
Carnestown				10		9.5
Royal Palm				9.5		11
Goodland	1.5		13.5	10		11.5
Marco Island	1.5		13.5	10.5		12.5
Marco Island Bridge				10		12
Isle of Capri	0		8.5	10		12
Naples Manor				9.5		12
Collier County EOC				9		12
Naples				8.5		11.5
Pine Ridge				8		11.5
Naples Park				7.5		11
Bonita Shores	1.5		12.5	7.5		11.5

APPENDIX 1

CROSSING

PRE-EYE LANDFALL HAZARD TIMES - CATEGORY 1

GRID STORM POINTS	HOURS BEFORE EYE LANDFALL-FLOODING(1)	STORM TRACK	TOTAL DURATION IN HOURS	HOURS BEFORE EYE LANDFALL-SUSTAINED GALE FORCE WINDS(2)	STORM TRACK	TOTAL DURAT IN HOURS
Chokoloskee Island	2	(15 NS)	15	10	(15 NS)	10
Carnestown				10	(0 S)	9.5
Royal Palm				9	(15 SS)	8
Goodland	-1.5	(15 NS)	11.5	8	(15 NS)	10
Marco Island				7.5	(15 NS)	9.5
Marco Island Bridge				8	(15 SS)	7
Isle of Capri	1	(0 S)	2.5	8	(0 S)	9
Naples Manor				8	(15 SS)	7
Collier County EOC				8	(15 SS)	8.5
Naples				8	(15 SS)	8
Pine Ridge				8	(15 SS)	9.5
Naples Park				8	(15 SS)	10
Bonita Shores	3	(30 SS)	5.5	7.5	(15 SS)	9.5

CROSSING

PRE-EYE LANDFALL HAZARD TIMES - CATEGORY 2

GRID STORM POINTS	HOURS BEFORE EYE LANDFALL-FLOODING(1)	STORM TRACK	TOTAL DURATION IN HOURS	HOURS BEFORE EYE LANDFALL-SUSTAINED GALE FORCE WINDS(2)	STORM TRACK	TOTAL DURAT IN HOURS
Chokoloskee Island	2	(15 NS)	15	12	(0 S)	11.
Carnestown	-1.5	(15 NS)	11.5	12	(0 S)	12
Royal Palm				10.5	(15 SS)	10.5
Goodland	0	(15 NS)	13	10	(0 S)	11.
Marco Island	- .5	(15 NS)	12.5	9	(0 S)	10.
Marco Island Bridge				9.5	(15 SS)	10
Isle of Capri	2	(0 S)	4	9.5	(0 S)	11.5
Naples Manor				9.5	(0 S)	11.
Collier County EOC				9.5	(30 SS)	9.5
Naples				9	(15 SS)	11
Pine Ridge				9.5	(30 SS)	10.
Naples Park				9.5	(30 SS)	10.
Bonita Shores	3.5	(30 SS)	6.5	9	(15 SS)	12

CROSSING

APPENDIX 1

PRE-EYE LANDFALL HAZARD TIMES - CATEGORY 3

GRID STORM POINTS	HOURS BEFORE EYE LANDFALL-FLOODING(1)	STORM TRACK	TOTAL DURATION IN HOURS	HOURS BEFORE EYE LANDFALL-SUSTAINED GALE FORCE WINDS(2)	STORM TRACK	TOTAL DURATION IN HOURS
Chokoloskee Island	2.5	(15 NS)	15.5	10	(0 S)	11.5
Carnestown	.5	(15 NS)	13.5	10	(0 S)	12
Royal Palm	-1	(15 NS)	12	9	(15 SS)	11
Goodland	.5	(15 NS)	13.5	8.5	(15 SS)	10.5
Marco Island	1	(15 NS)	14	8	(0 S)	11.5
Marco Island Bridge	.5	(15 NS)	13.5	8	(15 SS)	10
Isle of Capri	2.5	(0 S)	7.5	8	(0 S)	11.5
Naples Manor	.5	(0 S)	6.5	8.5	(15 SS)	11
Collier County EOC	- .5	(0 S)	11.5	8	(0 S)	12
Naples				8	(15 SS)	11.5
Pine Ridge				8	(15 SS)	12
Naples Park				8	(15 SS)	12
Bonita Shores	3.5	(30 SS)	8	8	(15 SS)	12.5

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LEE COUNTY
PEACETIME EMERGENCY PLAN (Hurricanes)
[9J-5.012(2)(e)(i)]

HURRICANE VULNERABILITY

The hurricane vulnerability of Lee County has been analyzed using a numerical storm surge prediction model known as SLOSH, short for Sea, Lake, and Overland Surges from Hurricanes. This model is described in detail in the Regional Hurricane Evacuation Plan, 1981-82, prepared by the Southwest Florida Regional Planning Council; as well as A Storm Surge Atlas for Southwest Florida, prepared by the National Oceanic and Atmospheric Administration, Undated, @ 1983). These reports analyzed some 187 separate storms for their potential impact on Southwest Florida, including Lee County. Both reports provide an assessment of methodologies and provide assumptions that can act towards increasing or decreasing forecast flood and wind conditions. However, in summary, the following assumptions can be made.

(1) Landfalling storms provide the worst flooding potential

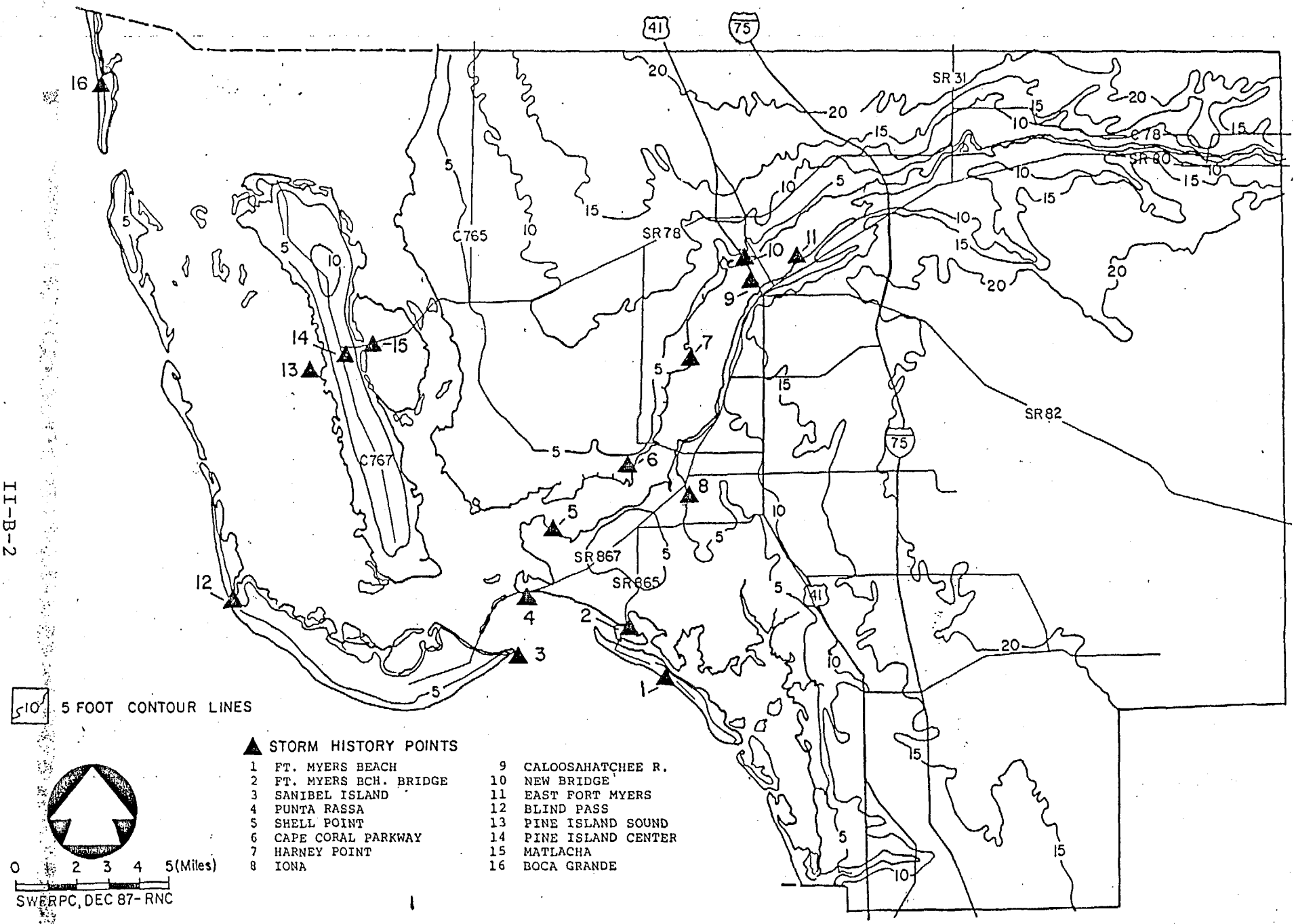
(2) Flooding will be worse south of the eye of the hurricane

(3) Wind conditions making roads unsafe for travel will arrive well before the eye of the hurricane, and usually before flood waters inundate evacuation routes

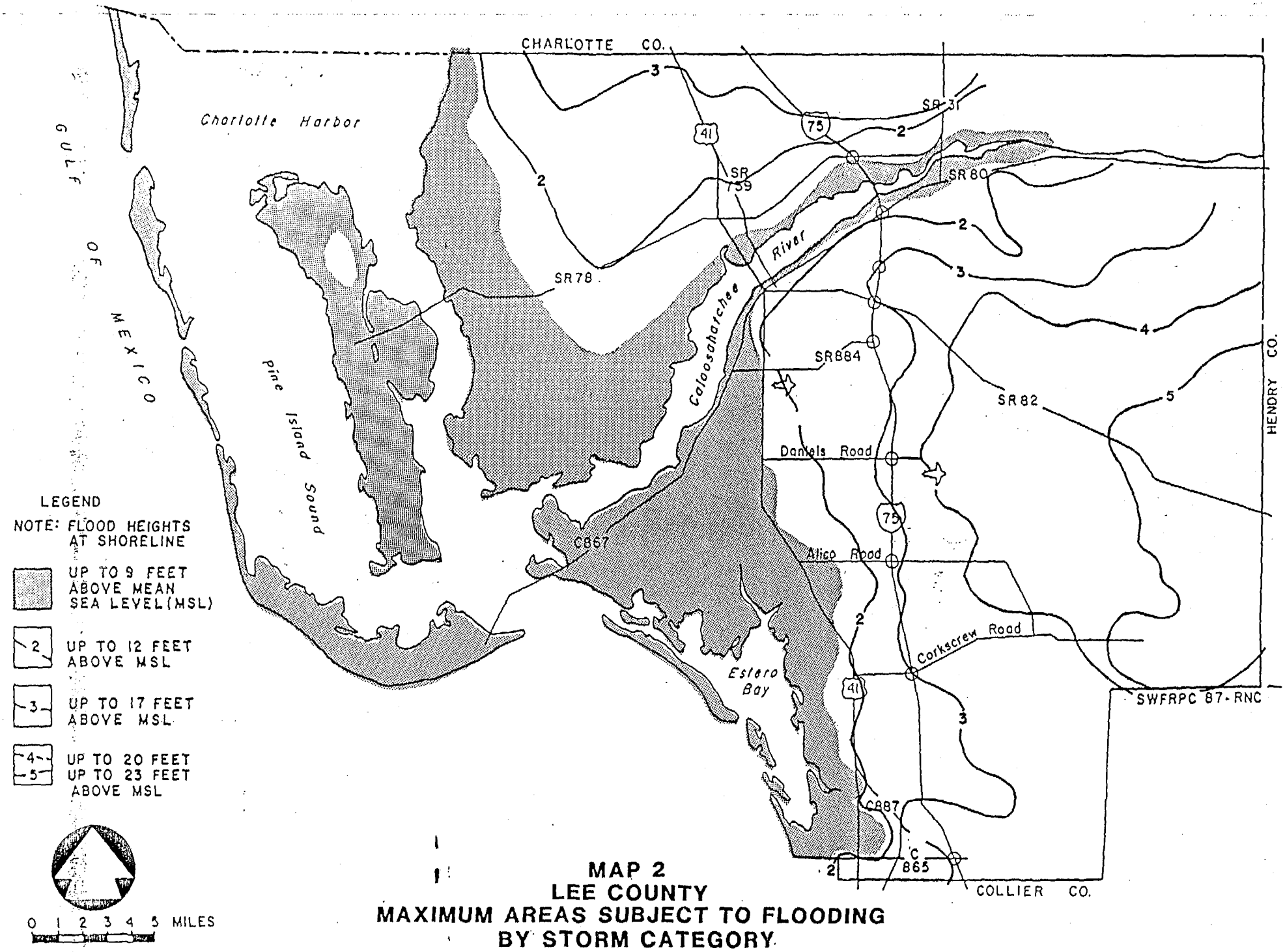
(4) Storm landfall prediction is not an exact science. Any approaching storm has the capacity to strengthen or veer, decreasing or increasing the flooding and surge potential of the storm.

The SLOSH model used sixteen points in Lee County for time history analysis. These points are depicted on Map 1. The greatest height of stormwaters for each category storm for each point are summarized in Table 1.

The SLOSH model also provided maps of the flooding that may be expected in Lee County. The 187 different simulations have been summarized by flood category, and a zone for each category has been created depicting the maximum extent of flooding resulting from all of the storms of that category. The five zones thus created are depicted on Map 2.



MAP 1
LEE COUNTY
SLOSH MODEL STORM HISTORY POINTS



MAP 2
LEE COUNTY
MAXIMUM AREAS SUBJECT TO FLOODING
BY STORM CATEGORY

TABLE 1
PREDICTED COASTAL STORM SURGES SIMULATED BY SLOSH MODEL, LANDFALLING STORMS

(If a point is over water, surge is reported in feet of flooding above msl; if a point is on land, surge is reported in feet above land at that point)*

GRID POINT	ELEVATION OF POINT	STORM CATEGORY 1	2	3	4	5
Fort Myers Beach	1	8	10	14	17	16
Ft. Myers Beach Bridge	1	9	11	14	18	17
Sanibel	1	6	8	12	14	13
Punta Rassa	1	7	9	13	16	16
Shell Point	1	8	10	14	17	17
Cape Coral Parkway	4	6	8	13	18	17
Harney Point	3	5	10	14	20	19
Iona	5	5	7	12	15	16
River	1	5	12	17	21	23
New Bridge	5	2	9	13	17	10
East Fort Myers	15	-	-	4	8	11
Blind Pass	1	5	6	9	11	10
Pine Island Sound	1	7	8	12	14	13.5
Pine Island Center	5	-	4	11	10	10
Matlacha	1	5	8	12	15	15
Boca Grande	1	5	8	10	13	12

*See Map 1 for grid point locations.

Although storms cannot be accurately forecasted in regard to storm behavior, the 187 simulations did provide insights into the differences in pre-landfall flooding for landfalling, paralleling, and crossing storms. These differences are summarized in Table 2 for hurricane eye location and points of worst impact. Table 3 summarizes the nature of flood and wind variation based on whether the storm is landfalling, crossing, or paralleling. Appendix A summarizes the pre-eye landfall hazard times that the County may experience.

TABLE 2
HURRICANES SIMULATED BY NUMERICAL STORM SURGE PREDICTION MODEL

MODEL	TYPE	LOCATION	CATEGORY	LANDFALL/EXITING POINT OR CLOSEST APPROACH	AREA RECEIVING MAXIMUM SURGE/WINDS
SL	L	5NS	1	Sanibel Island	Fort Myers Beach
SL	L	5NS	2	Sanibel Island	Fort Myers Beach
SL	L	5NS	3	Sanibel Island	Fort Myers Beach
SL	L	5NS	4	Sanibel Island	Fort Myers Beach
SL	L	5NS	5	Sanibel Island	Fort Myers Beach
SL	L	10NS	1	Sanibel-Captiva	Fort Myers Beach
SL	L	10NS	2	Sanibel-Captiva	Fort Myers Beach
SL	L	10NS	3	Sanibel-Captiva	Fort Myers Beach
SL	L	10NS	4	Sanibel-Captiva	Fort Myers Beach
SL	L	10NS	5	Sanibel-Captiva	Fort Myers Beach
SL	L	15NS	1	Captiva Island	Caloosahatchee River
SL	L	15NS	2	Captiva Island	Caloosahatchee River
SL	L	15NS	3	Captiva Island	Caloosahatchee River
SL	L	15NS	4	Captiva Island	Caloosahatchee River
SL	L	15NS	5	Captiva Island	Caloosahatchee River
SL	L	20NS	1	Upper Captiva Island	Caloosahatchee River
SL	L	20NS	2	Upper Captiva Island	Caloosahatchee River
SL	L	20NS	3	Upper Captiva Island	Caloosahatchee River
SL	L	20NS	4	Upper Captiva Island	Caloosahatchee River
SL	L	20NS	5	Upper Captiva Island	Caloosahatchee River
SL	L	25NS	1	Cayo Costa	Caloosahatchee River
SL	L	25NS	2	Cayo Costa	Caloosahatchee River
SL	L	25NS	3	Cayo Costa	Caloosahatchee River
SL	L	25NS	4	Cayo Costa	Caloosahatchee River
SL	L	25NS	5	Cayo Costa	Caloosahatchee River
SL	L	30NS	1	Gasparilla Island	Caloosahatchee River
SL	L	30NS	2	Gasparilla Island	Caloosahatchee River
SL	L	30NS	3	Gasparilla Island	Caloosahatchee River
SL	L	30NS	4	Gasparilla Island	Caloosahatchee River
SL	L	30NS	5	Gasparilla Island	Caloosahatchee River

KEY: SL - SLOSH (Sea, Lake, and Overland Surges from Hurricanes) Model
L - Landfalling Hurricane
C - Crossing Hurricane (Exiting Hurricane)
P - Paralleling Hurricane
SS - South of Sanibel Island
NS - North of Sanibel Island

TABLE 2 (Continued)
HURRICANES SIMULATED BY NUMERICAL STORM SURGE PREDICTION MODEL

MODEL	TYPE	LOCATION	CATEGORY	LANDFALL/EXITING POINT OR CLOSEST APPROACH	AREA RECEIVING MAXIMUM SURGE/WINDS
SL	P	30WS	1	30 mi. w. of Sanibel	Sanibel
SL	P	30WS	2	30 mi. w. of Sanibel	Sanibel
SL	P	30WS	3	30 mi. w. of Sanibel	Sanibel
SL	P	30WS	4	30 mi. w. of Sanibel	Sanibel
SL	P	45WS	1	45 mi. w. of Sanibel	Fort Myers Beach
SL	P	45WS	2	45 mi. w. of Sanibel	Fort Myers Beach
SL	P	45WS	3	45 mi. w. of Sanibel	Fort Myers Beach
SL	P	45WS	4	45 mi. w. of Sanibel	Fort Myers Beach
SL	C	15SS	1	Fort Myers	Shell Point
SL	C	15SS	2	Fort Myers	Shell Point
SL	C	15SS	3	Fort Myers	Shell Point
SL	C	0 S	1	Sanibel	Ft. Myers Beach Bridge
SL	C	0 S	2	Sanibel	Ft. Myers Beach Bridge
SL	C	0 S	3	Sanibel	Ft. Myers Beach Bridge
SL	C	15NS	1	Naples	Ft. Myers Beach Bridge
SL	C	15NS	2	Naples	Ft. Myers Beach Bridge
SL	C	15NS	3	Naples	Ft. Myers Beach Bridge

KEY: SL - SLOSH (Sea, Lake, and Overland Surges from Hurricanes) Model
L - Landfalling Hurricane
C - Crossing Hurricane (Exiting Hurricane)
P - Paralleling Hurricane
SS - South of Sanibel Island
NS - North of Sanibel Island
WS - West of Sanibel Island

TABLE 3
SELECTED STORM TRACTS BY CATEGORY AND TYPE

STORM TRACK	STORM CHARACTERISTICS	STORM TRACK	STORM CHARACTERISICS
5SS-L-1	S(1) W(1)	15ES-P-2	S(2) W(1)
15NS-L-1	S(3) W(1)	0 S-P-2	S(3) W(2)
35NS-L-1	S(2) W(1)	30WS-P-2	S(2) W(1)
55NS-L-1	S(2)	60WS-P-2	S(1)
75NS-L-1	S(1)		
		15ES-P-3	S(3) W(2)
5SS-L-2	S(1) W(2)	0 S-P-3	S(4) W(3)
15NS-L-2	S(3) W(2)	30WS-P-3	S(2) W(2)
35NS-L-2	S(3) W(2)	50WS-P-3	S(2) W(1)
55SS-L-2	S(3)		
75NS-L-2	S(2)	15SS-C-1	S(1) W(1)
		15NS-C-1	S(2) W(1)
45SS-L-3	W(1)		
25SS-L-3	S(1) W(2)	45SS-C-2	S(1)
5SS-L-3	S(3) W(3)	15SS-C-2	S(2) W(1)
15NS-L-3	S(4) W(3)	15NS-C-2	S(2) W(1)
35NS-L-3	S(4) W(3)		
55NS-L-3	S(3) W(1)	45SS-C-3	S(2) W(1)
75NS-L-3	S(3)	15SS-C-3	S(3) W(2)
		15NS-C-3	S(2) W(2)
15ES-P-1	S(2)		
0 S-P-1	S(3) W(1)		
30WS-P-1	S(2)		
60WS-P-1	S(1)		

KEY:
- SS - South of Sanibel
- NS - North of Sanibel
- ES - East of Sanibel
- WS - West of Sanibel
- S - Storm Surge
- L - Landfalling
- P - Parallel
- C - Crossing
- W - Wind (over 40 mph)
- (1) - Category 1
- (2) - Category 2
- (3) - Category 3
- (4) - Category 4

Saffir-Simpson Scale

	Surge	Wind
Category (1)	4 - 5 ft.	74-95 mph
Category (2)	6 - 8 ft.	96-110 mph
Category (3)	9 -12 ft.	111-130 mph
Category (4)	13 -18 ft.	131-155 mph
Category (5)	18+ feet	155 + mph

Recent Storm History

Hurricane Donna was the last hurricane to affect Lee County to any significant degree. At the time the hurricane hit, the County's population was 56,000, concentrated primarily in Fort Myers and the unincorporated inland areas of Lee County. Hurricane Donna was a strong Category 3 when it passed over the area, but because the eye hugged the coast so closely, storm

surges were much less than they could have been. Tides at Punta Rassa were 6.4 feet above msl, Fort Myers Beach had 8.1 feet and high tide lines were found at the 10-foot contour bordering the Estero and Imperial Rivers. Estero Island was swept by tides and wave action which lowered 5 to 7 foot dunes by several feet, exposing and undermining foundations and toppling homes. In the South Banks area of Captiva Island, tides of 4 to 5 feet above normal overtopped the island, cutting through the narrow beaches to the bay in several places. A new entrance was cut to Blind Pass about one-fourth mile south of the Blind Pass Bridge. In Lee County, the Bonita Beach area was hardest hit, because nearly all beachfront homes were badly damaged or destroyed. Those farther inland sustained tidal flooding with only minor structural damage. Estimated damage totaled $16,449,000.

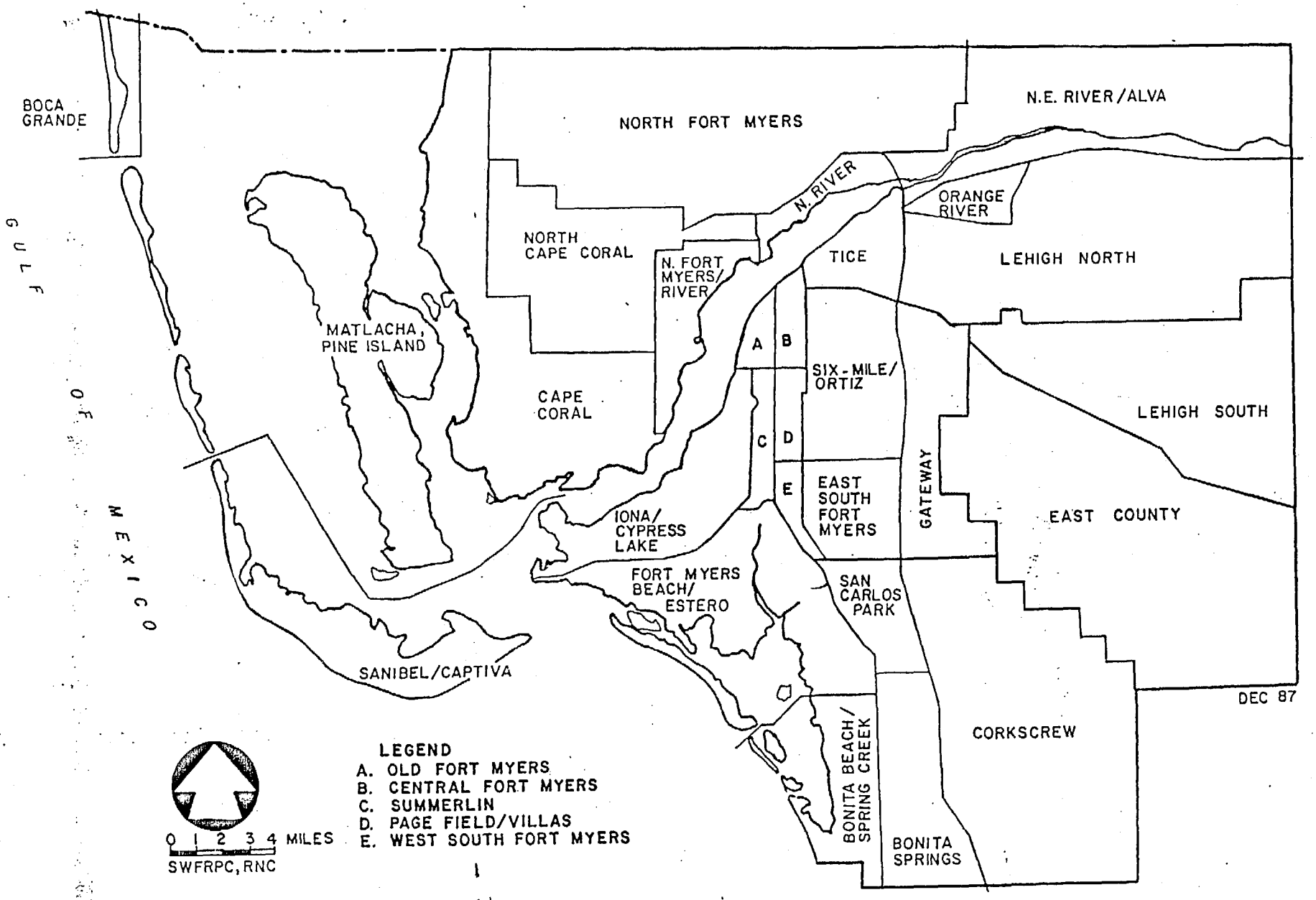
Hurricane Floyd provided the area a scare on October 16, 1987. However, it veered due east before the County received any impacts beyond gale force wind gusts and 6-7 inches of rain which flooded four of the five main evacuation routes. A voluntary evacuation order put approximately 850 persons in public shelters and an unknown number in area hotels, homes, and out of region locations.

Affected Population

Each zone depicted on Map 2 encompasses large segments of the County population. Each one has a certain degree of vulnerability to the threat of hurricane induced flooding. Category 1 zones have the most repeated threat potential, whereas it is highly unlikely (but the potential exists) that category 5 areas will need to evacuate during the comprehensive plan horizon.

Each zone, as drafted, mimics the coastline. Geographically, however, these zones are too cumbersome to assess the timing and shelter needs of the population. Consequently, in association with the Lee County Emergency Management Division, new subzones were created consistent with the existing evacuation routes, natural and manmade barriers and neighborhood or community boundaries where possible. As much as possible, subzones were identified with commonly understood names. These subzones are depicted on Map 3.

The first element in preparing an estimate of County population is to estimate dwelling units, and dwelling unit types. By counting roof-tops from a 1987 Lee County REDI-book (aerial photograph), supplemented by information on RV Parks from the Department of Health and Rehabilitative Services and information from the Florida Department of Community Affairs, it is estimated that there are 166,930 dwellings in the county. This estimate includes conventional housing, mobile homes, and transitional housing such as inhabited travel trailers, and hotel and motel units. The greatest concentration of these, 62% are located in the Category 1 Zone. Table 4 provides the estimate of dwelling units in the County by flood zone and by subzone name.



MAP 3
LEE COUNTY
EVACUATION ZONES

TABLE 4
LEE COUNTY - HOUSING UNITS

Storm Category	Zone	Residential Single-Family	Mobile Home	Recreational Vehicle	Apartment	Condo	Duplex	Hotel-Motel	Total
1	Boca Grande	473	8	0	0	166	0	156	803
1	Pine Island/Cape Coral	13,204	3,713	3,141	540	3,648	1,204	526	25,976
1	Sanibel/Captiva	5,223	531	299	95	3,015	0	1,651	10,814
1	N. Ft. Myers/River	7,814	326	0	1,662	2,532	697	69	13,100
1	N.E. River/Alva	3,621	1,869	1,121	147	23	90	298	7,169
1	Iona/Cypress Lake	7,244	3,250	1,724	987	6,133	475	54	19,867
1	Ft.Myers Beach/Estero	3,990	1,675	3,804	645	5,707	0	1,266	17,087
1	Bonita Bch./Spring Creek	744	111	157	164	2,018	92	77	3,363
1	Old Fort Myers	2,720	148	0	1,268	455	0	619	5,210
TOTALS	FLOOD ZONE 1	45,033	11,631	10,246	5,508	23,697	2,558	4,716	103,389
2	Bonita Springs	2,954	1,347	2,005	155	1,037	170	244	7,912
2	San Carlos Park	3,024	86	0	0	141	208	50	3,509
2	Central Fort Myers	2,992	378	47	1,967	621	0	153	6,158
2	W.S. Fort Myers	1,306	1,271	301	0	14	0	0	2,892
2	Summerlin	261	242	294	672	2,620	852	270	5,211
2	Tice	3,277	602	175	2,507	245	0	102	6,908
2	Orange River	148	365	234	6	0	0	0	753
2	North Cape Coral	3,892	1,509	7	268	535	920	0	7,131
TOTALS	FLOOD ZONE 2	17,854	5,800	3,063	5,575	5,213	2,150	819	40,474
3	E.S. Fort Myers	711	0	0	0	20	0	0	731
3	Page Field/Villas	1,524	0	0	81	147	14	575	2,341
3	Six Mile/Ortiz	367	6	0	336	0	0	0	709
3	North Fort Myers	1,882	8,093	1,337	69	0	0	485	11,866
TOTALS	FLOOD ZONE 3	4,484	8,099	1,337	486	167	14	1,060	15,647
4	Lehigh North	375	279	0	62	49	0	0	765
4	Gateway	8	10	0	0	0	0	0	18
4	Corkscrew	89	0	0	0	49	0	0	138
TOTALS	FLOOD ZONE 4	472	289	0	62	98	0	0	921
5	Lehigh South	4,772	0	0	323	1,275	0	124	6,494
5	East County	5	0	0	0	0	0	0	5
[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]

Using the housing unit estimate, a population estimate is then made. Two additional assumptions, however, are needed: persons per household, and vacancy rate. Persons per household was estimated at a standard of 2.4 persons per household, regardless of unit. Whereas this assumption has inaccuracies, the end result probably does not differ significantly from a more detailed analysis. More detailed analysis, however, is needed to determine vacancy rates for unit type, since different unit types have different vulnerability to flood or wind hazards. Using a survey estimate developed from postal vacancy rates and calling businesses listed in the phone book, two estimates of seasonal vacancy were prepared. These are as follows:

Unit Type	Seasonal Occupancy Rates July	November
Single-Family Unit	97%	97%
Duplex	94	93
Apartment	70	78
Condominium (Conventional)	51	64
Mobile Home	43	75
Travel Trailer	18	41
Motel/Hotel	54	63

Lee County is estimated in 1987 to average 278,741 persons in July and 318,222 persons at the start of November. This is summarized by subzone in Table 5. Numerically, the greatest seasonality occurs in Hurricane Category Zone 1, which has 187,944 persons in July and 223,703 in November, an increase of 16%.

TABLE 5
LEE COUNTY POPULATION ESTIMATE FOR EVACUATION ZONES

Storm Category	Zone	Population Estimates July	November
1	Boca Grande	1,514	1,606
	Pine Island/Matlacha	8,500	9,318
	Cape Coral	36,198	39,724
	Sanibel/Captiva	18,826	20,714
	North Fort Myers/River	19,559	20,579
	North River	6,519	6,860
	N.E. River/Alva	11,707	13,859
	Iona/Cypress Lake	31,270	36,820
	Fort Myers Beach/Estero	22,371	27,934
	Bonita Beach/Spring Creek	4,969	5,814
	Old Fort Myers	9,974	10,607
	Mobile Homes & Recreational Vehicles not otherwise included in the above flood prone areas (Category 2-5 Areas)	16,537	29,868
	TOTAL AREA 1	187,949	223,703

TABLE 5 (Continued)
LEE COUNTY POPULATION ESTIMATE FOR EVACUATION ZONES

Storm Category	Zone	Population Estimates July	November
2	Bonita Springs	11,362	13,906
	San Carlos Park	7,836	7,952
	Central Fort Myers	11,638	12,558
	W.S. Fort Myers	4,499	5,646
	Summerlin	7,593	8,925
	Tice	12,970	14,108
	Orange River	833	1,243
	North Cape Coral	13,802	15,161
	Mobile Homes & Recreational Vehicles not otherwise included in the above flood prone areas (Category 3-5 Areas)	9,228	16,414
	NEW EVACUEES	63,224	66,045
	TOTALS 1 - 2	251,168	289,748
3	E.S. Fort Myers	1,679	1,686
	Page Field/Villas	4,641	4,826
	Six Mile/Ortiz	1,418	1,494
	North Fort Myers	14,056	21,126
	Mobile Homes & Recreational Vehicles not otherwise included in the above flood prone areas (Category 4-5 Areas)	298	520
	NEW EVACUEES	12,864	13,238
	TOTALS 1 - 3	264,032	302,986
4	Lehigh North	1,325	1,566
	Gateway	29	37
	Corkscrew	267	282
	Mobile Homes & Recreational Vehicles not otherwise included in the above flood prone areas (Category 5 Area)	0	0
	NEW EVACUEES	1,323	1,365
	TOTALS 1 - 4	265,355	304,351
5	Lehigh South	13,374	13,859
	East County	12	12
	NEW EVACUEES	13,386	13,871
	TOTALS 1 - 5	278,741	318,222

Motor Vehicles

Nearly all of the population affected by an oncoming hurricane will evacuate by private vehicle. The question arises over how many vehicles will be used in the evacuation. Issues relevant to this include the number of vehicles owned, whether owners would be willing to leave any vehicles behind (since next to the home,

vehicles are the most expensive possession), whether all drivers feel confident to operate a vehicle in storm conditions, and whether evacuating families wish to be separated in different motor vehicles. Based on surveys, respondents indicated approximately 75% of available vehicles would be used in an evacuation. (Hurricane Evacuation Plan, 1981-82, SWFRPC). This averaged out to 1.1 vehicles per occupied unit.

Using this ratio of cars, and the occupancy ratio used previously, the total number of county vehicles used in an evacuation in July would be 127,487, and in November would be 146,019. Category I Zones again have the greatest number of vehicles, 78,367 (85,078 with mobile homes outside the Category 1 area) in July and 89,187 (100,892 with mobile homes) in November. Table 6 summarizes the vehicle generation by each community.

TABLE 6
LEE COUNTY VEHICLE ESTIMATES FOR EVACUATION

CATEGORY	ZONE	JULY	MOBILE HOME & REC. VEHICLES	NOVEMBER	MOBILE HOME & REC. VEHICLES
1	Boca Grande	695	(0)	737	(7)
1	Pine Island/ Matlacha	3,882	(2,321)	4,383	(2.820)
1	Cape Coral	16,548	(0)	18,685	(0)
1	Sanibel/Captiva	8,612	(304)	9,527	(605)
1	N.Ft.Myers/River	8,965	(0)	9,433	(0)
1	North River	2,989	(154)	3,144	(269)
1	Alva/North River	5,346	(1,086)	6,307	(2,002)
1	Iona/Cypress Lake	14,300	(1,847)	16,805	(3,388)
1	Fort Myers Beach/ Estero	10,185	(1,477)	12,646	(2,942)
1	Bonita Beach/ Spring Creek	2,274	(81)	2,659	(156)
1	Old Fort Myers	4,571	(70)	4,861	(122)
2	Bonita Springs	5,172	(998)	6,291	(1,933)
2	San Carlos Park	3,592	(41)	3,645	(71)
2	Central Ft. Myers	5,333	(187)	5,754	(331)
2	W.S. Fort Myers	2,057	(655)	2,576	(1,172)
2	Summerlin	3,475	(168)	4,080	(321)
2	Tice	5,942	(317)	6,460	(569)
2	Orange River	378	(215)	560	(397)
2	North Cape Coral	6,325	(715)	6,949	(1,248)
3	E.S. Fort Myers	770	(0)	773	(0)
3	Page Field/Villas	2,127	(0)	2,210	(0)
3	Six Mile/Ortiz	654	(3)	685	(5)
3	North Fort Myers	6,418	(4,069)	9,628	(7,225)
4	Lehigh North	607	(132)	717	(230)
4	Gateway	14	(5)	17	(8)
4	Corkscrew	122	(0)	129	(0)
5	Lehigh South	6,129	(0)	6,353	(0)
5	East County	5	(0)	5	(0)
		127,487	(14,845)	146,019	(25,821)

Shelters

Evacuees must have a place to go. The SWFRPC undertook surveys in 1979 and 1981 to determine evacuee preferences. This data is summarized as follows: public shelters (24%), leaving the County (34%), visit friends or go to hotel or stay home or "other" (21%), "don't know" (21%). Those are preference declarations; other studies indicate there is a significant variation from preference to actual behavior. For example, income level, available warning time, and what local officials tell evacuees to do, can change behavior. Additionally, the severity of impending storms or perception of risk may also change decisions, as increased community-wide evacuation limits or eliminates the hotel/ friends/public shelter/stay home prediction.

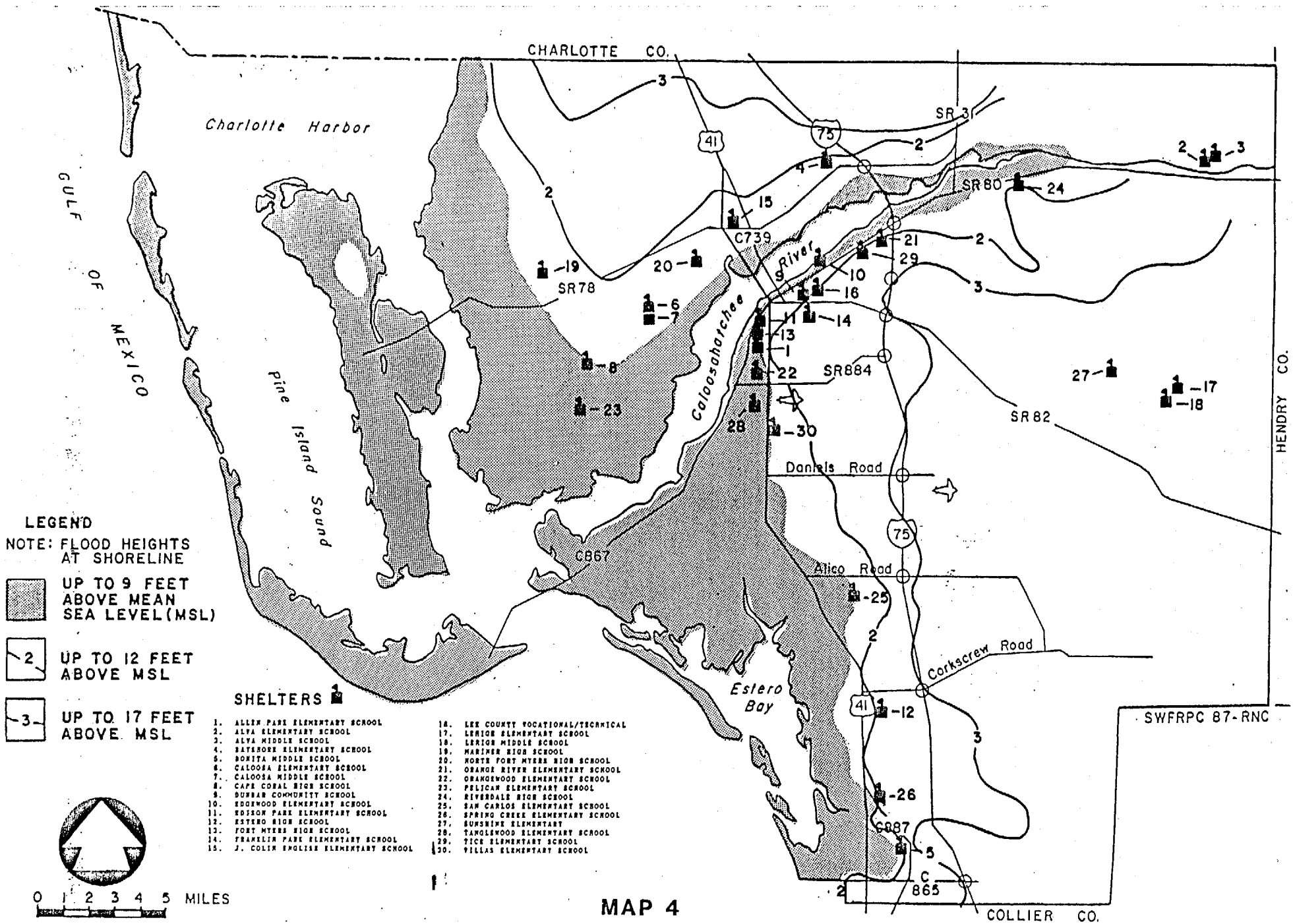
At this time, the County has thirty public shelters, with a capacity (at 20 square feet per person) of 59,670 persons. These shelters are summarized in Table 7, by vulnerability zone. They are depicted on Map 4. Additionally, an unknown number of shelter spaces may exist within mobile home parks. Unfortunately, records of these shelter spaces have not been kept.

Based upon the evacuees forecasted in Table 5, the county has limited public shelter capacity. For example, the county can accommodate 31.7% of the evacuees of Category 1 storm in July, but only 26.7% in November. Table 8 summarizes the County's public shelter capacities for storms.

TABLE 7
LEE COUNTY PRIMARY SHELTERS

Red Cross Managed Shelter	Address	Capacity at 20 sq. ft. per person	Zone* Vulnerability
Allen Park Elementary School	Canelo Drive	530	3
Alva Elementary School	Center St. & Church Ave.	1,040	Beyond 5
Alva Middle School	Center St. & Church Ave.	1,460	Beyond 5
Bayshore Elementary School	Williams Rd. off Bayshore	1,570	3
Bonita Middle School	W. Terry Street	3,110	4
Caloosa Elementary School	Del Prado Blvd.	2,610	3
Caloosa Middle School	Del Prado Blvd.	2,770	3
Cape Coral High School	Santa Barbara Blvd.	6,390	2
Dunbar Community School	High Street	720	3
Edgewood Elementary School	Edgewood Avenue	360	2
Edison Park Elementary	Euclid Avenue	190	4
Estero High School	River Ranch Rd. off Corkscrew Rd.	3,260	4

*Vulnerability accounts for both flood and wind hazards. Number represents that category storm and above for which the shelter cannot be used.



MAP 4
LEE COUNTY
RED CROSS MANAGED PUBLIC SHELTER LOCATIONS

TABLE 7 (Continued)
LEE COUNTY PRIMARY SHELTERS

Red Cross Managed Shelter	Address	Capacity at 20 sq. ft. per person	Zone* Vulner-ability
Fort Myers High School	Cortez Blvd.	2,920	3
Franklin Park Elementary	Ford Street	1,350	2
J. Colin English Elementary	Pine Island Road	670	3
Lee County Vocational/Tech.	Michigan Avenue	1,640	4
LeHigh Elementary School	Schoolway Court	690	Beyond 5
LeHigh Middle School	Arthur Avenue	3,020	Beyond 5
Mariner High School	Chiquita Blvd. & Tropicana Pkwy.	3,260	3
North Fort Myers High School	Orange Grove Blvd.	1,040	2
Orange River Elementary	Underwood Dr. off SR 80	180	3
Orangewood Elementary School	DeLeon Avenue	490	3
Pelican Elementary School	SW 3rd Avenue	2,720	2
Riverdale High School	Buckingham Rd. off SR80	6,070	3
San Carlos Elementary School	Lee Rd. off Alico Rd.	2,940	4
Spring Creek Elementary	US 41 SE	2,580	4
Sunshine Elementary	Sunshine Rd. off Lee Blvd.	2,510	Beyond 5
Tanglewood Elementary School	Manchester Blvd.	1,310	2
Tice Elementary School	Tice Street	1,140	4
Villas Elementary School	Beacon Blvd.	1,130	2

TOTAL: 30 Shelters CAPACITY: 59,670 persons

LEE COUNTY POSSIBLE SECONDARY SHELTERS

Name	Capacity at 20 sq.ft per person	Zone Vulnerability
Cypress Lake High	4,080	1
Edison Community College	3,233	2
	2,100	3
Civic Center	2,470	2
Community Center (Lee Rd.)	140	3
Gulf Elementary	2,580	2
Gulf Middle	4,550	1
Lee County Library	670	3
Lehigh Library	190	Beyond 5
Nature Center	250	3
Suncoast School	5,700	3
University of So. Florida	650	2

TOTAL: 11 Shelters CAPACITY: 26,613 persons

*Vulnerability accounts for both flood and wind hazards. Number represents that category storm and above for which the shelter cannot be used.

TABLE 8
PUBLIC SHELTER CAPACITY

STORM CATEGORY	SPACE	EVACUEES JULY	EVACUEES NOVEMBER	PERCENT MET JULY	PERCENT MET NOVEMBER
1	59,670	187,949	223,703	31.7	26.7
2	45,370	251,168	289,748	18.1	15.7
3	23,580	264,032	302,986	8.9	7.8
4	8,720	265,355	304,351	3.3	2.9
5	----------	----------	N/A	----------	----------

Public shelter within the county are not the only means of meeting evacuee shelter needs. Regretfully, they seem to be the largest. Other options for evacuees include "friends," hotels and one's own home (refusal to leave). Of these, only the commercial (hotel) option can be assessed. In Lee County, there are an estimated 6,719 hotel/motel rooms. By far the greatest portion (70%) of the rooms are located on the shoreline or are in the Category 1 storm surge zone. This leaves only 2,003 units available in a Category 1 storm, 1,184 in Category 2 and only 124 in Category 3, 4, and 5 storms.

The 2,003 units at 100% occupancy (4 persons per room), would satisfy 4.8% of the demand for shelter in July and 3.7% in November in a Category 1 storm. In a Category 2 storm, only 2.1% in July and 1.7% in November will be sheltered in this fashion. Category 3 and greater storms, the percentage is less than 1.

In summary, the table below shows how much of the county evacuee needs are met by the available public and commercial hotel/motel shelter space.

Storm Category 1 = 36.5% July, 30.4% November
Storm Category 2 = 20.2% July; 17.4% November
Storm Category 3 = 8.9% July; 7.8% November
Storm Category 4 = 3.3% July; 2.9% November
Storm Category 5 = ---------- N/A ----------

Without public or private commercial space available, evacuees have only the options of (a) staying with friends who are in safer areas within the county or (b) leaving the county for areas of the state expected to be less affected by the hurricane. The ability of "friends" to shelter evacuees is limited. The shelter capacity of those staying with friends decreases rapidly as the ratio of evacuees to those not affected increases. This problem is depicted in Table 9.

TABLE 9
POPULATION DISPLACEMENT RATIO

STORM CATEGORY	POPULATION					
	DISPLACED		NOT DISPLACED		RATIO	
	July	November	July	November	July	November
1	187,949	223,703	90,792	94,519	2.1:1	2.4:1
2	251,168	289,748	27,573	28,474	9.1:1	10.2:1
3	264,032	302,986	14,709	15,236	18.0:1	19.9:1
4	265,355	304,351	13,386	13,871	19.8:1	21.9:1
5	N/A					

It is an assumption that ratios of 1:1 or better (0.8:1, 0.6:1) will enable those seeking shelter with friends will find them. Ratios of worse than 1:1 (2.1, for example), will diminish that likelihood in proportion to the ratio. Given that assumption, only 48% of those evacuees from a Category 1 storm wishing to stay with friends will be able to do so (48%) in July and 42% in November).

For Category 1 storms, those evacuees wishing to stay with friends (as opposed to leaving the county or staying in public shelters or hotels/motels) will probably find that they are able to do so. The SWFRPC 1981 Evacuation Plan estimates 13% of the evacuating population will take this option. However, the opportunity to stay with friends rapidly decreases as storm intensity increases (forcing more people to evacuate). In a Category 1 storm, the percentage of persons able to stay with friends has fallen to 6.2% in July and 5.5% in November. In a Category 2 storm, the numbers are further reduced to 1.4% in July and 1.3% in November; in a Category 3 storm, .7% and .7%, respectively; Category 4 storm, .7% in July and .5% in November; and in a Category 5 storm, no one will be able to stay with friends.

These percentages, added to the shelter populations absorb the remainder of "in county shelter" demand satisfaction. This is summarized in Table 10, below.

TABLE 10
SHELTER SATISFACTION WITHIN LEE COUNTY

STORM CATEGORY	PERCENT MET	
	JULY	NOVEMBER
1	42.7	35.9
2	21.6	18.7
3	9.6	8.5
4	4.0	3.4
5	N/A	

If shelter needs cannot be met within the county, they must be met outside the county. For this reason, a knowledge of routes and route capacities becomes important.

Routes

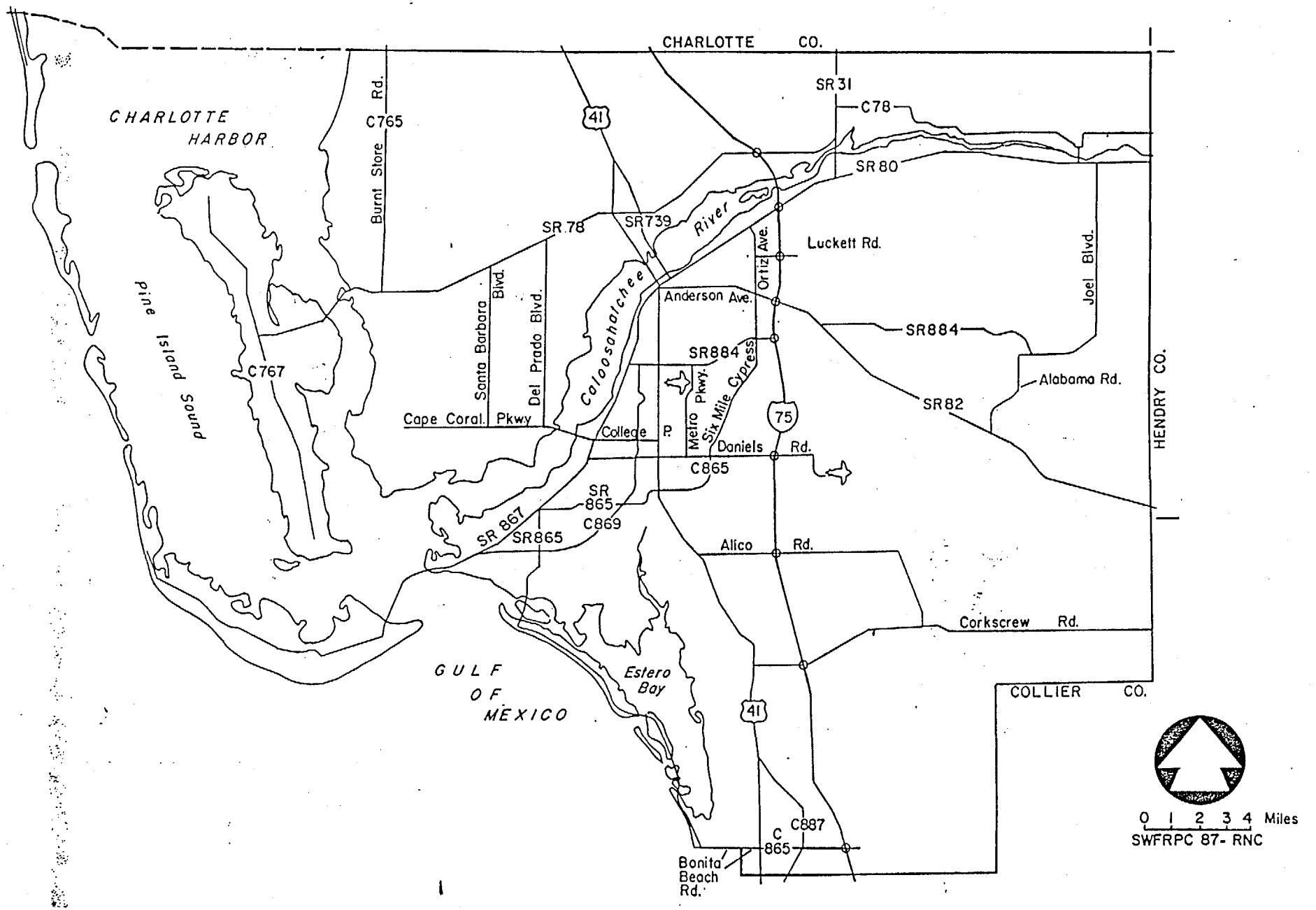
Arterial roadways form the backbone of any hurricane evacuation effort. Lee County's roadway system provides relatively few options for evacuees coming from the coast. Those that do exist are depicted on Map 5, "Evacuation Routes." Identification of routes is the first step in assessing the roadway system. The next step is assessing roadway capacities. The capacities of these roadways have been developed based on their characteristics, tied to the assessment methodologies of the Highway Capacity Manual, 1985. These capacities are contained in Table 11, and show that the roadways (at the 90/10 split) vary from a high hourly capacity at service level D of 2,410 trips for I-75, to a low of 692 trips on Summerlin Road (CR 869) from Colonial Boulevard (SR 884) to Daniels Road.

An important aspect of any route is its condition. Many routes along the shore are low lying. Their propensity to flood due to surge or tidal action causes their reliability to operate as a route to cease several hours before storm landfall. Appendix A depicts these possibilities. In most cases, however, winds, not shoreline flooding, will initially make roads unsafe for travel. The exceptions seem to be the Fort Myers Beach, Sanibel, Punta Rassa, Shell Point, Blind Pass and Boca Grande areas for landfalling storms of Category 1 or 2 strength. This exception also appears to be the case during a landfalling Category 3 storm for Fort Myers Beach, Sanibel, Punta Rassa and Blind Pass.

Rainfall flooding, however, may constitute a greater hazard to evacuation route operation than either early shoreline flooding or early winds. This is because roadways may flood and become partially or totally impassible early in an evacuation. Such areas have been documented for different storms and are depicted on Map 6. These are areas that must be passed before the presupposed onset of heavy rains, which is eight hours before eye landfall.

Clearance Times

There are several contributing factors towards calculating community clearance time. The first is the nature of the threat. Although there are no assurances that the County cannot be struck by Category 4 and 5 storms, the probabilities of this are low. The County does, however, lie subject to storms of Category 1, 2, and 3 strength in decreasing probability. With each storms of increasing strength, the number of persons at risk and evacuating vehicles also increase.



MAP 5
LEE COUNTY
EVACUATION ROUTES

TABLE 11
EVACUATION ROUTE CAPACITY CALCULATIONS
LEE COUNTY

ROUTE	# OF LANES	LANE WIDTH (FT.)	DESIGN SPEED (MPH)	HIGHWAY TYPE	PER-CENT NO PASSING ZONES	MAXIMUM HRLY. FLOW/ FLOW RATE (LOS D)	TRAFFIC FLOW SPLIT 50/50	70/30	90/10
CR 869 (Summerlin Road)									
College Pkwy to Sanibel Causeway	4	12	70	Rur.Div.	--	2,355			
CR 865 (Estero/Hickory/Bonita Beach Road)									
Matanzas Pass to Big Carlos Pass	2	12	50	--	100	1,078	770	897	970
Big Carlos Pass to Big Hickory Pass	2	12	60	--	80	1,176			1,058
Big Hickory Pass to Bonita Beach Road	2	10	50	--	100	971	647	806	874
Hickory Blvd. to I-75	2	12	50	--	90	1,117	745	928	1,005
CR 765 (Burnt Store Rd.)									
SR 78 (Pine Island Road) to Charlotte County	2	12	70	--	70	1,263	760	947	1,027
CR 767 (Stringfellow Blvd.)									
Bokeelia to St. James City	2	12	60	--	80	1,061	707	881	954
CR 78 (North River Road)									
SR 31 to Hendry County	2	11	60	--	100	671	497	557	604
Alabama Road									
SR 82 (Immokalee Rd.) to Leeland Heights Blvd.	2	12	60	--	70	1,482	788	982	1,064
Alico Road									
US 41 to Corkscrew Rd.	2	12	60	--	80	1,286	775	965	1,046
Cape Coral Parkway									
Chiquita Blvd. to the Cape Coral Bridge	4	10	50	Sub.Div.	--	1,588			

TABLE 11 (Continued)
EVACUATION ROUTE CAPACITY CALCULATIONS
LEE COUNTY

ROUTE	# OF LANES	LANE WIDTH (FT.)	DESIGN SPEED (MPH)	HIGHWAY TYPE	PER-CENT NO PASSING ZONES	MAXIMUM HRLY. FLOW/ FLOW RATE (LOS D)	TRAFFIC FLOW SPLIT 50/50	70/30	90/10
College Parkway									
Cape Coral Bridge to US 41	4	12	60	Sub.Div.	--	1,975			
Corkscrew Road									
US 41 to Alico Road	2	10	60	--	70	1,103	664	827	896
Cypress Lake Drive									
McGregor Blvd. to US 41	2	12	60	--	100	1,264	766	948	1,027
Daniels Road									
US 41 to I-75	2	12	60	--	100	1,129	752	938	1,016
Del Prado Blvd.									
SR 78 (Pine Island Rd.) to Cape Coral Parkway	4	12	60	Sub.Div.	--	1,935			
	6	12	60	Sub.Div.	--				
Gasparilla Road									
Charlotte Co. to Boca Grande	2	12	60	--	80	1,153	769	958	1,037
I-75									
Charlotte Co. to Collier Co.	4	12	70	Freeway	--	2,410			
US 41									
Excluding 6L	4	12	70	Rur.Div.	--	2,254			
Toro Lane to Fountain Interchange	6	11	70	Sub.Div.	--	2,860			

TABLE 11 (Continued)
EVACUATION ROUTE CAPACITY CALCULATIONS
LEE COUNTY

ROUTE	# OF LANES	LANE WIDTH (FT.)	DESIGN SPEED (MPH)	HIGHWAY TYPE	PER-CENT NO PASSING ZONES	MAXIMUM HRLY. FLOW/ FLOW RATE (LOS D)	TRAFFIC FLOW SPLIT 50/50	70/30	90/10
SR 739 (Business 41)									
US 41 to SR 78 (Bayshore)	2	12	60	--	100	1,086	774	902	977
SR 78 (Bayshore Rd.) to the Edison Bridge	4	12	60	Sub.Undiv.	--	1,599			
SR 78 (Pine Island Rd./Bayshore Rd.)									
Stringfellow Rd. to Piney Road	2	10	70	--	100	1,131	602	750	812
Piney Rd. to Hart Rd.	4	12	70	Sub.Div.	--	2,036			
Hart Rd. to SR 31	2	12	70	--	100	1,246	707	872	955
SR 80 (Palm Beach Blvd.)									
Seaboard Ave. to New York	4	12	60	Sub.Div.	--	1,744			
New York to SR 31	2	12	70	--	80	1,061	707	881	954
SR 31 to Buckingham Rd.	4	12	70	Rur.Div.	--	2,218			
Buckingham Rd. to Hendry Co.	2	12	70	--	100	1,043	696	867	939
SR 82 (Anderson Ave./Immokalee Rd.)									
US 41 to Ortiz Ave.	2	12	60	--	70	1,279	719	895	970
Ortiz Ave. to I-75	4	12	70	Rur.Div.	--	2,244			
I-75 to Hendry Co.	2	12	70	--	90	1,015	677	843	914
SR 884 (Colonial/Lee/Leeland Hts./Joel Blvd.)									
McGregor Blvd. to Metro Pkwy.	4	12	60	Sub.Div.	--	1,930			
Metro Pkwy. to I-75	4	12	70	Rur.Div.	--	2,380			
SR 82 (Immokalee Rd.) to SR 80	2	12	60	--	70	1,482	788	982	1,064

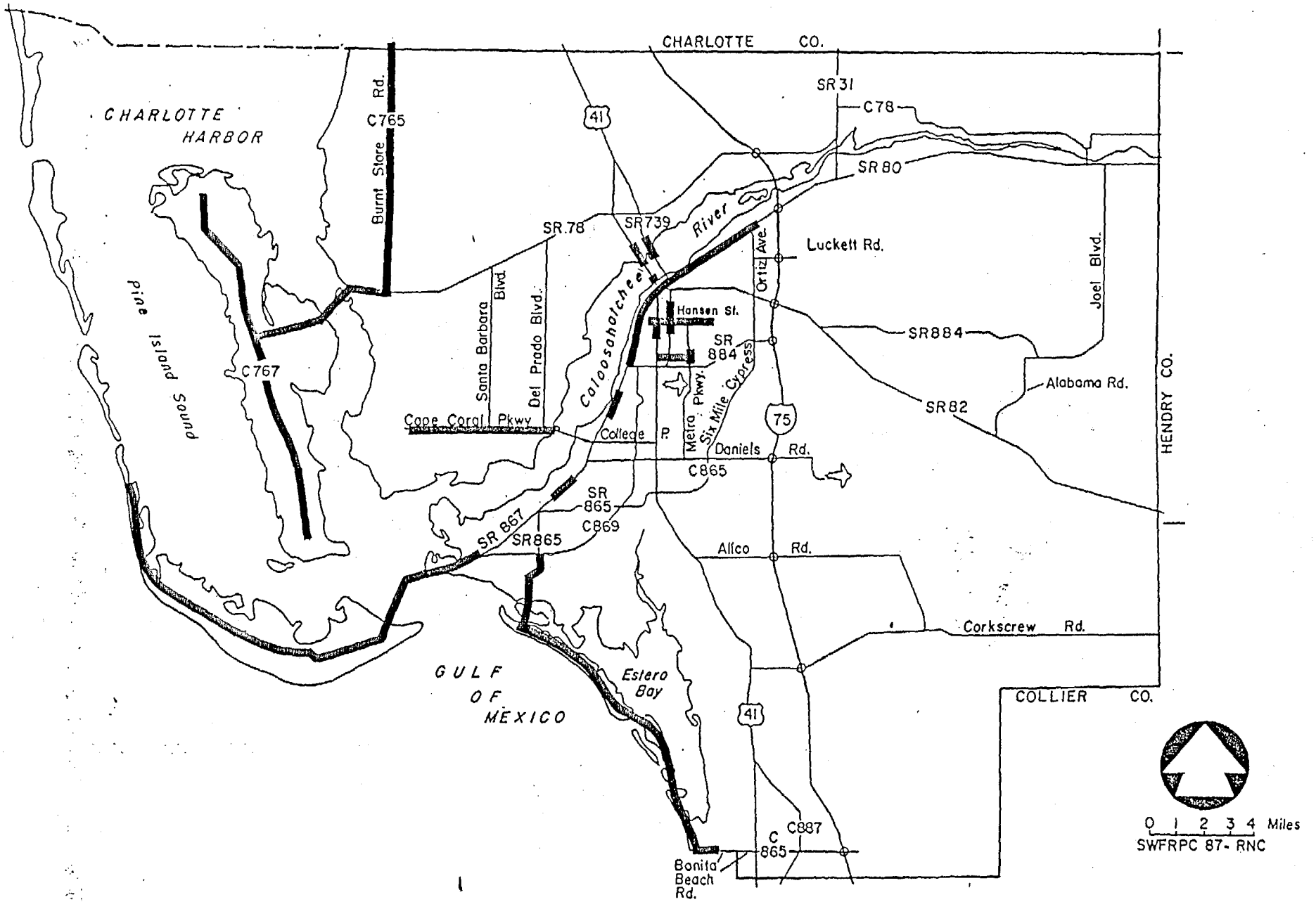
TABLE 11 (Continued)
EVACUATION ROUTE CAPACITY CALCULATIONS
LEE COUNTY

ROUTE	# OF LANES	LANE WIDTH (FT.)	DESIGN SPEED (MPH)	HIGHWAY TYPE	PER-CENT NO PASSING ZONES	MAXIMUM HRLY. FLOW/ FLOW RATE (LOS D)	TRAFFIC FLOW SPLIT 50/50	70/30	90/10
SR 867 (McGregor Blvd.)									
US 41 to San Carlos Blvd.	2	11	50	--	100	1,138	690	854	925
San Carlos Blvd. to Summerlin Rd.	4	12	60	Sub.Div.	--	1,941			
SR 865 (Gladiolus Dr./San Carlos Blvd.)									
US 41 to Summerlin Rd.	2	12	60	--	100	1,155	770	960	1,040
Summerlin Rd. to McGregor Blvd.	2	10	60	--	100	971	647	806	874
McGregor Blvd. to Estero Blvd.	2	12	60	--	100	1,050	700	872	945
SR 31									
Charlotte Co. to SR 80	2	10	60	--	80	976	649	809	878
CR 869 (Summerlin Rd.)									
Colonial Blvd. to College Pkwy.	4	12	60	Sub.Div.	--	1,957			
SR 884 (Colonial Blvd.) to Daniels Road	2	11	50	--	70	912	512	638	692
Ortiz Ave.									
SR 80 (Palm Beach Blvd.) to Colonial Blvd.	2	10	50	--	100	1,198	637	794	860
Periwinkle Way/Sanibel-Captiva Road									
Blind Pass to the Sanibel Causeway	2	10	50	--	100	971	647	806	879

TABLE 11 (Continued)
EVACUATION ROUTE CAPACITY CALCULATIONS
LEE COUNTY

ROUTE	# OF LANES	LANE WIDTH (FT.)	DESIGN SPEED (MPH)	HIGHWAY TYPE	PER-CENT NO PASSING ZONES	MAXIMUM HRLY. FLOW/ FLOW RATE (LOS D)	TRAFFIC FLOW SPLIT 50/50	70/30	90/10
Santa Barbara Blvd. SR 78 (Pine Island Rd.) to Cape Coral Parkway	4	10	50	Sub.Div.	--	1,607			
Six Mile Cypress Pkwy. Colonial Blvd. to US 41	2	12	60	--	80	1,149	766	954	1,034
Alva Bridge	2	10	50	--	100	1,119	595	741	803
Cape Coral Bridge	2	15	50	--	100	972	517	644	698
Edison Bridge	2	12	50	--	100	859	517	644	698
Matanzas Pass Bridge	2	12	50	--	100	1,078	770	897	970
Sanibel Causeway	2	12	50	--	100				

NOTE: The Peak Hour Factor was assumed to be .95 and the Driver Population Factor was assumed to be .75 in ALL cases.



MAP 6
LEE COUNTY
ROUTES SUBJECT TO RAINFALL FLOODING

Other factors contributing to clearance time are the number of vehicles evacuating, the capacity of roadways to carry evacuees, and behavioral tendencies. This translates into a number of hours it will take to move persons past any given point.

The final factors are the number and distance of "stopping" opportunities offered evacuees, and the distance to these opportunities. If the total number of stopping opportunities needed are only ten miles inland, the time is much less for an evacuation than if they are 100 miles distant.

For certain communities within the County, times are less than for others. This variation is because pre-landfall flood conditions are not as bad, shelter locations are closer, and better quality evacuation routes are available. Table 12 summarizes pre-landfall flood conditions, Table 13 summarizes shelter distances and options, and Table 14 summarizes the time it takes to clear the most restrictive point on the route for each community for each of the slow, intermediate, and quick responses. The results of these tables compose the evacuation time.

TABLE 12
PRE-LANDFALL HAZARD CONDITIONS

COMMUNITY	CATEGORY	TIME TO COASTAL FLOOD	TIME TO RAINFALL	TIME TO WIND
Pine Island/ Cape Coral	1	6.5	8	6.0
	2	7.0	8	7.0
	3	8.0	8	9.0
Sanibel/Captiva	1	10.5	8	6.0
	2	11.5	8	7.5
	3	12.5	8	9.5
North Fort Myers/ River	1	-	8	4.5
	2	1.0	8	6.0
	3	2.5	8	8.0
N.E. River/Alva	1	-	8	4.5
	2	-	8	5.5
	3	-	8	7.5
Iona/Cypress Lake	1	2.5	8	5.0
	2	3.5	8	6.5
	3	4.5	8	8.5
Ft. Myers Beach/ Estero	1	10.0	8	5.5
	2	11.0	8	7.0
	3	11.5	8	9.0
Bonita Beach/ Spring Creek	1	7.0	8	5.5
	2	7.5	8	7.0
	3	9.0	8	9.0
Old Ft. Myers	1	2.5	8	4.5
	2	3.5	8	5.5
	3	4.5	8	7.5
Bonita Springs	2	-	8	6.5
	3	9.0	8	9.0

TABLE 12 (Continued)
PRE-LANDFALL HAZARD CONDITIONS

COMMUNITY	CATEGORY	TIME TO COASTAL FLOOD	TIME TO RAINFALL	TIME TO WIND
San Carlos Park	2	–	8	–
	3	6.0	8	9.0
Central Ft. Myers	2	3.5	8	5.5
	3	4.5	8	7.5
WS Ft. Myers	2	3.5	8	5.5
	3	4.5	8	7.5
Summerlin	2	3.5	8	5.5
	3	4.5	8	7.5
Tice	2	–	8	5.0
	3	–	8	7.0
Orange River	2	–	8	5.0
	3	0.5	8	7.0
North Cape Coral	2	3.0	8	7.0
	3	4.5	8	9.0
ES Fort Myers	3	4.5	8	7.5
Page Fields/Villas	3	4.5	8	7.5
Six Mile/Ortiz	3	4.5	8	7.5
North Fort Myers	3	1.0	8	7.5

TABLE 13
SHELTER DESIGNATIONS AND OPTIONS

CATEGORY	ZONE	PUBLIC SHELTER NAME	ESTIMATED* TRAVEL TIME
1	Boca Grande	Lemon Bay High School West Charlotte Comm. Ctr.	.6 hr.
1	Pine Island/ Matlacha	Mariner High School	.6 hr.
1	Cape Coral	Mariner High School Cape Coral High School Pelican Elementary School	.2 hr.
1	Sanibel/ Captiva	Tanglewood Elementary School Villas Elementary School	1.0 hr.
1	N.Ft.Myers/ River	Caloosa Elementary School Caloosa Middle School N.Ft.Myers High School	.3 hr.
1	N. River	J.Colin English Elementary Bayshore Elementary School	.1 hr.
1	N.E. River/ Alva	Alva Elementary School Alva Middle School Riverdale High School	.5 hr.
1	Iona/Cypress Lake	Tanglewood Elementary School Villas Elementary School Orangewood Elementary School	.3 hr.
1	Ft. Myers Beach/ Estero	Tanglewood Elementary School Villas Elementary School Bonita Middle School	.5 hr.

TABLE 13 (Continued)
SHELTER DESIGNATIONS AND OPTIONS

CATEGORY	ZONE	PUBLIC SHELTER NAME	ESTIMATED* TRAVEL TIME
1	Bonita Bch/ Spring Creek	Bonita Middle School Spring Creek Elementary School Estero High School	.25 hr.
1	Old Fort Myers	Allen Park Elementary School Edison Park Elementary School Franklin Park Elementary School Fort Myers High School Orangewood Elementary School	.1 hr.
1	Mobile Homes (2-5)		
2	All 1 Zones	All shelters in County except: Cape Coral High School Edgewood Elementary School Franklin Park Elementary School N.Ft.Myers High School Pelican Elementary School Tanglewood Elementary School Villas Elementary School	.8 hr.
2	Bonita Springs	Bonita Middle School Spring Creek Elementary School Estero High School	.1 hr.
2	San Carlos Park	San Carlos Elementary School	.1 hr.
2	Central Fort Myers	Franklin Park Elementary School Dunbar Community School Lee County Vocational/Technical	.1 hr.
2	WS Ft. Myers	San Carlos Elementary School	.2 hr.
2	Summerlin	Orangewood Elementary School Allen Park Elementary School	.2 hr.
2	Tice	Dunbar Community School Lee County Vocational/Technical Orange River Elementary School Tice Elementary School	.1 hr.
2	Orange River	Orange River Elementary School Riverdale High School	.1 hr.
2	N.Cape Coral	Caloosa Elementary School Caloosa Middle School Mariner High School	.1 hr.
3	All 1 and 2 Zones	Alva Elementary School Alva Middle School Bonita Middle School Edison Park Elementary School Estero High School Lee County Vocational/Technical LeHigh Elementary School LeHigh Middle School San Carlos Elementary School Spring Creek Elementary School Sunshine Elementary School Tice Elementary School	

TABLE 13 (Continued)
SHELTER DESIGNATIONS AND OPTIONS

CATEGORY	ZONE	PUBLIC SHELTER NAME	ESTIMATED* TRAVEL TIME
3	ES Ft. Myers	San Carlos Elementary	.2 hr.
3	Page Field/ Villas	Edison Park Elementary Tice Elementary School Lee County Vocational/Technical	.25 hr.
3	Six Mile/Ortiz	Sunshine Elementary School Lee County Vocational/Technical Tice Elementary School Edison Park Elementary	
3	N.Ft.Myers	Alva Elementary School Alva Middle School	.8 hr.

*Time it takes for a car traveling 30 mph to travel from the furthest point in the zone to the nearest shelter to the zone.

A constricting point from Table 14 may represent an ultimate constricting point for more than 1 zone. That being the case, it may be expected that these times will become cumulative. This creates a "greatest time to clear" for the county as a whole. Table 15 depicts the "greatest time to clear" calculation for each category storm.

TABLE 15
ULTIMATE CONSTRICTING ROUTE

		JULY			NOVEMBER		
CATEGORY	CONSTRICTING POINT	SLOW	INTER-MEDIATE	QUICK	SLOW	INTER-MEDIATE	QUICK
1	SR 78 (W)	13.7	11.0	10.2	15.5	12.5	11.5
2	SR 78 (W)	24.2	19.4	18.0	27.0	21.8	20.1
3	SR 78 (W)	24.2	19.4	18.0	27.0	21.8	20.1

Clearly, route constriction becomes a concern when it is unevenly distributed between different parts of the County. The relative isolation of the Sanibel and Fort Myers Beach shoreline and the limited routes available limits evacuation capacity causing the large times. The possibility exists that increased traffic control can better distribute loadings. If that is the case, the ultimate constricting points move to the sum of the routes exiting the County. Table 16 depicts the times that may occur, given different routing scenarios.

The last factor to be incorporated into calculating the County clearance time is the response of potential evacuees to an evacuation order. The original 1981-82 Regional Hurricane Evacuation Plan discussed this topic on page 125, and concluded

TABLE 14
TIME TO CLEAR

CATEGORY	ZONE	RESTRICTING POINT	JULY SLOW	JULY INTER-MEDIATE	JULY QUICK	NOVEMBER SLOW	NOVEMBER INTER-MEDIATE	NOVEMBER QUICK	TO COUNTY LINE
1	Pine Island/ Matlacha	Matlacha Bridge	6.4	5.2	4.8	7.3	5.8	5.4	1.0
1	Cape Coral	SR 78(W) & Hunter Blvd.	13.7	11.0	10.2	15.5	12.5	11.5	.6
1	Sanibel/Captiva	Periwinkle	13.3	10.7	9.8	14.7	11.8	10.8	1.6
1	N.Ft.Myers/River River	SR 78 (W) & Hancock Bridge Pwky.	3.5	3.3	3.3	3.7	3.5	3.4	0.5
1	North River	SR 78 & SR 739	.8	.8	.8	.9	.9	.9	0.3
1	NE River/Alva	CR 78 & SR 80	4.5	3.8	3.5	5.3	4.4	4.1	0.2
1	Tona/Cypress Lake	McGregor & Summerlin	4.7	4.5	4.4	5.5	5.2	5.1	1.0
1	Ft.Myers Bch./ Estero	SR 865	9.7	7.8	7.2	12.1	9.7	9.0	1.2
1	Bonita Beach/ Spring Creek	Bonita Beach Rd.	7.6	6.1	5.6	9.2	7.4	6.8	1.3
1	Old Ft. Myers	McGregor Blvd.	1.3	1.2	1.2	1.4	1.3	1.3	0.4
2	Bonita Springs	Bonita Beach Rd. & Old US 41	3.6	2.9	2.6	4.3	3.5	3.2	1.1
2	San Carlos Park	Alico Road & Corkscrew Road	1.2	1.1	1.1	1.2	1.2	1.1	0.8
2	Central Ft. Myers	SR 80 and 82	2.2	2.0	2.0	2.3	2.2	2.1	0.5
2	WS Ft. Myers	Daniels Rd. & Alico	1.3	1.1	1.0	1.7	1.4	1.2	0.6
2	Summerlin	Daniels Road	1.3	1.2	1.2	1.5	1.4	1.4	0.5
2	Tice	SR 80 and 82	2.4	2.3	2.2	2.6	2.5	2.4	0.5
2	Orange River	SR 80	0.5	0.4	0.4	0.8	0.6	0.6	0.4
2	N. Cape Coral	SR 78 (W)	10.5	8.4	7.8	11.5	9.3	8.6	0.5
3	ES Ft. Myers	Daniels Road & Alico Road	0.5	0.4	0.4	0.5	0.4	0.4	0.6
3	Page Field/ Villas	Daniels Road	0.8	0.7	0.7	0.8	0.8	0.8	0.5
3	Six Mile/Ortiz	Daniels Rd.& SR82	0.2	0.2	0.2	0.2	0.2	0.2	0.5
3	N.Ft. Myers	SR 78(E) & Old 41	4.3	3.6	3.3	6.5	5.4	5.0	0.3

TABLE 16
COUNTY EXITING ROUTES

CATEGORY	TOTAL VEHICLES LEAVING CO.	% OF TOTAL EVACUATING VEHICLES*	ROUTES	COMBINED CAPACITIES			TIMES					
							JULY			NOVEMBER		
				SLOW	INTER-MEDIATE	QUICK	SLOW	INTER-MEDIATE	QUICK	SLOW	INTER-MEDIATE	QUICK
1(a)	48,750(J) 64,672(N)	57.3 64.1	US 41(N), I-75(N), SR 31 SR 80	6,009	6,340	6,481	8.1	7.7	7.5	10.8	10.2	9.8
1(b)			US 41(N), I-75(S & E), SR 80 & 82	6,037	6,374	6,517	8.1	7.6	7.5	10.7	10.1	9.9
2(a)	86,743(J) 111,549(N)	78.4 81.3	same as 1(a)				14.4	13.7	13.4	18.6	17.6	17.2
2(b)			same as 1(b)				14.4	13.6	13.3	18.6	17.5	17.2
3(a)	109,155(J) 127,218(N)	90.4 91.5	same as 1(a)				18.1	17.2	16.8	21.2	20.0	19.6
3(b)			same as 1(b)				18.1	17.1	16.7	21.2	20.0	19.5

(a) = landfalling and crossing storms south of Lee County and paralleling storms
(b) = landfalling and crossing storms north of Lee County and paralleling storms
* = percent of total evacuating vehicles for that category storm plus mobile home/recreational vehicles in County.

that seven hours would be the minimum time needed to clear a zone, because some evacuees would dawdle more than others. More recent history indicates that sudden or dramatic changes in hurricanes can heighten the evacuees' response into a "quick" evacuation, limited basically by road capacity. Consequently, in evaluating the final criteria that determines a slow, intermediate, or quick evacuation, both slow and intermediate zones will have a minimum response time of seven hours; "quick" times, however, will be limited only by roadway capacity. All of these factors combine into creating a countywide clearance time. This time will vary depending upon the routes available for out-of-county evacuation, the time of season, and whether it is a slow, intermediate, or quick response. Table 17 summarizes the contribution to the greatest clearance time for the County for each category storm.

The clearance time for the County as a whole for Category 3 storms will increase if out-of-county evacuation is limited soley to I-75 (north) or US 41 (north). If more routes are provided, the time may lessen. This, of course, depends upon the impact on the other evacuating counties.

TABLE 17
TOTAL EVACUATION TIME

CATEGORY	DESTINATION(1)	WEATHER(2)	CLEARANCE TIME SLOW	CLEARANCE TIME INTER-MEDIATE	CLEARANCE TIME QUICK	TOTAL EVACUATION TIME SLOW	TOTAL EVACUATION TIME INTER-MEDIATE	TOTAL EVACUATION TIME QUICK
1	1.6	10.5	13.7(J)	11.0(J)	10.2(J)	25.8(J)	23.1(J)	22.3(J)
			15.5(N)	12.5(N)	11.5(N)	27.6(N)	24.6(N)	23.6(N)
2	1.1	11.5	13.7(J)	11.0(J)	10.2(J)	26.3(J)	23.6(J)	22.8(J)
			15.5(N)	12.5(N)	11.5(N)	28.1(N)	25.1(N)	24.1(N)
3	.8	12.5	13.7(J)	11.0(J)	10.2(J)	27.0(J)	24.3(J)	23.5(J)
			15.5(N)	12.5(N)	11.5(N)	28.8(N)	25.8(N)	24.8(N)

(1) From Table 13 or 14, whichever is greater

(2) From Table 12

PART II - 1991 FORECASTS

Part of hurricane preparedness involves understanding and evaluating the growth expected in the forthcoming years. This element discusses short ranged growth (4 years) the area may undergo, and the facilities that are expected to be added to serve it.

The growth predicted follows a single straight-lined forecast technique of roughly 3.9% a year or approximately a 15.6% increase over the 4-year period. Applied uniformly, increases by category and community for housing, persons, and vehicles for 1991 are depicted in Tables 18, 19, and 20. The 15.6% increase over 4 years was determined by the Bureau of Economic and Business Research at the University of Florida from history growth trends between 1980 and 1987.

Table 18 forecasts a total of 192,975 dwelling units for 1991.

Table 19 forecasts a total of 322,231 persons in July; and 369,694 in November.

Table 20 forecasts a total of 147,386 vehicles in July; and 168,820 in November.

The additional facilities expected can be categorized as "shelters" and "routes". Regretfully, future shelter site and capacity information has not yet been exactly determined. Route improvements, however, are better known.

One new school a year is forecasted to be built in Lee County. A new school a year equates to approximately 2,000 additional shelter spaces a year. The roughly 7,956 new spaces increases the County shelter capacity by 12% during a period when the County is expected to increase demand by 14.0%. Table 21 summarizes the County's estimated 1991 public shelter capacities by storm category.

TABLE 18
LEE COUNTY HOUSING ESTIMATES FOR 1991

Storm Category	Zone	Residential Single-Family	Mobile Home	Recreational Vehicle	Multi-Family Apartment	Multi-Family Condo	Duplex	Hotel-Motel	Total
1	Boca Grande	547	9	0	0	192	0	180	928
	Pine Island/Cape Coral	15,264	4,292	3,631	624	4,217	1,392	608	30,028
1	Sanibel/Captiva	6,038	614	346	110	3,485	0	1,909	12,502
1	North Fort Myers/ River	9,033	377	0	1,921	2,927	806	80	15,144
1	North East River/Alva	4,186	2,161	1,296	170	27	104	344	8,288
1	Iona/Cypress Lake	8,374	3,757	1,993	1,141	7,090	549	62	22,966
1	Fort Myers Beach/Estero	4,612	1,936	4,397	746	6,597	0	1,463	19,751
1	Bonita Beach/Spring Creek	860	128	181	190	2,333	106	89	3,887
1	Old Fort Myers	3,144	171	0	1,466	526	0	716	6,023
TOTALS	FLOOD ZONE 1	52,058	13,445	11,844	6,368	27,394	2,957	5,451	119,517
2	Bonita Springs	3,415	1,557	2,318	179	1,199	197	282	9,147
2	San Carlos Park	3,496	99	0	0	163	240	58	4,056
2	Central Fort Myers	3,459	437	54	2,274	718	0	177	7,119
2	W.S. Fort Myers	1,510	1,469	348	0	16	0	0	3,343
2	Summerlin	302	280	340	777	3,029	985	312	6,025
2	Tice	3,788	696	202	2,898	283	0	118	7,985
2	Orange River	171	422	271	7	0	0	0	871
2	North Cape Coral	4,499	1,744	8	310	618	1,064	0	8,243
TOTALS	FLOOD ZONE 2	20,640	6,704	3,541	6,445	6,026	2,486	947	46,789
3	E.S. Fort Myers	822	0	0	0	23	0	0	845
3	Page Field/Villas	1,762	0	0	94	170	16	665	2,707
3	Six Mile/Ortiz	424	7	0	388	0	0	0	819
3	North Fort Myers	2,176	9,356	1,546	80	0	0	561	13,719
TOTALS	FLOOD ZONE 3	5,184	9,363	1,546	562	193	16	1,226	18,090
4	Lehigh North	434	323	0	72	57	0	0	886
4	Gateway	9	12	0	0	0	0	0	21
4	Corkscrew	103	0	0	0	57	0	0	160
TOTALS	FLOOD ZONE 4	546	335	0	72	114	0	0	1,067
5	Lehigh South	5,516	0	0	373	1,474	0	143	7,506
5	East County	6	0	0	0	0	0	0	6
TOTALS	FLOOD ZONE 5	5,5[illegible]	[illegible]	0	[illegible]73	[illegible]	[illegible]	[illegible]3	7,5[illegible]

TABLE 19
LEE COUNTY POPULATION ESTIMATE FOR 1991

Storm Category	Zone	Population Estimates July	November
1	Boca Grande	1,750	1,856
	Pine Island/Matlacha	9,817	11,115
	Cape Coral	41,854	47,389
	Sanibel/Captiva	21,764	23,946
	North Fort Myers/River	22,612	23,790
	North River	7,538	7,930
	N.E. River/Alva	13,535	16,021
	Iona/Cypress Lake	36,145	42,564
	Fort Myers Beach/Estero	25,859	32,291
	Bonita Beach/Spring Creek	5,741	6,721
	Old Fort Myers	11,530	12,262
	Mobile Homes & Recreational Vehicles, not otherwise included in the above flood prone areas (Category 2-5 Areas)	19,122	34,533
	TOTAL AREA 1	217,267	260,418
2	Bonita Springs	13,136	16,077
	San Carlos Park	9,057	9,191
	Central Fort Myers	13,455	14,521
	W.S. Fort Myers	5,201	6,526
	Summerlin	8,777	10,321
	Tice	14,991	16,308
	Orange River	963	1,438
	North Cape Coral	15,954	17,526
	Mobile Homes & Recreational Vehicles, not otherwise included in the above flood prone areas (Category 3-5 Areas)	10,675	18,979
	NEW EVACUEES	73,087	76,354
	TOTALS 1 - 2	290,354	336,772
3	E.S. Fort Myers	1,942	1,949
	Page Field/Villas	5,366	5,580
	Six Mile/Ortiz	1,646	1,726
	North Fort Myers	16,250	24,426
	Mobile Homes & Recreational Vehicles, not otherwise included in the above flood prone areas (Category 4-5 Areas)	345	604
	NEW EVACUEES	14,874	15,306
	TOTALS 1 - 3	305,228	352,078

TABLE 19 (Continued)
LEE COUNTY POPULATION ESTIMATE FOR 1991

Storm Category	Zone	Population Estimates July	November
4	Lehigh North	1,534	1,814
	Gateway	33	44
	Corkscrew	310	328
	Mobile Homes & Recreational Vehicles, not otherwise included in the above flood prone areas (Category 5 Area)	0	0
	NEW EVACUEES	1,532	1,582
	TOTALS 1 - 4	306,760	353,660
5	Lehigh South	15,457	16,020
	East County	14	14
	NEW EVACUEES	15,471	16,034
	TOTALS 1 - 5	322,231	369,694

TABLE 20
LEE COUNTY VEHICLE ESTIMATES FOR EVACUATION

CATEGORY	ZONE	JULY	MOBILE HOME & REC. VEHICLES	NOVEMBER	MOBILE HOME & REC. VEHICLES
1	Boca Grande	803	(0)	851	(7)
1	Pine Island/ Matlacha	4,487	(2,684)	5,607	(3,259)
1	Cape Coral	19,130	(0)	21,599	(0)
1	Sanibel/Captiva	9,969	(352)	10,962	(649)
1	N.Ft.Myers/River	10,363	(0)	10,903	(0)
1	North River	3,455	(178)	3,635	(311)
1	Alva/North River	6,179	(1,255)	7,289	(2,314)
1	Iona/Cypress Lake	16,532	(2,136)	19,427	(3,917)
1	Fort Myers Beach/ Estero	11,772	(1,707)	14,619	(3,400)
1	Bonita Beach/ Spring Creek	2,630	(94)	3,067	(180)
1	Old Fort Myers	5,285	(81)	5,620	(141)
2	Bonita Springs	5,980	(1,153)	7,274	(2,235)
2	San Carlos Park	4,150	(47)	4,213	(82)
2	Central Ft. Myers	6,168	(218)	6,653	(383)
2	W.S. Fort Myers	2,378	(758)	2,997	(1,355)
2	Summerlin	4,015	(193)	4,715	(371)
2	Tice	6,867	(365)	7,466	(657)
2	Orange River	436	(249)	647	(459)
2	North Cape Coral	7,312	(826)	8,031	(1,442)

TABLE 20 (Continued)
LEE COUNTY VEHICLE ESTIMATES FOR EVACUATION

CATEGORY	ZONE	JULY	MOBILE HOME & REC. VEHICLES	NOVEMBER	MOBILE HOME & REC. VEHICLES
3	E.S. Fort Myers	890	(0)	893	(0)
3	Page Field/Villas	2,459	(0)	2,638	(0)
3	Six Mile/Ortiz	754	(3)	791	(6)
3	North Fort Myers	7,420	(4,703)	11,133	(8,353)
4	Lehigh North	703	(153)	831	(266)
4	Gateway	16	(6)	20	(10)
4	Corkscrew	142	(0)	150	(0)
5	Lehigh South	7,085	(0)	7,343	(0)
5	East County	6	(0)	6	(0)
		147,386	(17,165)	168,820	(29,797)

TABLE 21
1991 PUBLIC SHELTER CAPACITY*

Storm Category	Shelter Space	Evacuating Population July	Evacuating Population November	% Population Sheltered July	% Population Sheltered November
1	67,626	217,267	260,418	31.1	26.0
2	53,326	290,354	336,772	18.4	15.8
3	31,536	305,228	352,078	10.3	9.0
4	16,676	306,760	353,660	5.4	4.7
5	16,676	322,231	269,694	5.2	4.5

* Assumes new shelter space is built at or above Category 5 flood level.

Route improvements for the next 4 years indicate substantial improvements will be made to routes exiting the Category 1 zone. Using the 1988-1992 TIP of the Fort Myers/Lee County Metropolitan Planning Organization as a guide, the following significant improvements are forecasted:

(a) Extending Metro Parkway from SR 884 (Colonial) to Six Mile Parkway.

(b) Adding two lanes on CR 865 (Bonita Beach Road) from Hickory Boulevard to I-75.

(c) Adding two lanes on Cypress Lake Drive from McGregor Boulevard to US 41.

(d) Adding two lanes on Daniels Road from US 41 to I-75.

(e) Extending Daniels Road (4 lanes) from Airport Entrance, to SR 82.

(f) Adding two lanes on College Parkway from the Bridge to US 41.

(g) Adding two lanes on Summerlin Road from Gladiolus to SR 884 (Colonial).

(h) Adding two lanes on Del Prado Boulevard from Cape Coral Parkway to Coralwood Drive.

(i) Extending SR 884 (Colonial Boulevard) from I-75 to SR 82.

(j) Adding two lanes on SR 80 from New York Avenue to SR 31.

(k) Replace the existing 2 lane SR 739 (Old US 41) including Bridge with a six-lane road to US 41.

(l) Adding a center tuning lane on San Carlos Boulevard from Summerlin Road to Hurricane Pass.

Even though the exact capacities of these new improvements cannot be calculated at this time, an estimate can be made. Table 22 provides a revision of the previously provided Table 11 to represent 1991 conditions.

TABLE 22
REVISED CAPACITIES

Route	New Capacity	Old Capacity
Metro Parkway from SR 884 to Daniels Road	1,975	None
Metro Pkwy. from Daniels Rd. to Six Mile Pkwy	1,021 (Quick)	None
CR 865 (Bonita Beach Rd.) from Hickory Boulevard to I-75	1,898	1,005 (Quick)
Cypress Lake Drive from McGregor to US 41	1,935	1,027 (Quick)
Daniels Road from US 41 to I-75	2,169	1,016 (Quick)
Daniels Rd. Ext. from Airport entrance to SR 82	2,386	None
College Parkway from Bridge to US 41	2,903	1,975
Summerlin from Gladiolus to Colonial	2,906	1,975
Del Prado Blvd. from Cape Coral Pkwy. to Coralwood Dr.	2,903	1,935
Extend Colonial Blvd. from I-75 to SR 82	1,017 (Quick)	None
SR 80 from New York Avenue to SR 31	1,876	954 (Quick)
SR 739 (Old US 41) including Bridge to US 41	2,726	
San Carlos Blvd. from Summerlin Rd. to Hurricane Pass	1,029 (Quick)	945 (Quick)

Assuming that these improvements are in place, new shelter satisfaction capacities (Table 10), time to clear (Table 14),

ultimate constricting route (Table 15), exiting route assessments (Table 16), and total evacuation time calculations (Table 17) can be made.

Shelter capacities for a Category 1 storm do not improve with the facilities projected because growth is out-stripping the capacity added. Since the methodology used was a single straight-line process, the only factors changing were the population (up 14%) and shelter space (up 12%). As a result, shelter satisfaction within the County will demonstrate a decline for a Category 1 storm and a slight increase for Category 2 and higher storms. Table 23 depicts this change.

TABLE 23
SHELTER SATISFACTION, 1991

Category	Percent Met July	Percent Met November
1	41.6	35.1
2	21.7	18.7
3	11.2	9.9
4	6.3	5.4
5	<1	<1

The decline for a Category 1 storm can only worsen evacuation and clearance times unless comparable out-of-county route improvements are made. Using the improvements listed, there are route improvements forecasted that improve in-county movement capacities. The most effective improvements are Bonita Beach Road, San Carlos Boulevard, Summerlin and Daniels Road. Table 24 depicts these changes.

TABLE 24
TIME TO CLEAR, 1991

CATEGORY	ZONE	RESTRICTING POINT	JULY SLOW	JULY INTER-MEDIATE	JULY QUICK	NOVEMBER SLOW	NOVEMBER INTER-MEDIATE	NOVEMBER QUICK
1	Pine Island/ Matlacha	Matlacha Bridge	7.4	6.0	5.5	8.4	6.8	6.2
1	Cape Coral	SR 78(W) & Hunter Blvd.	15.8	12.7	11.8	17.9	14.4	13.3
1	Sanibel/Captiva	Periwinkle	15.4	12.4	11.3	16.9	13.6	12.5
1	N.Ft.Myers/River River	SR 78 (W) & Hancock Bridge Pwky.	4.1	3.9	3.8	4.3	4.1	4.0
1	North River	SR 78 & SR 739	1.0	1.0	1.0	1.0	1.0	1.0
1	NE River/Alva	CR 78 & SR 80	5.2	4.3	4.0	6.1	5.1	4.7
1	Iona/Cypress Lake	McGregor & Summerlin	4.6	4.4	4.3	5.4	5.2	5.1
1	Ft.Myers Bch./ Estero	SR 865	10.4	8.3	7.7	12.9	10.3	9.5
1	Bonita Beach/ Spring Creek	Bonita Beach Rd.	3.4	3.4	3.4	3.8	3.8	3.8
1	Old Ft. Myers	McGregor Blvd.	1.5	1.4	1.4	1.6	1.5	1.5
2	Bonita Springs	Bonita Beach Rd. & Old US 41	2.3	2.2	2.1	2.8	2.6	2.6
2	San Carlos Park	Alico Road & Corkscrew Road	1.4	1.3	1.3	1.4	1.3	1.3
2	Central Ft. Myers	SR 80 and 82	2.4	2.2	2.2	2.6	2.4	2.3
2	WS Ft. Myers	Daniels Rd. & Alico	0.8	0.8	0.7	1.0	0.9	0.9
2	Summerlin	Daniels Road	1.0	1.0	1.0	1.2	1.2	1.2
2	Tice	SR 80 and 82	2.6	2.5	2.4	2.9	2.7	2.6
2	Orange River	SR 80	0.2	0.2	0.2	0.3	0.3	0.3
2	N. Cape Coral	SR 78 (W)	12.1	9.7	9.0	13.3	10.1	9.9
3	ES Ft. Myers	Daniels Road & Alico Road	0.3	0.3	0.3	0.3	0.3	0.3
3	Page Field/ Villas	Daniels Road	0.6	0.6	0.6	0.6	0.6	0.6
3	Six Mile/Ortiz	Daniels Rd.& SR82	0.1	0.1	0.1	0.2	0.1	0.1
3	N.Ft. Myers	SR 78(E) & Old 41	5.0	4.2	3.8	7.5	6.3	5.8

TABLE 25
ULTIMATE CONSTRICTING ROUTE, 1991

CATEGORY	CONSTRICTING POINT	JULY SLOW	JULY INTER-MEDIATE	JULY QUICK	NOVEMBER SLOW	NOVEMBER INTER-MEDIATE	NOVEMBER QUICK
1	SR 78 (W)	15.8	12.7	11.8	17.9	14.4	13.5
2	SR 78 (W)	27.9	22.4	20.8	31.2	24.5	23.4
3	SR 78 (W)	27.9	22.4	20.8	31.2	24.5	23.4

Regretfully, none of the out-of-county routes have improvements slated. Consequently, traffic growth combined with a reduced ability to provide shelter during a Category 1 increased out-of-county times. This is depicted in Table 26.

Unfortunately, the only Category 1 zone which has a reduction in evacuation times is the Bonita Beach/Spring Creek zone. This reduction will occur because of four-laning Bonita Beach Road. Other zone evacuation times in the Category 1 area would have increased more if it had not been for the predicted transportation improvements. One transportation improvement which should be completed as soon as possible is the 4-laning of SR 78 west of US 41. If SR 78 was four-laned, the Cape Coral clearance times for November 1991 (the highest in the County) would be reduced from 17.9 hours to 8.2 hours during a Category 1 slow response. Consequently, the total evacuation time would be reduced from 30 hours to 20.3 hours for Cape Coral.

Table 27 indicates that the total County evacuation time for 1991 can be expected to increase by approximately 2.5 hours. This can be prevented through more shelters in the County and improving critical evacuation routes such as SR 78 west of US 41.

TABLE 26
COUNTY EXITING ROUTES, 1991

CATEGORY	TOTAL VEHICLES LEAVING CO.	% OF TOTAL EVACUATING VEHICLES*	ROUTES	COMBINED CAPACITIES			TIMES					
							JULY			NOVEMBER		
				SLOW	INTER-MEDIATE	QUICK	SLOW	INTER-MEDIATE	QUICK	SLOW	INTER-MEDIATE	QUICK
1(a)	57,979(J) 77,009(N)	58.4 64.9	US 41(N), I-75(N), SR 31 SR 80	6,009	6,340	6,481	9.6	9.1	8.9	12.8	12.1	11.9
1(b)			US 41(N), I-75(S & E), SR 80 & 82	6,037	6,374	6,517	9.6	9.1	8.9	12.8	12.1	11.8
2(a)	103,964(J) 124,917(N)	78.3 81.3	same as 1(a)				17.3	16.4	16.0	20.8	19.7	19.3
2(b)			same as 1(b)				17.2	16.3	16.0	20.7	19.6	19.2
3(a)	123,959(J) 144,832(N)	88.8 90.1	same as 1(a)				20.6	19.6	19.1	24.1	22.8	22.3
3(b)			same as 1(b)				20.5	19.4	19.0	24.0	22.7	22.2

(a) = landfalling and crossing storms south of Lee County and paralleling storms
(b) = landfalling and crossing storms north of Lee County and paralleling storms
* = percent of total evacuating vehicles for that category storm plus mobile home/recreational vehicles in County.

TABLE 27
TOTAL EVACUATION TIME, 1991

CATEGORY	DESTINATION(1)	WEATHER(2)	CLEARANCE TIME SLOW	CLEARANCE TIME INTER-MEDIATE	CLEARANCE TIME QUICK	TOTAL EVACUATION TIME SLOW	TOTAL EVACUATION TIME INTER-MEDIATE	TOTAL EVACUATION TIME QUICK
1	1.6	10.5	15.8(J) 17.9(N)	12.7(J) 14.4(N)	11.8(J) 13.3(N)	27.9(J) 30.0(N)	24.8(J) 26.5(N)	23.9(J) 25.4(N)
2	1.1	11.5	15.8(J) 17.9(N)	12.7(J) 14.4(N)	11.8(J) 13.3(N)	28.4(J) 30.5(N)	25.3(J) 27.0(N)	24.4(J) 25.9(N)
3	.8	12.5	1587(J) 17.9(N)	12.7(J) 14.4(N)	11.8(J) 13.3(N)	29.1(J) 31.2(N)	26.0(J) 27.7(N)	25.1(J) 26.6(N)

(1) From Table 13 or 14, whichever is greater

(2) From Table 12

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LANDFALLING

PRE-EYE LANDFALL HAZARD TIMES - CATEGORY 1

GRID STORM POINTS	HOURS BEFORE EYE LANDFALL-FLOODING(1)	STORM TRACK	TOTAL DURATION IN HOURS	HOURS BEFORE EYE LANDFALL-SUSTAINED GALE FORCE WINDS(2)	STORM TRACK	TOTAL DURATION IN HOURS
Fort Myers Beach	10	(75 NS)	13	5.5	(35 NS)	8
Ft. Myers Beach Bridge	3	(35 NS)	14	5.5	(40 NS)	7.5
Sanibel	10.5	(75 NS)	13.5	6	(35 NS)	8.5
Punta Rassa	8	(75 NS)	17	6	(45 NS)	7.5
Shell Point	6.5	(70 NS)	15.5	5.5	(40 NS)	8
Cape Coral Parkway	1	(30 NS)	12	5	(30 NS)	8
Harney Point	0	(30 NS)	11	4.5	(24 NS)	8.5
Iona	0	(25 NS)	9	5	(30 NS)	8.5
River	2.5	(65 NS)	11.5	4.5	(35 NS)	8.5
New Bridge	-1.5	(25 NS)	7.5	4.5	(40 NS)	7.5
East Fort Myers				4	(35 NS)	8
Blind Pass	9	(70 NS)	12.5	7	(60 NS)	7
Pine Island Sound	4.5	(70 NS)	13.5	6	(45 NS)	8.5
Pine Island Center				6	(55 NS)	7.5
Matlacha	2	(45 NS)	12	5.5	(40 NS)	8.5
Boca Grande	7	(70 NS)	11.5	6	(60 NS)	8.5

LANDFALLING

PRE-EYE LANDFALL HAZARD TIMES - CATEGORY 2

GRID STORM POINTS	HOURS BEFORE EYE LANDFALL-FLOODING(1)	STORM TRACK	TOTAL DURATION IN HOURS	HOURS BEFORE EYE LANDFALL-SUSTAINED GALE FORCE WINDS(2)	STORM TRACK	TOTAL DURATION IN HOURS
Fort Myers Beach	11	(75 NS)	15	7	(40 NS)	10
Ft. Myers Beach Bridge	4.5	(50 NS)	14.5	7	(60 NS)	8
Sanibel	11.5	(75 NS)	15	7.5	(45 NS)	10
Punta Rassa	9	(75 NS)	18	7	(40 NS)	10
Shell Point	7	(65 NS)	16	7	(40 NS)	10.5
Cape Coral Parkway	2	(40 NS)	12	6.5	(40 NS)	10
Harney Point	1	(35 NS)	12	6	(40 NS)	10
Iona	1.5	(40 NS)	11.5	6.5	(45 NS)	9.5
River	3.5	(70 NS)	12.5	5.5	(40 NS)	9.5
New Bridge	- .5	(25 NS)	10.4	5.5	(40 NS)	10
East Fort Myers				5	(30 NS)	10
Blind Pass	10	(75 NS)	13.5	8	(65 NS)	9
Pine Island Sound	5.5	(75 NS)	14.5	7	(45 NS)	10.5
Pine Island Center	1.5	(40 NS)	8.5	7	(45 NS)	10.5
Matlacha	3	(50 NS)	13	6.5	(45 NS)	10
Boca Grande	8	(75 NS)	11.5	7	(60 NS)	10.5

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PRE-EYE LANDFALL HAZARD TIMES - CATEGORY 3

GRID STORM POINTS	HOURS BEFORE EYE LANDFALL-FLOODING(1)	STORM TRACK	TOTAL DURATION IN HOURS	HOURS BEFORE EYE LANDFALL-SUSTAINED GALE FORCE WINDS(2)	STORM TRACK	TOTAL DURATION IN HOURS
Fort Myers Beach	11.5	(75 NS)	15.5	9	(45 NS)	13
Ft. Myers Beach Bridge	6	(55 NS)	16	9	(60 NS)	12
Sanibel	12.5	(75 NS)	16.5	9.5	(45 NS)	13.5
Punta Rassa	10	(75 NS)	19	9	(45 NS)	13.5
Shell Point	8	(75 NS)	20	9	(60 NS)	12.5
Cape Coral Parkway	4	(60 NS)	13	8.5	(60 NS)	12.5
Harney Point	2.5	(45 NS)	12.5	8	(40 NS)	13
Iona	3	(50 NS)	13	8.5	(60 NS)	12.5
River	4.5	(70 NS)	13.5	7.5	(40 NS)	13
New Bridge	1	(35 NS)	13	7.5	(45 NS)	13
East Fort Myers	-1	(25 NS)	4.5	7	(35 NS)	13
Blind Pass	11.5	(75 NS)	14	10	(60 NS)	13.5
Pine Island Sound	6	(75 NS)	15	9	(55 NS)	14.5
Pine Island Center	3	(40 NS)	13	9	(65 NS)	12.5
Matlacha	4.5	(60 NS)	13.5	8.5	(45 NS)	13.5
Boca Grande	8.5	(70 NS)	12	9	(75 NS)	13

LANDFALLING

PRE-EYE LANDFALL HAZARD TIMES - CATEGORY 4

GRID STORM POINTS	HOURS BEFORE EYE LANDFALL-FLOODING(1)	STORM TRACK	TOTAL DURATION IN HOURS	HOURS BEFORE EYE LANDFALL-SUSTAINED GALE FORCE WINDS(2)	STORM TRACK	TOTAL DURATION IN HOURS
Fort Myers Beach	12	(75 NS)	16	10.5	(45 NS)	15
Ft. Myers Beach Bridge	7	(75 NS)	16	10.5	(60 NS)	14
Sanibel	13	(75 NS)	17	11	(50 NS)	15
Punta Rassa	10.5	(75 NS)	19.5	10.5	(45 NS)	15
Shell Point	9	(75 NS)	18	10	(40 NS)	15
Cape Coral Parkway	5	(75 NS)	14	10	(55 NS)	14.5
Harney Point	4	(60 NS)	13	9.5	(45 NS)	15
Iona	4	(55 NS)	14	10	(60 NS)	14
River	5	(70 NS)	14	9	(40 NS)	14.5
New Bridge	3	(45 NS)	12	9	(40 NS)	14.5
East Fort Myers	0	(30 NS)	7	9	(50 NS)	14
Blind Pass	11	(75 NS)	14.5	11.5	(60 NS)	15
Pine Island Sound	6.5	(75 NS)	15.5	10.5	(55 NS)	15
Pine Island Center	4	(45 NS)	14	10.5	(60 NS)	14.5
Matlacha	5.5	(65 NS)	14.5	10	(50 NS)	15
Boca Grande	9	(75 NS)	12	10	(55 NS)	15.5

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PRE-EYE LANDFALL HAZARD TIMES - CATEGORY 5

GRID STORM POINTS	HOURS BEFORE EYE LANDFALL-FLOODING(1)	STORM TRACK	TOTAL DURATION IN HOURS	HOURS BEFORE EYE LANDFALL-SUSTAINED GALE FORCE WINDS(2)	STORM TRACK	TOTAL DURATION IN HOURS
Fort Myers Beach	12	(75 NS)	16	9.5	(40 NS)	13.5
Ft. Myers Beach Bridge	6.5	(65 NS)	15.5	9.5	(45 NS)	13
Sanibel	12.5	(75 NS)	16	10	(45 NS)	13.5
Punta Rassa	10	(75 NS)	19	10	(60 NS)	12.5
Shell Point	8.5	(70 NS)	17.5	9.5	(45 NS)	13.5
Cape Coral Parkway	4	(50 NS)	14	9	(45 NS)	13.5
Harney Point	3	(50 NS)	13	9	(60 NS)	12.5
Iona	4.5	(55 NS)	13.5	9	(45 NS)	13
River	5	(75 NS)	14	8.5	(45 NS)	13
New Bridge	1.5	(45 NS)	10.5	8.5	(45 NS)	13.5
East Fort Myers	- .5	(35 NS)	4.5	8	(45 NS)	13
Blind Pass	10.5	(75 NS)	13.5	10.5	(60 NS)	13
Pine Island Sound	6	(75 NS)	15	10	(60 NS)	12.5
Pine Island Center	4	(60 NS)	13	9.5	(55 NS)	13.5
Matlacha	5	(65 NS)	14	9	(45 NS)	13.5
Boca Grande	8.5	(75 NS)	11.5	9.5	(60 NS)	14

PARALLEL

PRE-EYE LANDFALL HAZARD TIMES - CATEGORY 1

GRID STORM POINTS	HOURS BEFORE EYE LANDFALL-FLOODING(1)	STORM TRACK	TOTAL DURATION IN HOURS	HOURS BEFORE EYE LANDFALL-SUSTAINED GALE FORCE WINDS(2)	STORM TRACK	TOTAL DURATION IN HOURS
Fort Myers Beach	2	(60 WS)	13	5	(0 S)	8.5
Ft. Myers Beach Bridge	0	(15 WS)	12	5	(15 WS)	9
Sanibel	2.5	(60 WS)	13.5	4.5	(0 S)	8.5
Punta Rassa	1	(15 WS)	13	4.5	(0 S)	8.5
Shell Point	0	(15 WS)	12	4.5	(0 S)	8.5
Cape Coral Parkway				5	(15 ES)	9
Harney Point				5	(15 ES)	9
Iona				4.5	(0 S)	8.5
River	-3	(0 S)	9	4.5	(15 ES)	9
New Bridge				4	(15 ES)	8.5
East Fort Myers				4	(15 ES)	8.5
Blind Pass	0	(60 WS)	11.5	4	(0 S)	8.5
Pine Island Sound	-1.5	(15 ES)	8	4	(0 S)	8
Pine Island Center				4	(0 S)	8
Matlacha	-2	(15 WS)	10	4	(0 S)	8
Boca Grande	-2.5	(15 ES)	3	2.5	(15 WS)	8.5

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PRE-EYE LANDFALL HAZARD TIMES - CATEGORY 2

GRID STORM POINTS	HOURS BEFORE EYE LANDFALL-FLOODING(1)	STORM TRACK	TOTAL DURATION IN HOURS	HOURS BEFORE EYE LANDFALL-SUSTAINED GALE FORCE WINDS(2)	STORM TRACK	TOTAL DURATION IN HOURS
Fort Myers Beach	2	(60 WS)	14	7	(0 S)	11
Ft. Myers Beach Bridge	.5	(15 WS)	12.5	6.5	(0 S)	11.5
Sanibel	2.5	(60 WS)	14.5	6.5	(15 WS)	11
Punta Rassa	4	(15 WS)	16	6.5	(0 S)	11.5
Shell Point	.5	(15 WS)	12.5	6	(0 S)	11
Cape Coral Parkway	-1.5	(0 S)	10.5	6	(0 S)	11
Harney Point	-2	(0 S)	10	6	(0 S)	11
Iona	-2	(0 S)	10	6.5	(15 ES)	11
River	-2.5	(0 S)	9.5	6	(15 ES)	11
New Bridge				6	(15 ES)	11
East Fort Myers				6	(15 ES)	11
Blind Pass	.5	(60 WS)	12.5	6	(15 WS)	11
Pine Island Sound	-1.5	(15 ES)	11.5	5.5	(15 WS)	11
Pine Island Center	-1.5	(15 WS)	10.5	5.5	(15 WS)	11
Matlacha	-1	(15 WS)	11	5.5	(15 ES)	11
Boca Grande	-2	(60 WS)	10	3.5	(15 WS)	10.5

PARALLEL

PRE-EYE LANDFALL HAZARD TIMES - CATEGORY 3

GRID STORM POINTS	HOURS BEFORE EYE LANDFALL-FLOODING(1)	STORM TRACK	TOTAL DURATION IN HOURS	HOURS BEFORE EYE LANDFALL-SUSTAINED GALE FORCE WINDS(2)	STORM TRACK	TOTAL DURATION IN HOURS
Fort Myers Beach	2	(60 WS)	14	8.5	(0 S)	14
Ft. Myers Beach Bridge	1	(15 WS)	13	8	(0 S)	13.5
Sanibel	2.5	(60 WS)	14.5	8	(15 WS)	13.5
Punta Rassa	5	(15 ES)	3.5	8	(0 S)	14
	1.5	(45 WS)	13			
Shell Point	.5	(30 WS)	12.5	8	(0 S)	14
Cape Coral Parkway	-1	(15 WS)	11	7.5	(0 S)	13.5
Harney Point	-1.5	(0 S)	10.5	7.5	(0 S)	14
Iona	-1	(0 S)	11	8	(15 ES)	14
River	-2	(0 S)	10	7.5	(15 ES)	14
New Bridge	-2.5	(0 S)	9.5	7.5	(15 ES)	14
East Fort Myers				7.5	(15 ES)	14
Blind Pass	1	(60 WS)	13	7.5	(15 WS)	14.5
Pine Island Sound	-1.5	(15 WS)	10.5	7	(15 WS)	14
Pine Island Center	-1	(15 WS)	11	7	(0 S)	14
Matlacha	-1	(15 WS)	11	7	(0 S)	14
Boca Grande	-2.5	(60 WS)	9.5	5.5	(0 S)	13.5

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PRE-EYE LANDFALL HAZARD TIMES - CATEGORY 4

GRID STORM POINTS	HOURS BEFORE EYE LANDFALL-FLOODING(1)	STORM TRACK	TOTAL DURATION IN HOURS	HOURS BEFORE EYE LANDFALL-SUSTAINED GALE FORCE WINDS(2)	STORM TRACK	TOTAL DURATION IN HOURS
Fort Myers Beach	2.5	(60 WS)	14.5	8.5	(30 WS)	15.5
Ft. Myers Beach Bridge	1	(30 WS)	13	8.5	(30 WS)	16
Sanibel	2.5	(60 WS)	14.5	8.5	(30 WS)	16
Punta Rassa	2	(60 WS)	14	8	(30 WS)	16
Shell Point	.5	(30 WS)	12.5	8	(30 WS)	16
Cape Coral Parkway	-1.5	(30 WS)	10.5	8	(30 WS)	16
Harney Point	-2.5	(30 WS)	9.5	7.5	(30 WS)	15.5
Iona	-1.5	(30 WS)	10.5	8	(30 WS)	15.5
River	-2.5	(30 WS)	9.5	7.5	(30 WS)	15.5
New Bridge	-5.5	(45 WS)	7.5	7.5	(30 WS)	15.5
East Fort Myers				7.5	(30 WS)	15
Blind Pass	1.5	(60 WS)	13.5	8	(30 WS)	16.5
Pine Island Sound	-1.5	(30 WS)	10.5	7.5	(30 WS)	16.5
Pine Island Center	-1	(30 WS)	11	7.5	(30 WS)	16.5
Matlacha	-1	(30 WS)	11	7	(30 WS)	16
Boca Grande	-2	(60 WS)	10	6	(30 WS)	16.5

PARALLEL - 60 WS ONLY

PRE-EYE LANDFALL HAZARD TIMES - CATEGORY 5

GRID STORM POINTS	HOURS BEFORE EYE LANDFALL-FLOODING(1)	STORM TRACK	TOTAL DURATION IN HOURS	HOURS BEFORE EYE LANDFALL-SUSTAINED GALE FORCE WINDS(2)	STORM TRACK	TOTAL DURATION IN HOURS
Fort Myers Beach	2		14	6.5		11.5
Ft. Myers Beach Bridge	- .5		11.5	6.5		11.5
Sanibel	2.5		14.5	6.5		12
Punta Rassa	2		14	6		11.5
Shell Point	.5		12.5	6		11.5
Cape Coral Parkway	-5.5		6.5	5.5		10.5
Harney Point	-7.5		4.5	5		10
Iona	-6.5		4	5.5		10.5
River	-4		8	4.5		9
New Bridge				4.5		9.5
East Fort Myers				4.5		8.5
Blind Pass	1		13	6		13
Pine Island Sound	-3		9	5.5		12.5
Pine Island Center	-7		3	5.5		12
Matlacha	-3		9	5		11.5
Boca Grande	-2.5		9.5	4		12.5

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CROSSING

PRE-EYE LANDFALL HAZARD TIMES - CATEGORY 1

GRID STORM POINTS	HOURS BEFORE EYE LANDFALL-FLOODING(1)	STORM TRACK	TOTAL DURATION IN HOURS	HOURS BEFORE EYE LANDFALL-SUSTAINED GALE FORCE WINDS(2)	STORM TRACK	TOTAL DURATI IN HOURS
Fort Myers Beach	3.5	(45 SS)	8.5	7	(15 SS)	10
Ft. Myers Beach Bridge	-1	(0 S)	11	7	(15 SS)	10
Sanibel	2	(30 SS)	7	6	(15 SS)	9.5
Punta Rassa	5.5	(30 SS)	16.5	6.5	(15 SS)	10
Shell Point	4	(30 SS)	15	7	(30 SS)	9
Cape Coral Parkway				7.5	(30 SS)	10
Harney Point				7.5	(30 SS)	10
Iona				7.5	(30 SS)	10
River	1	(45 SS)	11	8	(45 SS)	9
New Bridge				7.5	(30 SS)	10
East Fort Myers				8	(30 SS)	10.5
Blind Pass	1.5	(30 SS)	6	5	(15 SS)	9.5
Pine Island Sound	4.5	(30 SS)	11.5	5.5	(15 SS)	10
Pine Island Center						
Matlacha	3.5	(45 SS)	4.5	6	(30 SS)	9.5
Boca Grande	1	(45 SS)	5.5	5	(30 SS)	10

CROSSING

PRE-EYE LANDFALL HAZARD TIMES - CATEGORY 2

GRID STORM POINTS	HOURS BEFORE EYE LANDFALL-FLOODING(1)	STORM TRACK	TOTAL DURATION IN HOURS	HOURS BEFORE EYE LANDFALL-SUSTAINED GALE FORCE WINDS(2)	STORM TRACK	TOTAL DURATION IN HOURS
Fort Myers Beach	4	(45 SS)	9.5	8.5	(30 SS)	11
Ft. Myers Beach Bridge	0	(15 SS)	11	8.5	(30 SS)	11.5
Sanibel	2.5	(45 SS)	7.5	7.5	(30 SS)	10.5
Punta Rassa	7	(40 SS)	18	8	(30 SS)	11.5
Shell Point	5	(45 SS)	15	8	(15 SS)	12
Cape Coral Parkway	-3	(0 S)	7.5	9	(45 SS)	11.5
Harney Point	-5.5	(15 SS)	2.5	9	(45 SS)	11.5
Iona				9	(30 SS)	12.5
River	1.5	(45 SS)	11.5	9	(30 SS)	12.5
New Bridge				9	(30 SS)	12.5
East Fort Myers				9.5	(30 SS)	12.5
Blind Pass	2	(45 SS)	6.5	6.5	(30 SS)	10.5
Pine Island Sound	6.5	(45 SS)	16.5	7	(30 SS)	11.5
Pine Island Center	-3.5	(0 S)	8.5	7	(15 SS)	12
Matlacha	4	(30 SS)	15	7.5	(30 SS)	11.5
Boca Grande	1.5	(45 SS)	7.5	6	(45 SS)	11

CROSSING

APPENDIX A

PRE-EYE LANDFALL HAZARD TIMES - CATEGORY 3

GRID STORM POINTS	HOURS BEFORE EYE LANDFALL-FLOODING(1)	STORM TRACK	TOTAL DURATION IN HOURS	HOURS BEFORE EYE LANDFALL-SUSTAINED GALE FORCE WINDS(2)	STORM TRACK	TOTAL DURATION IN HOURS
Fort Myers Beach	4	(45 SS)	14	7.5	(30 SS)	12
Ft. Myers Beach Bridge	.5	(15 SS)	11.5	7.5	(30 SS)	12
Sanibel	2.5	(45 SS)	8	6.5	(15 SS)	12
Punta Rassa	5.5	(15 SS)	16.5	6.5	(15 SS)	12
Shell Point	4.5	(30 SS)	15.5	7	(30 SS)	12
Cape Coral Parkway	4	(30 SS)	15	7.5	(30 SS)	12.5
Harney Point	-1	(30 SS)	9.5	7.5	(30 SS)	12.5
Iona	-1	(15 SS)	10	7.5	(15 SS)	13
River	1.5	(45 SS)	11.5	8	(45 SS)	12
New Bridge	-2.5	(15 SS)	8.5	8	(45 SS)	12
East Fort Myers				8	(30 SS)	12.5
Blind Pass	2.5	(45 SS)	7	5.5	(15 SS)	12
Pine Island Sound	5.5	(45 SS)	15.5	6	(15 SS)	12.5
Pine Island Center				6.5	(45 SS)	11
Matlacha	4	(45 SS)	15	6.5	(30 SS)	12.5
Boca Grande	1.5	(45 SS)	11.5	5.5	(45 SS)	11.5

(1) Greatest time before landfall - not necessarily for worst case storm; some tracks cause early flooding even through they may not produce highest surge - if more than 1 track produces same time, the one with the worse surge then chosen.

(2) Greatest time before landfall - same is true for winds as above for flooding.

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CHARLOTTE COUNTY
PEACETIME EMERGENCY PLAN (Hurricanes)
[9J-5.012(2)(e)(i)]

HURRICANE VULNERABILITY

The hurricane vulnerability of Charlotte County has been analyzed using a numerical storm surge prediction model known as SLOSH, short for Sea, Lake, and Overland Surges from Hurricanes. This model is described in detail in the Regional Hurricane Evacuation Plan, 1981-82, prepared by the Southwest Florida Regional Planning Council; as well as A Storm Surge Atlas for Southwest Florida, prepared by the National Oceanic and Atmospheric Administration, Undated, @ 1983). These reports analyzed some 187 separate storms for their potential impact on Southwest Florida, including Charlotte County. Both reports provide an assessment of methodologies and provide assumptions that can act towards increasing or decreasing forecast flood and wind conditions. However, in summary, the following assumptions can be made.

(1) Landfalling storms provide the worst flooding potential

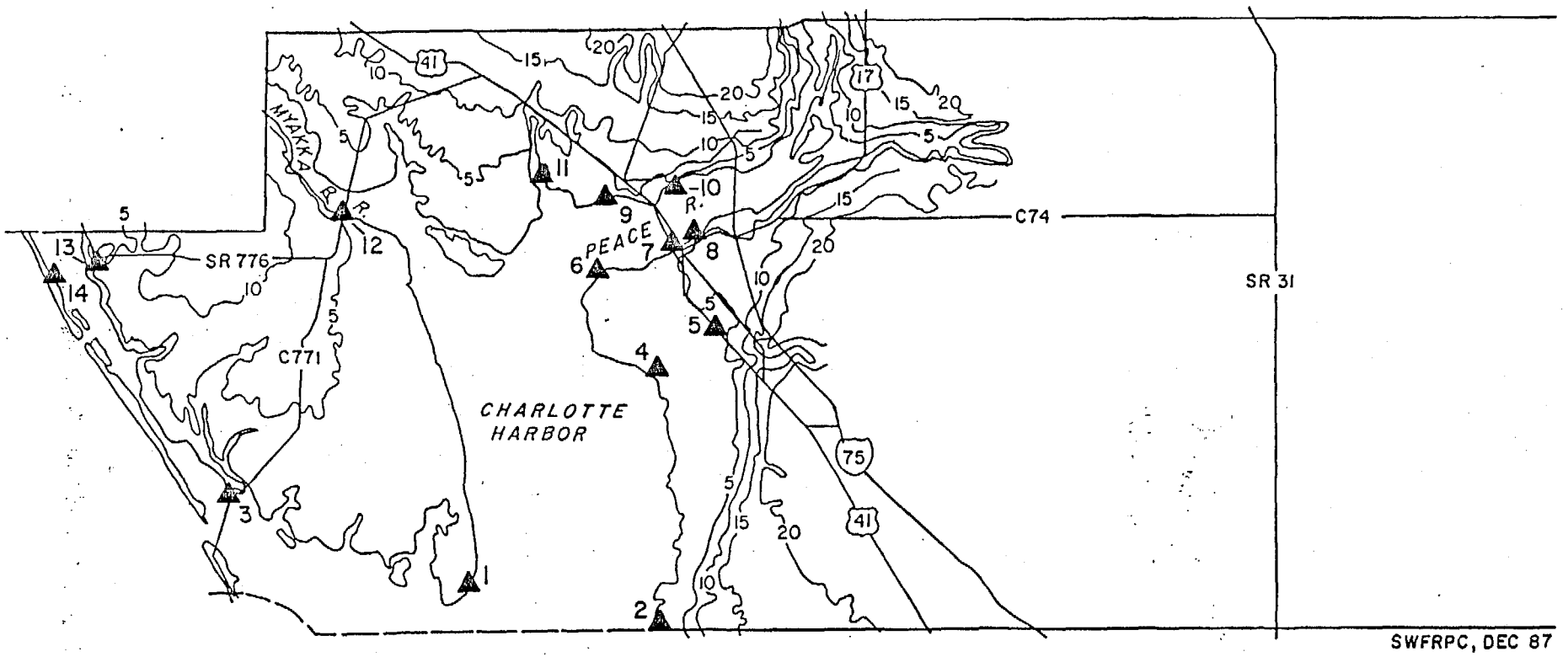
(2) Flooding will be worse south of the eye of the hurricane

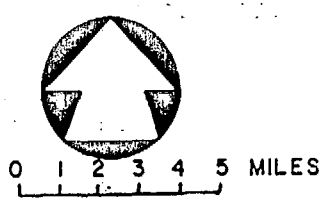
(3) Wind conditions making roads unsafe for travel will arrive well before the eye of the hurricane, and usually before flood waters inundate evacuation routes

(4) Storm landfall prediction is not an exact science. Any approaching storm has the capacity to strengthen or veer, decreasing or increasing the flooding and surge potential of the storm.

The SLOSH model used fourteen points in Charlotte County for time history analysis. These points are depicted on Map 1. The greatest height of stormwaters for each category storm, for each point, are summarized in Table 1.

The SLOSH model also provides maps of the flooding that may be expected in Charlotte County. The 187 different simulations have been summarized by flood category, and a zone for each category has been created depicting the maximum extent of flooding resulting from all of the storms of that category. The five zones thus created are depicted on Map 2.



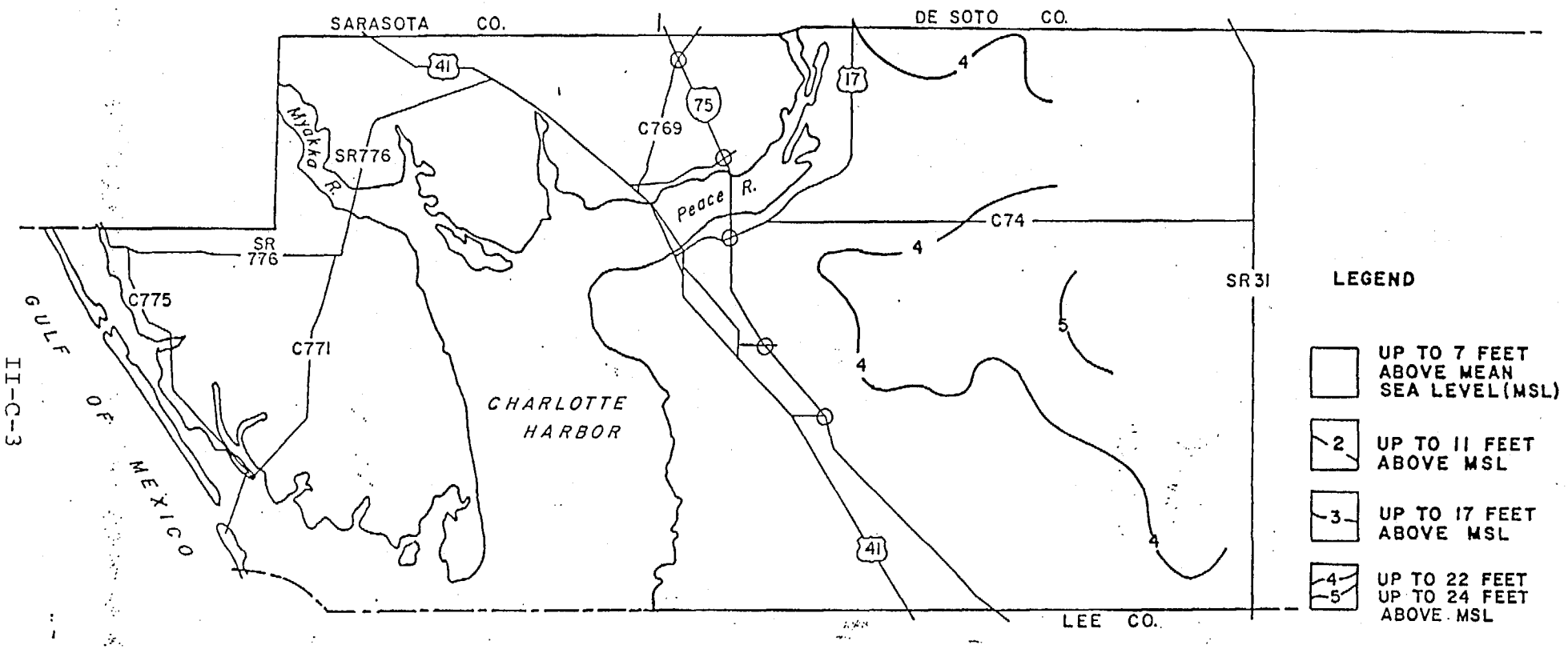


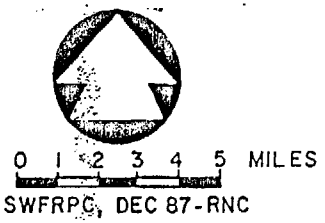
▲ STORM HISTORY POINTS

1 CAPE HAZE
2 CHARLOTTE CO. LINE
3 PLACIDA
4 ALLIGATOR CREEK
5 ACLINE
6 PUNTA GORDA ISLES
7 US 41 BRIDGE
8 EAST PUNTA GORDA
9 EAST GRASSY POINT
10 WEST HARBOR VIEW
11 ALLIGATOR BAY
12 SR 771 BRIDGE
13 AINGER CREEK
14 ENGLEWOOD BEACH

5 FOOT CONTOUR LINES

MAP 1
CHARLOTTE COUNTY
SLOSH MODEL STORM HISTORY POINTS





SWFRPC, DEC 87-RNC

MAP 2
CHARLOTTE COUNTY
MAXIMUM AREAS SUBJECT TO FLOODING
BY STORM CATEGORY

TABLE 1

PREDICTED COASTAL STORM SURGES SIMULATED BY SLOSH MODEL, LANDFALLING STORMS

(If a point is over water, surge is reported in feet of flooding above msl; if a point is on land, surge is reported in feet above land at that point)*

GRID POINT	ELEVATION OF POINT	STORM CATEGORY 1	2	3	4	5
Cape Haze	1	5	8	13	16.5	15
Charlotte Co. Line	1	5	9	13	17	17
Placida	1	6	8	10	14	13
Alligator Creek	1	6	10	15	20	20.5
Acline	13	–	–	4	9	10
Punta Gorda Isles	4	4	7	13	18	19
41 Bridge	1	7	11	17	22	24
East Punta Gorda	1	7	11	17	22	24
East Grassy Point	1	7	10	17	21.5	23
West Harbor View	7	–	6	12	16.5	19
Alligator Bay	4	4	8	14	18.5	20
771 Bridge	1	5	9	15	20	20
Ainger Creek	1	6	8	12	15	14
Englewood Beach	1	5	7	11	14	13

*See Figures 8-11 for grid point locations.

Although storms cannot be accurately forecast in regard to their behavior, the 187 simulations did provide insights into the differences in pre-landfall flooding for landfalling, paralleling, and crossing storms. These differences are summarized in Table 2 for hurricane eye location and points of worst impact. Table 3 summarizes the nature of flood and wind variation based on whether the storm is landfalling, crossing, or paralleling. Appendix A summarizes the pre-eye landfall hazard times that the County may experience.

Recent Storm History

The most recent hurricane impacts in Charlotte County were during Hurricane Floyd. This storm, on October 16, 1987, caused "recommended evacuation" advisories for the Charlotte County Barrier Islands. Sixteen people were admitted to county shelters, and an unknown number sought shelter in hotels and motels in the County. Floyd turned away before directly impacting Charlotte County.

The County sustained minor beach erosion on the barrier islands from Hurricane Elena and Tropical Storm Juan, in 1985. Some minor road flooding also occurred during Juan. The major thrust of both of these storms was further north, but voluntary evacuations were recommended from barrier islands.

TABLE 2
HURRICANES SIMULATED BY NUMERICAL STORM SURGE PREDICTION MODEL

MODEL	TYPE	LOCATION	CATEGORY	LANDFALL/EXITING POINT OR CLOSEST APPROACH	AREA RECEIVING MAXIMUM SURGE/WINDS
SL	L	35NS	1	Cape Haze	East Punta Gorda
SL	L	35NS	2	Cape Haze	East Punta Gorda
SL	L	35NS	3	Cape Haze	East Punta Gorda
SL	L	35NS	4	Cape Haze	East Punta Gorda
SL	L	35NS	5	Cape Haze	East Punta Gorda
SL	L	40NS	1	Englewood	East Punta Gorda
SL	L	40NS	2	Englewood	East Punta Gorda
SL	L	40NS	3	Englewood	East Punta Gorda
SL	L	40NS	4	Englewood	East Punta Gorda
SL	L	40NS	5	Englewood	East Punta Gorda
SL	L	45NS	1	Manasota Beach	Peace River Bridge
SL	L	45NS	2	Manasota Beach	Peace River Bridge
SL	L	45NS	3	Manasota Beach	Peace River Bridge
SL	L	45NS	4	Manasota Beach	Peace River Bridge
SL	L	45NS	5	Manasota Beach	Peace River Bridge
SL	L	50NS	1	South Venice	Peace River Bridge
SL	L	50NS	2	South Venice	Peace River Bridge
SL	L	50NS	3	South Venice	Peace River Bridge
SL	L	50NS	4	South Venice	Peace River Bridge
SL	L	50NS	5	South Venice	Peace River Bridge
SL	L	55NS	1	Venice	East Punta Gorda
SL	L	55NS	2	Venice	East Punta Gorda
SL	L	55NS	3	Venice	East Punta Gorda
SL	L	55NS	4	Venice	East Punta Gorda
SL	L	55NS	5	Venice	East Punta Gorda
SL	L	60NS	1	Nokomis Beach	East Punta Gorda
SL	L	60NS	2	Nokomis Beach	East Punta Gorda

KEY:
SL - SLOSH (Sea, Lake, and Overland Surges from Hurricanes) Model
L - Landfalling Hurricane
C - Crossing Hurricane (Exiting Hurricane)
P - Paralleling Hurricane
SS - South of Sanibel Island
NS - North of Sanibel Island

TABLE 2 (Continued)
HURRICANES SIMULATED BY NUMERICAL
STORM SURGE PREDICTION MODEL

MODEL	TYPE	LOCATION	CATEGORY	LANDFALL/EXITING POINT OR CLOSEST APPROACH	AREA RECEIVING MAXIMUM SURGE/WINDS
SL	L	60NS	3	Nokomis Beach	East Punta Gorda
SL	L	60NS	4	Nokomis Beach	East Punta Gorda
SL	L	60NS	5	Nokomis Beach	East Punta Gorda
SL	L	65NS	1	Casey Key	771 Bridge
SL	L	65NS	2	Casey Key	771 Bridge
SL	L	65NS	3	Casey Key	771 Bridge
SL	L	65NS	4	Casey Key	771 Bridge
SL	L	65NS	5	Casey Key	771 Bridge
SL	L	70NS	1	Siesta Key	771 Bridge
SL	L	70NS	2	Siesta Key	771 Bridge
SL	L	70NS	3	Siesta Key	771 Bridge
SL	L	70NS	4	Siesta Key	771 Bridge
SL	L	70NS	5	Siesta Key	771 Bridge
SL	L	75NS	1	Longboat Key	Venice Beach
SL	L	75NS	2	Longboat Key	Venice Beach
SL	L	75NS	3	Longboat Key	Venice Beach
SL	L	75NS	4	Longboat Key	Venice Beach
SL	L	75NS	5	Longboat Key	Venice Beach
SL	L	80NS	1	Longboat Key	Bay Island
SL	L	80NS	2	Longboat Key	Bay Island
SL	L	80NS	3	Longboat Key	Bay Island
SL	L	80NS	4	Longboat Key	Bay Island
SL	L	80NS	5	Longboat Key	Bay Island
SL	C	45SS	1	LaBelle	771 Bridge
SL	C	45SS	2	LaBelle	771 Bridge
SL	C	45SS	3	LaBelle	771 Bridge
SL	C	30SS	1	Alva	771 Bridge
SL	C	30SS	2	Alva	771 Bridge
SL	C	30SS	3	Alva	771 Bridge

KEY:
SL - SLOSH (Sea, Lake, and Overland Surges from
L - Landfalling Hurricane
C - Crossing Hurricane (Exiting Hurricane)
P - Paralleling Hurricane
SS - South of Sanibel Island
RS - Right of Sanibel Island

TABLE 3
SELECTED STORM TRACTS BY CATEGORY AND TYPE

STORM TRACK	STORM CHARACTERISTICS
35NS-L-1	S(1) W(1)
55NS-L-1	S(1) W(1)
75NS-L-1	S(1)
5SS-L-2	S(1) W(1)
35NS-L-2	S(3) W(2)
55NS-L-2	S(3) W(2)
75NS-L-2	S(2) W(1)
95NS-L-3	W(1)
15NS-L-3	S(2) W(1)
35NS-L-3	S(4) W(1)
55NS-L-3	S(4) W(3)
75NS-L-3	S(3) W(2)
15ES-P-2	W(1)
0 S-P-2	S(1) W(1)
30WS-P-2	S(1) W(1)
60WS-P-2	S(1)
15ES-P-3	S(1) W(2)
0 S-P-3	S(2) W(3)
30WS-P-3	S(2) W(2)
50WS-P-3	S(2) W(1)
45NS-C-2	S(1) W(1)
15NS-C-2	W(1)
45NS-C-3	S(3) W(2)
15NS-C-3	W(2)

KEY:

SS - South of Sanibel	L - Landfalling
NS - North of Sanibel	P - Parallel
ES - East of Sanibel	C - Crossing
WS - West of Sanibel	
S - Storm Surge	(1) - Category 1
W - Wind (over 40 mph)	(2) - Category 2
SL - SLOSH Model	(3) - Category 3

Saffir-Simpson Scale

Category (1) - 4-5 foot Surge	74-95 mph wind
Category (2) - 6-8 foot Surge	96-110 mph wind
Category (3) - 9-12 foot Surge	111-130 mph wind
Category (4) - 13-18 foot Surge	131-155 mph wind

The last hurricane to directly impact Charlotte County was Hurricane Donna in 1960. This storm passed through Charlotte County on its path across the penninsula. Donna was a Category 3 storm with 177 mph winds.

Affected Population

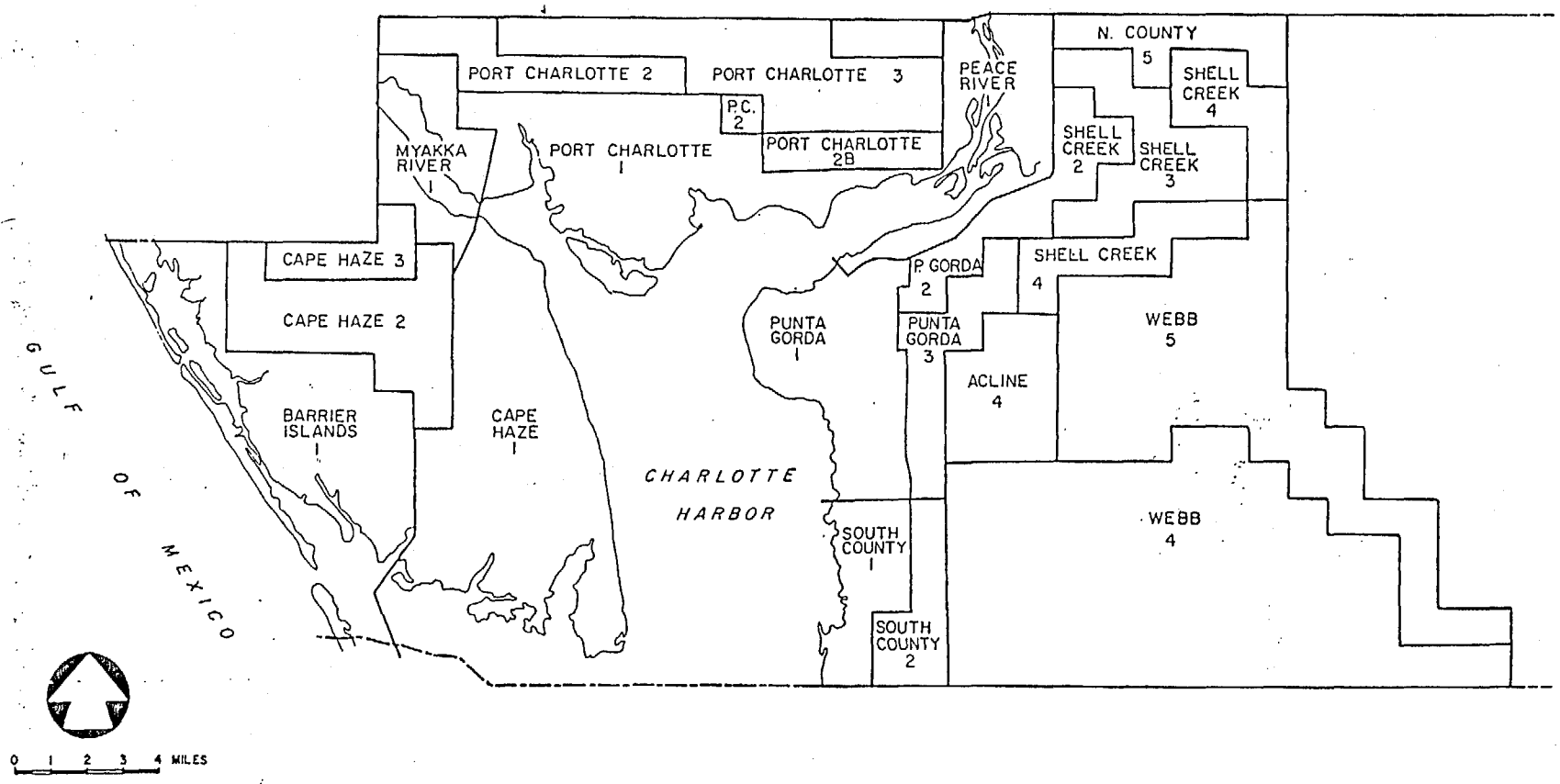
Each zone depicted on Map 2 encompasses large segments of the County population. Each one has a certain degree of vulnerability to the threat of hurricane induced flooding. Category 1 zones have the most repeated threat potential, whereas it is highly unlikely (but the potential exists) that category 5 areas will need to evacuate during the comprehensive plan horizon.

Each zone, as drafted, mimics the coastline. Geographically, however, these zones are too cumbersome to assess the timing and shelter needs of the population. Consequently, in association with the Charlotte County Disaster Preparedness Department, new subzones were created consistent with local knowledge used by the Department. These are depicted in Map 3. These sub-zones are valid solely for evacuation planning purposes and should not be considered as identifying actual neighborhoods or communities.

The first element in preparing an estimate of County population is to estimate dwelling units, and dwelling unit types. A count of housing units (principally single-family homes and mobile homes) was undertaken using aerial photographs. This information was supplemented with information on mobile home parks (provided by the Florida Department of Health and Rehabilitative Services), rental units (provided by the Division of Hotels and Restaurants (FDCA), and Condominium information (from County tax rolls).

A compilation of this information suggests that there are 48,932 dwelling units in the county. This estimate includes conventional housing, mobile homes, and transitional housing such as inhabited travel trailers, and hotel/motel units. The greatest concentration of these, 58.0% are located in the Category 1 zone. Table 4 provides the estimate of dwelling units in the County by Flood Zone and by community name.

Using the housing unit estimate, a population estimate is then made. Two additional assumptions, however, are needed: persons per household, and vacancy rate. The number of persons per household was estimated to be a standard 2.2 persons per household, regardless of unit. Whereas this assumption has inaccuracies, the end result probably does not differ significantly from a more detailed analysis. More detailed analysis, however, is needed to determine vacancy rates for unit type, since different unit types have different vulnerability to flood or wind hazards. Using a survey estimate developed from a telephone survey in October-November, 1987, two estimates of seasonal vacancy were developed for the region. These are as follows:



MAP 3
CHARLOTTE COUNTY
EVACUATION ZONES

TABLE 4
CHARLOTTE COUNTY - HOUSING UNITS

Storm Category	Zone	Residential Single-Family	Mobile Home	Recreational Vehicle	Multi-Family Apartment	Multi-Family Condo	Multi-Family Duplex	Hotel-Motel	Total
Tropical Storm	Barrier Islands	4,528	637	95	321	789	2	151	6,523
1	Myakka River	758	59	0	20	0	0	0	837
1	Barrier Islands	4,528	637	95	321	789	2	151	6,523
1	Cape Haze	240	550	0	0	0	0	0	790
1	Port Charlotte	7,392	0	0	379	938	0	158	8,867
1	Peace River	2,284	1,201	21	172	73	4	299	4,054
1	Punta Gorda	3,767	1,559	387	87	810	0	159	6,769
1	South County	451	103	0	0	0	0	0	554
TOTALS	ZONE 1	19,420	4,109	503	979	2,610	6	767	28,394
2	Cape Haze	1,713	1,427	0	0	126	2	83	3,351
2	Port Charlotte	3,062	0	0	0	1,036	84	0	4,182
2	Shell Creek	172	15	0	3	0	0	0	190
2	Punta Gorda	278	72	0	0	0	0	8	358
2	South County	12	0	0	0	0	0	0	12
TOTALS	ZONE 2	5,237	1,514	0	3	1,162	86	91	8,093
3	Cape Haze	621	0	0	0	0	26	0	647
3	Port Charlotte	6,454	1,508	0	0	190	6	100	8,258
3	Shell Creek	141	305	68	0	0	0	0	514
3	Punta Gorda	298	173	0	0	2	0	200	673
TOTALS	ZONE 3	7,514	1,986	68	0	192	32	300	10,092
4	Port Charlotte	119	0	0	0	600	0	0	719
4	Shell Creek	56	0	0	0	0	0	0	56
4	Acline	193	690	117	0	0	0	21	1,021
4	Webb	543	0	0	0	0	0	0	543
TOTALS	ZONE 4	911	690	117	0	600	0	21	2,339
5	North County	0	0	0	0	0	0	0	0
5	Webb	14	0	0	0	0	0	0	14
TOTALS	ZONE 5	14	0	0	0	0	0	0	14
TOTALS	ALL ZONES	33,096	8,299	688	982	4,564	124	1,179	48,932

Unit Type	Seasonal Occupancy Rates July	November
Single-Family Unit	95%	96%
Duplex (& Multiplexes)	95	96
Apartment	70	78
Condominium (Conventional)	51	64
Mobile Home	43	75
Travel Trailer/R.V.	18	41
Motel/Hotel	54	63

In 1987, Charlotte County is estimated to have a July population of 83,696, and a November population of 94,153. This information is summarized by subzone in Table 5. Numerically, the greatest seasonality occurs in Hurricane Category Zone 1, which has 53,998 persons in July and 61,593 in November, an increase of 14.1%.

TABLE 5
CHARLOTTE COUNTY POPULATION ESTIMATES
FOR EVACUATION ZONES

Storm Category	Zone	Population Estimate July	November
1	Myakka River	1,671	1,733
	Barrier Islands	11,667	12,575
	Cape Haze	1,022	1,414
	Port Charlotte	17,273	17,802
	Peace River	6,628	7,645
	Punta Gorda	10,733	12,387
	South County	1,040	1,122
	Mobile Homes, not otherwise included in the above flood prone areas (Category 2-5 Areas)	3,964	6,914
	TOTALS AREA 1	53,998	61,593
2	Cape Haze	5,174	6,269
	Port Charlotte	7,738	8,107
	Shell Creek	378	393
	Punta Gorda	659	717
	South County	25	25
	Mobile Homes, not otherwise included in the above flood prone areas (Category 3-5 Areas)	2,531	4,415
	NEW EVACUEES	12,542	13,013
	TOTALS 1 - 2	66,539	74,606

TABLE 5 (Continued)
CHARLOTTE COUNTY POPULATION ESTIMATES FOR EVACUATION ZONES

Storm Category	Zone	Population Estimate July	November
3	Cape Haze	1,471	1,368
	Port Charlotte	13,715	16,538
	Shell Creek	559	862
	Punta Gorda	981	1,195
	Mobile Homes, not otherwise included in the above flood prone areas (Category 4-5 Areas)	653	1,139
	NEW EVACUEES	14,848	16,686
	TOTALS 1 - 3	81,387	91,292
4	Port Charlotte	1,096	1,096
	Shell Creek	147	118
	Acline	513	1,608
	Webb	1,176	1,147
	Mobile Homes, not otherwise included in the above flood prone areas (Category 5 Area)	0	0
	NEW EVACUEES	2,280	2,831
	TOTALS 1 - 4	83,667	94,123
5	North County	0	0
	Webb	29	30
	NEW EVACUEES	29	30
	TOTALS 1 - 5	83,696	94,153

Motor Vehicles

Nearly all of the population affected by an oncoming hurricane will evacuate by private vehicle. The question arises as to how many vehicles will be used in the evacuation. Issues relevant to this include the number of vehicles owned, whether owners would be willing to leave any vehicles behind (since next to the home, vehicles are the most expensive possession), whether all drivers feel confident to operate a vehicle in storm conditions, and whether evacuating families wish to be separated in different motor vehicles. Based on surveys, respondents indicated approximately 75% of available vehicles would be used in an evacuation. (Hurricane Evacuation Plan, 1981-82, SWFRPC). This averaged out to 1.1 vehicles per occupied unit.

Using this ratio of cars and the occupancy ratio used previously, the potential number of county vehicles used in an evacuation in July would be 43,007, and in November would be 47,110. Category 1 Zones would have the greatest number of vehicles, 23,199 (25,233 with RVs and mobile homes) in July and 23,723 (27,340

with RVs and mobile homes) in November. Table 6 summarizes the vehicle generation by each subzone.

TABLE 6
CHARLOTTE COUNTY VEHICLE ESTIMATES
FOR EVACUATION

CATEGORY	SUBZONE	JULY	RECREATIONAL VEHICLE	NOVEMBER	RECREATIONAL VEHICLE
1	Myakka River	840	0	866	0
1	Barrier Islands	5,888	17	6,245	43
1	Cape Haze	511	0	707	0
1	Port Charlotte	8,724	0	8,901	0
1	Peace River	3,350	4	3,813	9
1	Punta Gorda	5,310	70	6,019	175
1	South County	520	0	561	0
2	Cape Haze	2,587	0	3,135	0
2	Port Charlotte	3,869	0	4,052	0
2	Shell Creek	190	0	197	0
2	Punta Gorda	329	0	359	0
2	South County	13	0	13	0
3	Cape Haze	676	0	683	0
3	Port Charlotte	7,630	0	8,269	0
3	Shell Creek	292	12	401	31
3	Punta Gorda	513	0	597	0
4	Port Charlotte	461	0	548	0
4	Shell Creek	59	0	59	0
4	Acline	541	21	788	53
4	Webb	567	0	573	0
5	North County	0	0	0	0
5	Webb	15	0	15	0
TOTALS	ALL ZONES	42,883	124	46,800	310

Shelters

Evacuees must have a place to go. The SWFRPC undertook surveys in 1979 and 1981 to determine evacuee preferences. This data is summarized as follows: public shelters (24%), leaving the County (34%), visit friends or go to hotel or stay home or "other" (21%), "don't know" (21%). Those are preference declarations; other studies indicate there is a significant variation from preference to actual behavior. Additionally, the severity of impending storms may also change decisions, as increased community-wide evacuation limits or eliminates the hotel/friends/public shelter/stay home prediction.

At this time, the County has eighteen public shelters, with a capacity (at 20 square feet per person) of 12,503 persons. These shelters are summarized in Table 7, by vulnerability zone. They are depicted on Map 4.

TABLE 7
CHARLOTTE COUNTY SHELTERS

Red Cross Managed Shelter	Address	Capacity 20 sq.ft. per Person	Zone Vulner-ability
Benjamin J. Baker Elem.	Charlotte Ave., PG	180	1
Charlotte Harbor School	Beaver Lane	355	2
Charlotte Sr. High	Cooper Street, PG	406	1
Charlotte Vo-Tech Center	Toledo Blade Blvd., PC	400	2
East Elementary School	Tee and Green Estates	525	2
L.A. Ainger School	Rotonda West	375	2
Lemon Bay High	Placida Road	800	2
Liberty Elementary	Atwater St., PC	1,000	3
Meadow Park Elementary	Lakeview Blvd.	920	1
Neal Armstrong Elementary	Breezeswept Ave.	80	3
Peace River Elementary	Hancock Ave., NW	1,250	1
Port Charlotte Cultural Center	Aaron Street, PC	750	2
Port Charlotte High	Toledo Blade Blvd.	1,957	2
Port Charlotte Jr. High	Midway Blvd., NE	1,215	3
Punta Gorda Jr. high	Carmalita Street	825	1
Sallie Jones Elementary	Cooper Street, PG	314	1
Vineland Elementary	Boundary Blvd.	1,000	2
West Charlotte Community Center*	Englewood	150	3

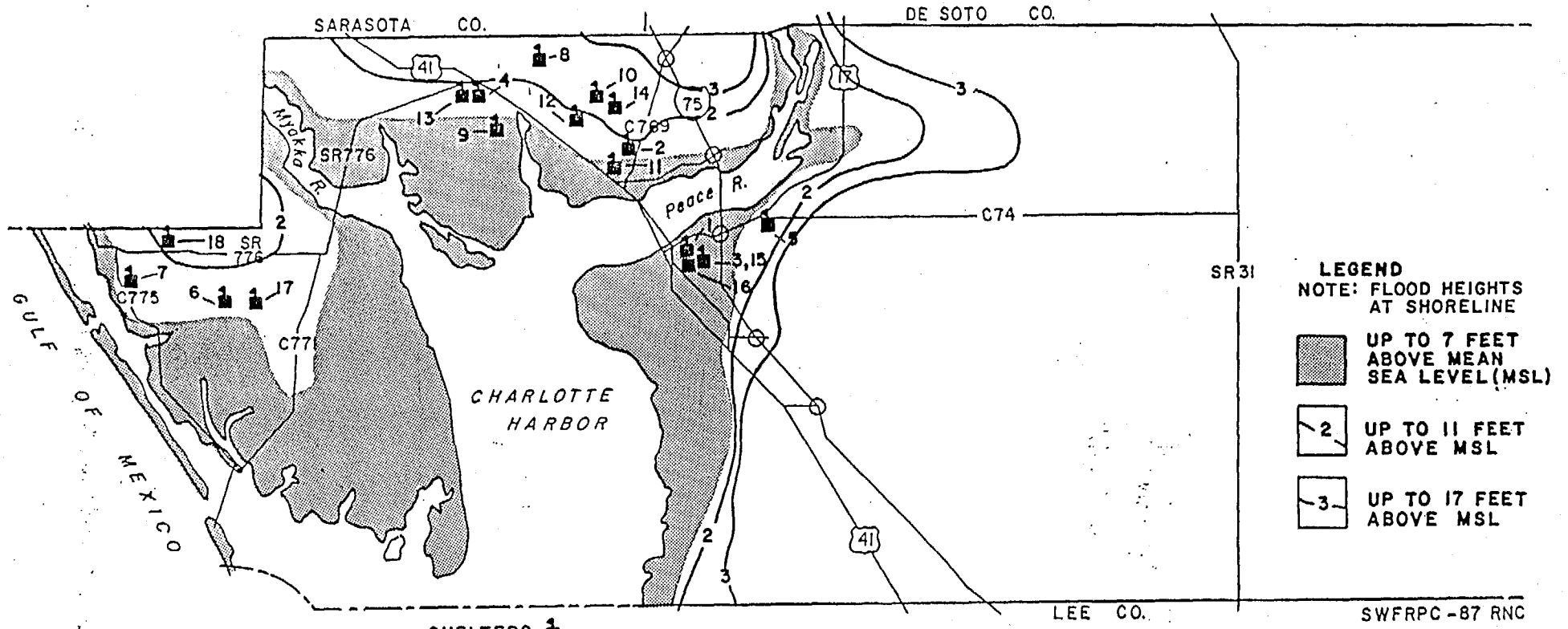
TOTAL: 18 Shelters Capacity: 12,503 persons

*Secondary Shelter

Based upon the evacuees forecasted in Table 5, the county has limited public shelter capacity. For example, the county can accommodate 23.2% of the evacuees of Category 1 storm in July, and 20.3% in November. Table 8 summarizes the County's public shelter capacities for storms.

TABLE 8
PUBLIC SHELTER CAPACITY

STORM CATEGORY	SPACE	EVACUEES JULY	EVACUEES NOVEMBER	PERCENT MET JULY	PERCENT MET NOVEMBER
1	12,353	53,998	61,593	23.2	20.3
2	7,657	66,539	74,606	11.5	10.3
3	3,252	81,387	91,292	4.0	3.6
4	3,252	83,667	94,123	3.9	3.5
5	3,252	83,696	94,153	3.8	3.5



SHELTERS

1. BENJAMIN J. BAKER ELEMENTARY
2. CHARLOTTE HARBOR SCHOOL
3. CHARLOTTE SENIOR HIGH SCHOOL
4. CHARLOTTE VO-TECH CENTER
5. EAST ELEMENTARY SCHOOL
6. L.A. AINGER SCHOOL
7. LEMON BAY HIGH SCHOOL
8. LIBERTY ELEMENTARY SCHOOL
9. MEADOW PARK ELEMENTARY SCHOOL
10. NEAL ARMSTRONG ELEMENTARY SCHOOL
11. PEACE RIVER ELEMENTARY SCHOOL
12. PORT CHARLOTTE CULTURAL CENTER
13. PORT CHARLOTTE HIGH SCHOOL
14. PORT CHARLOTTE JUNIOR HIGH SCHOOL
15. PUNTA GORDA JUNIOR HIGH SCHOOL
16. SALLIE JONES ELEMENTARY SCHOOL
17. VINELAND ELEMENTARY
18. WEST CHARLOTTE COMMUNITY CENTER

0 1 2 3 4 5 MILES

MAP 4
CHARLOTTE COUNTY
RED CROSS MANAGED PUBLIC SHELTER LOCATIONS

Public shelter demand within the County is not the only means of meeting evacuee shelter needs. Regretfully, it seems to be the largest. Of these, only the hotel option can be assessed. Other sources of shelter include "friends," hotels, or one's own home (refusal to evacuate).

In Charlotte County, there are an estimated 1,179 hotel/motel rooms. By far the greatest portion (65%) of the rooms are located on the shoreline or are in the Category 1 storm surge zone. This leaves only 412 units available in a Category 1 storm, 321 in Category 2, 21 in Category 3, and 4 storms and none in a Category 5 storm.

The 412 units, at 100% occupancy (2.2 persons per room), would satisfy only 1.7% of the demand for shelter space in July and 1.5% in November for a Category 1 storm. In Category 2 and greater storms, the availability of commercial hotel/motel space is essentially nil.

In summary, the public and commercial hotel/motel shelter space meets this much of county evacuee needs:

Storm Category 1 = 24.9% July, 21.8% November
Storm Category 2 = 12.6% July; 11.3% November
Storm Category 3 = 4.0% July; 3.6% November
Storm Category 4 = 3.9% July; 3.5% November
Storm Category 5 = 3.8% July; 3.4% November

Without public or private commercial space available, evacuees have only the options of (a) staying with friends who are in safer areas within the county or (b) leaving the county for areas of the state expected to be less affected by the hurricane. The County's ability to "stay with friends" is limited. The capacity of space available for evacuees, when staying with friends, decreases rapidly as the ratio of evacuees to those not affected increases. This problem is depicted in Table 9.

TABLE 9
POPULATION DISPLACEMENT RATIO

STORM CATEGORY	POPULATION					
	DISPLACED		NOT DISPLACED		RATIO	
	July	November	July	November	July	November
1	53,998	61,593	29,698	32,560	1.8:1	1.9:1
2	66,539	74,606	17,157	19,547	3.9:1	3.8:1
3	81,387	91,292	2,309	2,861	35:1	32:1
4	83,667	94,123	29	30	>36:1	>33:1
5	83,696	94,153	0	0	>36:1	>33:1

For Category 1 storms, those wishing to stay with friends (as opposed to leaving the county or staying in public shelters or hotels/motels) will probably find that they are not able to do so. The SWFRPC 1981 Evacuation Plan estimates 13% of the evacuating population will take this option. However, the opportunity to stay with friends rapidly decreases as storm intensity increases (forcing more people to evacuate). In a Category 1 storm in July only 7.2% and 6.8% in November will be able to stay with friends. In a Category 2 storm, the percentage of evacuees able to stay with a friend has fallen to 3.3% in July and 3.4% in November; for Category 3 storms, and greater storms the figure becomes almost trivial.

These percentages, added to the public and commercial summary, absorb the remainder of "in county" shelter demand satisfaction. This is summarized in Table 10.

TABLE 10
SHELTER SATISFACTION IN CHARLOTTE COUNTY

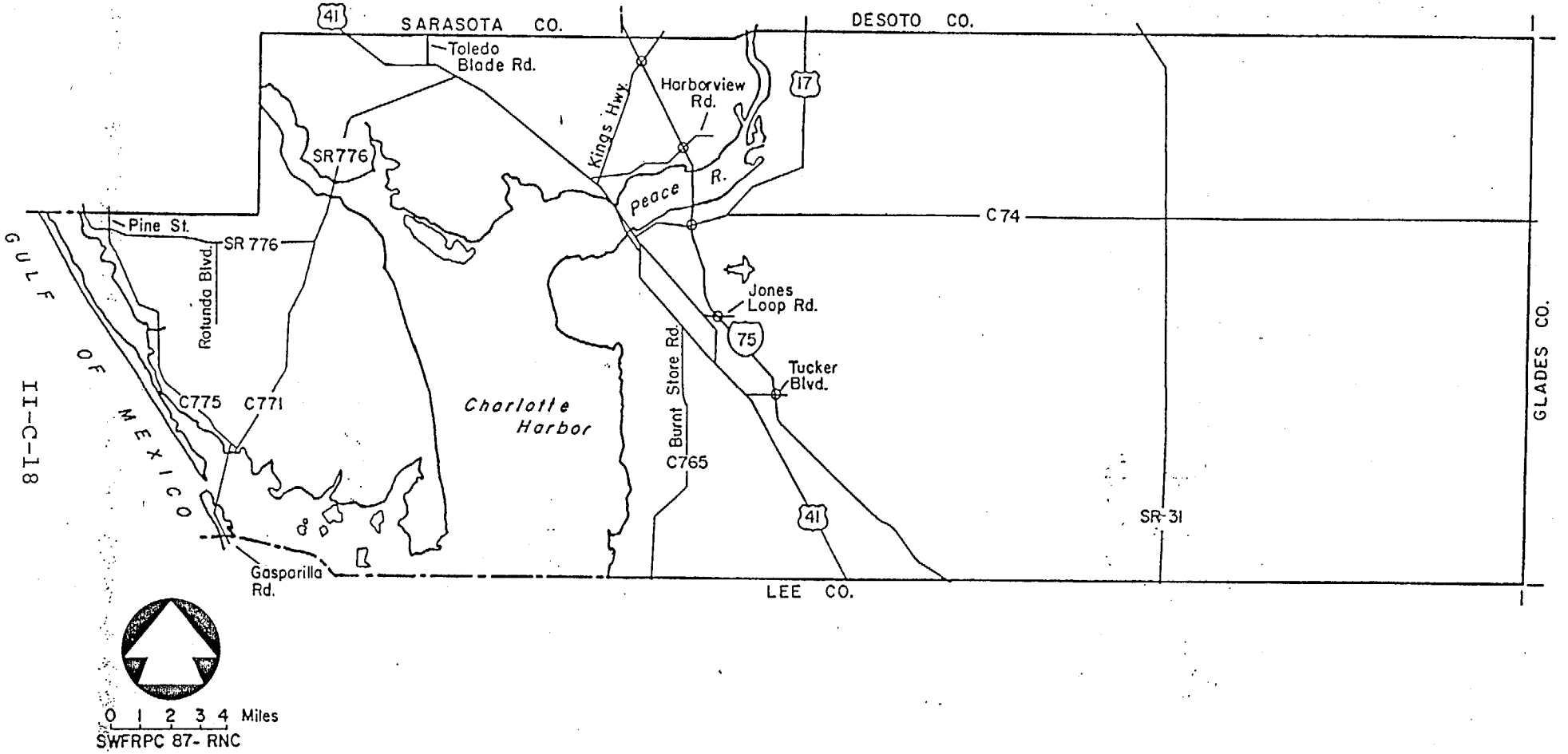
CATEGORY	PERCENT MET JULY	NOVEMBER
1	32.1	28.6
2	15.9	14.7
3	4.5	4.1
4	3.9	3.5
5	3.8	3.5

If shelter needs cannot be met within the County, they must be met outside of the County. For this reason, a knowledge of routes and route capacities becomes important.

ROUTES

Arterial roadways form the backbone of any hurricane evacuation effort. Charlotte County's roadway system provides relatively few options for evacuees coming from the coast. This is particularly true in the Cape Haze area where 3 major highways narrow to just one (SR 776) across the Myakka River. Charlotte County Evacuation Routes are depicted on Map 5. Identification of routes is the first step in assessing the roadway system. The next step is assessing roadway capacities. The capacities of these roadways have been developed based on their characteristics, tied to the assessment methodologies of the Highway Capacity Manual, 1985. These capacities are contained in Table 11.

An important aspect of any route is its condition. Many routes along the shore are low lying. Their propensity to flood due to surge or tidal action causes their reliability to operate as a route to cease several hours before storm landfall. Appendix 1 depicts these possibilities. In most cases, however, winds, not shoreline flooding, will initially make roads unsafe for travel.



MAP 5
CHARLOTTE COUNTY
EVACUATION ROUTES

TABLE 11
EVACUATION ROUTE CAPACITY CALCULATIONS
CHARLOTTE COUNTY

ROUTE	# OF LANES	LANE WIDTH (FT.)	DESIGN SPEED (MPH)	HIGHWAY TYPE	PER-CENT NO PASSING ZONES	MAXIMUM HRLY. FLOW/ FLOW RATE (LOS D)	TRAFFIC FLOW SPLIT 50/50	70/30	90/10
I-75									
Sarasota Co. to Lee Co.	4	12	70	Freeway	--	2,407			
US 41									
Sarasota Co. to Toledo Blade Blvd.	4	12	70	Rur.Div.	--	2,260			
Toledo Blade Blvd. to Harborview Dr.	4	12	70	Sub.Div.	--	2,034			
Harborview Dr. to Aqui Esta Dr.	4	12	70	Sub.Div.	--	2,014			
Aqui Esta Dr. to Lee Co.	4	12	70	Rur.Div.	--	2,260			
US 17									
Desoto Co. to CR 74	2	11	60	--	90	1,034	689	859	930
CR 74 to I-75	4	12	60	Sub.Div.	--	1,964			
I-75 to US 41	6	12	50	Sub.Div.	--	2,579			
SR 775									
Sarasota Co. to SR 776	2	12	60	--	100	1,489	745	927	1,005
SR 776									
SR 775 to US 41	2	12	60	--	90	1,257	757	944	1,022
SR 31									
Desoto Co. to Lee Co.	2	10	60	--	80	930	620	772	837
CR 771									
SR 776 to Boca Grande Causeway	2	11	60	--	80	1,027	685	853	924

TABLE 11 (CONTINUED)
EVACUATION ROUTE CAPACITY CALCULATIONS
CHARLOTTE COUNTY

ROUTE	# OF LANES	LANE WIDTH (FT.)	DESIGN SPEED (MPH)	HIGHWAY TYPE	PER-CENT NO PASSING ZONES	MAXIMUM HRLY. FLOW/ FLOW RATE (LOS D)	TRAFFIC FLOW SPLIT 50/50	70/30	90/10
CR 775									
SR 776 to CR 771	2	11	60	--	90	1,027	685	853	924
CR 74									
US 17 to SR 31	2	12	60	--	80	1,063	709	882	957
SR 31 to Glades Co.	2	9	60	--	80	751	500	623	675
CR 765 (Burnt Store Rd.)									
US 41 to Lee Co.	2	12	70	--	80	1,241	748	931	1,009
Gasparilla Rd.									
CR 771 to Lee Co.	2	12	60	--	90	1,061	707	881	954
King's Highway									
US 41 to Desoto Co.	2	10	60	--	80	880	586	731	792
North Rotonda/Sunnybrook Blvd.									
SR 776 to Rotonda	2	11	50	--	70	1,228	690	859	931
Toledo Blade Blvd.									
Sarasota Co. to US 41	2	12	70	--	60	1,274	767	956	1,036
Tucker Grade Blvd.									
US 41 to I-75	4	12	70	Rur.Div.	--	2,395			

NOTE: The Peak Hour Factor was assumed to be .95 and the Driver Population Factor assumed to be .75 in ALL cases

Rainfall flooding, however, may constitute a greater hazard to evacuation route operation than either early shoreline flooding or early winds. This is because roadways may flood and become partially or totally impassible early in an evacuation. Such areas have been documented for different storms and are depicted on Map 6. These are areas that must be passed before the presupposed onset of heavy rains, which is eight hours before eye landfall. This is relevant for Category 1 storms for most areas of Charlotte County and for fewer areas for Category 2 or greater storms.

Clearance Times

There are several factors taken into account when calculating community clearance time. The first is the nature of the threat. Although there are no assurances that the County cannot be struck by Category 4 and 5 storms, the probabilities of this are low. The County does, however, lie subject to storms of Category 1, 2, and 3 strength in decreasing probability. With each storm of increasing strength, the number of persons and vehicles also increases.

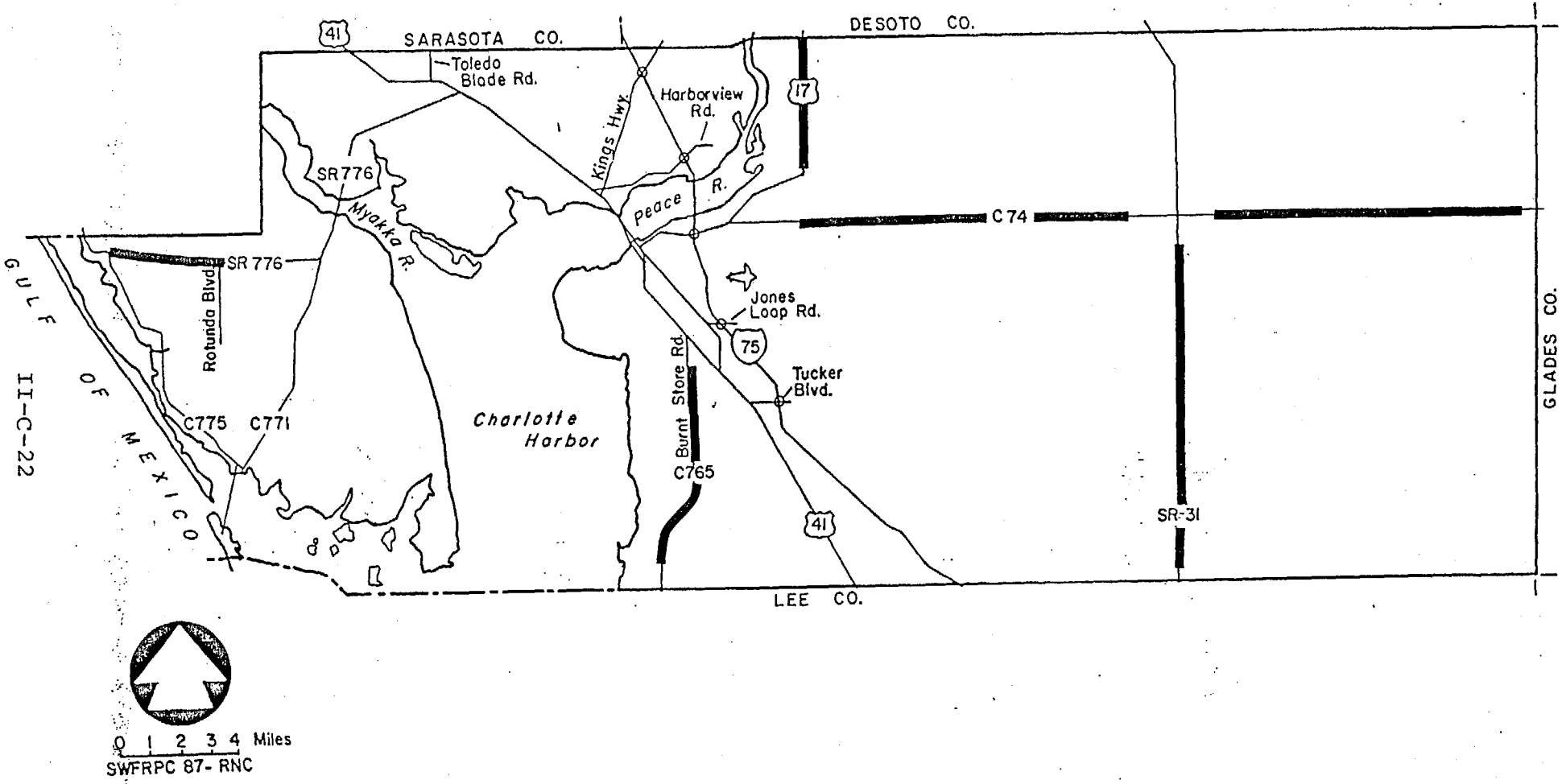
Other factors contributing to clearance time are the number of vehicles evacuating and the capacity of roadways to carry evacuees. This translates into a number of hours it will take to move persons past any given point.

The final factors are the amount and distance of "stopping" opportunities offered evacuees, and the distance to these opportunities. If the largest amount of stopping opportunities needed are only ten miles inland, the time is much less for an evacuation than if they are 100 miles distant.

These factors compose the evacuation time. For certain subzones within the County, times are less than for others. This variation is because pre-landfall flood conditions are not as bad, shelter locations are closer, and better quality evacuation routes are available. Table 12 summarizes pre-landfall flood conditions, Table 13 summarizes shelter distances and options, and Table 14 summarizes the time it takes to clear the most restrictive point on the route for each community for each of the slow, intermediate, and quick responses.

TABLE 12
PRE-LANDFALL FLOOD CONDITIONS

ZONE	CATEGORY	TIME TO COASTAL FLOOD	TIME TO RAINFALL	TIME TO WIND
Myakka River	1	4.0	8	5.0
Barrier Islands	1	4.5	8	5.5
Cape Haze	1	4.5	8	5.5
Port Charlotte	1	4.0	8	5.0
Peace River	1	1.0	8	4.5
Punta Gorda	1	1.0	8	4.5



MAP 6
CHARLOTTE COUNTY
ROUTES SUBJECT TO RAINFALL FLOODING

TABLE 12 (Continued)
PRE-LANDFALL FLOOD CONDITIONS

ZONE	CATEGORY	TIME TO COASTAL FLOOD	TIME TO RAINFALL	TIME TO WIND
South County	1	3.0	8	5.0
Cape Haze	2	5.0	8	6.5
Port Charlotte	2	4.5	8	6.0
Shell Creek	2	1.5	8	5.5
Punta Gorda	2	1.5	8	5.5
South County	2	3.5	8	5.5
Cape Haze	3	5.5	8	8.5
Port Charlotte	3	4.0	8	7.5
Shell Creek	3	2.0	8	7.5
Punta Gorda	3	2.0	8	7.5

TABLE 13
SHELTER DESIGNATIONS AND OPTIONS

CATEGORY	ZONE	PUBLIC SHELTERS NAME	ESTIMATED TRAVEL TIME
1	Myakka River	Port Charlotte High School	.30 hr
		Charlotte Vo-Tech Center	
		Liberty Elementary School	.40 hr
1	Barrier Islands	W. Charlotte Comm. Ctr.	.15 hr
		Lemon Bay High School	.15 hr
		L.A. Ainger School	.30 hr
		Vineland Elementary	.30 hr
1	Cape Haze	Lemon Bay High School	.30 hr
		L.A. Ainger School	.30 hr
		Vineland Elementary	.30 hr
		W. Charlotte Comm. Ctr.	.50 hr
1	Port Charlotte	Charlotte Harbor School	.20 hr
		Port Charlotte High School	.20 hr
		Charlotte Vo-Tech Center	.20 hr
		Liberty Elementary School	.30 hr
1	Peace River	Port Charlotte Jr. High School	.20 hr
		Neal Armstrong Elementary School	.20 hr
1	Punta Gorda	East Elementary School	.30 hr
1	South County	East Elementary School	.45 hr
2	Cape Haze	W. Charlotte Comm. Ctr.	.20 hr
		Liberty Elementary School	.50 hr
2	Port Charlotte	Neal Armstrong Elementary School	.10 hr
		Port Charlotte Jr. High School	.10 hr
		Liberty Elementary School	.20 hr
2	Shell Creek	No Shelter Availability	
2	Punta Gorda	No Shelter Availability	
2	South County	No Shelter Availability	
3	All Category 3 Zones	No Shelter Availability	

TABLE 14
TIME TO CLEAR

CATEGORY	ZONE	RESTRICTING POINT	JULY SLOW	JULY INTER-MEDIATE	JULY QUICK	NOVEMBER SLOW	NOVEMBER INTER-MEDIATE	NOVEMBER QUICK	TO COUNTY LINE
1	Myakka River	SR 776	1.1	0.9	0.8	1.1	0.9	0.8	0.5
1	Barrier Islands	SR 776	7.8	6.3	5.8	8.3	6.7	6.2	0.6
1	Cape Haze	SR 776	0.7	0.5	0.5	0.9	0.7	0.7	0.6
1	Port Charlotte	US 41	-	4.3	-	-	4.4	-	0.4
1	Peace River	US 17	4.2	3.9	3.6	5.5	4.5	4.1	0.3
1	Punta Gorda	US 41	-	2.7	-	-	3.1	-	0.4
1	South County	CR 765	0.7	0.6	0.5	0.8	0.6	0.6	0.7
2	Cape Haze	CR 775	3.5	2.8	2.6	4.2	3.4	3.1	0.5
2	Port Charlotte	Toledo Blade	5.0	4.0	3.7	5.3	5.2	3.9	0.3
2	Shell Creek	US 17	0.3	0.2	0.2	0.3	0.2	0.2	0.3
2	Punta Gorda	US 17	0.5	0.4	0.4	0.5	0.4	0.4	0.3
2	South County	CR 765	0.1	0.1	0.1	0.1	0.1	0.1	0.7
3	Cape Haze	Pine Street	-	0.8	-	-	0.8	-	0.1
3	Port Charlotte	Kings Highway	13.0	10.4	9.6	14.1	11.3	10.4	0.2
3	Shell Creek	CR 74	0.4	0.3	0.3	0.6	0.5	0.5	0.7
3	Punta Gorda	CR 765	0.7	0.6	0.5	0.8	0.5	0.6	0.7

A constricting point from Table 14 (on the following page) may represent an ultimate constricting point for more than one zone. That being the case, it may be expected that these times (from Table 14) will become cumulative. This creates a "greatest time to clear" for the county as a whole. Table 15 depicts the "greatest time to clear" calculation for each category storm.

TABLE 15
ULTIMATE CONSTRICTING ROUTE

Category	Constricting Route	July Slow	July Intermediate	July Quick	November Slow	November Intermediate	November Quick
1	SR 776	9.6	7.7	7.1	10.3	8.3	7.7
2	SR 776	9.6	7.7	7.1	10.3	8.3	7.7
3	Kings Highway	13.0	10.4	9.6	14.1	11.3	10.4

Clearly, route constriction becomes a concern when it is unevenly distributed between different parts of the County. The relative isolation of the Cape Haze area, and much of the Barrier Islands region (which has no roads) limits evacuation capacity, causing large times on SR 776. Even so, it is conceivable that increased traffic control can better distribute loadings. In that case, the ultimate constricting points would move to the sum of the routes exiting the County. Table 16 depicts the times that may occur, given different routing scenarios.

The last factor to be incorporated into calculating the County clearance time is the response of potential evacuees to an evacuation order. The original 1981-82 Regional Hurricane Evacuation Plan discussed this topic on page 125, and concluded that seven hours would be the minimum time needed to clear a zone, because some evacuees would daudle more than others. More recent history indicates that sudden or dramatic changes in hurricanes can heighten the evacuees response into a "quick" evacuation, limited basically by road capacity. Consequently, in evaluating the final criteria that determines a slow, intermediate, or quick evacuation, both slow and intermediate zones will have a minimum response time of seven hours; "quick" times, however, will be limited only by roadway capacity. All of these factors combine into creating a countywide clearance time. This time will vary depending upon the routes available for county evacuation, the time of season, and whether it is a slow, intermediate, or quick response. Table 17 summarizes the contribution to the greatest clearance time for the County for each category storm.

TABLE 16
COUNTY EXITING ROUTES

CATEGORY	TOTAL VEHICLES LEAVING CO.	% OF TOTAL COUNTY VEHICLES	ROUTES	COMBINED CAPACITIES			TIMES					
							JULY			NOVEMBER		
				SLOW	INTER-MEDIATE	QUICK	SLOW	INTER-MEDIATE	QUICK	SLOW	INTER-MEDIATE	QUICK
1(a)	16,931(J) 19,520(N)	67.9 71.4	US41/SR 776 US 17	3,460	3,817	3,966	4.9	4.4	4.3	5.6	5.1	4.9
2(a)	25,387(J) 26,852(N)	84.1 85.3	US 41/SR 776 US 17/CR 74	4,169	4,699	4,923	6.1	5.4	5.2	6.4	5.7	5.5
3(a)	37,529(J) 39,730(N)	95.5 95.9	same as 2(a)	4,169	4,699	4,923	9.0	8.0	7.6	9.53	8.5	8.1
3(b)	37,529(J) 39,730(N)	84.1 85.3	same as 2(a) plus I-75	6,576	7,106	7,330	5.7	5.3	5.1	6.0	5.6	5.4

TABLE 17
CLEARANCE TIME

CATEGORY	DESTINATION(1)	WEATHER(2)	ROUTE SLOW	ROUTE INTER-MEDIATE	ROUTE QUICK	SUMMARY SLOW	SUMMARY INTER-MEDIATE	SUMMARY QUICK
1	0.7	8	(J) 7.9	(J) 6.3	(J) 5.8	(J)16.6	(J)15.0	(J)14.5
			(N) 8.6	(N) 6.9	(N) 6.4	(N)17.3	(N)15.6	(N)15.1
2	0.7	8	(J) 5.0	(J) 4.0	(J) 3.7	(J)13.7	(J)12.7	(J)12.4
			(N) 5.4	(N) 4.3	(N) 4.0	(N)14.1	(N)13.0	(N)12.7
3	0.7	8.5	(J)12.8	(J)10.3	(J) 9.5	(J)22.0	(J)19.5	(J)17.6
			(N)14.4	(N)11.5	(N)10.7	(N)23.6	(N)20.7	(N)19.9

(1) From Table 13 or 14, whichever is greater

(2) From Table 12

PART II - 1991 FORECASTS

Part of hurricane preparedness involved understanding and evaluating the growth that the study shows Charlotte County may expect in the forthcoming years. This element discusses short-ranged growth (4 years) the County may undergo, and the facilities that are expected to be added to serve that growth.

The growth predicted follows a single straight-lined forecast technique. Applied uniformly, increases by category and community for housing, persons, and vehicles for 1991 are depicted in Tables 18, 19 and 20.

Table 18 forecasts a total of 57,151 dwelling units for 1991.

Table 19 forecasts a total of 99,710 persons in July; and 113,020 in November.

Table 20 forecasts a total of 50,359 vehicles in July; and 56,515 vehicles in November.

The additional facilities expected can be categorized as "shelters" and "routes." Route improvements can be determined from county and State five-year plans. Shelters (schools) can be estimated from school board plans for new construction and improvements to existing schools which in turn are based on projected population growth.

TABLE 18
CHARLOTTE COUNTY - HOUSING ESTIMATES FOR 1991
(Based on projected units of 57,151)

Storm Category	Zone	Residential Single-Family	Mobile Home	Travel-Trailer	Multi-Family Apartment	Multi-Family Condo	Multi-Family Duplex	Hotel-Motel	Total
1	Myakka River	891	69	N/P*	20	24	N/P	N/P	1,004
1	Barrier Islands	5,321	749	112	377	927	2	177	7,665
1	Cape Haze	282	646	N/P	N/P	N/P	N/P	N/P	928
1	Port Charlotte	8,686	N/P	N/P	445	1,102	N/P	186	10,419
1	Peace River	2,684	1,411	25	202	86	6	351	4,765
1	Punta Gorda	4,426	1,832	455	102	952	N/P	187	7,954
1	South County	530	121	N/P	N/P	N/P	N/P	N/P	657
TOTALS	ZONE 1	22,820	4,828	592	1,146	3,091	8	901	33,386
2	Cape Haze	2,013	1,677	N/P	N/P	148	2	98	3,938
2	Port Charlotte	3,598	N/P	N/P	N/P	1,217	99	N/P	4,914
2	Shell Creek	202	18	N/P	4	N/P	N/P	N/P	224
2	Punta Gorda	327	85	N/P	N/P	N/P	N/P	9	421
2	South County	14	N/P	N/P	N/P	N/P	N/P	N/P	14
TOTALS	ZONE 2	6,154	1,780	N/P	4	1,365	101	107	9,511
3	Cape Haze	730	N/P	N/P	N/P	N/P	31	N/P	761
3	Port Charlotte	7,584	1,772	N/P	N/P	233	8	100	9,687
3	Shell Creek	166	358	80	N/P	N/P	N/P	N/P	604
3	Punta Gorda	350	203	N/P	N/P	2	N/P	200	755
TOTALS	ZONE 3	8,830	2,333	80	N/P	225	39	300	11,807
4	Port Charlotte	140	N/P	N/P	N/P	705	N/P	N/P	845
4	Shell Creek	66	N/P	N/P	N/P	N/P	N/P	N/P	66
4	Acline	227	811	138	N/P	N/P	N/P	25	1,201
4	Webb	638	N/P	N/P	N/P	N/P	N/P	N/P	638
TOTALS	ZONE 4	1,071	811	138	N/P	705	N/P	25	2,750
5	North County	N/P	N/P	N/P	N/P	N/P	N/P	N/P	N/P
5	Webb	17	N/P	N/P	N/P	N/P	N/P	N/P	17
TOTALS	ZONE 5	17	N/P	N/P	N/P	N/P	N/P	N/P	17

* No Projection

TABLE 19
CHARLOTTE COUNTY POPULATION ESTIMATES FOR 1991

Storm Category	Zone	Population Estimate July	Population Estimate November
1	Myakka River	1,985	2,064
	Barrier Islands	13,709	14,777
	Cape Haze	1,200	1,661
	Port Charlotte	20,296	20,918
	Peace River	7,791	8,896
	Punta Gorda	12,611	14,556
	South County	1,222	1,319
	Mobile Homes & Recreational Vehicles, not otherwise included in the above flood prone areas (Category 2 - 5 Areas)	4,658	8,125
TOTAL	ZONE 1	63,474	72,405
2	Cape Haze	6,080	7,367
	Port Charlotte	9,092	9,526
	Shell Creek	445	463
	Punta Gorda	773	842
	South County	29	30
	Mobile Homes & Recreational Vehicles, not otherwise included in the above flood prone areas (Category 3 - 5 Areas)	2,974	5,188
	NEW EVACUEES	14,737	15,291
	TOTALS 1 - 2	78,210	87,696
3	Cape Haze	1,709	1,609
	Port Charlotte	16,129	19,425
	Shell Creek	616	1,013
	Punta Gorda	1,090	1,354
	Mobile Homes & Recreational Vehicles, not otherwise included in the above flood prone areas (Category 4-5 Areas)	767	1,338
	NEW EVACUEES	17,337	19,552
	TOTALS 1 - 3	95,548	107,248

TABLE 19 (Continued)
CHARLOTTE COUNTY POPULATION ESTIMATES
FOR 1991

Storm Category	Zone	Population Estimate July	Population Estimate November
4	Port Charlotte	1,288	1,288
	Shell Creek	174	139
	Acline	604	1,891
	Webb	1,382	1,347
	Mobile Homes & Recreational Vehicles, not otherwise included in the above flood prone area (Category 5 Area)	0	0
	NEW EVACUEES	2,681	3,328
	TOTALS 1 - 4	98,229	110,576
5	North County	0	0
	Webb	36	36
	Mobile Homes	0	0
	NEW EVACUEES	36	36
	TOTALS 1 - 5	98,264	110,612

TABLE 20
MOTOR VEHICLE ESTIMATES
FOR 1991

Storm Category	Zone	Population Estimate July	Recreational Vehicle	Population Estimate November	Recreational Vehicle
1	Myakka River	997	0	1,032	0
	Barrier Islands	6,863	20	7,338	51
	Cape Haze	600	0	831	0
	Port Charlotte	10,185	0	10,459	0
	Peace River	3,907	5	4,482	11
	Punta Gorda	6,224	82	7,073	205
	South County	611	-	660	0
	TOTAL ZONE 1	29,387	107	31,873	267
2	Cape Haze	3,040	0	3,683	0
	Port Charlotte	4,546	0	4,761	0
	Shell Creek	223	0	232	0
	Punta Gorda	387	0	421	0
	South County	15	0	15	0
	TOTAL ZONE 2	8,210	0	9,112	0

TABLE 20 (Continued)
MOTOR VEHICLE ESTIMATES
FOR 1991

Storm Category	Zone	Population Estimate July	Recreational Vehicle	November	Recreational Vehicle
3	Cape Haze	795	0	804	0
	Port Charlotte	8,962	0	9,712	0
	Shell Creek	343	14	471	36
	Punta Gorda	582	0	677	0
	TOTAL ZONE 3	10,682	14	11,664	36
4	Port Charlotte	542	0	644	0
	Shell Creek	69	0	70	0
	Acline	636	25	926	62
	Webb	667	0	674	0
	TOTAL ZONE 4	1,913	25	2,314	62
5	North County	0	0	0	0
	Webb	18	0	18	0
	TOTAL ZONE 5	18	0	18	0
	TOTAL ALL ZONES	50,210	146	54,980	365

TABLE 21
1991 PUBLIC SHELTER CAPACITY

Storm Category	Shelter Space	Evacuating Population July	November	% Population Sheltered July	November
1	28,354	63,474	72,405	44.7	39.2
2	23,838	78,210	87,696	30.5	27.2
3	19,433	95,548	107,248	20.3	18.1
4	19,433	98,229	110,576	19.8	18.1
5	19,433	98,264	110,612	19.8	17.6

County wide, the above figures would represent an increase of 2,001 square feet, or 16.2%.

Route improvements for the next five-year period indicate some improvements will be made to routes exiting the Category 1 zones. Using the 1985-1990 CIP of the Charlotte County Metropolitan Planning Organization as a guide, the following significant improvements are forecasted:

(a) King's Highway — 4-laning from Harborview to I-75
(b) Pine Street — 4-laning from SR 776 to County Line
(c) Edgewater — 4-laning segments from US 41 to Harbor
(d) CR 775 — 4-laning from San Casa to SR 775

(e) Harbor 4-laning from Edgewater to US 41
(f) Toledo Blade 4-laning from US 41 to SR 776
(g) Winchester 2-laning from CR 775 to County Line
(h) Jones Loop Ext. 2-laning from US 41 to Taylor Road
(i) Kennilworth Blvd. US 41 to I-75

TABLE 22
REVISED CAPACITIES

Route	New Capacity	Old Capacity
King's Highway, Harborview - I-75	2,346	792 (quick)
Pine Street, SR 776 - County Line	1,846	--
Edgewater, US 41 - Harbor	1,828	--
CR 775, San Casa - SR 775	2,800*	924 (quick)
Harbor, Edgewater - US 41	1,828	--
Toledo Blade, US 41 - SR 776	2,800*	931 (quick)
Winchester, CR 775 - County Line	1,301	--
Jones Loop Ext., US 41 - Taylor Rd.	1,323	--
Kennilworth Blvd., US 41 - I-75	1,346	--

*Ideal Capacity

Assuming that these improvements are in place, new shelter satisfaction capacities (Table 23), time to clear (Table 24), ultimate constricting route (Table 25), exiting route assessments (Table 26), and clearance time calculations (Table 27) can be made.

The County is planning to construct five new schools around the county between now and 1992. All of these new projects will (as of now) be at least in the Category III surge zone, therefore, the assumption is made that all will be useable as shelters. The sizes of these schools can only be estimated and the useable square feet in then a further estimation. As of 1987 based on preliminary school location, school size and category of storm, it is estimated there will be space for 14,000 people (at 20 sq. ft./person) in these new shelters.

TABLE 23
SHELTER SATISFACTION IN CHARLOTTE COUNTY, FOR 1991

Category	Percent Met July	Percent Met November
1	53.6	47.5
2	34.8	31.6
3	20.8	18.6
4	19.8	17.6
5	19.8	17.6

Thanks to the County's agressive building program, the total amount of space will increase 127% over what it is now. The

TABLE 24
TIME TO CLEAR, 1991

CATEGORY	ZONE	RESTRICTING POINT	JULY SLOW	JULY INTER-MEDIATE	JULY QUICK	NOVEMBER SLOW	NOVEMBER INTER-MEDIATE	NOVEMBER QUICK	TO COUNTY LINE
1	Myakka River	SR 776	1.3	1.1	1.0	1.4	1.1	1.1	0.5
1	Barrier Islands	SR 776	9.3	7.4	6.9	10.1	8.1	7.5	0.5
1	Cape Haze	SR 776	0.6	0.5	0.4	1.1	0.9	0.8	0.5
1	Port Charlotte	US 41	-	4.9	-	-	5.3	-	0.3
1	Peace River	US 17	5.5	4.4	4.1	6.7	5.4	5.0	0.3
1	Punta Gorda	US 41	-	3.0	-	-	3.7	-	0.4
1	South County	CR 765	0.8	0.7	0.6	0.9	0.7	0.7	0.8
2	Cape Haze	CR 771	4.0	3.2	2.9	5.4	4.4	4.0	0.5
2	Port Charlotte	US 41	-	1.1	-	-	1.1	-	0.3
2	Shell Creek	US 17	0.3	0.3	0.3	0.4	0.3	0.3	0.2
2	Punta Gorda	US 17	0.6	0.5	0.4	0.6	0.5	0.5	0.3
2	South County	CR 765	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	0.8
3	Cape Haze	SR 776	1.1	0.9	0.8	1.1	0.9	0.8	0.4
3	Port Charlotte	US 41	-	2.1	-	-	2.3	-	0.2
3	Shell Creek	US 17	0.4	0.3	0.3	0.7	0.6	0.6	0.2
3	Punta Gorda	Jones Loop Ext.	-	0.7	-	-	0.8	-	0.3

The only route representing distinct improvement for 1991, would be Jones Loop Extension, which will allow greater access to I-75 for Punta Gorda residents. However, Toledo Blade, Winchester, street and CR 775 all act to decrease the times shown in the last column. Improvements will still be needed on SR 776, the only route from the Cape Haze area to US 41.

population growth as estimated by the straight-line process will increase about 18%. As a result, shelter satisfaction within the County will increase.

Several caveats must be kept in mind: shelter sizes and useable square feet are only early estimates; school location is planned for Category III areas, but that could change; and the school construction program is through 1992 whereas population increase is only through 1991. Therefore, the numbers in Table 23 will be somewhat lower than as shown.

Because route improvements are not county-wide, traffic and population increases can only worsen evacuation and clearance ties unless comparable out-of-county route improvements are made. Using the improvements listed, there are route improvements forecasted that improve in-county movement capacities.

TABLE 25
ULTIMATE CONSTRICTING ROUTES
FOR 1991

		July			November		
Category	Constricting Route	Slow	Inter-mediate	Quick	Slow	Inter-mediate	Quick
1	SR 776	11.2	9.0	8.3	12.6	10.1	9.3
2	CR 771	4.4	3.6	3.3	5.4	4.3	4.0
3	US 41	-	4.4	-	-	4.8	-

TABLE 26
COUNTY EXITING ROUTES

CATEGORY	TOTAL VEHICLES LEAVING CO.	% OF TOTAL COUNTY VEHICLES	ROUTES	COMBINED CAPACITIES			TIMES					
							JULY			NOVEMBER		
				SLOW	INTER-MEDIATE	QUICK	SLOW	INTER-MEDIATE	QUICK	SLOW	INTER-MEDIATE	QUICK
1(a)	13,703(J) 15,504(N)	46.4 52.5	US41/SR 776	2,771	2,958	3,036	4.9	4.6	4.5	5.6	5.2	5.1
1(b)	13,703(J) 15,504(N)	46.4 52.5	US 41/US 17	2,703	2,873	2,944	5.1	4.8	4.7	5.7	5.4	5.3
2(a)	24,608(J) 25,816(N)	65.2 68.4	US 41/SR 776 CR 74	3,480	3,840	3,933	7.1	6.4	6.3	7.4	6.7	6.6
2(b)	24,608(J) 25,816(N)	65.2 68.4	US 41/US 17/ Toledo Blade	3,470	3,829	3,980	7.1	6.4	6.2	7.4	6.7	6.5
3(a)	38,353(J) 39,418(N)	79.2 81.4	I-75/US 41/ CR 74	5,130	5,303	5,378	7.5	7.2	7.1	7.73	7.4	7.3
3(b)	38,353(J) 39,418(N)	79.2 81.4	I-75/US 41/ SR 17	5,110	5,280	5,351	7.5	7.3	7.2	7.7	7.5	7.4

TABLE 27
CLEARANCE TIME

CATEGORY	DESTINATION(1)	WEATHER(2)	ROUTE SLOW	ROUTE INTER-MEDIATE	ROUTE QUICK	SUMMARY SLOW	SUMMARY INTER-MEDIATE	SUMMARY QUICK
1	0.8	8	(J) 9.1	(J) 7.3	(J) 6.7	(J)17.9	(J)16.1	(J)15.5
			(N) 9.8	(N) 7.8	(N) 7.2	(N)18.7	(N)16.6	(N)16.0
2	0.8	8	(J) 4.4	(J) 3.6	(J) 3.3	(J)13.2	(J)12.4	(J)12.1
			(N) 5.4	(N) 4.3	(N) 4.0	(N)14.2	(N)13.1	(N)12.8
3	0.4	8	(J) 1.1	(J) 4.4	(J) 0.8	(J) 9.5	(J)12.8	(J) 9.2
			(N) 1.1	(N) 4.8	(N) 0.8	(N) 9.5	(N)13.2	(N) 9.2

(1) From Table 13, 14 or 24, whichever is greater

(2) From Table 12

CHARLOTTE COUNTY
APPENDIX A - PRE-EYE LANDFALL HAZARDS TIMES

The pre-eye landfall hazard times projected by the SLOSH model appear in the following table. The table consists of the estimated times for each selected grid point, by storm category (1-5) and type of storm track (landfalling, parallel and crossing). In all cases, the worst probable times are used. The table is divided into 50 parts, for category 1 through 5 respectively. The first column names the grid point being examined, followed by the projected time, in hours before estimated eye landfall, that tidal flooding would reach that point. This time estimate is followed by a code "identifying the particular storm track producing this worst probably (longest) time. These coded storm tracks are fully described in Table 1, giving the track's landfall point and the area receiving the maximum surge and/or winds. The next column, "Total Duration in Hours" lists the length of time the grid point is projected to experience one foot or more of flooding in a 24-hour period.

Following these figures, the next column lists the projected time, in hours before estimated eye landfall, that sustained gale force winds would reach the grid point. Again, this is followed by the coded storm track producing the worst probable (longest) times, and the duration each point is expected to experience the wind force during a 24-hour period. Note that "sustained gale force winds" regers to winds sustained at over 40 mph. In all cases, eye landfall is the reference point used to determine pre-eye landfall hazard times.

APPENDIX A

PRE-EYE LANDFALL HAZARD TIMES - CATEGORY 1

LANDFALLING

GRID STORM POINTS	HOURS BEFORE EYE LANDFALL-FLOODING(1)	STORM TRACK	TOTAL DURATION IN HOURS	HOURS BEFORE EYE LANDFALL-SUSTAINED GALE FORCE WINDS(2)	STORM TRACK	TOTAL DURATION IN HOURS
Cape Haze	3	(70 NS)	12	5.5	(60 NS)	8
Charlotte Co. Line	2	(70 NS)	11	5	(45 NS)	8.5
Placida	1	(60 NS)	10	5.5	(55 NS)	8.5
Alligator Creek	3	(75 NS)	13	4.5	(45 NS)	8.5
Acline				4	(40 NS)	8.5
Punta Gorda Isles	0	(60 NS)	7.5	4.5	(55 NS)	8.5
US 41 Bridge	1	(65 NS)	10	4.5	(60 NS)	8
East Punta Gorda	1	(75 NS)	10	4	(45 NS)	8.5
East Grassy Point	3	(75 NS)	12	4.5	(55 NS)	8
West Harbor View				4	(45 NS)	8.5
Alligator Bay	0	(55 NS)	11.5	4.5	(55 NS)	8.5
771 Bridge	4	(75 NS)	13	5	(55 NS)	8.5
Ainger Creek	4.5	(75 NS)	13.5	5.5	(55 NS)	9
Englewood Beach	4	(75 NS)	13	5.5	(55 NS)	9

LANDFALLING

PRE-EYE LANDFALL HAZARD TIMES - CATEGORY 2

GRID STORM POINTS	HOURS BEFORE EYE LANDFALL-FLOODING(1)	STORM TRACK	TOTAL DURATION IN HOURS	HOURS BEFORE EYE LANDFALL-SUSTAINED GALE FORCE WINDS(2)	STORM TRACK	TOTAL DURATION IN HOURS
Cape Haze	4	(75 NS)	13	6.5	(60 NS)	10
Charlotte Co. Line	2.5	(75 NS)	11.5	6	(45 NS)	10.5
Placida	2.5	(70 NS)	11.5	7	(65 NS)	10
Alligator Creek	3.5	(75 NS)	12.5	5.5	(45 NS)	10.5
Acline				5.5	(60 NS)	9.5
Punta Gorda Isles	1	(65 NS)	10	5.5	(60 NS)	9.5
US 41 Bridge	1.5	(70 NS)	10.5	5.5	(60 NS)	10
East Punta Gorda	1.5	(75 NS)	10.5	5.5	(60 NS)	10
East Grassy Point	3.5	(75 NS)	12.5	5.5	(60 NS)	10
West Harbor View	- .5	(60 NS)	6	5	(45 NS)	10.5
Alligator Bay	1	(70 NS)	10	5.5	(60 NS)	10
771 Bridge	4.5	(70 NS)	7.59	6	(60 NS)	10.5
Ainger Creek	5	(75 NS)	14	6.5	(65 NS)	10
Englewood Beach	4.5	(75 NS)	13.5	6.5	(65 NS)	10.5

(1) Greatest time before landfall - not necessarily for worst case storm; some tracks cause early flooding even though they may not produce highest surge - if more than 1 track produces same time, the one with the worse surge then chosen.

(2) Greatest time before landfall - same is true for winds as above for flooding.

APPENDIX A

LANDFALLING

PRE-EYE LANDFALL HAZARD TIMES - CATEGORY 3

GRID STORM POINTS	HOURS BEFORE EYE LANDFALL-FLOODING(1)	STORM TRACK	TOTAL DURATION IN HOURS	HOURS BEFORE EYE LANDFALL-SUSTAINED GALE FORCE WINDS(2)	STORM TRACK	TOTAL DURATION IN HOURS
Cape Haze	4.5	(75 NS)	13.5	8	(55 NS)	13.5
Charlotte Co. Line	3.5	(75 NS)	12.5	8	(55 NS)	13
Placida	4	(75 NS)	13	8.5	(60 NS)	13.5
Alligator Creek	3.5	(70 NS)	12.5	7.5	(55 NS)	13
Acline	- .5	(45 NS)	3.5	7	(40 NS)	13.5
Punta Gorda Isles	2	(70 NS)	11	7.5	(65 NS)	12.5
US 41 Bridge	2.5	(75 NS)	11.5	7	(50 NS)	13.5
East Punta Gorda	2	(70 NS)	11	7	(55 NS)	13
East Grassy Point	4	(70 NS)	13	7.5	(65 NS)	13
West Harbor View	5	(60 NS)	9.5	7	(55 NS)	13.5
Alligator Bay	2	(65 NS)	11	7.5	(65 NS)	13
771 Bridge	5.5	(75 NS)	14.5	7.5	(55 NS)	13.5
Ainger Creek	5.5	(75 NS)	14.5	8.5	(65 NS)	13.5
Englewood Beach	5.5	(75 NS)	14.5	8.5	(70 NS)	13

LANDFALLING

PRE-EYE LANDFALL HAZARD TIMES - CATEGORY 4

GRID STORM POINTS	HOURS BEFORE EYE LANDFALL-FLOODING(1)	STORM TRACK	TOTAL DURATION IN HOURS	HOURS BEFORE EYE LANDFALL-SUSTAINED GALE FORCE WINDS(2)	STORM TRACK	TOTAL DURATION IN HOURS
Cape Haze	5	(75 NS)	14	9.5	(55 NS)	15
Charlotte Co. Line	4	(75 NS)	13	9.5	(60 NS)	14.5
Placida	4.5	(75 NS)	13.5	10	(60 NS)	15
Alligator Creek	4	(75 NS)	13	9	(60 NS)	14.5
Acline	.5	(60 NS)	5	8.5	(50 NS)	14.5
Punta Gorda Isles	2.5	(75 NS)	11.5	8.5	(50 NS)	14.5
US 41 Bridge	3	(75 NS)	12	8.5	(55 NS)	14.5
East Punta Gorda	3	(75 NS)	12	8.5	(55 NS)	15
East Grassy Point	4.5	(75 NS)	13.5	9	(70 NS)	14.5
West Harbor View	1.5	(70 NS)	12.5	8.5	(60 NS)	14.5
Alligator Bay	2.5	(70 NS)	13.5	9.5	(75 NS)	14.5
771 Bridge	6	(75 NS)	15	9	(60 NS)	14.5
Ainger Creek	6	(75 NS)	15	7.5	(65 NS)	15
Englewood Beach	6	(70 NS)	15	10	(75 NS)	15

(1) Greatest time before landfall - not necessarily for worst case storm; some tracks cause early flooding even though they may not produce highest surge - if more than 1 track produces same time, the one with the worse surge then chosen.

(2) Greatest time before landfall - same is true for winds as above for flooding.

LANDFALLING

APPENDIX A

PRE-EYE LANDFALL HAZARD TIMES - CATEGORY 5

GRID STORM POINTS	HOURS BEFORE EYE LANDFALL-FLOODING(1)	STORM TRACK	TOTAL DURATION IN HOURS	HOURS BEFORE EYE LANDFALL-SUSTAINED GALE FORCE WINDS(2)	STORM TRACK	TOTAL DURATION IN HOURS
Cape Haze	5	(75 NS)	14	9.	(60 NS)	13.5
Charlotte Co. Line	3.5	(75 NS)	12.5	8.5	(55 NS)	13.5
Placida	4	(70 NS)	13	9	(55 NS)	14
Alligator Creek	4	(75 NS)	13	8	(45 NS)	13.5
Acline	- .5	(35 NS)	4.5	8	(60 NS)	13
Punta Gorda Isles	2.5	(75 NS)	11.5	8	(60 NS)	13
US 41 Bridge	2.5	(75 NS)	11.5	8	(60 NS)	13
East Punta Gorda	2.5	(75 NS)	11.5	8	(60 NS)	13
East Grassy Point	4.5	(75 NS)	13.5	8	(60 NS)	13
West Harbor View	2	(75 NS)	10	7.5	(50 NS)	13.5
Alligator Bay	2.5	(75 NS)	11.5	8	(60 NS)	13.5
771 Bridge	6	(75 NS)	15	7.5	(65 NS)	13.5
Ainger Creek	6	(75 NS)	15	9	(60 NS)	14
Englewood Beach	6	(75 NS)	15	9.5	(75 NS)	13.5

PARALLEL

PRE-EYE LANDFALL HAZARD TIMES - CATEGORY 1

GRID STORM POINTS	HOURS BEFORE EYE LANDFALL-FLOODING(1)	STORM TRACK	TOTAL DURATION IN HOURS	HOURS BEFORE EYE LANDFALL-SUSTAINED GALE FORCE WINDS(2)	STORM TRACK	TOTAL DURATION IN HOURS
Cape Haze	-9	(60 WS)	3	3	(15 ES)	12
Charlotte Co. Line	-9	(60 WS)	3	3	(15 ES)	12.5
Placida				2	(0 S)	8.5
Alligator Creek	- -5	(15 WS)	6	2.5	(0 S)	8.5
Acline				4	(15 ES)	9
Punta Gorda Isles				3.5	(15 ES)	8.5
US 41 Bridge				2	(0 S)	8
East Punta Gorda				2	(0 S)	8
East Grassy Point	-11.5	(60 WS)	.5	2	(0 S)	8
West Harbor View				2.5	(15 ES)	8.5
Alligator Bay				2	(0 S)	8.5
771 Bridge	-7.5	(0 S)	4.5	2	(0 S)	9
Ainger Creek	-4.5	(0 S)	7.5	1.5	(15 WS)	8.5
Englewood Beach	-4.5	(0 S)	6.5	1.5	(15 WS)	8.5

(1) Greatest time before landfall - not necessarily for worst case storm; some tracks cause early flooding even though they may not produce highest surge - if more than 1 track produces same time, the one with the worse surge then chosen.

(2) Greatest time before landfall - same is true for winds as above for flooding.

APPENDIX A

PARALLEL

PRE-EYE LANDFALL HAZARD TIMES - CATEGORY 2

GRID STORM POINTS	HOURS BEFORE EYE LANDFALL-FLOODING(1)	STORM TRACK	TOTAL DURATION IN HOURS	HOURS BEFORE EYE LANDFALL-SUSTAINED GALE FORCE WINDS(2)	STORM TRACK	TOTAL DURATION IN HOURS
Cape Haze	-7	(0 S)	5	4.5	(15 ES)	11
Charlotte Co. Line	-7	(0 S)	5	4.5	(0 S)	10.5
Placida				3.5	(0 S)	10.5
Alligator Creek	-5	(15 ES)	6.5	4	(0 S)	11
Acline				4.5	(15 ES)	11
Punta Gorda Isles				4	(15 ES)	11
US 41 Bridge	12	(60 WS)	24	4	(15 ES)	11
East Punta Gorda	12	(60 WS)	24	4	(15 ES)	11
East Grassy Point	- 8	(0 S)	4	3.5	(0 S)	10.5
West Harbor View				3.5	(15 ES)	10.5
Alligator Bay				3.5	(15 ES)	10.5
771 Bridge	- 7	(0 S)	5	3	(0 S)	11
Ainger Creek	- 4	(0 S)	8	3	(0 S)	11
Englewood Beach	- 5	(0 S)	7	2.5	(0 S)	10.5

PARALLEL

PRE-EYE LANDFALL HAZARD TIMES - CATEGORY 3

GRID STORM POINTS	HOURS BEFORE EYE LANDFALL-FLOODING(1)	STORM TRACK	TOTAL DURATION IN HOURS	HOURS BEFORE EYE LANDFALL-SUSTAINED GALE FORCE WINDS(2)	STORM TRACK	TOTAL DURATION IN HOURS
Cape Haze	-3.5	(0 S)	8.5	6	(0 S)	14
Charlotte Co. Line	-3.5	(0 S)	8.5	6.5	(0 S)	14
Placida	-4	(0 S)	8	5.5	(0 S)	14
Alligator Creek	-4	(15 ES)	8	5.5	(0 S)	13.5
Acline				6	(15 ES)	14
Punta Gorda Isles	-4.5	(0 S)	7.5	5.5	(0 S)	13.5
US 41 Bridge	-5	(0 S)	7	5.5	(0 S)	14
East Punta Gorda	-5	(0 S)	7	5.5	(15 ES)	14
East Grassy Point	-4.5	(0 S)	7.5	5	(15 ES)	13.5
West Harbor View	-6	(0 S)	.5	5	(0 S)	13.5
Alligator Bay	-5	(0 S)	7	5	(15 ES)	13.5
771 Bridge	-5	(0 S)	7	5	(0 S)	14
Ainger Creek	-4	(0 S)	8	4.5	(15 WS)	13.5
Englewood Beach	-1	(0 S)	1	4.5	(15 WS)	14

(1) Greatest time before landfall - not necessarily for worst case storm; some tracks cause early flooding even though they may not produce highest surge - if more than 1 track produces same time, the one with the worse surge then chosen.

(2) Greatest time before landfall - same is true for winds as above for flooding.

APPENDIX A

PARALLEL

PRE-EYE LANDFALL HAZARD TIMES - CATEGORY 4

GRID STORM POINTS	HOURS BEFORE EYE LANDFALL-FLOODING(1)	STORM TRACK	TOTAL DURATION IN HOURS	HOURS BEFORE EYE LANDFALL-SUSTAINED GALE FORCE WINDS(2)	STORM TRACK	TOTAL DURATION IN HOURS
Cape Haze	-5	(30 WS)	7	6	(30 WS)	15.5
Charlotte Co. Line	-5.5	(30 WS)	6.5	6.5	(30 WS)	16
Placida	-5	(30 WS)	7	6	(30 WS)	16.5
Alligator Creek	-5.5	(30 WS)	6.5	6	(30 WS)	16
Acline				5.5	(30 WS)	15
Punta Gorda Isles	-7	(30 WS)	5	5.5	(30 WS)	15.5
US 41 Bridge	-7	(30 WS)	5	5.5	(30 WS)	15.5
East Punta Gorda	-7	(30 WS)	5	5.5	(30 WS)	15.5
East Grassy Point	-6.5	(30 WS)	5.5	5	(30 WS)	15.5
West Harbor View				5	(30 WS)	15
Alligator Bay	-7	(30 WS)	5	5	(30 WS)	15.5
771 Bridge	-6	(30 WS)	6	5	(30 WS)	16
Ainger Creek	-4.5	(60 WS)	7.5	5	(30 WS)	16.5
Englewood Beach	-4.5	(60 WS)	7.5	5	(30 WS)	16.5

PARALLEL - 60 WS ONLY

PRE-EYE LANDFALL HAZARD TIMES - CATEGORY 5

GRID STORM POINTS	HOURS BEFORE EYE LANDFALL-FLOODING(1)	STORM TRACK	TOTAL DURATION IN HOURS	HOURS BEFORE EYE LANDFALL-SUSTAINED GALE FORCE WINDS(2)	STORM TRACK	TOTAL DURATION IN HOURS
Cape Haze	-6.5		5.5	4		11.5
Charlotte Co. Line	-6.5		5.5	4		11.5
Placida	-6.5		3.5	4		12.5
Alligator Creek	--7		5	3		10
Acline				3		9.5
Punta Gorda Isles	-9.5		2.5	2.5		9.5
US 41 Bridge	-8		3.5	2.5		9.5
East Punta Gorda	-9		3	2.5		9.5
East Grassy Point	-8		4	3		10.5
West Harbor View				2.5		9.5
Alligator Bay	-10		3	3		10.5
771 Bridge	-7.5		4.5	2.5		11
Ainger Creek	-5		7	3		12.5
Englewood Beach	-5		7	3		13

(1) Greatest time before landfall - not necessarily for worst case storm; some tracks cause early flooding even though they may not produce highest surge - if more than 1 track produces same time, the one with the worse surge then chosen.

(2) Greatest time before landfall - same is true for winds as above for flooding.

APPENDIX A

CROSSING

PRE-EYE LANDFALL HAZARD TIMES - CATEGORY 1

GRID STORM POINTS	HOURS BEFORE EYE LANDFALL-FLOODING(1)	STORM TRACK	TOTAL DURATION IN HOURS	HOURS BEFORE EYE LANDFALL-SUSTAINED GALE FORCE WINDS(2)	STORM TRACK	TOTAL DURATION IN HOURS
Cape Haze	- .5	(45 NS)	9.5	6	(45 NS)	9
Charlotte Co. Line	3	(45 NS)	13	6.5	(45 NS)	9
Placida				5	(45 NS)	9
Alligator Creek	.5	(45 NS)	10.5	6.5	(45 NS)	9.5
Acline				7	(45 NS)	10
Punta Gorda Isles				6.5	(45 NS)	10
US 41 Bridge	-1.5	(45 NS)	8.5	6.5	(45 NS)	10
East Punta Gorda	-1.5	(45 NS)	8.5	6.5	(45 NS)	9.5
East Grassy Point	- .5	(45 NS)	9.5	6.5	(45 NS)	10
West Harbor View				6.5	(45 NS)	10
Alligator Bay				6	(45 NS)	9.5
771 Bridge	-2	(45 NS)	8	5.5	(45 NS)	9.5
Ainger Creek	-1	(45 NS)	9	5	(45 NS)	9.5
Englewood Beach	-2.5	(45 NS)	7.5	4.5	(45 NS)	9

CROSSING

PRE-EYE LANDFALL HAZARD TIMES - CATEGORY 2

GRID STORM POINTS	HOURS BEFORE EYE LANDFALL-FLOODING(1)	STORM TRACK	TOTAL DURATION IN HOURS	HOURS BEFORE EYE LANDFALL-SUSTAINED GALE FORCE WINDS(2)	STORM TRACK	TOTAL DURATION IN HOURS
Cape Haze	- .5	(45 NS)	9.5	7	(30 NS)	12
Charlotte Co. Line	7.5	(45 NS)	13.5	7.5	(30 NS)	12
Placida				6	(30 NS)	11.5
Alligator Creek	- 1	(45 NS)	11	8	(45 NS)	12
Acline				8	(45 NS)	12
Punta Gorda Isles				7.5	(45 NS)	11.5
US 41 Bridge	-1	(45 NS)	9	8	(45 NS)	12
East Punta Gorda	-1	(45 NS)	9	8	(45 NS)	12
East Grassy Point	- .5	(45 NS)	9.5	7.5	(45 NS)	12
West Harbor View				8	(45 NS)	12
Alligator Bay	-2	(45 NS)	8	7.5	(45 NS)	12
771 Bridge	-2	(45 NS)	8	6.5	(45 NS)	11.5
Ainger Creek	-1	(45 NS)	9	5.5	(45 NS)	11.5
Englewood Beach	-2	(45 NS)	8	5.5	(45 NS)	11.5

(1) Greatest time before landfall - not necessarily for worst case storm; some tracks cause early flooding even though they may not produce highest surge - if more than 1 track produces same time, the one with the worse surge then chosen.

(2) Greatest time before landfall - same is true for winds as above for flooding.

CROSSING

APPENDIX A

PRE-EYE LANDFALL HAZARD TIMES - CATEGORY 3

GRID STORM POINTS	HOURS BEFORE EYE LANDFALL-FLOODING(1)	STORM TRACK	TOTAL DURATION IN HOURS	HOURS BEFORE EYE LANDFALL-SUSTAINED GALE FORCE WINDS(2)	STORM TRACK	TOTAL DURATION IN HOURS
Cape Haze	0	(45 NS)	10	6.5	(45 NS)	12
Charlotte Co. Line	4	(45 NS)	14	7	(45 NS)	12
Placida	-1	(45 NS)	9	5.5	(45 NS)	12
Alligator Creek	1	(45 NS)	11	7	(45 NS)	12.5
Acline				7	(45 NS)	12
Punta Gorda Isles	- .5	(45 NS)	9.5	6.5	(45 NS)	12
US 41 Bridge	-1	(45 NS)	9	7	(45 NS)	12.5
East Punta Gorda	- .5	(45 NS)	9.5	7	(45 NS)	12.5
East Grassy Point	0	(45 NS)	10	6.5	(45 NS)	12.5
West Harbor View	-3.5	(45 NS)	6.5	7	(45 NS)	13
Alligator Bay	-1	(45 NS)	9	6.5	(45 NS)	12.5
771 Bridge	-1.5	(45 NS)	8.5	6	(45 NS)	11.5
Ainger Creek	- .5	(45 NS)	9.5	5	(30 NS)	13
Englewood Beach	-1.5	(45 NS)	8.5	5	(30 NS)	13

(1) Greatest time before landfall - not necessarily for worst case storm; some tracks cause early flooding even though they may not produce highest surge - if more than 1 track produces same time, the one with the worse surge then chosen.

(2) Greatest time before landfall - same is true for winds as above for flooding.

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SARASOTA COUNTY
PEACETIME EMERGENCY PLAN (HURRICANES)
[9J-5.012(2)(e)(i)]

HURRICANE VULNERABILITY

The hurricane vulnerability of Sarasota County has been analyzed using a numerical storm surge prediction model known as SLOSH, short for Sea, Lake, and Overland Surges from Hurricanes. This model is described in detail in the Regional Hurricane Evacuation Plan, 1981-82 prepared by the Southwest Florida Regional Planning Council; as well as A Storm Surge Atlas for Southwest Florida, prepared by the National Oceanic and Atmospheric Administration, Undated (@ 1983). These reports analyzed some 187 separate storms for their potential impact on Southwest Florida, including Sarasota County. Both reports provide an assessment of methodologies and provide assumptions that can act towards increasing or decreasing forecast flood and wind conditions. However, in summary, the following assumptions can be made.

(1) Landfalling storms provide the worst flooding potential

(2) In general, flooding will be worse south of the eye of the hurricane

(3) Wind conditions causing travel to become unsafe will occur well before the eye of the storm makes landfall, and are likely to precede flooding of evacuation routes.

(4) Storm landfall prediction cannot be considered an exact science. An approaching storm may strengthen or change course before making landfall, and these changes will decrease or increase rain-flooding and surge potential of the storm.

The SLOSH model used ten points in Sarasota County for a time-history analysis. These points are depicted on Map 1. The greatest height of stormwaters for each category storm for each point are summarized in Table 1. The storm surge heights are based on the Saffir/Simpson Scale of flooding above mean sea level.

TABLE 1
PREDICTED COASTAL STORM SURGES SIMULATED BY SLOSH MODEL, LANDFALLING STORMS

(If a point is over water, the surge is reported in feet of flooding above msl; if a point is on land, the surge is reported in feet above land at that point.)*

GRID POINT	ELEVATION OF POINT	STORM CATEGORY 1	2	3	4	5
Englewood	12	-	-	-	4	4
Buchanan Airport	12	-	-	-	4	4
Manasota Key	7	-	2	5	9	8
South Venice	14	-	-	-	3	3
Venice Airport	16	-	-	-	1	1
Venice Groves	7	-	2	7	11	11
Venice Beach	1	6	8	13	16	17
Longboat Key	1	-	3.5	5.8	9	11
Ringling Causeway	1	-	6	8.3	10.6	12
Bay Island	1	-	4.6	7.5	11	13

*See Map 1 for grid point locations.

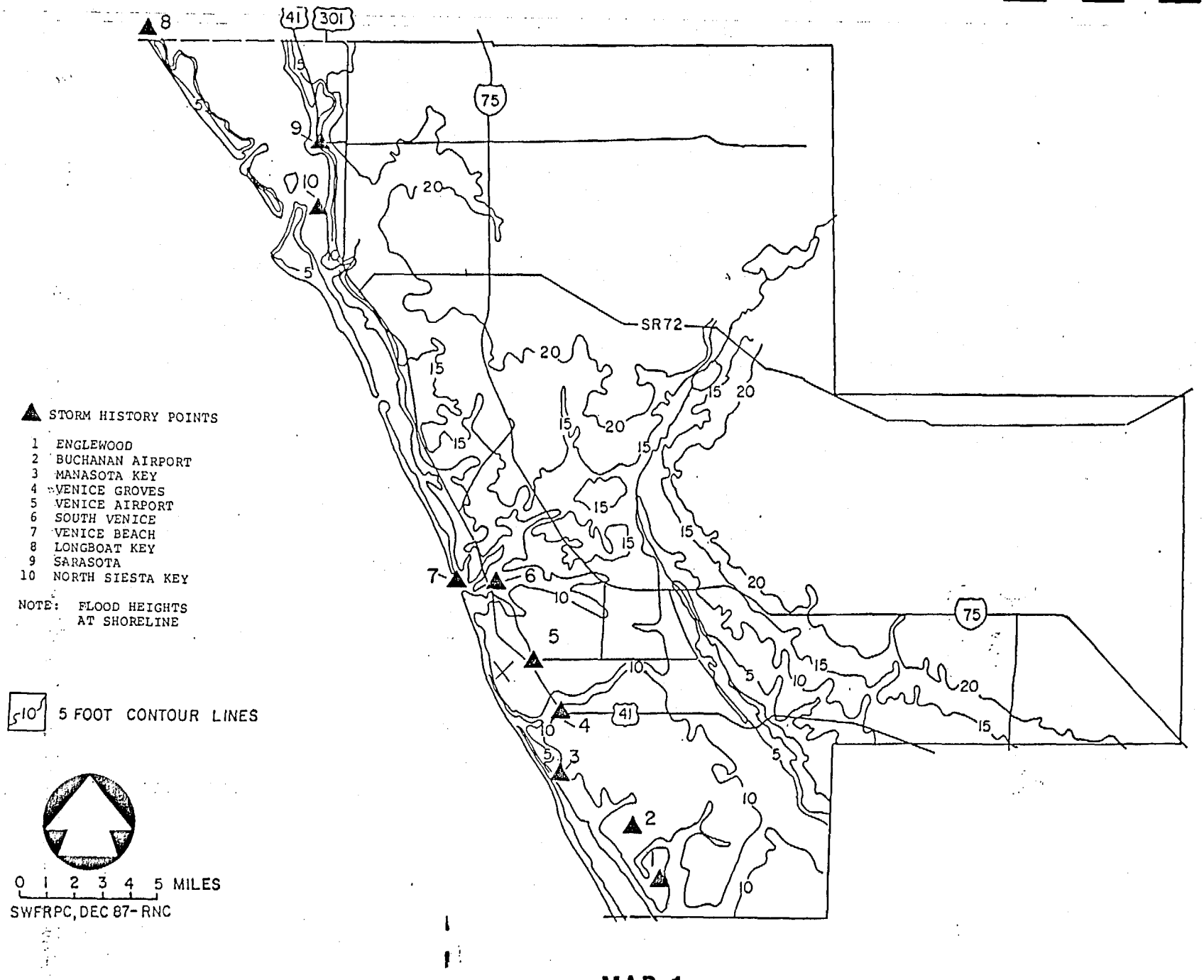
The SLOSH model also provided maps of the flooding that may be expected in Sarasota County. The 187 different simulations [from the Tampa Bay and Charlotte Harbor SLOSH Models have been summarized by flood category, and a zone for each category has been created depicting the maximum extent of flooding resulting from all of the storms of that category. The five zones thus created are depicted on Map 2.

Although hurricanes cannot be accurately forecast in regard to behavior, the SLOSH simulations provided insights into the differences in pre-landfall flooding for landfalling, paralleling and crossing storms. These differences are summarized in Table 2 for storm eye location and points of worst impact.

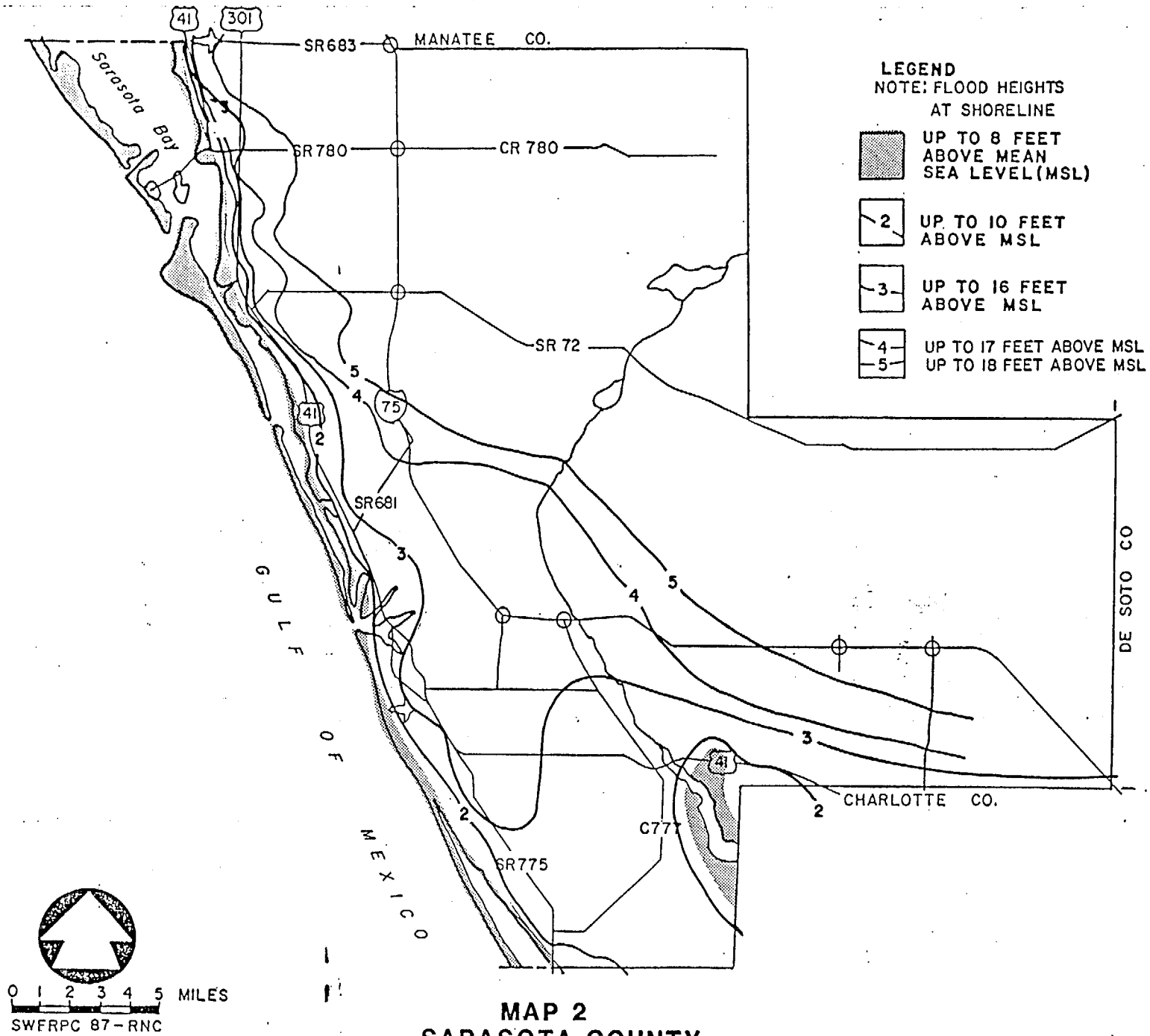
Appendix 1 summarizes the pre-eye landfall hazard times that the County may experience.

Recent Storm History

As in the rest of the Southwest Florida Region, Sarasota County has suffered no direct hit from a hurricane since Donna in 1960. However, the County did come under the fringe of Hurricane Elena in 1985. Elena caused some wave erosion along the varrier islands, and flooding of the back bay area along Blue Heron Drive. Most hard hit was the area south of Stickney Point and west of Midnight Pass Road. Building on the affects of Elena, tropical storm Juan caused serious structural damage to shoreline areas of the county (also in 1985). Most of the damage from Juan occurred on the middle portion of Longboat Key, in the



MAP 1
SARASOTA COUNTY
SLOSH MODEL STORM HISTORY POINTS



MAP 2
SARASOTA COUNTY
MAXIMUM AREAS SUBJECT TO FLOODING
BY STORM CATEGORY

northwestern portion of Sarasota County. Between them, the two storms destroyed about 990 feet of bulkheads, as well as several single-family homes.

The more southerly barrier islands in Sarasota County all sustained some damage from Elena and Juan. The most significant damage was the destruction of beachfront roads. Three-hundred feet of road was damaged on Siesta Key by Juan. Elena wrecked about 115 feet of bulkhead on Siesta Key. Along the island's southwest coast, both storms destroyed a total of 200 feet of bulkhead.

Elena closed over 2,500 feet of road on Casey Key. After the road was repaired, Juan destroyed it again. In Venice, over 400 feet of seawalls were destroyed by Juan and about 200 feet were wrecked by Elena. Elena destroyed over 1,000 feet of road on Manasota Key, as well as a 150 foot wooden bulkhead. No loss of life was sustained in Sarasota County from either storm.

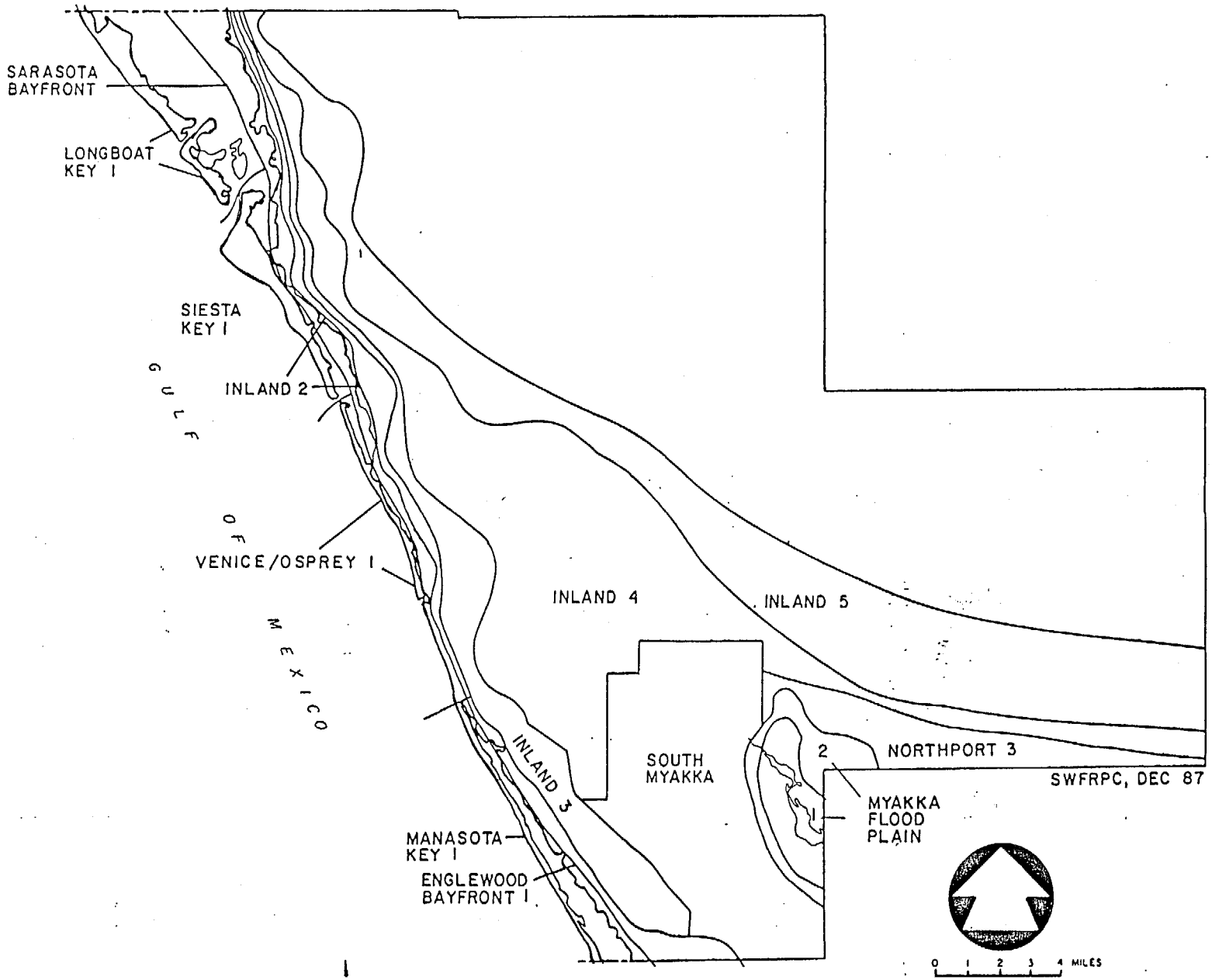
Earlier this year, on October 16, 1987, Hurricane Floyd provided what amounted to an evacuation exercise for Sarasota County. Because of Floyd's change of course in the Florida Keys, Sarasota County experienced only heavy rains and strong winds.

No evacuations occurred in the County during Juan. However, Elena required the evacuation of 37,000 persons from Category 1 areas. About 6,500 of these people stayed in County shelters.

Affected Population

The zones depicted on Map 2 encompass large segments of the County population. For planning purposes, any remaining population in the county, landward of Zone 5, is placed in Zone 5 to represent a "total evacuation" scenario for any purpose. Each zone has some vulnerability to the threat of hurricane-related tidal flooding. All zones are likely to experience hurricane-force winds. Category 1 zones are the most vulnerable, and are likely to be affected by every hurricane. Category 5 zones are the least vulnerable, although the potential for evacuation does exist, and are unlikely to evacuate during a storm event.

Each zone is an attempt to mimic the storm-surge coastline of the county. However, these zones are too large to accurately assess the timing and shelter needs of the population. Consequently, in association with the Sarasota County Disaster Preparedness, and the Sarasota-Manatee Area Transportation Service (SMATS), new subzones were created for the County floodprone areas. These subzones were created in accordance with local place names and areas, wherever possible, but they should not be considered to represent specific communities or neighborhoods. Rather the subzones identify areas of the county which are generally recognized by a particular place-name. These communities are shown on Map 3.



MAP 3
SARASOTA COUNTY
EVACUATION ZONES

TABLE 2
SARASOTA COUNTY - HOUSING UNITS

Storm Category	Zone	Residential Single-Family	Mobile Home	Recreational Vehicle	Multi-Family Apartment	Multi-Family Condo	Multi-Family Duplex	Hotel-Motel	Total
1	Longboat Key	1,625	286	0	106	5,384	62	1,133	8,596
1	Siesta Key	1,539	0	0	797	6,190	2	91	8,619
1	Casey Key	380	0	0	146	422	0	26	974
1	Manasota Key	260	0	0	45	1	0	0	306
1	Myakka Floodplain	1,943	2,313	0	109	0	0	0	4,365
1	Englewood Bayfront	804	1,199	1	80	92	2	29	2,207
1	Venice Osprey	3,018	226	4	121	305	4	65	3,743
1	Sarasota Bayfront	3,196	333	0	506	3,746	0	68	7,849
TOTALS	FLOOD ZONE 1	12,765	4,357	5	1,910	16,140	70	1,412	36,659
2	Myakka Floodplain	1,902	0	0	131	0	0	73	2,106
2	Inland	810	7,701	107	781	3,410	408	348	13,565
TOTALS	FLOOD ZONE 2	2,712	7,701	107	912	3,410	408	421	15,671
3	Myakka Floodplain	429	197	0	13	1,195	0	0	1,834
3	North Port	2,647	865	0	35	9	0	0	3,556
3	Inland	3,904	2,181	426	652	5,050	522	521	13,256
TOTALS	FLOOD ZONE 3	6,980	3,243	426	700	6,254	522	521	18,646
4	FLOOD ZONE 4	6,472	1,529	2	1,141	2,652	150	1,130	13,076
5	FLOOD ZONE 5	31,820	2,403	1,142	1,622	4,737	1,030	213	42,967
TOTAL ALL ZONES		60,749	19,233	1,682	6,285	33,193	2,180	3,697	127,019

The first step in estimating Sarasota County population was to estimate the number of dwelling units in the county, and to locate these units in the various subzones. Using information from the County, the City of Sarasota, the City of North Port, and SMATS; as well as information provided by the Florida Department of Community Affairs, it was determined that Sarasota County contains 136,049 dwelling units. This estimate includes single-family homes, duplexes (and multi-plexes) mobile homes, RVs (or travel trailers), apartments, condominiums, hotels and motels. The largest number of dwelling units in the County are located in Category 5 areas (42,967), but 31,584 dwelling units occur in the Category 1 zone. This information is contained in Table 2, Housing Units.

A population estimate is derived from the housing unit estimate. This derivation requires knowledge of two additional factors: persons per household and occupancy rates. For Sarasota County, it has been estimated that there is an average of 2.2 people per household. This assumption is regardless of the type of unit (e.g. duplexes vs. mobile homes).

A more detailed analysis was required to determine occupancy/vacancy rates because this may vary between structure types. It is also necessary to be somewhat more accurate with these rates because some structures are more vulnerable to wind damage than others. Using estimates derived from the survey in Regional Hurricane Evacuation Plan, Appendix C, two estimates of seasonal vacancy were prepared, as indicated in Table 3, below.

TABLE 3
SEASONAL OCCUPANCY RATES

UNIT TYPE	JULY	NOVEMBER
Single-Family	96%	97%
Duplex	96%	95%
Condominium (Conventional)	51%	64%
Mobile Home	43%	75%
Travel Trailer	18%	41%
Apartment	70%	78%
Motel/Hotel	54%	63%

In 1987, it is estimated that Sarasota population in July within the 5 zones is 203,081, and the population in November is 230,093. Table 4 summarizes this information. The greatest seasonal variance occurs in Hurricane Category Zone 1, which has 53,960 persons in July and 62,540 in November, for an increase of 15.9%.

TABLE 4
SARASOTA COUNTY POPULATION ESTIMATES FOR EVACUATION ZONES

Storm Category	Zone	Population Estimate July	November
1	Longboat Key	11,384	13,403
	Siesta Key	11,534	13,498
	Casey Key	1,533	1,692
	Manasota Key	619	633
	Myakka Floodplain	6,460	8,150
	Englewood Bayfront	3,098	4,006
	Venice/Osprey	7,204	7,552
	Sarasota Bayfront	12,128	13,606
	Mobile Homes, not otherwise included in above flood-prone areas (Category 2-5 Areas)	14,735	26,059
	SUBTOTAL	68,695	88,599
2	Myakka Floodplain	4,306	4,385
	Inland	15,342	22,009
	Mobile Homes, not otherwise included in above flood-prone areas (Category 3-5 Areas)	7,408	13,255
	NEW EVACUEES	12,321	13,590
	TOTALS 1 - 2	81,016	102,189
3	South Myakka	2,453	2,946
	North Port	6,473	7,149
	Inland	18,869	22,356
	Mobile Homes, not otherwise included in above flood-prone areas (Category 4-5 Areas)	4,708	7,520
	NEW EVACUEES	25,095	26,716
	TOTALS 1 - 3	106,111	128,905
4	Inland	32,508	23,908
	Mobile Homes, not otherwise included in above flood-prone area (Category 5 Area)	2,725	4,995
	NEW EVACUEES	19,525	21,383
	TOTALS 1 - 4	125,636	150,288
5	Inland	80,170	84,805
	NEW EVACUEES	77,445	79,805
	TOTALS 1 - 5	203,081	230,093

Motor Vehicles

The vast majority of evacuating persons will travel by a private motor vehicle. Thus, it is important to estimate the number of vehicles likely to be used in an evacuation. Certain factors for each household must be taken into account in order to derive a county-wide vehicle estimate. How many vehicles does the average Sarasota family own? Will some of these vehicles be left behind? How many drivers feel competent to operate a vehicle under storm conditions? Would families separate themselves into two or more vehicles? The original survey, as mentioned above, suggested that about 75% of county-based vehicles would be used in an evacuation. This averages, over the entire region, to 1.1 vehicles per household.

Using these figures, and the vacancy rates already discussed, Sarasota County evacuees would use include 101,545 vehicles in July and 115,047 vehicles in November. The greatest number of vehicles (40,087 - 42,401) are in Category 5 areas, but these are unlikely to evacuate. The greatest number of evacuating vehicles is likely to be in Category 1 zones (26,983 in July and 31,272 in November).

Table 5 summarizes vehicle information for Sarasota County.

TABLE 5
SARASOTA COUNTY VEHICLE ESTIMATES FOR EVACUATION - BY SEASON

CATEGORY	ZONE	JULY	RECREATIONAL VEHICLES	NOVEMBER	RECREATIONAL VEHICLES
1	Longboat Key	5,692	0	6,701	0
1	Siesta Key	5,768	0	6,749	0
1	Casey Key	765	0	846	0
1	Manasota Key	311	0	317	0
1	Myakka Floodplain	3,230	0	4,075	0
1	Englewood Bayfront	1,550	1	2,004	1
1	Venice/Osprey	3,602	1	3,777	2
1	Sarasota Bayfront	6,065	0	6,803	0
2	Myakka Floodplain	2,153	0	2,192	0
2	Inland 2	7,671	21	11,003	48
3	South Myakka	1,226	0	1,473	0
3	North Port	3,236	0	3,574	0
3	Inland	9,435	84	11,178	192
4	Inland	10,754	1	11,954	1
5	Inland	40,087	226	42,401	515

Shelters

Evacuees must have a place to go. The SWFRPC undertook surveys in 1979 and 1981 to determine evacuees' preferred destinations.

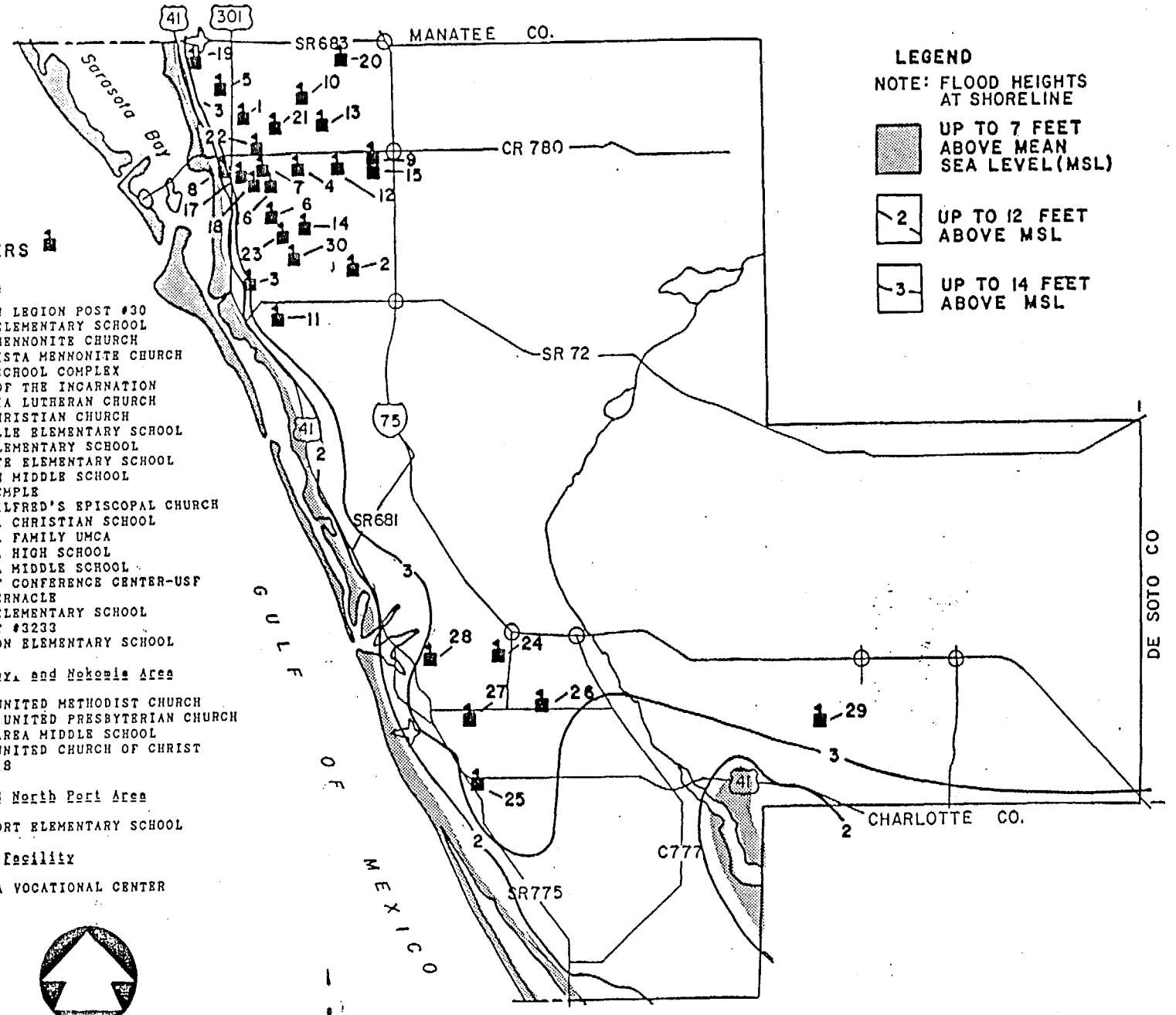
These surveys revealed the following information: 24% of those surveyed preferred to go to a public shelter; 34% said they would leave the county; 21% would go to "other" locations (friends, relatives, hotels, etc.); while 21% had not determined where they would go during an evacuation.

It must be mentioned that these are declarations before the fact, and that actual destinations might be different. Severity and route of impending storms may also affect destinations, because of pressures placed on roads and facilities by large-scale evacuations. This could have the effect of eliminating or limiting the 21% "don't knows" and/or the 21% "other locations" preferences.

Currently, Sarasota County has 30 public shelters, one of which (Sarasota Vocational Center) has been designated a special care facility. Shelter capacity is computed at 20 square feet per person, for a total capacity of 20,095 persons. Table 6 lists the shelters, while Table 7 summarizes shelter space by vulnerability zone. Map 4 depicts shelter locations.

TABLE 6
SARASOTA SHELTERS

Shelter	Address	Capacity at 20 sq. ft. per person
Sarasota Area		
American Legion Post #30	6th Street	200
Ashton Elementary School	Ashton Road	1,050
Ashton Mennonite Church	Ashton Road	200
Bahia Vista Mennonite Church	Bahia Vista	660
Booker School Complex	N. Orange Avenue	1,420
Church of the Incarnation	Bee Ridge Road	300
Concordia Lutheran Church	Wood Street	200
First Christian Church	S. Washington Blvd.	300
Fruitville Elementary School	Honore Avenue	480
Gocio Elementary School	Gocio Road	1,050
Gulf Gate Elementary School	Lockwood Ridge Road	500
McIntosh Middle School	S. McIntosh	1,950
Sahib Temple	N. Beneva Road	300
Saint Wilfred's Episcopal Church	Wilkinson Road	300
Sarasota Christian School	Bahia Vista	400
Sarasota Family YMCA	S. Euclid Avenue	825
Sarasota High School	S. Washington Blvd.	1,010
Sarasota Middle School	S. School Avenue	1,700
Sudakoff Conference Center-USF	N. Tamiami Trail	48
The Tabernacle	DeSoto Road	300
Tuttle Elementary School	N. Brink Avenue	900
VFW Post #3233	S. Tuttle Avenue	240
Wilkinson Elementary School	Wilkinson Road	900



SHELTERS

Sarasota Area

1. AMERICAN LEGION POST #30
2. ASHTON ELEMENTARY SCHOOL
3. ASHTON MENNONITE CHURCH
4. BAHIA VISTA MENNONITE CHURCH
5. BOOKER SCHOOL COMPLEX
6. CHURCH OF THE INCARNATION
7. CONCORDIA LUTHERAN CHURCH
8. FIRST CHRISTIAN CHURCH
9. FRUITVILLE ELEMENTARY SCHOOL
10. GOCIO ELEMENTARY SCHOOL
11. GULF GATE ELEMENTARY SCHOOL
12. MCINTOSH MIDDLE SCHOOL
13. SAHIB TEMPLE
14. SAINT WILFRED'S EPISCOPAL CHURCH
15. SARASOTA CHRISTIAN SCHOOL
16. SARASOTA FAMILY UMCA
17. SARASOTA HIGH SCHOOL
18. SARASOTA MIDDLE SCHOOL
19. SUDAKOFF CONFERENCE CENTER-USF
20. THE TABERNACLE
21. TUTTLE ELEMENTARY SCHOOL
22. VFW POST #3233
23. WILKINSON ELEMENTARY SCHOOL

Venice, Osprey, and Nokomis Area

24. CHRIST UNITED METHODIST CHURCH
25. TRINITY UNITED PRESBYTERIAN CHURCH
26. VENICE AREA MIDDLE SCHOOL
27. VENICE UNITED CHURCH OF CHRIST
28. VFW #8118

Englewood and North Port Area

29. NORTH PORT ELEMENTARY SCHOOL

Special Care Facility

30. SARASOTA VOCATIONAL CENTER

0 1 2 3 4 5 MILES

SWFRPC 87-RNC

MAP 4
SARASOTA COUNTY
PUBLIC SHELTER LOCATIONS

TABLE 6 (continued)
SARASOTA SHELTERS

Shelter	Address	Capacity at 20 sq. ft. per person
Venice, Osprey, and Nokomis Area		
Christ United Methodist Church	Center Road	220
Trinity United Presbyterian Church	SR 775	220
Venice Area Middle School	Center Road	1,950
Venice United Church of Christ	Shamrock	220
VFW #8118	E. Venice Avenue	240
Englewood and North Port Area		
North Port Elementary School	Glenallen Blvd.	1,580

COUNTY TOTAL: 29 shelters CAPACITY: 20,095 persons

Special Care Facility*		
Sarasota Vocational Center	Beneva Road	700

* This facility is available only to citizens requiring medical, transportation, or other special assistance.

TABLE 7
PUBLIC SHELTER CAPACITY

CATEGORY	SPACE	EVACUEES JULY	EVACUEES NOVEMBER	PERCENT MET JULY	PERCENT MET NOVEMBER
Tropical Storm	20,095	25,070	29,226	80.2	68.8
1	20,095	68,695	88,599	29.3	22.7
2	20,095	81,016	102,189	24.8	19.7
3	20,095	106,111	128,905	18.9	15.6
4	20,095	125,636	150,288	16.0	13.4
5	N/A				

For lower category storms, public shelter demand is not the largest means of meeting evacuee shelter needs. Because of the narrowness of the Category 1, 2, and 3 zones on the Sarasota coast, most evacuees from these types of hurricanes can go inland to friend's/relative's homes, or hotel/motel rooms. Public shelter capacity is most likely to become severely stressed only in storms of Category 3 or greater. However, this statement assumes that evacuees from other counties (into Sarasota County shelters) are light. If large numbers of non-residents required sheltering in Sarasota County, then the shelter capacity of the County might quickly prove inadequate.

The only "non-public" shelter space which can be accurately assessed is that in hotel/motel rooms. This space can be

estimated from Table 2. In Sarasota County, there are an estimated 3,697 hotel/motel rooms. The greatest portion (38.2%) of the rooms are located on the shoreline or are in the Category 1 storm surge zone. This leaves 2,285 units available in a Category 1 storm. In a Category 2 storm, 1,864 units are available and in a Category 3 storm, 1,343. In Category 4 storms, only 213 units are available.

The 2,285 units, at 100% occupancy, would satisfy only 7.3% of the demand for shelter space in July and 5.7% in November for a Category 1 storm. In Category 2 storms, the availability of commercial hotel/motel space would provide shelter for 5.1% in July and 4.0% in November. In Category 3 storms, this falls to 2.8% in July and 2.3% in November. Category 4 storms less than one-half of one percent would be able to use commercial hotel/motel space as shelter.

In summary, this public and commercial hotel/motel shelter space meets this much of county evacuee needs:

Tropical Storm = 100% July, 86.0% November
Storm Category 1 = 36.6% July, 28.4% November
Storm Category 2 = 29.9% July; 23.8% November
Storm Category 3 = 21.7% July; 17.9% November
Storm Category 4 = 16.5% July; 13.9% November
Storm Category 5 = --------- N/A ----------

Without public or private commercial space available, evacuees have only the options of (a) staying with friends who are in safer areas within the county or (b) leaving the county for areas of the state expected to be less affected by the hurricane. "Friends" can only provide limited shelter space. The shelter capacity for those staying with friends decreases as the ratio of evacuees to those not affected increases.

TABLE 8
POPULATION DISPLACEMENT RATIO

CATEGORY	POPULATION				RATIO	
	DISPLACED		NOT DISPLACED			
	JULY	NOVEMBER	JULY	NOVEMBER	JULY	NOVEMBER
Tropical Storm	25,070	29,226	178,011	200,867	0.1	0.1
1	68,695	88,599	134,386	141,494	0.5	0.6
2	81,016	102,189	122,065	127,904	0.7	0.8
3	106,111	128,905	96,970	101,188	1.1	1.3
4	125,636	150,288	77,445	79,805	1.6	1.3
5	----------	----------	N/A	----------	----------	----------

Sarasota County is in an enviable position in this regard. Because of the presence of a "ridge" that roughly parallels US Highway 41, a large portion of the population will not be displaced in a Category 1 through 3 hurricane. Only in Category 5 storms does displacement become a problem. In a Category 5 storm, only 3.9% will find shelter available with friends.

Irrespective of the above displacement figures, there is a shortage of shelter space in the County. The shelter satisfaction within the County is summarized in Table 9 below.

TABLE 9
SHELTER SATISFACTION WITHIN THE COUNTY

Storm Category	Percent Met July	Percent Met November
Tropical Storm	100.0	99.0
1	49.6	41.4
2	42.9	36.8
3	33.4	27.9
4	24.6	20.7
5	------ N/A -------	

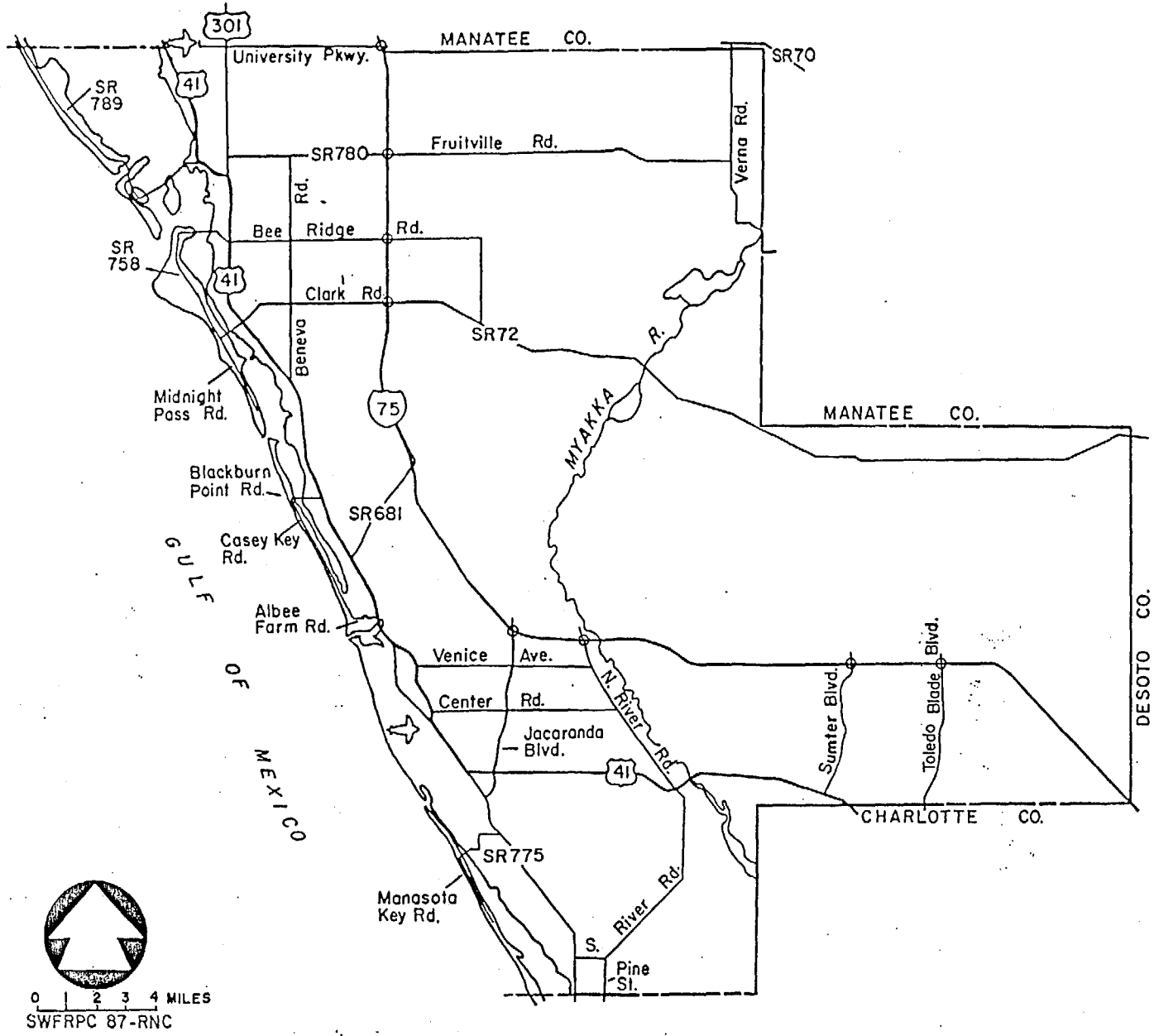
Without being able to meet shelter needs in the County, an outside resource is required. That leaves only alternative (b), leaving the county, as a viable course of action. For this reason, a knowledge of routes and route capacities is essential.

Routes

Arterial roadways form the backbone of any hurricane evacuation effort. Sarasota County's roadway system provides many options for evacuees coming from the coast. While there may be some difficulty in evacuating the barrier islands, the County's narrow flood zones lessen the problem of widespread coastal evacuations. County evacuation routes are shown in Map 5. Identification of routes is the first step in assessing the roadway system. The next step is assessing roadway capacities. The capacities of these roadways have been developed based on their characteristics, tied to the assessment methodologies of the Highway Capacity Manual, 1985. These capacities are contained in Table 10.

An important aspect of any route is its condition. Many routes along the shore are low lying. Their propensity to flood due to surge or tidal action causes their reliability to operate as a route to cease several hours before storm landfall. Appendix 1 depicts these possibilities. In most cases, however, winds, not shoreline flooding, will initially make roads unsafe for travel.

Rainfall flooding, however, may constitute a greater hazard to evacuation route operation than either early shoreline flooding or early winds. This is because roadways may flood and become partially or totally impassible early in an evacuation. Such areas have been documented for different storms and are depicted on Map 6. These are areas that must be passed before the presupposed onset of heavy rains, which is eight hours before eye landfall. This is relevant for Category 1 storms for most areas of Sarasota County and for fewer areas for Category 2 or greater storms.



MAP 5
SARASOTA COUNTY
EVACUATION ROUTES

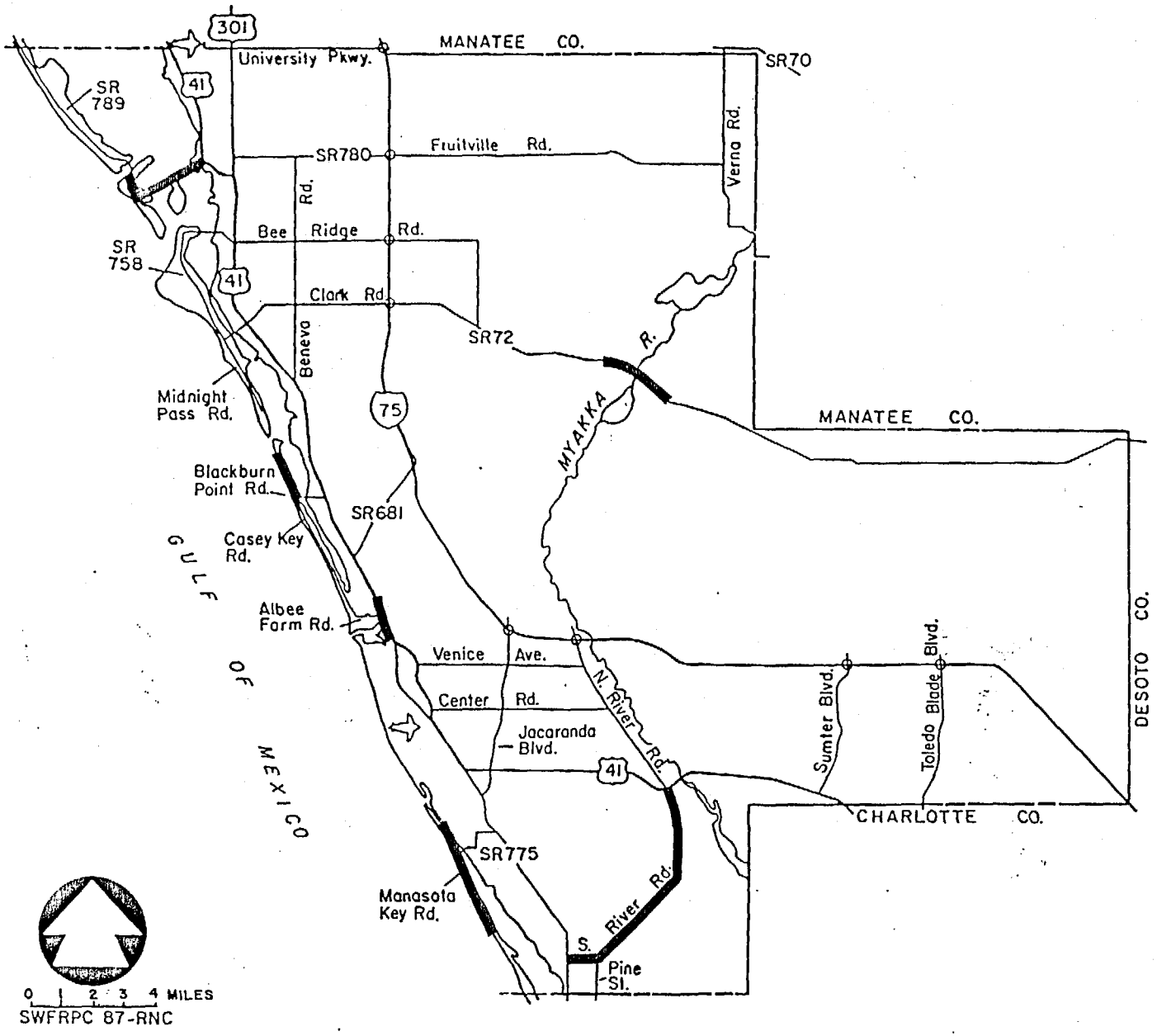
TABLE 10
EVACUATION ROUTE CAPACITY CALCULATIONS
SARASOTA COUNTY

ROUTE	# OF LANES	LANE WIDTH (FT.)	DESIGN SPEED (MPH)	HIGHWAY TYPE	PER-CENT NO PASSING ZONES	MAXIMUM HRLY. FLOW/ FLOW RATE (LOS D)	TRAFFIC FLOW SPLIT 50/50	70/30	90/10
I-75									
Manatee Co. to SR 681 (Venice Connector)	6	12	70	Freeway	--	3,647			
SR 681 (Venice Connector) to Charlotte Co.	4	12	70	Freeway	--	2,432			
SR 681 (Venice Connector I-75 to US 41	4	12	70	Freeway	--	2,491			
US 41									
Manatee Co. to US 301	4	12	60	Sub.Div.	--	1,828			
US 301 to Proctor Rd.	6	12	60	Sub.Div.	--	2,742			
Proctor Rd. to SR 775	4	12	70	Sub.Div.	--	1,997			
SR 775 to Charlotte Co.	4	12	70	Rur.Div.	--	2,317			
US 301									
Manatee Co. to 17th St.	4	12	70	Sub.Div.	--	2,135			
17th St. to US 41	4	12	50	Sub.Div.	--	1,687			
SR 39 (Toledo Blade Blvd.)									
I-75 to Charlotte Co.	2	12	60	--	80	1,162	775	965	1,045
SR 789									
Manatee Co. to St. Armands Key	2	12	50	--	100	1,535	768	956	1,036
St. Armands Key to US 41	4	12	50	Sub.Div.	--	1,786			
SR 780 (Fruitville Road)									
US 301 to I-75	2	12	60	--	90	1,248	751	936	1,014
San Carlos Blvd. to Summerlin Rd.	4	12	60	Sub.Div.	--	1,941			

TABLE 10 (CONTINUED)
EVACUATION ROUTE CAPACITY CALCULATIONS
SARASOTA COUNTY

ROUTE	# OF LANES	LANE WIDTH (FT.)	DESIGN SPEED (MPH)	HIGHWAY TYPE	PER-CENT NO PASSING ZONES	MAXIMUM HRLY. FLOW/ FLOW RATE (LOS D)	TRAFFIC FLOW SPLIT 50/50	70/30	90/10
SR 775									
US 41 to Charlotte Co.	2	12	60	--	100	1,325	744	927	1,004
SR 777 (South River Rd.)									
US 41 to SR 775	2	12	60	--	80	1,045	697	868	940
SR 72 (Clark Road)									
US 41 to I-75	2	12	60	--	90	1,371	770	960	1,040
I-75 to Myakka River	2	12	60	--	80	1,343	754	940	1,018
Myakka River to Desoto Co.	2	9	60	--	80	913	513	639	692
SR 758									
Stickney Point Rd. to US 41	2	12	50	--	100	1,489	745	927	1,005

NOTE: The Peak Hour Factor was assumed to be .95 and the Driver Population Factor was assumed to be .75 in ALL cases



MAP 6
SARASOTA COUNTY
ROUTES SUBJECT TO RAINFALL FLOODING

Clearance Times

There are several factors involved in calculating community clearance time. The first is the nature of the threat. Although there are no assurances that the County cannot be struck by Category 4 and 5 storms, the probabilities of this are low. The County does, however, lie subject to Storms of Category 1, 2, and 3 strength in decreasing probability. With each storm of increasing strength, the number of persons and vehicles also increases.

Other factors contributing to clearance time are the number of vehicles evacuating and the capacity of roadways to carry evacuees. This translates into a number of hours it will take to move persons past any given point.

The final factors are the number and distance of "stopping" opportunities offered evacuees, and the distance to these opportunities. If stopping opportunities are only ten miles inland, the time is much less for an evacuation than if they are 100 miles distant.

These factors compose the evacuation time. For certain communities within the County, times are less than for others. This variation is because pre-landfall flood conditions are not as bad, shelter locations are closer, and better quality evacuation routes are available. Table 11 summarizes pre-landfall flood conditions, Table 12 summarizes shelter distances and options, and Table 13 summarizes the time it takes to clear the most restrictive point on the route for each community for each of the slow, intermediate, and quick responses.

TABLE 11
PRE-LANDFALL FLOOD CONDITIONS

COMMUNITY	CATEGORY	TIME TO COASTAL FLOOD	RAINFALL	WIND
Longboat Key	1	6.0	8	5.5
Siesta Key	1	6.0	8	5.5
Casey Key	1	6.0	8	5.5
Myakka Flood-plain	1	-	8	5.5
Inland	1	-	8	5.5
Myakka Flood-plain	2	-	8	6.5
Inland	2	-	8	6.5
Myakka Flood-plain	3	-	8	8.0
North Port	3	-	8	8.0
Inland	3	-	8	7.3

TABLE 12
SHELTER DESIGNATIONS AND OPTIONS

CATEGORY	ZONE	PUBLIC SHELTERS NAME	ESTIMATED TRAVEL TIME
1	Longboat Key	First Christian Church	0.3 hr.
		Sarasota High School	0.3 hr.
		Sarasota Middle School	0.4 hr.
		Sarasota Family YMCA	0.4 hr.
		Concordia Lutheran Church	0.3 hr.
		VFW Post #3233	0.3 hr.
1	Siesta Key	Ashton Mennonite Church	0.1 hr.
		Gulf Gate Elementary	0.2 hr.
1	Casey Key	VFW #8118	0.3 hr.
		Christ United Methodist Church	0.3 hr.
		Venice United Church of Church	0.3 hr.
		Venice Area Middle School	0.4 hr.
		Gulf Gate Elementary	0.4 hr.
		Ashton Mennonite Church	0.4 hr.
1	Myakka Floodplain	North Port Elementary	0.1 hr.
		Venice Area Middle School	0.3 hr.
		Trinity United Presbyterian Church	0.3 hr.
1	Inland	All Shelters	<0.2 hr.
2	Myakka Floodplain	North Port Elementary	0.1 hr.
		Trinity United Presbyterian Church	0.3 hr.
		Venice Area Middle School	0.2 hr.
2	Inland	All Shelters	<0.2 hr.
3	Myakka Floodplain	North Port Elementary	0.1 hr.
		Trinity United Presbyterian	0.1 hr.
		Venice Area Middle School	0.4 hr.
3	North Port	North Port Elementary	0.4 hr.
3	Inland	All Shelters except First Christian Church	<0.2 hr.

As this table shows, US 41 ends up being a restricting route for more than one zone. Times for zones feeding into US 41 will thus become cumulative. Such a restricting point is called an ultimate constricting point (see Table 14). Such an accumulation of times creates a "greatest time to clear" for each category storm. For Sarasota County, however, out-of-county and shelter-bound vehicles from the south county will be assumed to have left

TABLE 13
TIME TO CLEAR

CATEGORY	ZONE	RESTRICTING POINT	JULY SLOW	JULY INTER-MEDIATE	JULY QUICK	NOVEMBER SLOW	NOVEMBER INTER-MEDIATE	NOVEMBER QUICK	TO COUNTY LINE
1	Longboat Key	SR 789	7.4	6.0	5.5	8.7	7.0	6.5	0.5
1	Siesta Key	SR 758	7.7	6.2	5.7	9.1	7.3	6.7	0.9
1	Casey Key	Blackburn Pt. Rd.	1.4	1.1	1.1	1.6	1.3	1.2	0.8
1	Manasota Key	Manasota Key Road	0.5	0.4	0.4	0.5	0.4	0.4	1.1
1	Myakka Flood-plain	US 41	-	1.4	-	-	1.8	-	1.3
1	Englewood Bayfront	SR 775	2.1	1.7	1.5	2.7	2.2	2.0	1.0
1	Venice/Osprey	US 41	-	1.8	-	-	1.9	-	0.8
1	Sarasota Bayfront	US 41	-	3.3	-	-	3.7	-	0.4
2	Myakka Flood-plain	US 41	-	0.9	-	-	0.9	-	1.2
2	Inland	US 41	-	4.2	-	-	6.0	-	0.9
3	South Myakka plain	SR 777	1.8	1.4	1.3	2.1	1.7	1.6	1.4
3	North Port	Sumter Road	4.2	3.4	3.1	4.2	3.7	3.4	1.5
3	Inland	I-75	-	2.6	-	-	3.1	-	1.0

US 41 before traffic enters the City of Sarasota. However. even with such an assumption, US 41 remains the ultimate constricting route.

TABLE 14
ULTIMATE CONSTRICTING ROUTE

CATEGORY	CONSTRICTING ROUTE	TIME					
		JULY			NOVEMBER		
		SLOW	INTER-MEDIATE	QUICK	SLOW	INTER-MEDIATE	QUICK
Tropical Storm	SR 758	7.7	6.2	5.7	9.1	7.3	6.7
1	SR 758	7.7	6.2	5.7	9.1	7.3	6.7
2	US 41	-	8.1	-	-	10.0	-
3	US 41	-	8.1	-	-	10.0	-

The large times required on US-41 for a Category 3 hurricane could perhaps be lessened by a third north-south road through the county. Of course, the possibility exists that improved traffic control during the evacuation would better distribute loadings. If that is the case, the ultimate constricting points become the sum of the routes exiting the County. Table 15 depicts times that may occur, given different routing scenarios.

The last factor to be incorporated into calculating the County clearance time is the response of potential evacuees to an evacuation order. The original 1981-82 Regional Hurricane Evacuation Plan discussed this topic on page 125, and concluded that seven hours would be the minimum time needed to clear a zone, because some evacuees would dawdle more than others. More recent history indicates that sudden or dramatic changes in hurricanes can heighten the evacuees response into a "quick" evacuation, limited basically by road capacity. Consequently, in evaluating the final criteria that determines a slow, intermediate, or quick evacuation, both slow and intermediate zones will have a minimum response time of seven hours; "quick" times, however, will be limited only by roadway capacity. All of these factors combine to create a countywide clearance time. This time will vary depending upon the routes available for out of county evacuation, the time of season, and whether it is a slow, intermediate, or quick response. Table 16 summarizes the contribution to the greatest clearance time for the County for each category storm.

The clearance time for the County as a whole for Category 3 storms will increase if out-of-county evacuation is limited solely to I-75 (north). If more routes are provided, the time may lessen. This, of course depends upon the impact on the other evacuating counties.

TABLE 15
COUNTY EXITING ROUTES

CATEGORY	TOTAL VEHICLES LEAVING CO.	% OF TOTAL COUNTY VEHICLES	ROUTES	COMBINED CAPACITIES	TIMES JULY	TIMES NOVEMBER
Tropical Storm	0(J) 146(N)	0 (J) 1 (N)				
1(a)	17,311(J) 25,959(N)	50.4(J) 58.6(N)	I-75	3,647	4.7	7.1
1(b)			US 41 & I-75	5,475	3.2	4.7
2(a)	23,130(J) 31,780(N)	57.1(J) 62.2(N)	same as 1(a)		6.3	8.7
2(b)			same as 1(b)		4.2	5.8
3(a)	35,335(J) 46,470(N)	66.6(J) 72.1(N)	same as 1(a)		9.7	12.7
3(b)			same as 1(b)		6.4	8.5
3(c)			US 41, US 301, and I-75	7,162	4.9	6.5

TABLE 16
TOTAL EVACUATION TIME

CATEGORY	CLEARANCE TIME SLOW	CLEARANCE TIME INTER-MEDIATE	CLEARANCE TIME QUICK	DESTINATION(1)	WEATHER(2)	SUMMARY SLOW	SUMMARY INTER-MEDIATE	SUMMARY QUICK
1	7.7(J) 9.1(N)	6.2(J) 7.3(N)	5.7(J) 6.7(N)	1.3	8	17.0(J) 18.4(N)	15.5(J) 16.6(N)	15.0(J) 16.0(N)
2	8.1(J) 10.0(N)	8.1(J) 10.0(N)	8.1(J) 10.0(N)	1.2	8	17.3(J) 19.2(N)	17.3(J) 19.2(N)	17.3(J) 19.2(N)
3	8.1(J) 10.0(N)	8.1(J) 10.0(N)	8.1(J) 10.0(N)	1.5	8	17.6(J) 19.5(N)	17.6(J) 19.5(N)	17.6(J) 19.5(N)

(1) From Table 12 or 13, whichever is greater.

(2) From Table 11

PART II - 1991 FORECASTS

Units, Population, and Vehicles

Part of hurricane preparedness involves understanding and evaluating the growth that is expected in the forthcoming years. This element discusses short ranged growth (4 years) the area may undergo, and the facilities that are expected to be added to serve it.

The growth predicted follows a single straight-line forecast technique. Expected increases by category and community for housing, persons, and vehicles for 1991 are depicted in Tables 17, 18, and 19.

Table 17 forecasts a total of 154,578 dwelling units for 1991.

Table 18 forecasts a total of 247,144 persons in July; and 280,003 in November.

Table 19 forecasts a total of 123,578 vehicles in July; and 140,009 in November.

TABLE 17
SARASOTA COUNTY - HOUSING ESTIMATE FOR 1991
(Based upon 143,545 projected Housing Units)

Storm Category	Zone	Residential Single-Family	Mobile Home	Recreational Vehicle	Apartment	Condo	Duplex	Hotel-Motel	Total
1	Longboat Key	1,978	348	N/P*	129	6,552	76	1,379	10,462
1	Siesta Key	1,873	N/P	N/P	970	7,533	2	110	10,488
1	Casey Key	463	N/P	N/P	178	514	N/P	32	1,187
1	Manasota Key	316	N/P	N/P	55	1	N/P	N/P	372
1	Myakka Floodplain	2,364	2,815	N/P	133	N/P	N/P	N/P	5,312
1	Englewood Bayfront	978	1,459	1	97	112	2	35	2,684
1	Venice/Osprey	3,673	275	6	147	371	5	79	4,556
1	Sarasota Bayfront	3,889	406	N/P	615	4,558	N/P	82	9,556
TOTALS	FLOOD ZONE 1	15,534	5,303	7	2,324	19,641	85	1,717	44,611
2	Myakka Floodplain	2,314	N/P	N/P	160	N/P	N/P	89	2,563
2	Inland	986	9,372	131	951	4,149	497	424	16,510
TOTALS	FLOOD ZONE 2	3,300	9,372	131	1,111	4,149	497	513	19,073
3	South Myakka	523	240	N/P	16	1,455	N/P	N/P	2,234
3	North Port	3,221	1,053	N/P	43	11	N/P	N/P	4,328
3	Inland	4,751	2,655	518	794	6,145	635	634	16,132
TOTALS	FLOOD ZONE 3	8,495	3,948	518	853	7,611	635	634	22,694
4	FLOOD ZONE 4	7,876	1,861	2	1,389	3,227	183	1,375	15,913
5	FLOOD ZONE 5	38,722	2,924	1,389	1,974	5,765	1,254	259	52,287
GRAND TOTALS	ALL ZONES	73,927	23,408	2,047	7,651	40,393	2,654	4,498	154,478

* No Projection

TABLE 18
SARASOTA COUNTY POPULATION ESTIMATES FOR 1991

CATEGORY	ZONE	JULY	RECREATIONAL VEHICLE	NOVEMBER	RECREATIONAL VEHICLE
1	Longboat Key	13,854	329	16,310	574
	Siesta Key	14,037	N/P*	16,426	N/P
	Casey Key	1,867	N/P	2,059	N/P
	Manasota Key	753	N/P	770	N/P
	Myakka Floodplain	7,861	2,663	9,918	4,645
	Englewood Bayfront	3,768	1,381	4,875	2,408
	Venice/Osprey	8,766	262	9,191	459
	Sarasota Bayfront	14,756	384	16,556	669
	Subtotal	65,662		76,105	
	Mobile Homes 2-5	17,936		31,711	
	TOTAL	83,598		107,816	
2	Myakka Floodplain	5,239	N/P	5,336	N/P
	Inland	18,674	8,918	26,783	15,581
	NEW EVACUEES	14,995		16,538	
	TOTAL 1 - 2	98,593		124,354	
3	South Myakka	2,990	227	3,586	396
	North Port	7,877	996	8,700	1,737
	Inland	22,963	2,717	27,206	4,847
	NEW EVACUEES	29,890		32,512	
	TOTAL 1 - 3	128,483		156,866	
4	Zone 4	26,177	1,762	29,094	3,072
	NEW EVACUEES	24,415		26,022	
	TOTAL 1 - 4	152,898		182,888	
5	Zone 5	97,562	3,316	103,193	6,078
	NEW EVACUEES	94,246		97,115	
	TOTALS 1 - 5	247,144		280,003	

* No Projection

TABLE 19
MOTOR VEHICLE ESTIMATES FOR 1991

Zone	Name	July	Recreational Vehicle	November	Recreational Vehicle
1	Longboat Key	6,928	N/P*	8,157	N/P
	Siesta Key	7,018	N/P	8,212	N/P
	Casey Key	933	N/P	1,031	N/P
	Myakka Floodplain	3,930	N/P	385	N/P
	Englewood Bayfront	1,885	1	2,437	1
	Venice/Osprey	4,383	1	4,596	3
	Sarasota Bayfront	7,379	N/P	8,279	N/P
2	Myakka Floodplain	2,620	N/P	2,658	N/P
	Inland	9,337	26	13,393	59
3	South Myakka	1,500	N/P	1,794	N/P
	North Port	3,938	N/P	4,351	N/P
	Inland	11,482	103	13,603	234
4	Zone 4	13,088	1	14,548	1
5	Zone 5	48,780	275	51,597	626

Additional Facilities

The additional facilities expected can be categorized as "shelters" and "routes." Regretfully, future shelter site and capacity information has not yet been exactly determined. Route improvements, however, are better known.

The Sarasota County school board expects growth in school facilities to keep up with population growth. Two new elementary schools and a middle school are expected to be built by 1991. In addition, a number of existing schools are likely to undergo expansion. All planned expansion and new facilities are expected to be in Category 3 zones or further inland. Thus, they will add to shelter facilities in any likely storm scenario.

Table 20 shows expected shelter capacities for 1991. However, new shelter growth (10%) does not match forecasted population growth (21%). Consequently, conditions will worsen regarding shelters with the exception of tropical storm (less than 1) conditions, where the increase in shelter space should rouse new barrier island residents.

TABLE 20
1991 PUBLIC SHELTER CAPACITY

STORM CATEGORY	SHELTER SPACE	EVACUATING POPULATION JULY	EVACUATING POPULATION NOVEMBER	% POPULATION SHELTERED JULY	% POPULATION SHELTERED NOVEMBER
Tropical Storm	22,174	30,511	35,565	72.7	62.4
1	22,174	83,598	107,816	26.5	20.6
2	22,174	98,593	124,354	22.5	17.8
3	22,174	128,483	156,866	17.3	14.1
4	22,174	152,898	182,888	14.5	12.1
5	----------	----------	N/A	----------	----------

TABLE 21
POPULATION DISPLACEMENT RATIO

STORM CATEGORY	DISPLACED JULY	DISPLACED NOVEMBER	NOT DISPLACED JULY	NOT DISPLACED NOVEMBER	RATIO JULY	RATIO NOVEMBER
Tropical Storm	30,511	35,565	216,633	244,438	0.1	0.1
1	83,598	107,816	163,546	172,187	0.5	0.6
2	98,593	124,354	148,551	155,649	0.7	0.8
3	128,483	156,866	118,661	123,137	1.1	1.3
4	152,898	182,888	94,246	97,115	1.6	1.9
5	----------	----------	N/A	----------	----------	----------

Route improvements for the next five-year period indicate substantial improvements and expansions will be made to routes leading to I-75. This will probably speed evacuation, particularly in the South Venice area. Using the Sarasota County

Capital Improvements Program (1983) as a guide, the following significant improvements are forecast:

(a) Jacaranda - add 2 lanes to existing 2 lanes - Major Arterial
Venice to Center
(b) Manasota Beach - Resurface and widen 4 feet - Collector
Bridge to SR 775
(c) Lockwood Ridge - Construct 4 lanes - Major Arterial
Myrtle to University Parkway
(d) Old Myakka - Resurface and widen 2 feet - Minor Arterial
Fruitville Road to North County Line
(e) University Parkway - Add 2 lanes to existing 2 lanes -
Major Arterial US 301 to I-75

Whereas the exact capacities of these new improvements cannot be calculated at this time, an estimate can be made. Table 22 provides a revision of the previously provided in Table 10 to represent 1991 conditions.

TABLE 22
REVISED CAPACITIES

ROUTE	NEW CAPACITY	OLD CAPACITY
Jacaranda Boulevard, Venice Avenue - Center Road	2,113	996 (quick)
Manasota Beach Road, SR 775 - County Line	1,044 (quick)	877 (quick)
Lockwood Ridge, Myrtle - University Parkway	1,607	new route
Old Myakka Road, Fruitville - County line	989 (quick)	new route
University Parkway, US 301 - I-75	2,178	1,032 (quick)

Improvements on Lockwood Ridge Road will cause it to connect with Beneva, via Twelfth Street, and thus form a potential evacuation route. Not shown are improvements on I-75, through Sarasota County, which are likely to increase its capacity to some degree.

Assuming that these improvements are in place, new shelter satisfaction capacities (Table 23), time to clear (Table 24), ultimate constricting route (Table 25), exiting route assessments (Table 26), and clearance time calculations (Table 27) can be made.

TABLE 23
SHELTER SATISFACTION, 1991

CATEGORY	PERCENT MET JULY	PERCENT MET NOVEMBER
Tropical Storm	92.5	90.8
1	46.8	39.3
2	40.6	34.9
3	31.8	26.4
4	23.1	19.4
5	------ N/A ----	

Because all of its shelters are located in Category 3 zones for further inland, it is the only county in the Region to show an increase in shelter satisfaction. This is helped by the availability of hotel/motel rooms in the higher storm categories, and the narrowness of the flood areas in most of the county.

It can be seen that the new routes, described in Table 22, do not affect clearance times directly. However, it should be noted that these routes do affect times to the County line. In this regard, the greatest affect is achieved by University Boulevard, and the Lockwood Ridge-Beneva Corridor.

TABLE 24
TIME TO CLEAR 1991

CATEGORY	ZONE	RESTRICTING POINT	JULY SLOW	JULY INTER-MEDIATE	JULY QUICK	NOVEMBER SLOW	NOVEMBER INTER-MEDIATE	NOVEMBER QUICK
1	Longboat Key	SR 789	9.0	7.3	6.7	10.6	8.5	7.9
1	Siesta Key	SR 758	9.4	7.5	6.9	11.1	8.9	8.2
1	Casey Key	Blackburn Pt. Rd.	1.7	1.3	1.2	1.9	1.6	1.5
1	Myakka Flood-plain	US 41	-	1.7	-	-	2.2	-
1	Engelwood Bayfront	SR 775	2.6	2.1	1.8	3.3	2.7	2.4
1	Venice/Osprey	US 41	-	2.2	-	-	2.3	-
1	Sarasota/ Bayfront	US 41	-	4.1	-	-	4.5	-
2	Myakka Flood-plain	US 41	-	1.1	-	-	1.1	-
2	Inland	US 41	-	5.1	-	-	7.3	-
3	South Myakka	SR 777	2.2	1.7	1.6	2.6	2.1	1.9
3	North Port	Sumter Road	5.1	4.1	3.8	5.1	4.5	4.1
3	Inland	I-75	-	3.2	-	-	3.8	-

TABLE 25
ULTIMATE CONSTRICTING ROUTE FOR 1991

CATEGORY	CONSTRICTING ROUTE	JULY SLOW	JULY INTER-MEDIATE	JULY QUICK	NOVEMBER SLOW	NOVEMBER INTER-MEDIATE	NOVEMBER QUICK
Tropical Storm	SR 758	9.4	7.5	6.9	11.1	8.9	8.2
1	SR 758	9.4	7.5	6.9	11.0	8.9	8.2
2	US 41	-	9.8	-	-	12.1	-
3	US 41	-	9.8	-	-	12.1	-

Table 25 shows that the county's ultimate constricting route times for (1991) has increased over current estimated times. A third north-south road through the county would certainly decrease these times. Such a road, Honore' Avenue, is planned for the 1990's, but is not expected to be in place by 1991.

Tables 26 and 27 indicate that both the County exiting route times and the total evacuation times for 1991 can be expected to increase. This can be prevented through more shelters in the County. The critical conditions, however, exist primarily for Category 2 and 3 storms, and not so severely for Category 1 storms.

TABLE 26
COUNTY EXITING ROUTES

CATEGORY	TOTAL VEHICLES LEAVING CO.	% OF TOTAL COUNTY VEHICLES	ROUTES	COMBINED CAPACITIES	TIMES JULY	TIMES NOVEMBER
Tropical Storm	1,044(J) 1,636(N)	7.5 9.2	I-75	3,647	0.3	0.4
1(a)	22,237(J) 32,722(N)	53.4 60.7	I-75	3,647	6.1	9.0
1(b)			US 41 & I-75	5,475	4.1	6.0
2(a)	29,282(J) 40,477(N)	59.4 65.1	I-75	3,647	8.0	11.1
2(b)			US 41 & I-75	5,475	5.3	7.4
3(a)	43,812(J) 57,727(N)	68.2 73.6	I-75	3,647	12.0	15.8
3(b)			US 41 & I-75	5,475	8.0	10.5
3(c)			US 41, US 301 and I-75	7,162	6.1	8.1

TABLE 27
TOTAL EVACUATION TIME FOR 1991

CATEGORY	CLEARANCE TIME SLOW	CLEARANCE TIME INTER-MEDIATE	CLEARANCE TIME QUICK	DESTINATION(1)	WEATHER(2)	SUMMARY SLOW	SUMMARY INTER-MEDIATE	SUMMARY QUICK
Tropical Storm	9.4(J) 11.1(N)	7.5(J) 8.9(N)	6.9(J) 8.2(N)	1.0	8	18.4(J) 20.1(N)	16.5(J) 17.9(N)	15.9(J) 17.2(N)
1	9.4(J) 11.1(N)	7.5(J) 8.9(N)	6.9(J) 8.2(N)	1.0	8	18.4(J) 20.1(N)	16.5(J) 17.9(N)	15.9(J) 14.2(N)
2	9.8(J) 12.1(N)	9.8(J) 12.1(N)	9.8(J) 12.1(N)	1.0	8	18.8(J) 21.1(N)	18.8(J) 21.1(N)	18.8(J) 21.1(N)
3	9.8(J) 12.1(N)	9.8(J) 12.1(N)	9.8(J) 12.1(N)	1.0	8	18.8(J) 21.1(N)	18.8(J) 21.1(N)	18.8(J) 21.1(N)

(1) From Table 25.

(2) From Table 12.

SARASOTA COUNTY
APPENDIX 1 - PRE-EYE LANDFALL HAZARDS TIMES

The pre-eye landfall hazard times projected by the SLOSH model appear in the following table. The table consists of the estimated times for each selected grid point, by storm category (1-5) and type of storm track (landfalling, parallel and crossing). In all cases, the worst probably times are used. The table is divided into 50 parts, for category 1 through 5 respectively. The first column names the grid point being examined, followed by the projected time, in hours before estimated eye landfall, that tidal flooding would reach that point. This time estimate is followed by a code "identifying the particular storm track producing this worst probably (longest) time. These coded storm tracks are fully described in Table 1, giving the track's landfall point and the area receiving the maximum surge and/or winds. The next column, "Total Duration in Hours" lists the length of time the grid point is projected to experience one foot or more of flooding in a 24-hour period.

Following these figures, the next column lists the projected time, in hours before estimated eye landfall, that sustained gale force winds would reach the grid point. Again, this is followed by the coded storm track producing the worst probable (longest) times, and the duration each point is expected to experience the wind force during a 24-hour period. Note that "sustained gale force winds" regers to winds sustained at over 40 mph. In all cases, eye landfall is the reference point used to determine pre-eye landfall hazard times.

APPENDIX 1

PRE-EYE LANDFALL HAZARD TIMES - CATEGORY 1

LANDFALLING

GRID STORM POINTS	HOURS BEFORE EYE LANDFALL-FLOODING(1)	STORM TRACK	TOTAL DURATION IN HOURS	HOURS BEFORE EYE LANDFALL-SUSTAINED GALE FORCE WINDS(2)	STORM TRACK	TOTAL DURATION IN HOURS
Englewood				5.5	(60 NS)	8.5
Buchanan Airport				5.5	(70 NS)	8.5
Manasota				5.5	(60 NS)	9
Venice Grove				5.5	(75 NS)	8.5
Venice Airport				5.5	(75 NS)	8.5
Venice				5	(60 NS)	9
Venice Beach	6	(75 NS)	10	5.5	(75 NS)	8.5
Longboat Key				5.5	(95 NS)	8.5
Sarasota				5.5	(95 NS)	8.5
Bay Island				5.5	(95 NS)	8.5

LANDFALLING

PRE-EYE LANDFALL HAZARD TIMES - CATEGORY 2

GRID STORM POINTS	HOURS BEFORE EYE LANDFALL-FLOODING(1)	STORM TRACK	TOTAL DURATION IN HOURS	HOURS BEFORE EYE LANDFALL-SUSTAINED GALE FORCE WINDS(2)	STORM TRACK	TOTAL DURATION IN HOURS
Englewood				6.5	(65 NS)	10
Buchanan Airport				6.5	(70 NS)	10
Manasota	1.5	(75 NS)	2.5	6.5	(65 NS)	10.5
Venice Grove				6.5	(75 NS)	10
Venice Airport				6.5	(75 NS)	10.
Venice	0	(75 NS)	2	6.5	(75 NS)	10.
Venice Beach	6.5	(75 NS)	14	6.5	(75 NS)	10
Longboat Key	0.5	(95 NS)	3	6.0	(95 NS)	10.
Sarasota	1.0	(95 NS)	3	6.0	(90 NS)	10
Bay Island	1.0	(95 NS)	2.5	6.5	(95 NS)	10.5

(1) Greatest time before landfall - not necessarily for worst case storm; some tracks cause early flooding even though they may not produce highest surge - if more than 1 track produces same time, the one with the worse surge then chosen.

(2) Greatest time before landfall - same is true for winds as above for flooding.

LANDFALLING

PRE-EYE LANDFALL HAZARD TIMES - CATEGORY 3

GRID STORM POINTS	HOURS BEFORE EYE LANDFALL-FLOODING(1)	STORM TRACK	TOTAL DURATION IN HOURS	HOURS BEFORE EYE LANDFALL-SUSTAINED GALE FORCE WINDS(2)	STORM TRACK	TOTAL DURATION IN HOURS
Englewood				8	(60 NS)	13.5
Buchanan Airport				8	(60 NS)	13.5
Manasota	3	(75 NS)	5.5	8	(70 NS)	13
Venice Grove				8	(70 NS)	13
Venice Airport				8	(75 NS)	13
Venice	1.5	(75 NS)	4	8	(75 NS)	13.5
Venice Beach	7	(75 NS)	16	8	(75 NS)	13.5
Longboat Key	2	(95 NS)	4	8	(95 NS)	13.5
Sarasota	2	(95 NS)	5	8.5	(95 NS)	14
Bay Island	2	(95 NS)	4.5	8.5	(95 NS)	14

LANDFALLING

PRE-EYE LANDFALL HAZARD TIMES - CATEGORY 4

GRID STORM POINTS	HOURS BEFORE EYE LANDFALL-FLOODING(1)	STORM TRACK	TOTAL DURATION IN HOURS	HOURS BEFORE EYE LANDFALL-SUSTAINED GALE FORCE WINDS(2)	STORM TRACK	TOTAL DURATION IN HOURS
Englewood	1.5	(70 NS)	4	9.5	(60 NS)	15
Buchanan Airport	1.5	(70 NS)	7	9.5	(75 NS)	15
Manasota	3.5	(75 NS)	6	9.5	(70 NS)	15
Venice Grove	.5	(70 NS)	9.5	9.5	(75 NS)	15
Venice Airport	-1	(75 NS)	.5	9.5	(75 NS)	15
Venice	2	(75 NS)	5	9	(60 NS)	15
Venice Beach	- 7.5	(75 NS)	14.5	9	(60 NS)	15
Longboat Key	2.5	(95 NS)	7.5	9.5	(95 NS)	15.5
Sarasota	3	(95 NS)	8.5	9.5	(95 NS)	15.5
Bay Island	3	(95 NS)	8	9.5	(95 NS)	15.5

(1) Greatest time before landfall - not necessarily for worst case storm; some tracks cause early flooding even though they may not produce highest surge - if more than 1 track produces same time, the one with the worse surge then chosen.

(2) Greatest time before landfall - same is true for winds as above for flooding.

LANDFALLING

PRE-EYE LANDFALL HAZARD TIMES - CATEGORY 5

GRID STORM POINTS	HOURS BEFORE EYE LANDFALL-FLOODING(1)	STORM TRACK	TOTAL DURATION IN HOURS	HOURS BEFORE EYE LANDFALL-SUSTAINED GALE FORCE WINDS(2)	STORM TRACK	TOTAL DURATION IN HOURS
Englewood	1.5	(65 NS)	2.5	9	(65 NS)	13.5
Buchanan Airport	1	(60 NS)	5.5	9	(75 NS)	13.5
Manasota	3	(75 NS)	5	9	(65 NS)	14
Venice Grove	.5	(65 NS)	2.5	9	(75 NS)	13.5
Venice Airport	-1	(75 NS)	.5	8.5	(60 NS)	14
Venice	1.5	(75 NS)	3.5	8.5	(65 NS)	13.5
Venice Beach	7	(75 NS)	9.5	8.5	(70 NS)	14
Longboat Key	3	(95 NS)	5.0	10.5	(95 NS)	5.5
Sarasota	3.5	(95 NS)	6.0	10.5	(95 NS)	5.5
Bay Island	3	(95 NS)	5.5	10.5	(95 NS)	5.5

PARALLEL

PRE-EYE LANDFALL HAZARD TIMES - CATEGORY 1

GRID STORM POINTS	HOURS BEFORE EYE LANDFALL-FLOODING(1)	STORM TRACK	TOTAL DURATION IN HOURS	HOURS BEFORE EYE LANDFALL-SUSTAINED GALE FORCE WINDS(2)	STORM TRACK	TOTAL DURATION IN HOURS
Englewood				1.5	(0 S)	8.5
Buchanan Airport				1	(15 WS)	8.5
Manasota				1	(15 WS)	8.5
Venice Grove				1	(0 S)	8.5
Venice Airport				1	(0 S)	9
Venice				1	(15 ES)	8.5
Venice Beach	--4	(15 ES)	3.5	.5	(0 S)	8.5

(1) Greatest time before landfall - not necessarily for worst case storm; some tracks cause early flooding even though they may not produce highest surge - if more than 1 track produces same time, the one with the worse surge then chosen.

(2) Greatest time before landfall - same is true for winds as above for flooding.

PARALLEL

PRE-EYE LANDFALL HAZARD TIMES - CATEGORY 2

GRID STORM POINTS	HOURS BEFORE EYE LANDFALL-FLOODING(1)	STORM TRACK	TOTAL DURATION IN HOURS	HOURS BEFORE EYE LANDFALL-SUSTAINED GALE FORCE WINDS(2)	STORM TRACK	TOTAL DURATION IN HOURS
Englewood				2.5	(0 S)	10.5
Buchanan Airport				2.5	(15 ES)	10.5
Manasota				2	(0 S)	10.5
Venice Grove				2	(15 WS)	10.5
Venice Airport				1.5	(0 S)	10.5
Venice				1.5	(15 WS)	10.5
Venice Beach	-4.5	(60 WS)	7.5	1.5	(15 WS)	10.5

PARALLEL

PRE-EYE LANDFALL HAZARD TIMES - CATEGORY 3

GRID STORM POINTS	HOURS BEFORE EYE LANDFALL-FLOODING(1)	STORM TRACK	TOTAL DURATION IN HOURS	HOURS BEFORE EYE LANDFALL-SUSTAINED GALE FORCE WINDS(2)	STORM TRACK	TOTAL DURATION IN HOURS
Englewood				4.5	(0 S)	13.5
Buchanan Airport				4	(0 S)	13.5
Manasota	-5	(0 S)	1.5	4	(15 WS)	14
Venice Grove				4	(15 WS)	14
Venice Airport				3.5	(15 WS)	13.5
Venice				2	(15 WS)	13.5
Venice Beach	-4.5	(0 S)	4	2	(15 WS)	13.5

(1) Greatest time before landfall - not necessarily for worst case storm - some tracks cause early flooding even though they may not produce highest surge - if more than 1 track produces same time, the one with the worse surge then chosen.

(2) Greatest time before landfall - same is true for winds as above for flooding.

PARALLEL

PRE-EYE LANDFALL HAZARD TIMES - CATEGORY 4

GRID STORM POINTS	HOURS BEFORE EYE LANDFALL-FLOODING(1)	STORM TRACK	TOTAL DURATION IN HOURS	HOURS BEFORE EYE LANDFALL-SUSTAINED GALE FORCE WINDS(2)	STORM TRACK	TOTAL DURATIO IN HOURS
Englewood				5	(30 WS)	16.5
Buchanan Airport				4.5	(30 WS)	16
Manasota	-5.5	(30 WS)	.5	4.5	(30 WS)	16.5
Venice Grove				4.5	(30 WS)	16.5
Venice Airport				5	(30 WS)	17
Venice	-8.5	(30 WS)	1	5	(30 WS)	17
Venice Beach	-4	(60 WS)	8	5	(30 WS)	17

PARALLEL - 60 WS ONLY

PRE-EYE LANDFALL HAZARD TIMES - CATEGORY 5

GRID STORM POINTS	HOURS BEFORE EYE LANDFALL-FLOODING(1)	STORM TRACK	TOTAL DURATION IN HOURS	HOURS BEFORE EYE LANDFALL-SUSTAINED GALE FORCE WINDS(2)	STORM TRACK	TOTAL DURAT IN HOURS
Englewood				3		12
Buchanan Airport				2.5		12.5
Manasota				2.5		12.5
Venice Grove				2		12
Venice Airport				2		12
Venice				2		13
Venice Beach	-4		8	2		13

(1) Greatest time before landfall - not necessarily for worst case ~~storm,~~ some tracks cause early flooding even though they may not produce highest surge - if more than 1 track produces same time, the one with the worse surge then chosen.

(2) Greatest time before landfall - same is true for winds as above for flooding.

CROSSING

PRE-EYE LANDFALL HAZARD TIMES - CATEGORY 1

GRID STORM POINTS	HOURS BEFORE EYE LANDFALL-FLOODING(1)	STORM TRACK	TOTAL DURATION IN HOURS	HOURS BEFORE EYE LANDFALL-SUSTAINED GALE FORCE WINDS(2)	STORM TRACK	TOTAL DURATION IN HOURS
Englewood				4.5	(45 NS)	10
Buchanan Airport				4.5	(45 NS)	9.5
Manasota				4.5	(45 NS)	9.5
Venice Grove				4.5	(45 NS)	9.5
Venice Airport				4	(45 NS)	9.5
Venice				4	(45 NS)	9.5
Venice Beach	-2	(45 NS)	2.5	4	(45 NS)	9.5

CROSSING

PRE-EYE LANDFALL HAZARD TIMES - CATEGORY 2

GRID STORM POINTS	HOURS BEFORE EYE LANDFALL-FLOODING(1)	STORM TRACK	TOTAL DURATION IN HOURS	HOURS BEFORE EYE LANDFALL-SUSTAINED GALE FORCE WINDS(2)	STORM TRACK	TOTAL DURATION IN HOURS
Englewood				5.5	(30 NS)	11.5
Buchanan Airport				5	(30 NS)	11.5
Manasota				5	(30 NS)	11.5
Venice Grove				5.5	(45 NS)	11.5
Venice Airport				5	(45 NS)	11
Venice				5	(45 NS)	11
Venice Beach	-1.5	(45 NS)	8.5	4.5	(45 NS)	11.5

CROSSING

PRE-EYE LANDFALL HAZARD TIMES - CATEGORY 3

GRID STORM POINTS	HOURS BEFORE EYE LANDFALL-FLOODING(1)	STORM TRACK	TOTAL DURATION IN HOURS	HOURS BEFORE EYE LANDFALL-SUSTAINED GALE FORCE WINDS(2)	STORM TRACK	TOTAL DURATION IN HOURS
Englewood				5	(30 NS)	13
Buchanan Airport				5	(45 NS)	12
Manasota	-2.5	(45 NS)	1	5	(30 NS)	13.5
Venice Grove				5	(45 NS)	12.5
Venice Airport				5	(45 NS)	12.5
Venice				5	(45 NS)	13
Venice Beach	-1	(45 NS)	9	4.5	(45 NS)	12.5

(1) Greatest time before landfall - not necessarily for worst case storm; some tracks cause early flooding even though they may not produce highest surge - if more than 1 track produces same time, the one with the worse surge then chosen.

(2) Greatest time before landfall - same is true for winds as above for flooding.

TABLE 2
HURRICANES SIMULATED BY NUMERICAL STORM SURGE PREDICTION MODEL

MODEL	TYPE	LOCATION	CATEGORY	LANDFALL/EXITING POINT OR CLOSEST APPROACH	AREA RECEIVING MAXIMUM SURGE/WINDS
SL	L	75NS	1	Longboat Key	Venice Beach
SL	L	75NS	2	Longboat Key	Venice Beach
SL	L	75NS	3	Longboat Key	Venice Beach
SL	L	75NS	4	Longboat Key	Venice Beach
SL	L	75NS	5	Longboat Key	Venice Beach
SL	L	80NS	1	Longboat Key	Bay Island
SL	L	80NS	2	Longboat Key	Bay Island
SL	L	80NS	3	Longboat Key	Bay Island
SL	L	80NS	4	Longboat Key	Bay Island
SL	L	80NS	5	Longboat Key	Bay Island
SL	L	85NS	1	Anna Maria Key	Bay Island
SL	L	85NS	2	Anna Maria Key	Bay Island
SL	L	85NS	3	Anna Maria Key	Bay Island
SL	L	85NS	4	Anna Maria Key	Bay Island
SL	L	85NS	5	Anna Maria Key	Bay Island
SL	L	90NS	1	Tampa Bay	Bay Island
SL	L	90NS	2	Tampa Bay	Bay Island
SL	L	90NS	3	Tampa Bay	Bay Island
SL	L	90NS	4	Tampa Bay	Bay Island
SL	L	90NS	5	Tampa Bay	Bay Island
SL	L	95NS	1	Egmont Key	Sarasota
SL	L	95NS	2	Egmont Key	Sarasota
SL	L	95NS	3	Egmont Key	Sarasota
SL	L	95NS	4	Egmont Key	Sarasota
SL	L	95NS	5	Egmont Key	Sarasota
SL	L	KE	1	Egmont Key	Longboat Key
SL	L	KE	2	Egmont Key	Longboat Key
SL	L	KE	3	Egmont Key	Longboat Key
SL	L	KE	4	Egmont Key	Longboat Key
SL	L	KE	5	Egmont Key	Longboat Key

KEY:
SL - SLOSH (Sea, Lake, and Overland Surges from
L - Landfalling Hurricane
P - Paralleling Hurricane
NS - North of Sanibel Island
WS - West of Sanibel Island

TABLE 2 (Continued)
HURRICANES SIMULATED BY NUMERICAL
STORM SURGE PREDICTION MODEL

MODEL	TYPE	LOCATION	CATEGORY	LANDFALL/EXITING POINT OR CLOSEST APPROACH	AREA RECEIVING MAXIMUM SURGE/WINDS
SL	P	60WS	1	60 mi. west of Sanibel	Venice Beach
SL	P	60WS	2	60 mi. west of Sanibel	Venice Beach
SL	P	60WS	3	60 mi. west of Sanibel	Venice Beach
SL	P	60WS	4	60 mi. west of Sanibel	Venice Beach
SL	P	60WS	5	60 mi. west of Sanibel	Venice Beach

KEY:
SL - SLOSH (Sea, Lake, and Overland Surges from Hurricanes (Model)
L - Landfalling Hurricane
P - Paralleling Hurricane
KE - Egmont Key

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HENDRY COUNTY
NATURAL DISASTER PLAN (Hurricanes)

HURRICANE VULNERABILITY

The hurricane vulnerability of Hendry County has been analyzed using a numerical storm surge prediction model known as SLOSH, short for Sea, Lake, and Overland Surges from Hurricanes. In fact, the SLOSH model was first applied to Lake Okeechobee. This model is described in detail in the Regional Hurricane Evacuation Plan, 1981-82, prepared by the Southwest Florida Regional Planning Council, as well as A Storm Surge Atlas for Southwest Florida, prepared by the National Oceanic and Atmospheric Administration, Undated, @ 1983). These reports analyzed some 187 separate storms for their potential impact on Southwest Florida. Both reports provide an assessment of methodologies and provide assumptions that can act towards increasing or decreasing forecasted flood and wind conditions. However, in summary, the following assumptions can be made.

(1) Landfalling storms provide the worst flooding potential

(2) Flooding will be worse south of the eye of the hurricane

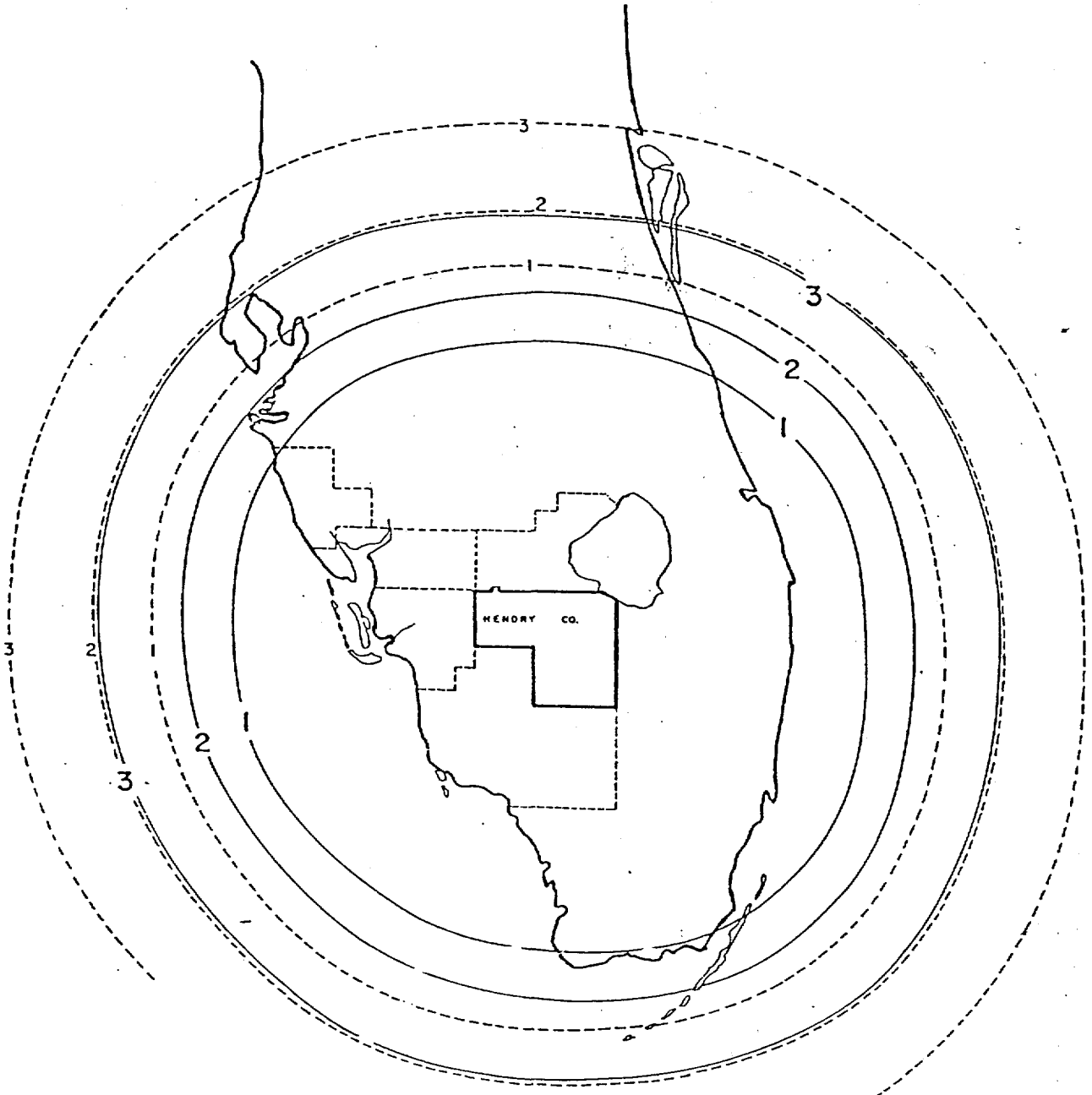
(3) Wind conditions making roads unsafe for travel will arrive well before the eye of the hurricane, and usually before flood waters inundate evacuation routes

(4) Storm landfall prediction is not an exact science. Any approaching storm has the capacity to strengthen or veer, decreasing or increasing the flooding and surge potential of the storm.

However, in the case of Hendry County, the model does not predict any flooding over the dike from Lake Okeechobee unless the lake level is over 18 feet (the preferred control level is 16 feet) and only then in a very severe hurricane. The assumption here is that if the lake is approaching 18 feet, the locks can be opened to reduce it to the desired control level of 16 feet.

The hurricane problem facing Hendry County is high winds (See Map 1). This is a problem because mobile homes are required to evacuate in all categories of hurricanes. There are more mobile home/travel trailer units in the County than any other type of dwelling unit and they contain about 30% of the population.

The County has been divided into vulnerability zones based on population, shelter locations and the transportation network. See Map 2 for the zones.



Legend

0 10 20 30 (MILES)

40 MPH SUSTAINED WIND LINE

2 HOUR WARNING LINE

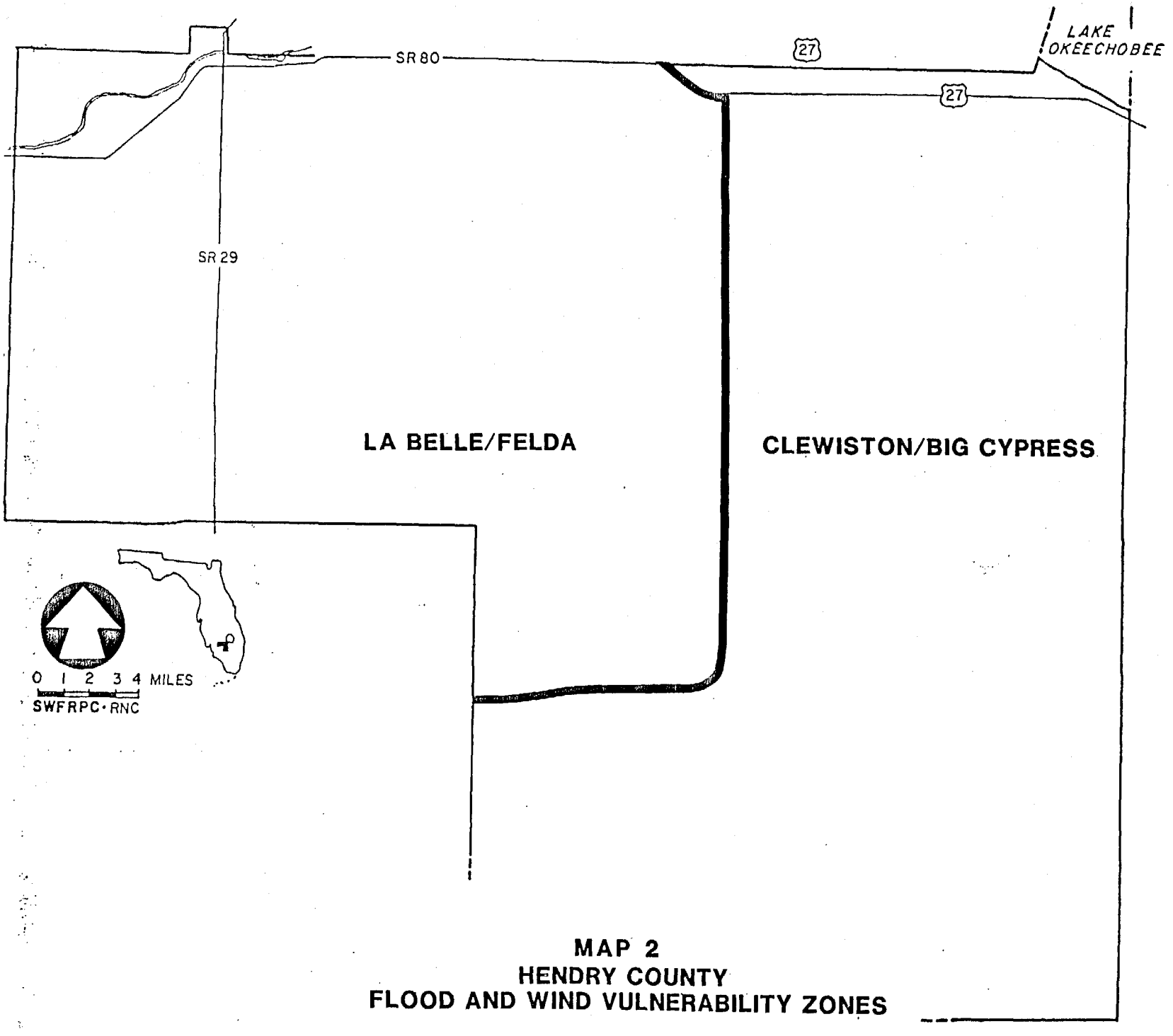
64 MILE COUNTY RADIUS - CATEGORY 1

76 - CATEGORY 2

98 - CATEGORY 3

SWFRPC
81 - RNC

MAP 1
HENDRY COUNTY
HURRICANE WIND IMPACT ZONE



MAP 2
HENDRY COUNTY
FLOOD AND WIND VULNERABILITY ZONES

Recent Storm History

Hurricane Donna was the last hurricane to affect Southwest Florida to any significant degree. At the time the hurricane hit, the County's population was 8,100, concentrated primarily in LaBelle and Clewiston.

Hurricane Floyd provided the area a scare on October 16, 1987. However, it veered due east before the County received any impacts beyond high wind gusts.

Affected Population

The first element in preparing an estimate of County population is to estimate dwelling units, and dwelling unit types. Using Planning Department information of the County, supplemented by information on RV Parks by the Division of Hotels and Restaurants, it is estimated that there are 9,747 dwellings in the county (See Table 1). This estimate includes conventional housing, mobile homes, and transitional housing such as inhabited travel trailers, and hotel and motel units.

TABLE 1
HENDRY COUNTY - HOUSING UNITS

Zone	Residential Single-Family	Mobile Home	Recreational Vehicle	Multi-Family Apt.	Multi-Family Condo	Hotel-Motel	Total
LaBelle/ Felda	2,441	1,002	884	44	0	129	4,500
Clewiston/ Big Cypress	2,631	1,574	406	362	80	194	5,247
TOTALS	5,072	2,576	1,290	406	80	323	9,747

Using the housing unit estimate, a population estimate is then made. Two additional assumptions, however, are needed: persons per household, and vacancy rate. The persons per household was estimated to be a standard 3.0 persons per household, regardless of unit. Whereas this assumption has inaccuracies, the end result probably does not differ significantly from a more detailed analysis. More detailed analysis, however, is needed to determine vacancy rates for unit type, since different unit types have different vulnerability to flood or wind hazards. Using a survey estimate used in Regional Hurricane Evacuation Plan, Appendix C, two estimates of seasonal vacancy were prepared. These are as follows:

Unit Type	Seasonal Occupancy Rates July	November
Single-Family Unit	0.95	0.96
Apartment	0.93	0.98
Condominium (Conventional)	0.51	0.64
Mobile Home	0.43	0.75
Recreational Vehicle	0.18	0.41
Motel/Hotel	0.54	0.63

Hendry County evacuating population is estimated in 1987 to average 4,987 persons in July and 8,699 persons at the start of November. This is summarized by community in Table 2.

TABLE 2
HENDRY COUNTY
EVACUATING POPULATION ESTIMATES FOR EVACUATION ZONES
ALL STORM CATEGORIES

ZONE (Mobile Homes/ Recreational Vehicles)	ESTIMATE JULY	NOVEMBER
LaBelle/Felda	2,433	4,244
Clewiston/Big Cypress	2,554	4,455
TOTAL	4,987	8,699

Motor Vehicles

Nearly all of the population affected by an oncoming hurricane will evacuate by private vehicle. The question arises over how many vehicles will be used in the evacuation. Issues relevant to this include the number of vehicles owned, whether owners would be willing to leave any vehicles behind (since next to the home, vehicles are the most expensive possession), whether all drivers feel confident to operate a vehicle in storm conditions, and whether evacuating families wish to be separated in different motor vehicles. Based on surveys, respondents indicated approximately 75% of vehicles available would be used in an evacuation. (Hurricane Evacuation Plan, 1981-82, SWFRPC). This averaged out to 1.1 vehicles per occupied unit.

Using this ratio of cars and the occupancy ratio used previously, the county potential total of vehicles used in an evacuation in July would be 1,829, and in November would be 3,189. Since the vast majority of Hendry County evacuees are mobile home residents, these figures are applicable in all categories of hurricanes. Table 3 summarizes the vehicle generation by each community.

TABLE 3
HENDRY COUNTY VEHICLE ESTIMATES OF EVACUATION FROM MOBILE HOMES/TRAVEL TRAILERS

Storm Category	Zone	July # vehicles evacuating	November # vehicles evacuating
All	LaBelle/Felda	892	1,556
	Clewiston/Big Cypress	937	1,634
	TOTAL	1,829	3,189

Shelters

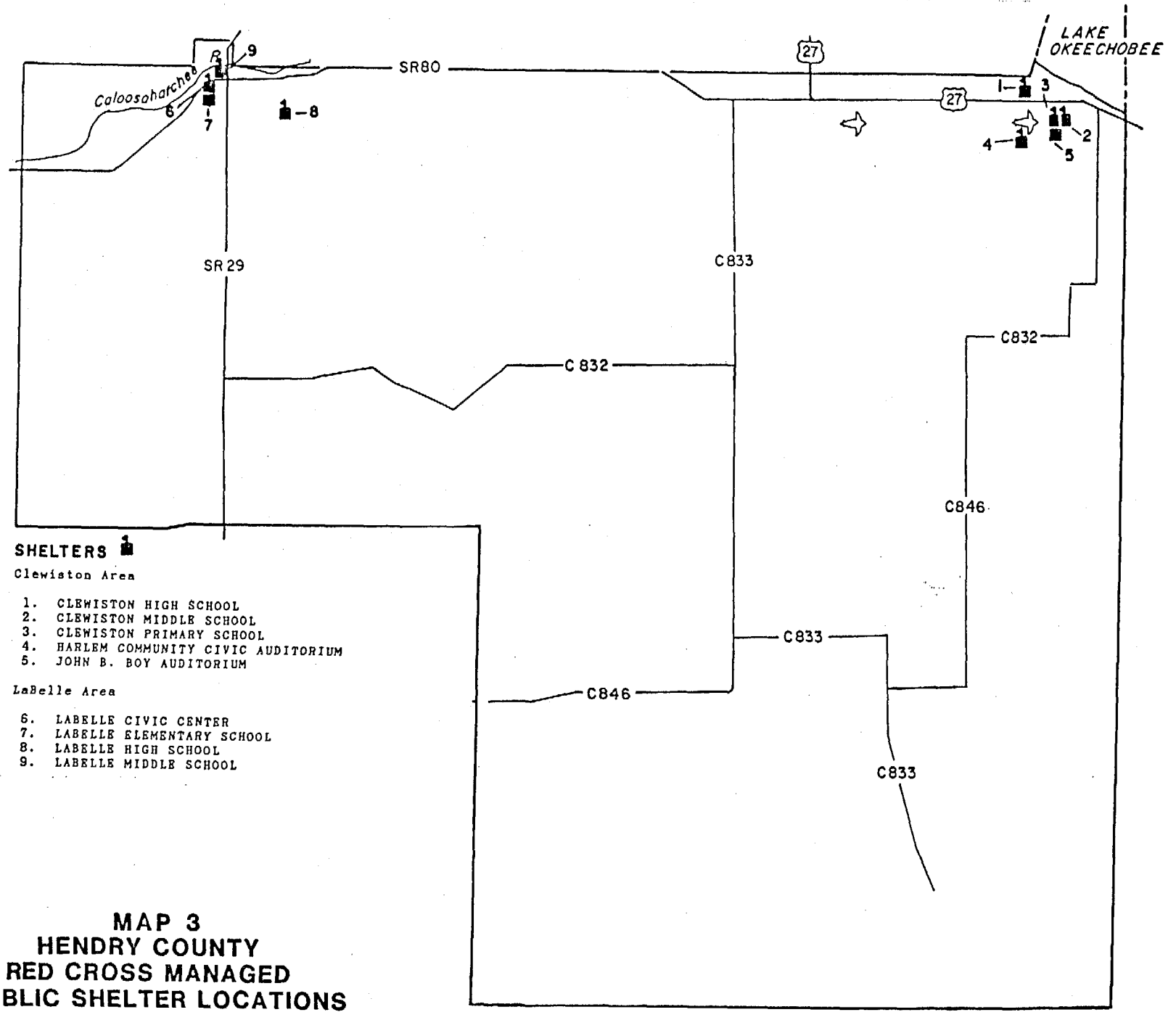
Evacuees must have a place to go. The SWFRPC undertook surveys in 1979 and 1981 to determine evacuee preferences. This data is summarized as follows: public shelters (24%), leaving the County (34%), visit friends or go to hotel or stay home or "other" (21%), "don't know" (21%). Those are preference declarations; other studies indicate there is a significant variation from preference to actual behavior. Additionally, the severity of impending storms may also change decisions, as increased community-wide evacuation needs limit or eliminate the hotel/friends/public shelter/stay home prediction.

At this time, the County has nine public shelters, with a capacity (at 20 square feet per person) of 4,089 persons. These shelters are summarized in Table 4. They are depicted on Map 3.

In Hendry County, there are an estimated 323 hotel/motel rooms. Since the county is outside all storm surge zones, theoretically these rooms will always be available. The 323 units (at 100% occupancy) would satisfy 19% of the demand for shelter space in July and 11% in November in a Category 1 storm. Since the evacuees in Hendry County are from mobile homes, these numbers do not change for the remaining category hurricanes.

In summary, the public and commercial hotel/motel shelter space will satisfy 100% of the demand for shelter space in July but only 58% in November in all categories of hurricanes.

With an overall shortage of public or private commercial space, evacuees have only the options of (a) staying with friends who are in safer areas within the county or of (b) leaving the county for areas of the state expected to be less affected by the hurricane.



SHELTERS

Clewiston Area

1. CLEWISTON HIGH SCHOOL
2. CLEWISTON MIDDLE SCHOOL
3. CLEWISTON PRIMARY SCHOOL
4. HARLEM COMMUNITY CIVIC AUDITORIUM
5. JOHN B. BOY AUDITORIUM

LaBelle Area

6. LABELLE CIVIC CENTER
7. LABELLE ELEMENTARY SCHOOL
8. LABELLE HIGH SCHOOL
9. LABELLE MIDDLE SCHOOL

MAP 3
HENDRY COUNTY
RED CROSS MANAGED
PUBLIC SHELTER LOCATIONS

TABLE 4
HENDRY COUNTY PUBLIC SHELTERS

Red Cross Managed Shelters	Address	Capacity at 20 sq. ft. per person
Clewiston Area		
Clewiston High School	West Osceola Avenue	593
Clewiston Middle School	Owen & Margaret Ave.	480
Clewiston Primary School	Owen Avenue	245
Harlem Community Civic Auditorium	2nd Ave. & Carolina	200
John B. Boy Auditorium	Owen Avenue	251
LaBelle Area		
LaBelle Civic Center	Hickpochee Avenue	500
LaBelle Elementary	Devils Garden Road	165
LaBelle High School	Devils Garden Drive	1,205
LaBelle Middle School	Ft. Thompson Avenue	450

TOTAL SHELTERS - 9 TOTAL CAPACITY - 4,089 persons

Because Hendry County is outside the flood surge zone (and, normally only mobile homes are evacuated), there should not be many additional people displaced beyond those who evacuate because of high winds (See Table 5).*

TABLE 5
POPULATION DISPLACEMENT RATIO

STORM CATEGORY	POPULATION DISPLACED JULY	POPULATION DISPLACED NOVEMBER	POPULATION NOT DISPLACED JULY	POPULATION NOT DISPLACED NOVEMBER	RATIO JULY	RATIO NOVEMBER
All	4,987	8,699	~21,204	~25,249	1:4.3	1:2.9

Thus, persons wishing to seek shelter with friends should not have trouble finding space provided they make timely arrangements. The SWFRPC 1981 Evacuation Plan estimates that 13% of the evacuating population will take this option.

This percentage added to the above July/November percentages absorb the remainder of "in county" shelter demand satisfaction. These figures are summarized in Table 6.

*Behavioral surveys have shown that under certain circumstances, people who live in "safe" areas and are not ordered to evacuate, will still leave for their own reasons. Therefore, shelter usage and transportation times may be somewhat higher figures than shown.

TABLE 6
HENDRY COUNTY SHELTER SPACE SATISFACTION RATEs

Storm Category	Evacuees July	Evacuees November	Public Shelter Space/% July / Nov.		Hotel/Motel Space*/% July / Nov.		Stay with Friends/% July / Nov.
All	4,987	8,699	4,089(J)	+	969(J)	+	648(J)
			4,089(N)		969(N)		1,131(N)
			82%(J)	+	19%(J)	+	not needed(J)
			47%(N)	+	11%(N)	+	13%(N)

= 100% shelter space met within County in July
= 71% shelter space met within County in November

*323 units X 3.0 pph X 100% occupancy

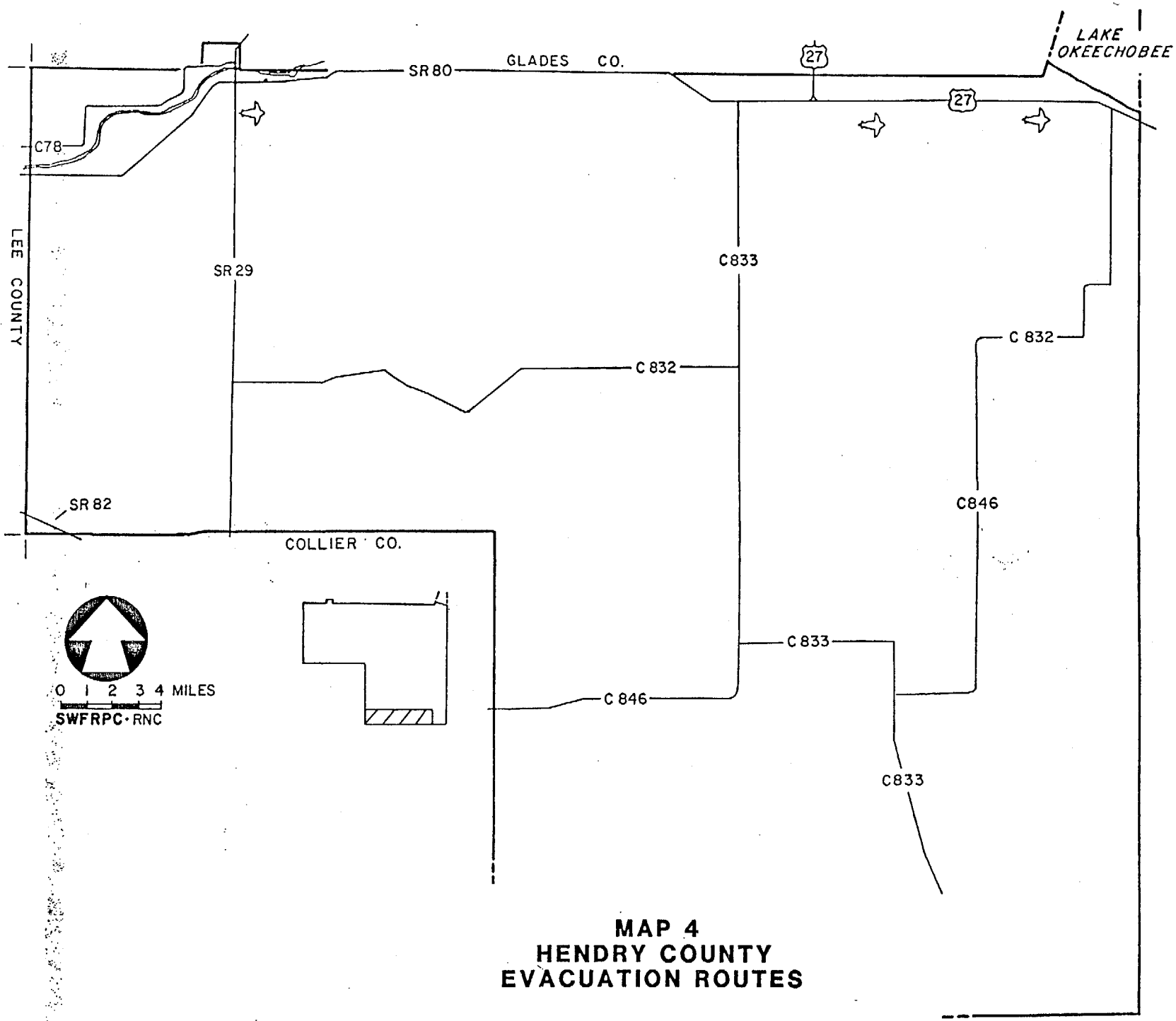
Since there are those that have expressed an out-of-county shelter preference and since there is an overall peak season shortage of in-county shelter, a knowledge of evacuation routes and capacities is essential.

Routes

Arterial roadways form the backbone of any hurricane evacuation effort. Hendry County's roadway system provides a good choice of options for evacuees (See Map 4). Identification of routes is the first step in assessing the roadway system. The next step is assessing roadway capacities. The capacities of these roadways have been developed based on their characteristics, tied to the assessment methodologies of the Highway Capacity Manual, 1985. These capacities are contained in Table 7 and show that the roadways (at the 50/50 split) vary from a high hourly capacity at service level D of 2,300 trips for US 27, to a low of 420 trips for CR 78.

An important aspect of any route is its condition. Winds and rainfall flooding will affect the reliability of the routes. Many routes are low lying. Their propensity to flood due to rainfall causes their reliability to operate as an evacuation route to cease several hours before storm landfall.

Whereas, gale winds may precede a hurricane by 5 to 8 hours, rainfall flooding may constitute a greater hazard to evacuation route operation than early winds. This is because roadways may flood and become partially or totally impassible early in an evacuation. Such areas have been documented for different storms and are depicted on Map 5. These are areas that must be passed before the presupposed onset of heavy rains, which is at least eight hours before eye landfall. This is relevant for all categories of storms.

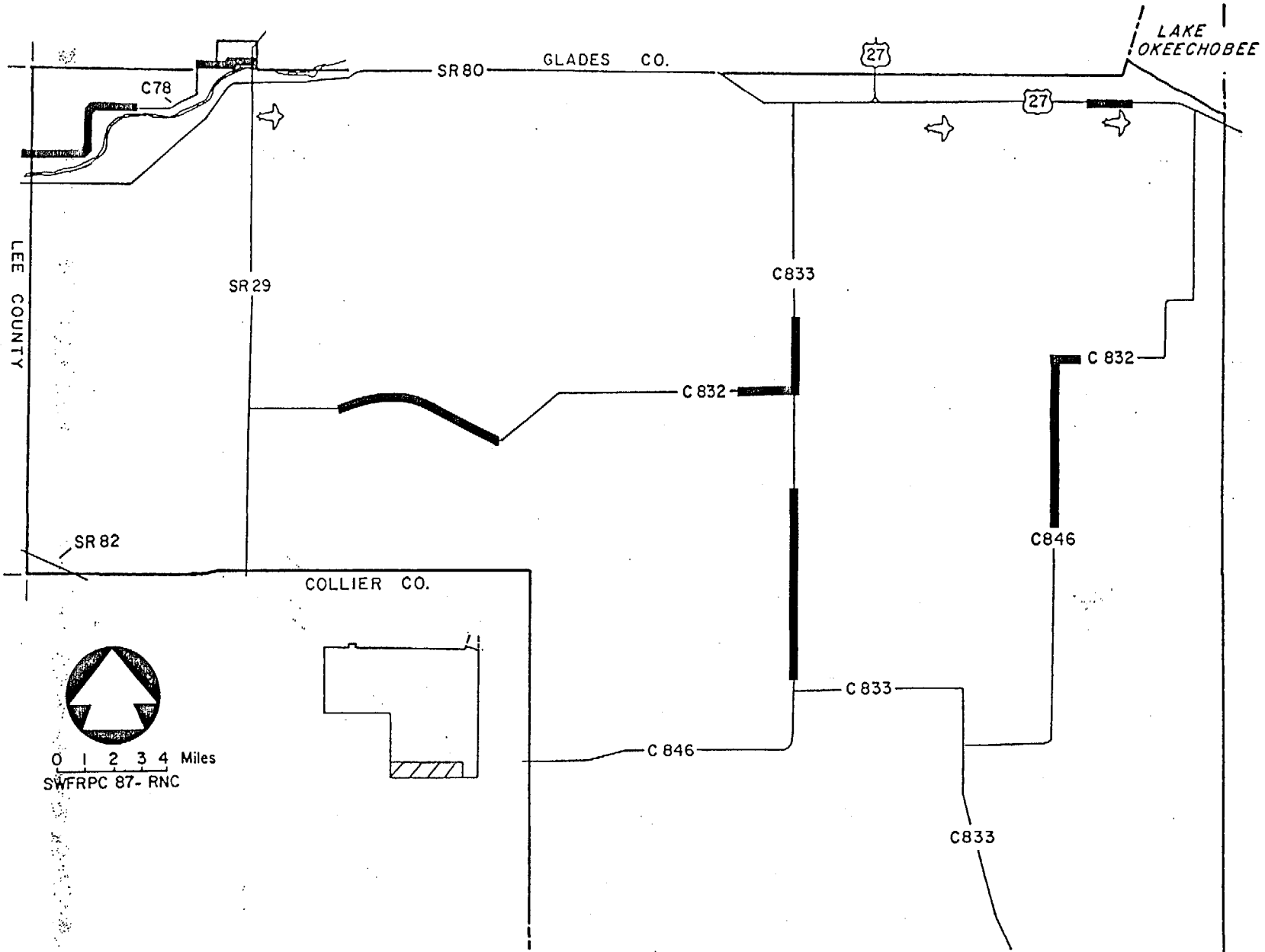


MAP 4
HENDRY COUNTY
EVACUATION ROUTES

TABLE 7
EVACUATION ROUTE CAPACITY CALCULATIONS
HENDRY COUNTY

ROUTE	# OF LANES	LANE WIDTH (FT.)	DESIGN SPEED (MPH)	HIGHWAY TYPE	PER-CENT NO PASSING ZONES	MAXIMUM HRLY. FLOW/ FLOW RATE (LOS D)	TRAFFIC FLOW SPLIT 50/50
US 27							
Glades Co. to CR 720	4	12	70	Rur.Div.	--	2,300	2,300
CR 720 to Palm Beach Co.	4	12	70	Sub.Div.	--	2,049	2,049
SR 80							
Lee Co. to LaBelle	2	12	70	--	100	1,032	516
LaBelle to US 27	2	12	70	--	80	1,413	707
SR 82							
Lee Co. to Collier Co.	2	12	70	--	80	1,112	556
SR 29							
Glades Co. to Collier Co.	2	10	60	--	80	840	420
CR 833							
SR 80 to CR 846	2	9	60	--	80	925	463
CR 846 to Broward Co.	2	9	60	--	80	992	496
CR 846							
Collier Co. to CR 832	2	10	60	--	70	1,172	586
CR 832 West							
SR 29 to CR 833	2	10	60	--	70	1,153	577
CR 832 East							
CR 846 to US 27	2	10	60	--	80	1,197	599
CR 78							
Lee Co. to SR 29	2	10	60	--	90	979	490

NOTE: The Peak Hour Factor was assumed to be .95 and the Driver Population Factor was assumed to be .75 in ALL cases



MAP 5
HENDRY COUNTY
ROUTES SUBJECT TO RAINFALL FLOODING

Clearance Times

There are several contributing factors towards calculating community clearance time. The first is the nature of the threat. With each storm of increasing strength, the number of persons and vehicles evacuating also increases.

The second factor contributing to clearance time is the number of vehicles evacuating and the capacity of roadways to carry evacuees. This translates into a number of hours it will take to move persons past any given point.

The third factor is the volume and distance of "stopping" opportunities offered evacuees, and the distance to these opportunities. If the total volume of stopping opportunities needed are ten miles inland, the time is much less for an evacuation than if they are 100 miles distant.

These three factors compose the evacuation time. For certain communities within the County, times are less than for others. This variation is because pre-landfall flood conditions are not as bad, shelter locations are closer, and there are better quality evacuation routes. Table 8 summarizes pre-landfall flood conditions, Table 9 summarizes shelter distances and options, and Table 10 summarizes the time it takes to clear the most restrictive point on the route for each community.

TABLE 8
PRE-LANDFALL FLOOD/WIND CONDITIONS

Zone	Storm Category	Time to Rainfall/Flood	Time to Gale Force Wind
All	1	8	5.5
	2	8	6.5
	3	8	8.0

TABLE 9
SHELTER DESIGNATION OPTIONS

Category	Zone	Shelter Name	Estimated Travel Time (Max.)
All (Mobile Homes)	Clewiston/ Big Cypress	Clewiston High School Clewiston Middle School Clewiston Primary School Harlem Community Civic Auditorium John B. Boy Auditorium	1.0 hr.
All (Mobile Homes)	LaBelle/ Felda	LaBelle Civic Center LaBelle Elementary LaBelle High School LaBelle Middle School	0.5

TABLE 10
TIME TO CLEAR

Category	Zone	Restricting Point	Route Capacity	Vehicle Load July / Nov.	Time July / Nov.	Time to County Line
All (Mobile Homes)	Clewiston/ Big Cypress	US 27	2,049	892/1,556	0.4/0.8	1.3
All (Mobile Homes)	LaBelle/ Felda	SR 29	420	937/1,634	2.2/3.8	.5

Because there are only two evacuation zones and each has its own route and restricting point, zones should not be competing with each other. That being the case, the ultimate constricting point arises due to evacuation from Lee County along SR 80 as can be seen in Table 11.

TABLE 11
ULTIMATE CONSTRICTING ROUTE

Category	Constricting Route	Time July	Time November
All (Mobile Homes)	SR 29/SR 80 from* Lee County/US 27	5.2	7.8

The greatest County exiting time (see Table 12) will be experienced along SR 80 if a conflict arises from a Lee County Evacuation. This would most likely only happen in a landfalling or paralleling storm from the Gulf and not from the Atlantic.

Because of the population centers and evacuation routes available in the county, out of county evacuation would probably follow these natural boundaries. LaBelle/Felda would use SR 80, Clewiston/Big Cypress would use US 27. If this scenario in fact occurs, the county exiting route times would be as shown in Table 12.

*LaBelle/Felda "time to clear" from Table 10 plus 3.0 hours in July and 4.0 hours in November for Lee County time to clear.

TABLE 12
COUNTY EXITING ROUTES

Category	Zone	Total Veh. Leaving County July/Nov.	% of Total Evacuating Vehicles	Route	Capacity	Times July	Times Nov.
All	LaBelle/ Felda	318/555	34%	SR 80	848	0.4	0.7
All	Clewiston/ Big Cypress	304/529	34%	US 27	2,300	0.1	0.2

The last factor to be incorporated into calculating the County clearance time is the response of potential evacuees to an evacuation order. The original 1981-82 Regional Hurricane Evacuation Plan discussed this topic on page 125, and concluded that seven hours would be the minimum time needed to clear a zone, because some evacuees would dawdle more than others. More recent history indicates that sudden or dramatic changes in hurricanes can heighten the evacuees response into a "quick" evacuation, limited basically by road capacity. Consequently, in evaluating the final criteria that determines a slow, intermediate, or quick evacuation, both slow and intermediate zones will have a minimum response time of seven hours; "quick" times, however, will be limited only by roadway capacity. All of these factors combine into creating a countywide clearance time. This time will vary depending upon the routes available for out of county evacuation, the time of season, and whether it is a slow, intermediate, or quick response. Table 13 summarizes the contribution to the greatest clearance time for the County for each category storm.

TABLE 13
TOTAL EVACUATION TIMES

Category	Destination(1)	Weather(2)	Route Times July	Route Times Nov.	Summary (Total Time) July	Summary (Total Time) Nov.
All	2.0	8	2.2	3.8	12.2	13.8

(1) From Table 9 or 10, whichever is greater
(2) From Table 8

PART II - 1991 FORECASTS

Part of hurricane preparedness involves anticipating future growth. This element discusses short term growth (4 years) and the facilities that are expected to be in place to serve that growth. Facilities in this sense include transportation (highway) improvements and school construction (since schools often serve as shelters).

Since Hendry County has a relatively small population and historically has shown slow population growth (averaging less than 800 people per year since 1980), the growth prediction follows a simple straight line technique. Applied uniformly to dwelling units, population and vehicles, the increases to 1991 are shown in Tables 14, 15, and 16.

TABLE 14
HENDRY COUNTY - HOUSING ESTIMATE FOR 1991
(Based on projected Housing Units of 9,794)

Zone	Residential Single-Family	Mobile Home	Recreational Vehicle	Multi-Family Apartment	Multi-Family Condo	Hotel-Motel	Total
LaBelle/ Felda	2,453	1,007	888	44	0	129	4,521
Clewiston/ Big Cypress	2,644	1,582	409	363	80	195	5,273
TOTALS	5,097	2,589	1,297	407	80	324	9,794

TABLE 15
HENDRY COUNTY - PEAK SEASON POPULATION
ESTIMATE FOR 1991 (Based on projected Housing Units of 9,794)

Zone	Residential Single-Family	Mobile Home	Recreational Vehicle	Multi-Family Apartment	Multi-Family Condo	Hotel-Motel	Total
LaBelle/ Felda	7,065	2,266	1,092	129	0	290	10,842
Clewiston/ Big Cypress	7,615	3,560	503	1,067	139	439	13,322
TOTALS	14,679	5,825	1,595	1,197	139	729	24,165

TABLE 15 (continued)
HENDRY COUNTY - OFF PEAK SEASON POPULATION ESTIMATE FOR 1991
(Based on Projected Housing Units of 9,794)

Zone	Residential Single-Family	Mobile Home	Recreational Vehicle	Multi-Family Apartment	Multi-Family Condo	Hotel-Motel	Total
LaBelle/ Felda	6,991	1,299	480	123	0	166	9,059
Clewiston/ Big Cypress	7,535	4,509	221	1,035	228	556	14,083
TOTALS	14,526	5,808	701	1,157	228	722	23,142

TABLE 16
HENDRY COUNTY - PEAK SEASON TRAFFIC ESTIMATE FOR 1991
(Based on Projected Housing Units of 9,794)

Zone	Residential Single-Family	Mobile Home	Recreational Vehicle	Multi-Family Apartment	Multi-Family Condo	Hotel-Motel	Total
LaBelle/ Felda	2,590	755	413	47	0	106	3,911
Clewiston/ Big Cypress	2,792	1,187	168	391	51	161	4,750
TOTALS	5,382	1,942	581	438	51	267	8,661

HENDRY COUNTY - OFF PEAK SEASON TRAFFIC ESTIMATE FOR 1991
(Based on Projected Housing Units of 9,794)

Zone	Residential Single-Family	Mobile Home	Recreational Vehicle	Multi-Family Apartment	Multi-Family Condo	Hotel Motel	Total
LaBelle/ Felda	2,563	433	160	45	0	61	3,262
Clewiston/ Big Cypress	2,763	680	74	371	39	92	4,019
TOTALS	5,326	1,113	233	416	39	153	7,281

In terms of shelter, there are three new schools forecast for the County along with several additions and improvements to be made to existing schools. Total size and capacity can only be approximated; the best guess estimate is given as a new total capacity in Table 17.

TABLE 17
IN-COUNTY SHELTER SATISFACTION

STORM CATEGORY	EVACUEES JULY/NOV	PUBLIC SHELTER SPACE/% JULY/NOV	HOTEL/MOTEL SPACE*/% JULY/NOV.	STAY W/ FRIENDS/% JULY/NOV.
All	6,509 7,420	5,905 +	1,200(J) +	not needed(J)
		91%(J) +	1,200(N) +	not needed(N)
		80%(N)	18% (J)	
			16% (N)	

= 100% shelter met in County in July
= 100% shelter met in County in November

* 400 units X 3.0 pph X 100%

It appears that all necessary shelter will be available within the County. However, since there still may be additional voluntary evacuation and people choosing to leave the county, it is necessary to again examine routes and capacities as they will exist in 1991.

For the purpose of this study, it is again assumed that up to 30% of all available vehicles might evacuate. The only significant evacuation route improvement to be in place by 1991 is the widening of SR 29 so that lane widths will increase from 10 feet to 12 feet. This will increase capacity from 756 vehicles per hour to 945. The new clearance time is shown in Table 18.

TABLE 18
TOTAL EVACUATION TIMES

CATEGORY	DESTINATION	WEATHER	ROUTE TIME JULY	ROUTE TIME NOV.	SUMMARY JULY	SUMMARY NOV.
All	2.0	8	2.2	3.8	12.2	13.8

Because the time to leave the county is longer than the time to shelter, the improvements to SR 29 are marginal in terms of hurricane evacuation.

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GLADES COUNTY
PEACETIME EMERGENCY PLAN (Hurricanes)

HURRICANE VULNERABILITY

The hurricane vulnerability of Glades County has been analyzed using a numerical storm surge prediction model known as SLOSH, short for Sea, Lake, and Overland Surges from Hurricanes. In fact, the SLOSH model was first applied to Lake Okeechobee. This model is described in detail in the Regional Hurricane Evacuation Plan, 1981-82, prepared by the Southwest Florida Regional Planning Council; as well as A Storm Surge Atlas for Southwest Florida, prepared by the National Oceanic and Atmospheric Administration, Undated, @ 1983). These reports analyzed some 187 separate storms for their potential impact on Southwest Florida. Both reports provide an assessment of methodologies and provide assumptions that can act towards increasing or decreasing forecast flood and wind conditions. However, in summary, the following assumptions can be made.

(1) Landfalling storms provide the worst flooding potential

(2) Flooding will be worse south of the eye of the hurricane

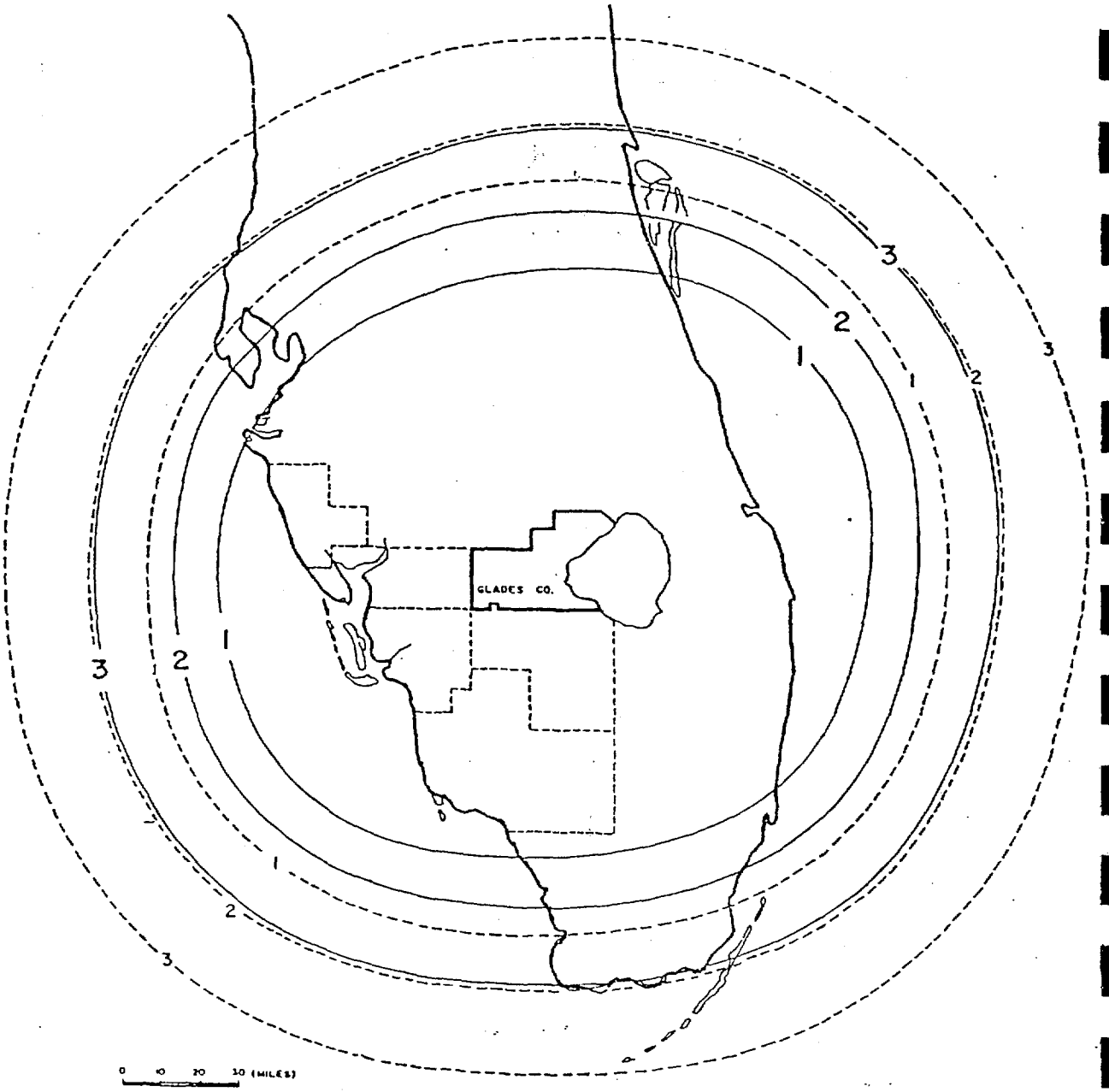
(3) Wind conditions making roads unsafe for travel will arrive well before the eye of the hurricane, and usually before flood waters inundate evacuation routes

(4) Storm landfall prediction is not an exact science. Any approaching storm has the capacity to strengthen or veer, decreasing or increasing the flooding and surge potential of the storm.

However, in the case of Glades County, the model does not predict any flooding over the dike from Lake Okeechobee unless the lake level is over 18 feet (the preferred control level is 16 feet) and only then in a very severe hurricane. The assumption here is that if the lake is approaching 18 feet, the locks can be opened to reduce it to the desired control level of 16 feet.

The hurricane problem facing Glades County is high winds (See Map 1). This is a problem because mobile homes are required to evacuate in all categories of hurricanes. There are more mobile home/travel trailer units in the County than any other type of dwelling unit and they contain almost 50% of the population.

The County has been divided into vulnerability zones based on population, shelter locations and the transportation network. See Map 2 for the zones.



Legend

0 10 20 30 (MILES)

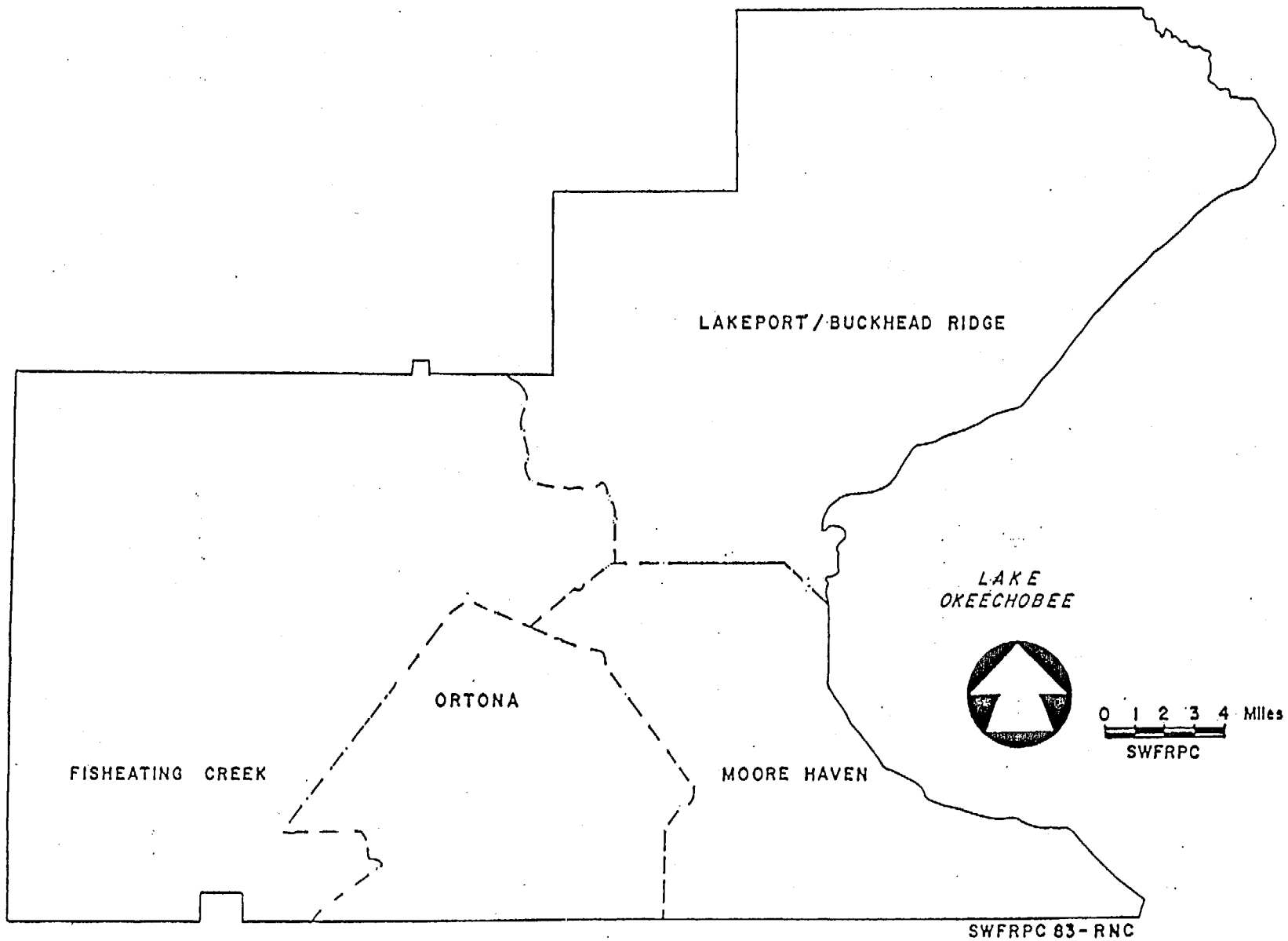
40 MPH SUSTAINED WIND LINE

2 HOUR WARNING LINE

64 MILE COUNTY RADIUS	- CATEGORY 1
76	- CATEGORY 2
98	- CATEGORY 3

SWFRPC
81-RNC

MAP 1
GLADES COUNTY
HURRICANE WIND IMPACT ZONE



MAP 2
GLADES COUNTY
FLOOD AND WIND VULNERABILITY ZONES

Recent Storm History

Hurricane Donna was the last hurricane to affect Southwest Florida to any significant degree. At the time the hurricane hit, the County's population was 3,000, concentrated primarily in Moore Haven, Palmdale and Buckhead Ridge.

Hurricane Floyd provided the area a scare on October 16, 1987. However, it veered due east before the County received any impacts beyond high wind gusts.

Affected Population

The first element in preparing an estimate of County population is to estimate dwelling units, and dwelling unit types. Using Planning Department and Building and Zoning information, supplemented by information on RV Parks from the Department of Health and Rehabilitative Services, it is estimated that there are 4,278 dwellings in the county (See Table 1). This estimate includes conventional housing, mobile homes, and transitional housing such as inhabited travel trailers, and hotel and motel units.

TABLE 1
GLADES COUNTY - HOUSING UNITS

Zone	Residential Single-Family	Mobile Home Rec. Vehicle	Multi-Family Apartment	Multi-Family Condo	Hotel-Motel	Total
Moore Haven	504	559	61	N/P*	186	1,310
Ortona	189	293	N/P	N/P	N/P	482
Fisheating Creek	100	154	N/P	N/P	N/P	254
Lakeport/ Buckhead Ridge	1,093	1,082	22	N/P	35	2,232
TOTALS	1,886	2,088	83	N/P	221	4,278

*No Projection

Using this estimate, a population estimate is then made. Two additional assumptions, however, are needed: persons per household, and vacancy rate. The first was estimated to be a standard 2.6 persons per household, regardless of unit. Whereas this assumption has inaccuracies, the end result probably does not differ significantly from a more detailed analysis. More detailed analysis, however, is needed to determine vacancy rates for unit type, since different unit types have different vulnerability to flood or wind hazards. Using a survey estimate

used in Regional Hurricane Evacuation Plan, Appendix C, two estimates of seasonal vacancy were prepared. These are as follows:

Unit Type	Seasonal Occupancy Rates July	November
Single-Family Unit	0.95%	0.96%
Apartment	0.70	0.78
Condominium (Conventional)	0.51	0.64
Rec. Vehicle/Mobile Home	0.43	0.75
Hotel/Motel	0.54	0.63

Since the residents of Glades County will not normally be subject to hurricane surge flooding, the evacuating population will be primarily from mobile homes. (There is some evidence from behavioral studies that other residences will be evacuated by the occupants even though they are in "safe" areas and will probably not be ordered to evacuate.) The mobile home population in Glades County in July is estimated to be about 2,334 and 4,072 in November. Since mobile homes are required to evacuate in all hurricanes, this represents the evacuating population as well.

TABLE 2
GLADES COUNTY
EVACUATING POPULATION ESTIMATES FOR EVACUATION ZONES
ALL STORM CATEGORIES

ZONE (Mobile Homes/ Recreational Vehicles)	ESTIMATE JULY	NOVEMBER
Moore Haven	625	1,090
Ortona	328	571
Fisheating Creek	172	300
Lakeport/Buckhead Ridge	1,210	2,110
TOTAL	2,334	4,072

Motor Vehicles

Nearly all of the population affected by an oncoming hurricane will evacuate by private vehicle. The question arises over how many vehicles will be used in the evacuation. Issues relevant to this include the number of vehicles owned, whether owners would be willing to leave any vehicles behind (since next to the home, vehicles are the most expensive possession), whether all drivers feel confident to operate a vehicle in storm conditions, and whether evacuating families wish to be separated in different motor vehicles. Based on surveys, respondents indicated

approximately 75% of available vehicles would be used in an evacuation. (Hurricane Evacuation Plan, 1981-82, SWFRPC). This averaged out to 1.1 vehicles per occupied unit.

Using this ratio of cars and the occupancy ratio used previously, the number of county vehicles used in an evacuation in July would be 988, and in November would be 1,723. Table 3 summarizes the vehicle generation by each community.

TABLE 3
GLADES COUNTY VEHICLE ESTIMATES OF
EVACUATION FROM MOBILE HOMES/RECREATIONAL VEHICLES

Storm Category	Zone	July # vehicles evacuating	November # vehicles evacuating
All	Moore Haven	264	461
	Ortona	139	242
	Fisheating Creek	73	127
	Lakeport/ Buckhead Ridge	512	893
	TOTAL	988	1,723
TOTAL VEHICLES IN COUNTY		3,154	3,939

Shelters

Evacuees must have a place to go. The SWFRPC undertook surveys in 1979 and 1981 to determine evacuee preferences. This data is summarized as follows: public shelters (24%), leaving the County (34%), visit friends or go to hotel or stay home or "other" (21%), "don't know" (21%). Those are preference declarations; other studies indicate there is a significant variation from preference to actual behavior. Additionally, the severity of impending storms may also change decisions, as increased community-wide evacuation limits or eliminates the hotel/ friends/public shelter/stay home prediction.

At this time, the County has twelve public shelters, with a capacity (at 20 square feet per person) of 3,340 persons. These shelters are summarized in Table 4. They are depicted on Map 3. At this writing, the shelters are being re-evaluated and their inventory updated. That information will be included as soon as it is available.

TABLE 4
GLADES COUNTY PUBLIC SHELTERS

Red Cross Managed Shelters	Address	Capacity 20 sq. ft. per person
Moore Haven Area		
American Legion Bldg.	Baker Highway	Not Available
Doyle Conner Aud.	US 27 W.	480*
First Methodist Church	3rd St. & Avenue L	Not Available
Moore Haven Elementary	8th St. & Avenue K	Not Available
Moore Haven High School	US 27 between 6th & 8th	2,355
Washington Park Community Complex	Washington Park/Gamble Street	Not Available
LaBelle Area		
Muse Fire Station/ Community Center	State Route 1	140
Ortona Fire Station & Community Center	SR 78/Ortona Road	112
Okeechobee Area		
Buckhead Ridge Community Center	Rt. 4 & SR 78	Not Available
Buckhead Ridge Fire Station	Rt. 4 & SR 78	Not Available
Lakeport Area		
Lakeport Fire Station & Community Center	CR 74	Not Available
Maple Grove Baptist Church	SR 78	Not Available

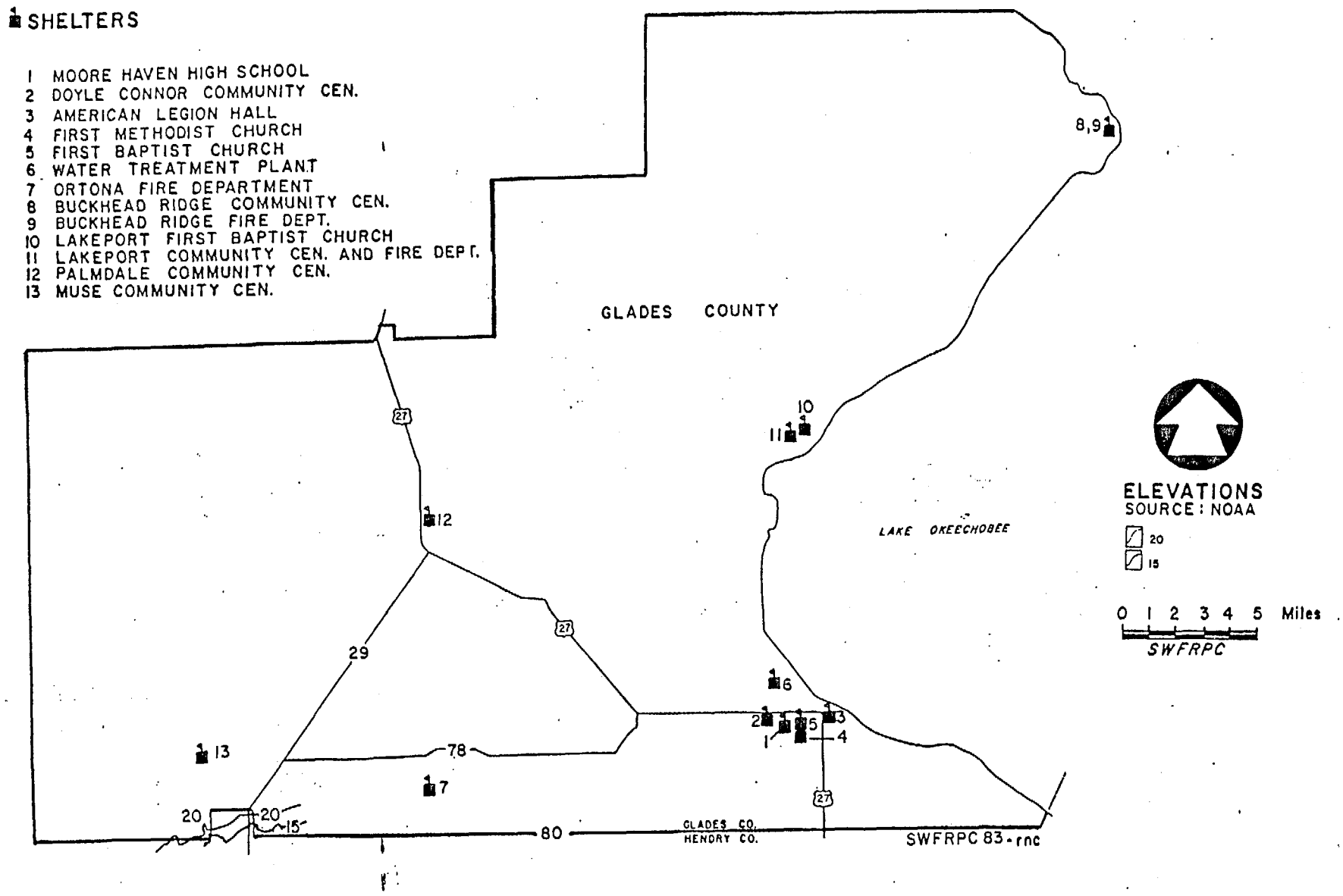
TOTAL SHELTERS - 12 TOTAL CAPACITY - approx. 3,339

* Planned for Expansion

In Glades County, there are about 221 hotel/motel units. Most of these are located near Lake Okeechobee, but will probably not be subject to hurricane-generated surge flooding. For this reason, all units are considered available regardless of the magnitude of the storm.

The 221 units, at 100% occupancy (3 persons per room) would satisfy 89% of the current space demand in July, but only 22% in November. Because the evacuees are almost exclusively mobile home residents who evacuate in all categories of hurricanes, these numbers are applicable for Category 1 through 5 hurricanes.

In summary, public shelter space added to hotel/motel availability will meet 100% of the demand in July and 90% in November. Normally, a lack of public and commercial space will leave evacuees with only two options: (a) leave the county for areas expected to be less affected or (b) stay with friends who



MAP 3
EMERGENCY SHELTER LOCATIONS
GLADES COUNTY

are in safe areas of the County and not in mobile homes. Since the County has almost 2,000 site-built homes and apartment buildings, mobile home evacuees should have no trouble finding shelter with friends provided they make arrangements in a timely manner.

TABLE 5
GLADES COUNTY SHELTER SPACE SATISFACTION RATEs

Storm Category	Evacuees July	Evacuees November	Public Shelter Space July / Nov.		Hotel/Motel Space*/% July / Nov.		Stay with Friends July / Nov.
All	2,334	4,072	~3,340 J	+	575 J	+	303 J
			~3,340 N	+	575 N	+	529 N
			100% J	+	not needed J	+	not needed J
			82% N	+	14% N	+	13% N

= 100% shelter demand met within County (both July and November)

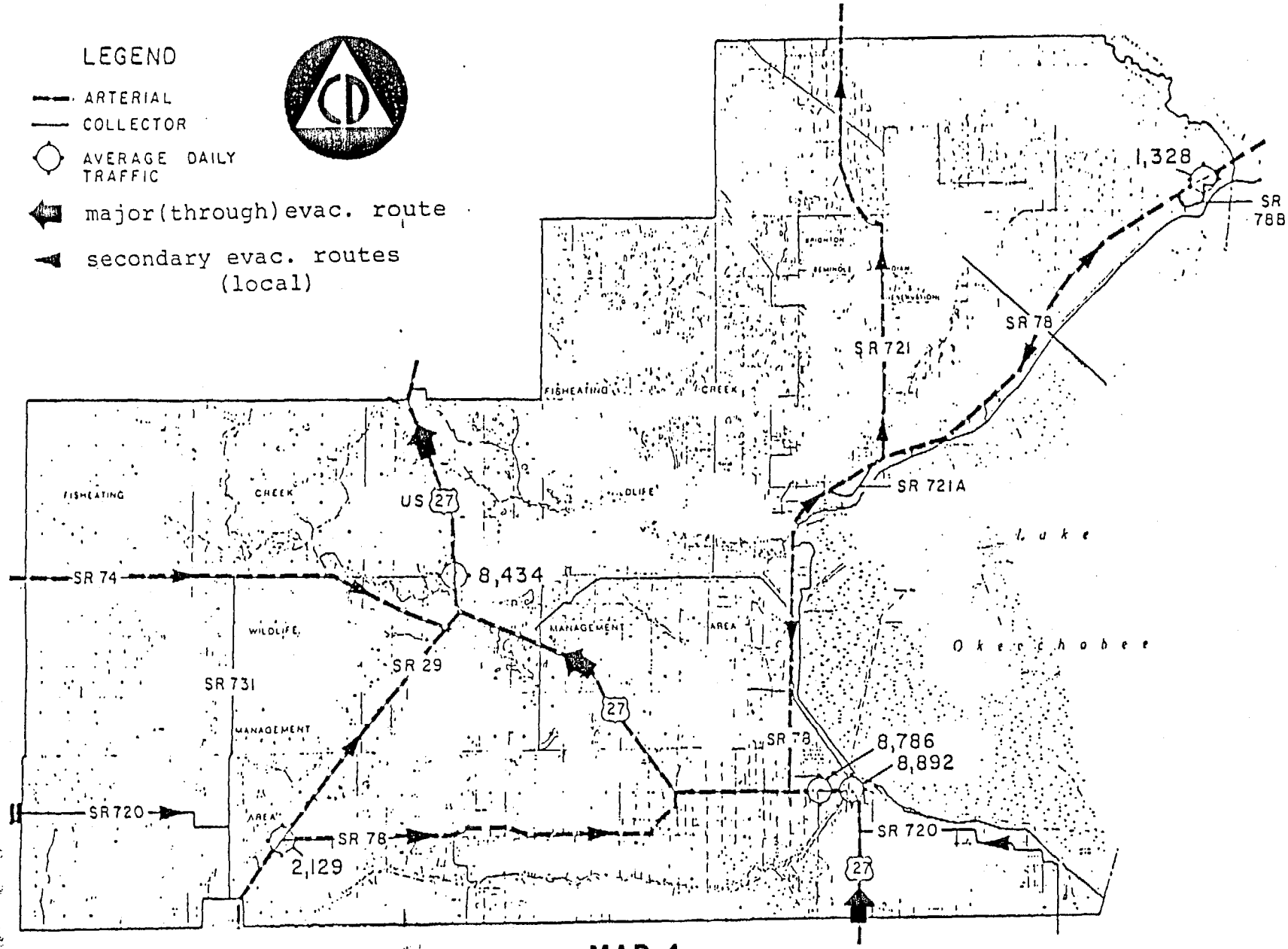
*221 units X 2.6 persons/unit

Although theoretically there is sufficient space within the County, there are persons who may wish to leave the County, regardless of the reason. Therefore, a knowledge of routes and route capacities is important.

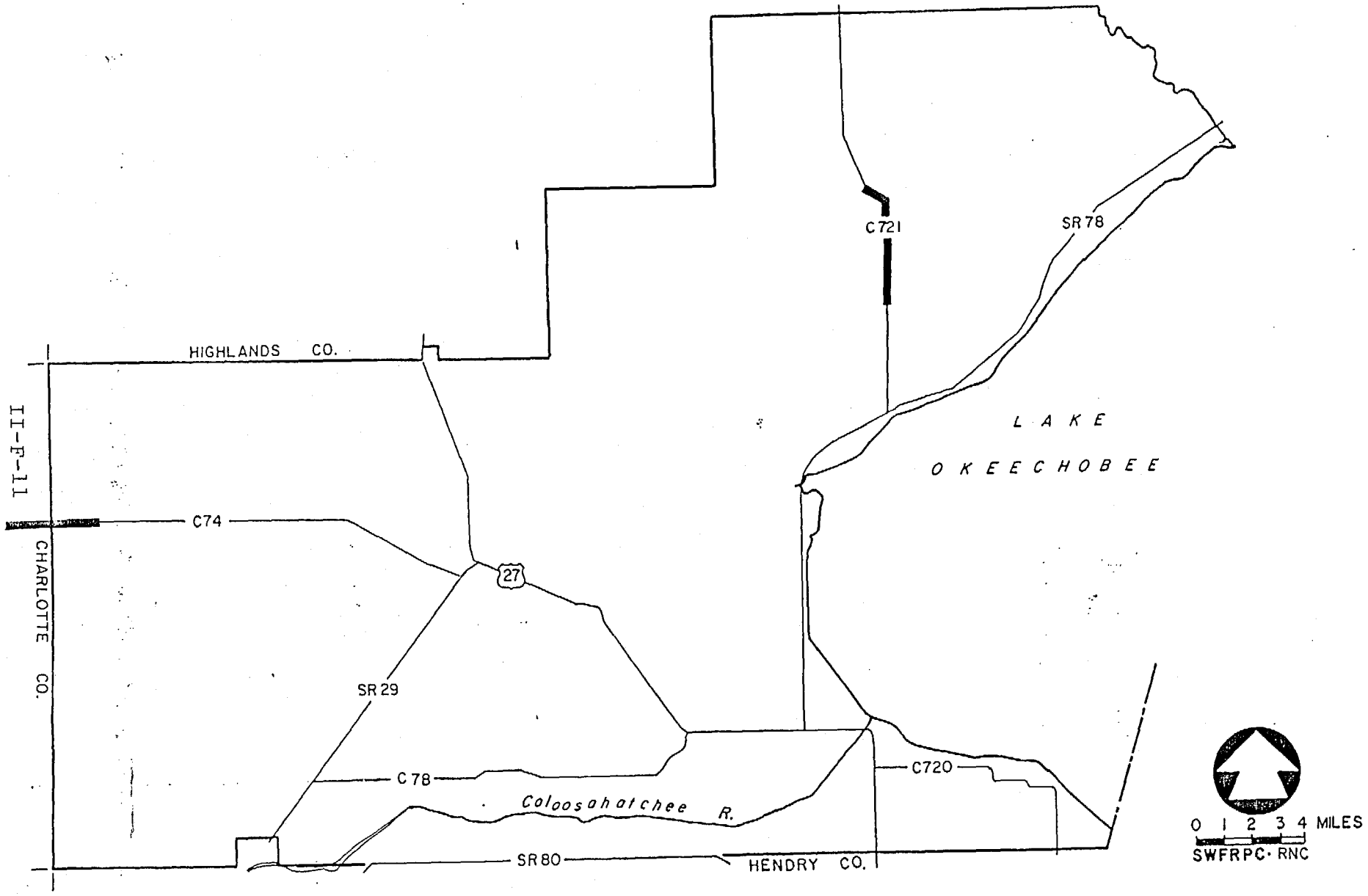
Routes

Arterial roadways form the backbone of any hurricane evacuation effort. Glades County's roadway system provides a good choice of options for evacuees (depicted on Map 4, "Evacuation Routes"). Identification of routes is the first step in assessing the roadway system. The next step is assessing roadway capacities. The capacities of these roadways have been developed based on their characteristics, tied to the assessment methodologies of the Highway Capacity Manual, 1985. These capacities are contained in Table 6, and show that the roadways (at the 50/50 split) vary from a high hourly capacity at service level D of 2,300 trips for US 27, to a low of 471 trips for CR 721.

An important aspect of any route is its condition. Winds and rainfall flooding will affect the reliability of the routes. Rainfall flooding may constitute a greater hazard to evacuation route operation than early winds. This is because roadways may flood and become partially or totally impassible early in an evacuation. Such areas have been documented for different storms and are depicted on Map 5. These are areas that must be passed before the presupposed onset of heavy rains, which is at least eight hours before eye landfall. This is relevant for all categories of storms.



MAP 4
GLADES COUNTY
EVACUATION ROUTES



MAP 5
GLADES COUNTY
ROUTES SUBJECT TO RAINFALL FLOODING

TABLE 6
EVACUATION ROUTE CAPACITY CALCULATIONS
GLADES COUNTY

ROUTE	# OF LANES	LANE WIDTH (FT.)	DESIGN SPEED (MPH)	HIGHWAY TYPE	PER-CENT NO PASSING ZONES	MAXIMUM HRLY. FLOW/ FLOW RATE (LOS D)	TRAFFIC FLOW SPLIT 50/50
US 27							
Highlands Co. to Moore Haven	4	12	70	Rur.Div.	--	2,300	2,300
Moore Haven Bridge/ Approaches	2	12	60	--	100	1,369	1,369
Moore Haven to Hendry Co.	4	12	70	Rur.Div.	--	2,300	2,300
SR 29							
US 27 to Hendry Co.	2	12	60	--	80	1,162	581
SR 78							
Okeechobee Co. to US 27	2	12	60	--	80	1,440	720
CR 720							
US 27 Moore Haven to US 27 Clewiston	2	9	60	--	90	1,046	523
CR 721							
SR 78 to Highlands Co.	2	9	60	--	80	941	471
CR 78							
SR 29 to US 27	2	9	60	--	80	1,011	506
CR 74							
Charlotte Co. to SR 29	2	10	60	--	80	1,072	536

NOTE: The Peak Hour Faqtor was assumed to be .95 and the Driver Population Factor was assumed to be .75 in ALL cases

Clearance Times

There are several factors involved in calculating community clearance time. The first is the nature of the threat. Generally, with each storm of increasing strength, the number of persons and vehicles evacuating also increases. Since Glades evacuees will be from mobile homes, evacuation may not vary with storm intensity; theoretically all evacuees will go in a Category 1 storm.

Other factors contributing to clearance time are the number of vehicles evacuating and the capacity of roadways to carry evacuees. This translates into the number of hours it will take to move persons past any given point.

The final factors are the number of "stopping" opportunities offered evacuees, and the distance to these opportunities. If the majority of stopping opportunities needed are only ten miles inland, the time is much less for an evacuation than if they are 100 miles distant.

These factors compose the evacuation time. For certain communities within the County, times are less than for others. This variation is because pre-landfall flood conditions are not as bad, shelter locations are closer, and there are better quality evacuation routes. Table 7 summarizes pre-landfall flood conditions, Table 8 summarizes shelter distances and options, and Table 9 summarizes the time it takes to clear the most restrictive point on the route for each community.

TABLE 7
PRE-LANDFALL FLOOD/WIND CONDITIONS

Zone	Storm Category	Time to Rainfall/Flood	Time to Gale Force Wind
All	1	8	5.5
	2	8	6.5
	3	8	8.0

TABLE 8
SHELTER DESIGNATION OPTIONS

Category	Zone	Shelter Name	Estimated Travel Time (Max.)
All (Mobile Homes)	Moore Haven	American Legion Bldg. Doyle Conner Aud. First Methodist Church Moore Haven Elementary Moore Haven High School Washington Park Community Center	.3 hr.
All (Mobile Homes)	Ortona	Ortona Fire Station	.25
All (Mobile Homes	Fisheating Creek	Muse Fire Station/ Ortona Fire Station	.3
All (Mobile Homes	Lakeport/ Buckhead Ridge	Buckhead Ridge/ Buckhead Ridge Fire Station/Moore Haven	1.0

Because there are only four evacuation zones and each has its own route and restricting point, zones should only be marginally competing with each other.

TABLE 9
TIME TO CLEAR

Category	Zone	Restricting Point	Route Capacity	Vehicle Load July	Vehicle Load November	Time July	Time November	Time to County Line
All	Moore Haven	CR 720	523	264	461	0.5	0.9	1.1
All	Ortona	CR 78	506	139	242	0.3	0.5	0.5
All	Fisheating Creek	SR 29	581	73	127	0.1	0.2	0.8
All	Lakeport/ Buckhead Ridge	CR 721	471	512	893	1.1	1.7	0.5

Clearly, route constriction becomes a concern when it is unevenly distributed between different parts of the County. The possibility exists that increased traffic control can better distribute loadings. If that is the case, the ultimate constricting points move to the sum of the routes exiting the County. Table 10 depicts the times that may occur, given different routing scenarios.

TABLE 10
COUNTY EXITING ROUTES

Category	Total Vehicles Leaving County July	Nov.	% of Total County Vehicles*	Routes	Combined Capacity	Times** July	November
All (mobile homes)	381	664	34	US 27 and CR 721 and SR 78	1,369 471 506 2,346	.2**	.3**

* Even though there is total shelter space available within the County, behavioral surveys have indicated that even people in safe areas, not ordered to evacuate will leave anyway.

** Therefore, the time to shelter is more restrictive than the time to exit the County.

The last factor to be incorporated into calculating the County clearance time is the response of potential evacuees to an evacuation order. The original 1981-82 Regional Hurricane Evacuation Plan discussed this topic on page 125, and concluded that seven hours would be the minimum time needed to clear a zone, because some evacuees would dawdle more than others. More recent history indicates that sudden or dramatic changes in hurricanes can heighten the evacuees response into a "quick" evacuation, limited basically by road capacity. Consequently, in evaluating the final criteria that determines a slow, intermediate, or quick evacuation, both slow and intermediate zones will have a minimum response time of seven hours; "quick" times, however, will be limited only by roadway capacity. All of these factors combine to create a countywide clearance time. This time will vary depending upon the routes available for out of county evacuation, the time of season, and whether it is a slow, intermediate, or quick response. Because of Glades' position as an inland county and the relatively small number of people evacuating, only the longest time is given to simulate a worst case situation. Table 11 summarizes the contribution to the greatest clearance time for the County for each category storm.

TABLE 11
TOTAL EVACUATION TIME

Category	Destination(1)	Weather(2)	Clearance Time July	November	Total Evacuation Time July	November
All	1.1	8	1.1	1.7	10.2	10.8

(1) From Table 8 or 9, whichever is greater
(2) From Table 7

The clearance time for the county as a whole will increase if out of county evcuation is forced into a single route. For example under ideal conditions, evacuees could choose between US 27 and SR 78/CR 721. However, if the storm was approaching directly from the east or west, the inclination of people to drive away from the storm could congest one route or the other. This would be compounded by other evacuating counties.

PART II - 1991 FORECASTS

Part of hurricane preparedness involves anticipating and evaluating near term growth. This element of the study examines population growth to 1991 and the transportation improvements and shelter facilities that are expected to come on line by then.

Since the population forecast is relatively short term (and since Glades' growth has been relatively slow, averaging fewer than 200 people per year since 1980), the growth predicted is a simple straight line increase. This is then applied uniformly to the communities for people, housing and vehicles. The results are depicted in Tables 12, 13, and 14 and are shown for both high and low season.

TABLE 12
GLADES COUNTY HOUSING ESTIMATE FOR 1991
(Based on Projected Housing Units of 4,414)

Zone	Residential Single-Family	Mobile Home/ Recreational Vehicle	Multi-Family Apartment	Multi-Family Condo	Hotel-Motel	Total
Moore Haven	520	577	63	N/P*	192	1,352
Ortona	195	302	N/P	N/P	N/P	497
Fisheating Creek	103	159	N/P	N/P	N/P	262
Lakeport/ Buckhead Ridge	1,128	1,116	23	N/P	36	2,303
TOTALS	1,946	2,154	86	N/P	228	4,414

TABLE 13
GLADES COUNTY PEAK SEASON POPULATION ESTIMATE FOR 1991
(Based on Projected Housing Units of 4,414)

Zone	Residential Single-Family	Mobile Home/ Recreational Vehicle	Multi-Family Apartment	Multi-Family Condo	Hotel-Motel	Total
Moore Haven	1,352	855	161	N/P*	290	2,658
Ortona	507	448	N/P	N/P	N/P	955
Fisheating Creek	269	236	N/P	N/P	N/P	505
Lakeport/ Buckhead Ridge	2,933	1,654	59	N/P	54	4,700
TOTALS	5,061	3,193	220	N/P	344	8,818

* No Projection

TABLE 13 (Continued)
GLADES COUNTY OFF SEASON POPULATION ESTIMATE FOR 1991
(Based on Projected Housing Units of 4,414)

Zone	Residential Single-Family	Mobile Home/ Recreational Vehicle	Multi-Family Apartment	Multi-Family Condo	Hotel-Motel	Total
Moore Haven	1,352	420	153	N/P*	425	2,350
Ortona	507	220	N/P	N/P	N/P	727
Fisheating Creek	268	116	N/P	N/P	N/P	384
Lakeport/ Buckhead Ridge	2,933	812	56	N/P	80	3,881
TOTALS	5,060	1,568	209	N/P	505	7,341

TABLE 14
GLADES COUNTY PEAK SEASON VEHICLE ESTIMATE FOR 1991
(Based on Projected Housing Units of 4,414)

Zone	Residential Single-Family	Mobile Home/ Recreational Vehicle	Multi-Family Apartment	Multi-Family Condo	Hotel-Motel	Total
Moore Haven	572	362	68	N/P*	123	1,125
Ortona	215	189	N/P	N/P	N/P	404
Fisheating Creek	113	100	N/P	N/P	N/P	213
Lakeport/ Buckhead Ridge	1,241	700	25	N/P	23	1,989
TOTALS	2,141	1,351	93	N/P	146	3,731

GLADES COUNTY OFF SEASON VEHICLE ESTIMATE FOR 1991
(Based on Projected Housing Units of 4,414)

Zone	Residential Single-Family	Mobile Home/ Recreational Vehicle	Multi-Family Apartment	Multi-Family Condo	Hotel-Motel	Total
Moore Haven	572	178	65	N/P*	180	955
Ortona	215	93	N/P	N/P	N/P	308
Fisheating Creek	113	50	N/P	N/P	N/P	163
Lakeport/ Buckhead Ridge	1,241	344	24	N/P	34	1,643
TOTALS	2,141	665	89	N/P	214	3,109

* No Projection

The facilities expected to come on line can be categorized as new routes and improvements to existing routes, and enlarging and improving existing school facilities (shelters are often in public schools).

Glades County has no evacuation route improvements that will be in place by 1991, although engineering studies and right of way purchases will be underway in several areas.

Likewise, the only school planned for modernization and expansion is Moore Haven Junior/Senior High School, but this facility is not currently in use as a shelter. After renovations are complete, the school will be re-evaluated for use as a shelter.

Assuming there will not be significant improvements in place, new shelter satisfaction rates (Table 5), times to clear (Table 9), county exiting times (Table 10) and clearance time totals (Table 11) will need to be calculated. The evacuating population (mobile homes) will grow by about 100 people and the number of evacuating vehicles by about 73. Granted, these numbers are small, but with the limited facilities that are and will be available, there will be an impact.

Total new shelter satisfaction is given in Table 15 and the new total clearance time is given in Table 16.

TABLE 15
IN-COUNTY SHELTER SATISFACTION, 1991

CATEGORY	EVACUEES JULY/NOV.	PUBLIC SHELTER SPACE/% JULY/NOV.	HOTEL/MOTEL SPACE/% JULY/NOV.	STAY W/ FRIENDS/% JULY/NOV.
All	1,568(J)	3,340(J)	+ not needed(J)	+ not needed(J)
	3,193(N)	3,340(N)	+ not needed(N)	not needed(N)
	-	100%(J)		
		100%(N)		

= 100% shelter met in County for July
= 100% shelter met in County for November

Since all necessary shelter is available within the County, it must again be assumed that there will be people voluntarily leaving the County and the number of evacuating vehicles could be as high as 30% of all vehicles in the County.

TABLE 16
TOTAL EVACUATION TIME

CATEGORY	DESTINATION	WEATHER	CLEARANCE TIME JULY	CLEARANCE TIME NOVEMBER	TOTAL EVACUATION TIME JULY	TOTAL EVACUATION TIME NOVEMBER
All	1.1	8	1.4	2.9	10.5	12.0

PART III - REGIONAL SUMMARY

The summary will discuss two aspects of a hurricane evacuation that have been discussed before. These are inter-county background traffic, and the guessing effect, if any, that may occur from one county's evacuees moving into another county.

Background Traffic, Present and 1991

Since hurricanes are slow-moving phenomena, it may be expected that, at least in the initial phases, there will be some traffic moving as usual. Within each county, this has been accounted for on critical road links as the "slow" response, or a 50/50 split in traffic movement. Greater concern for the storm (or more imperative evacuation orders) will in later stages reduce the split to 70/30 or 90/10.

Some normal movement between counties, however, must be expected. This reflects normal business activities, work trips, and the movement of goods. A "worst" case scenario would have the background trips experienced on a normal day be the background trips for a hurricane evacuation. That being the case, the region experiences an estimated 70,055 trips entering the region (with an equal number departing).

This varies from county to county, with Sarasota being the biggest recipient of inter-regional and inter-county travel. Table III-1 depicts this travel for current years and for 1991.

TABLE III-1
INTER-COUNTY TRAVEL

COUNTY	ROUTE	LOCATION	TOTAL COUNT 1987*	TOTAL COUNT 1991**	NOTE***
Sarasota	SR 789	N	10,260	11,659	To/From Manatee
	US 41	N	38,129	45,062	To/From Manatee
	US 301	N	30,558	36,114	To/From Manatee
	I-75	N	33,336	39,396	To/From Manatee
	SR 72	E	1,257	1,486	To/From DeSoto
	I-75	S	15,532	18,356	To/From Charlotte
	US 41	S	15,692	18,545	To/From Charlotte
	Pine Street	S	3,191	3,771	To/From Charlotte
	SR 775	S	19,580	23,150	To/From Charlotte
Charlotte	I-75	N	15,532	18,356	To/From Sarasota
	US 41	N	15,692	18,545	To/From Sarasota
	Pine Street	N	3,191	3,771	To/From Sarasota
	SR 775	N	19,588	23,150	To/From Sarasota
	SR 31	N	2,089	2,469	To/From DeSoto

* Projected from 1986 counts by a 5% increase.
** Projected from 1986 counts by a 25% increase.
*** Normally a 50% split in each direction.
N/C No Counts

TABLE III-1 (Continued)
INTER-COUNTY TRAVEL

COUNTY	ROUTE	LOCATION	TOTAL COUNT 1987*	TOTAL COUNT 1991**	NOTE***
	US 17	N	3,484	4,117	To/From DeSoto
	SR 39	N	N/C	N/C	To/From Sarasota
	Kings Hwy.	N	N/C	N/C	To/From DeSoto
	SR 74	E	N/C	N/C	To/From Glades Co.
	Burnt Store	S	N/C	N/C	To/From Lee County
	US 41	S	15,223	18,124	To/From Lee County
	I-75	S	15,529	18,352	To/From Lee County
	SR 31	S	2,001	2,365	To/From Lee County
Lee	US 41	N	15,223	18,124	To/From Charlotte
	I-75	N	15,529	18,352	To/From Charlotte
	SR 31	N	2,001	2,365	To/From Charlotte
	Burnt Store	N	N/C	N/C	To/From Charlotte
	SR 80	E	7,685	9,506	To/From Hendry
	SR 82	E	3,224	3,810	To/From Hendry
	US 41	S	17,582	20,931	To/From Collier
	I-75	S	14,177	16,877	To/From Collier
Collier	C 865	N	3,864	4,567	To/From Lee
	US 41	N	17,582	20,931	To/From Lee
	I-75	N	14,177	16,877	To/From Lee
	SR 82	N	3,224	3,810	To/From Lee
	SR 84	E	5,255	6,210	To/From Broward
	US 41	E	3,229	3,816	To/From Dade
	SR 29	N	2,999	3,544	To/From Hendry
Hendry	SR 29	S	2,999	3,544	To/From Collier
	US 27	S/E	13,966	16,505	To/From Palm Beach
	SR 80	W	7,685	9,506	To/From Lee
	SR 78	W	N/C	N/C	To/From Lee
	SR 29	N	12,223	14,446	To/From Glades
	US 27	N	9,211	10,886	To/From Glades
Glades	SR 78	N	3,384	3,999	To/From Okeechobee
	US 27	N	9,176	10,843	To/From Highlands
	SR 74	W	N/C	N/C	To/From Charlotte
	US 27	S	9,211	10,886	To/From Hendry
	SR 29	S	12,223	14,446	To/From Hendry

* Projected from 1986 counts by a 5% increase.
** Projected from 1986 counts by a 25% increase.
*** Normally a 50% split in each direction.
N/C No counts.

Using this information, it is possible to hypothicate the "in-out" and "through" traffic the region may experience. This is possible through summarizing the traffic entering by direction and comparing the differences. Once compared, the "low" point in

traffic counts can be considered "through trip equivalents" and the remainder represent destination satisfaction. Table III-2 presents this estimate for the Region as a whole.

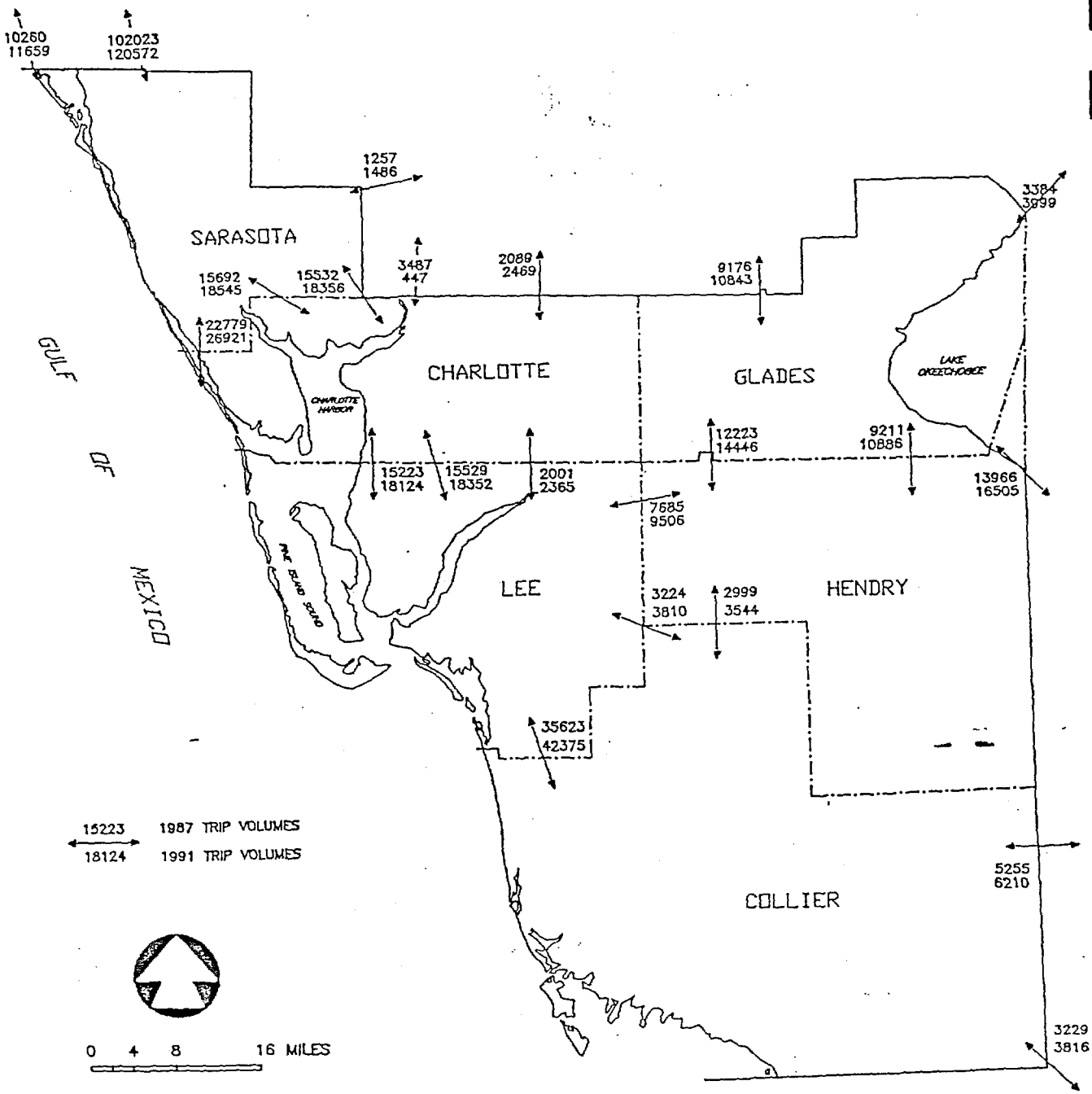
TABLE III-2
TRIP DESTINATION

COUNTY	DIRECTION	TOTAL TRIPS 1987	TOTAL TRIPS 1991	TRIPS* GENERATED OR TERMINATED 1987	TRIPS* GENERATED OR TERMINATED 1991	TRIPS* THROUGH 1987	TRIPS* THROUGH 1991
Sarasota	N	112,281	132,231	-	-	-	-
	E	1,257	1,486	-	-	-	-
	S	53,995	63,882	-	-	-	-
TOTAL		--	--	29,772	34,948	26,997	31,912
Charlotte	N	59,576	70,408	-	-	-	-
	W	N/C	N/C	-	-	-	-
	S	32,753	38,841	-	-	-	-
TOTAL		--	--	13,411	15,783	16,376	19,420
Lee	N	32,753	38,841	-	-	-	-
	E	10,909	13,316	-	-	-	-
	S	31,759	37,808	-	-	-	-
TOTAL		--	--	5,952	7,175	15,880	18,904
Collier	N	38,622	45,919	-	-	-	-
	W	3,224	3,810	-	-	-	-
	E	8,482	10,026	-	-	-	-
TOTAL		--	--	16,681	19,852	4,242	5,013
Hendry	N	21,434	25,332	-	-	-	-
	W	7,685	9,506	-	-	-	-
	E	13,966	16,505	-	-	-	-
	S	2,999	3,544	-	-	-	-
TOTAL		--	--	9,706	10,939	6,983	8,253
Glades	N	12,560	14,842	-	-	-	-
	W	N/C	N/C	-	-	-	-
	S	21,434	25,332	-	-	-	-
TOTAL		--	--	4,437	4,745	6,280	7,421

* Taking only 50% of trips, to be presumed as entering one side and exiting the other; or matched by an equivalent number of out trips.

N/C No Counts

This distribution is visually depicted in Map III-1.



MAP III-1
INTERCOUNTY TRAVEL, 1987, 1991

Inter-county Loadings

As stated previously, a hurricane is a regional phenomenon. It is unlikely that an evacuation order will be needed for only one county, or, for that matter, only one region. Evacuees going to other parts of the State or out-of-state will pass through other counties undergoing or preparing to undergo an evacuation. This situation was initially discussed in the 1981-82 Regional Hurricane Evacuation Plan for a worse case scenario. The purpose of this section is to provide a greater variety of possible incidents, so that local and state Emergency Management Officials can use the information for a better understanding of inter-county impacts.

The basic information used in this analysis will be the routes, the route capacities, and the total vehicle loadings, and the time it takes to exit the separate counties. This will be then modified for "in county" congestion points for critical roadways (commonly I-75, US 41, US 27, SR 29, among others) which will be used in multi-county evacuations. The usual direction for evacuation is northerly, although easterly routes will also be examined.

Overall, the greater the hurricane, the greater the regional evacuation need. Similarly, the more counties affected, the greater the evacuation need. This is depicted in Table III-3, as total vehicle estimates. Also provided is an estimate of "background" loadings, which remains the same, regardless of storm category.

TABLE III-3
MULTI-COUNTY VEHICLE LOADINGS (JULY)

STORM CATEGORY	COUNTY					
	COLLIER	LEE	CHARLOTTE	SARASOTA	HENDRY	GLADES
1	26,729	48,750	16,931	17,311	622	351
2	39,066	86,743	25,387	23,130	622	381
3	58,192	109,155	37,529	35,335	622	381
			(NOVEMBER)			
1	34,721	64,672	19,520	25,959	1,084	664
2	47,556	111,549	26,852	31,780	1,084	664
3	68,072	127,218	39,730	46,470	1,084	664
Background All Categories	4,242	15,880	16,376	26,997	6,983	6,280

These loadings indicate that there should be as few artificial restrictions on inter-county roadways as possible. For example, US 41 is an important inter-county roadways, yet it is also for each coastal county a locally important road for movement of evacuees within the county. Consequently, it is necessary to analyze specific inter-county routes and combination of routes to determine where congestion may occur, and if it will occur due to either reductions in design capacity or to overload by internal traffic. Map III-2 depicts the critical inter-county routes and their capacities for 1987 (slow response) only.

These capacities enable assessments to be made regarding inter-county loadings. This will be expressed in compact hours for simplicity sake. Behavior in actual loading will differ, but will not affect overall times. (For example, I-75 may be able to take 2,000 cars per hour; Collier County may actually only load 1,000 cars per hour, with Lee County then making up the difference). Using this approach, the roadway capacities "exiting" each county (depicted in Map III-2 as one-way volumes) combined with the vehicle loads in Table III-3 give traffic hour equivalents. These are depicted in Table III-4 for all routes.

TABLE III-4
SINGLE-COUNTY LOADING TIMES

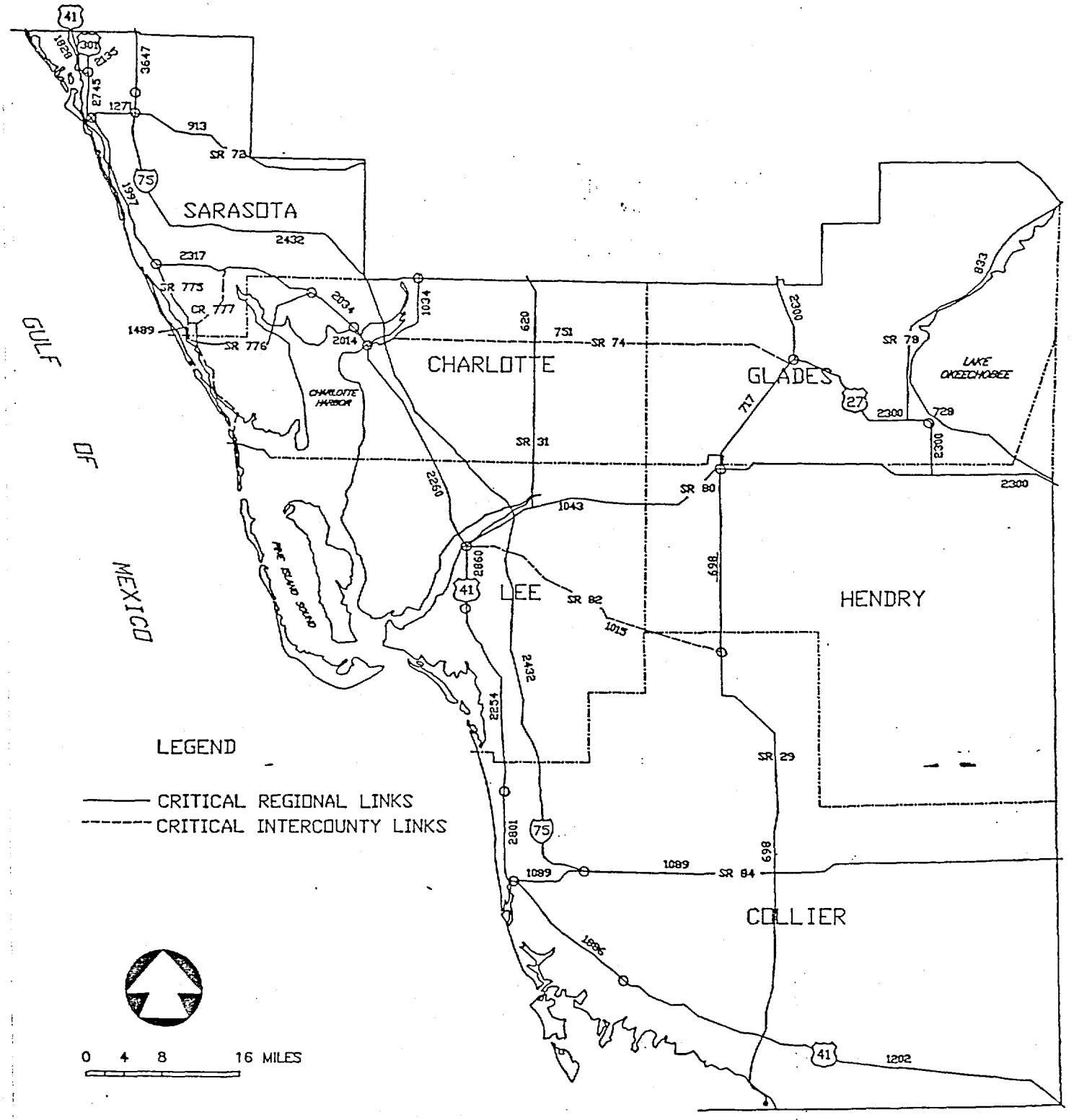
(JULY)

COUNTY	STORM CATEGORY 1	2	3
Collier	(4.5) 3.3	(6.6) 4.8	(9.8) 7.1
Lee	7.5	13.7	17.2
Charlotte	2.6	3.9	5.7
Sarasota	3.2	4.2	4.9
Hendry	0.4	0.4	0.4
Glades	0.2	0.2	0.2

(NOVEMBER)

Collier	(5.9) 4.2	(8.0) 5.8	(11.5) 8.3
Lee	9.8	17.2	19.6
Charlotte	3.0	4.1	6.0
Sarasota	4.7	5.8	6.5
Hendry	0.7	0.7	0.7
Glades	0.3	0.3	0.3

NOTE: Collier (US 41 N,E; I-75 N; SR 84 E; SR 29 N)
Lee (US 41 N; I-75 N; SR 31 N; SR 80 E)
Charlotte (SR 775 N; Pine N; US 41 W; I-75 N; US 17 N; SR 74 E)
Sarasota (I-75; US 41; US 301 for Category 3)
Hendry (US 27 N & E; SR 29 N)
Glades (US 27; SR 78)
( ) reflects roads not used due to a crossing storm.



MAP III-2
ROUTE LOADINGS

Crossing hurricanes from the east, however, negates counties' abilities to move traffic easterly. It may also affect County abilities to move traffic north, should the storm be crossing above some affected communities. An attempt to assess this is made through eliminating US 41 (E), I-75/SR 84 (E), and US 27 (E) as routes. Table III-4 reflects the changes this would have by the numbers in parenthesis.

As can be seen in the individual county tables, with all routes open, single county loading times are not excessive. Multi-county loading times, however, will climb. This is depicted in Table III-5, for different scenarios, with all counties evacuating according to the same category storm.

TABLE III-5
MULTI-COUNTY LOADING TIMES

COUNTY COMBINATION		STORM CATEGORY 1		STORM CATEGORY 2		STORM CATEGORY 3
C/L	(J)	10.8 (12.0)	(J)	18.5 (19.3)	(J)	24.3 (27.0)
	(N)	14.0 (15.7)	(N)	23.0 (25.2)	(N)	27.9 (31.2)
C/L/G/H	(J)	11.4 (12.6)	(J)	19.1 (19.9)	(J)	24.9 (27.6)
	(N)	15.0 (16.7)	(N)	24.0 (26.2)	(N)	28.9 (32.2)
C/L/CH	(J)	12.4 (13.6)	(J)	22.4 (24.2)	(J)	30.0 (32.7)
	(N)	17.0 (18.7)	(N)	27.1 (29.3)	(N)	33.9 (36.1)
C/L/CH/ G/H/	(J)	13.0 (14.2)	(J)	23.0 (24.8)	(J)	30.6 (33.3)
	(N)	18.0 (19.7)	(N)	28.1 (30.3)	(N)	34.9 (37.1)
C/L/CH/S	(J)	16.2 (17.4)	(J)	26.6 (28.4)	(J)	34.9 (37.6)
	(N)	22.7 (24.3)	(N)	32.9 (35.1)	(N)	40.4 (43.6)
C/L/CH/ S/G/H	(J)	16.8 (18.0)	(J)	27.2 (29.0)	(J)	35.5 (38.2)
	(N)	23.7 (25.3)	(N)	33.9 (36.1)	(N)	41.4 (44.6)
L/CH/S	(J)	13.5	(J)	21.8	(J)	27.8
	(N)	19.5	(N)	27.1	(N)	32.1
L/CH/S/G/H	(J)	14.1	(J)	22.6	(J)	28.4
	(N)	20.5	(N)	28.1	(N)	33.1
CH/S	(J)	5.8	(J)	8.1	(J)	10.6
	(N)	7.7	(N)	9.9	(N)	12.5
CH/S/G/H	(J)	6.4	(J)	8.7	(J)	12.2
	(N)	8.7	(N)	10.9	(N)	13.5

As the table demonstrates, a worse case Category 1 storm in July, even crossing and closing easterly routes, is likely to be accommodated with a maximum 18.0 hour inter-county time. However, a November Category 3 storm has extremely high times for evacuation, 41.4 hours, with a crossing 3 storm - very unlikely condition - requiring 44.6 hours. The appropriate storm surge tables demonstrate that a Category 4 or 5 storm winds are needed to create Category 3 storm flooding; consequently, it may be assumed that landfalling or paralleling time (44.4 hours) is the worse case scenario. Regretfully, this time also cannot be accommodated by any foreseeable community or state action.

What is useful to note is that neither Glades nor Hendry Counties provide traffic bottleneck for evacuation. In both cases, there is the capacity to move more traffic out of the county than there is traffic entering the county. Consequently, other than traffic control at the intersection of SR 80 and 29, no other action is needed.

This is not the case for the coastal counties of Lee and Charlotte. Both counties are generating traffic to such an extent that intra-regional travel times on US 41 will be increased.

One factor that is difficult to assess is the impact of background traffic. Given that a hurricane is known to be approaching, it is likely that normal intercounty and interregional traffic will not occur. It must be assumed, however, that there will be some background traffic. Consequently, the "through" trip depicted in Table III-2 probably constitute the worse case conditions. Contrary to evacuation traffic, however, this travel is not compressible into a single loading number expressed in hours. Instead, it must be considered a factor absorbing a portion of the loading times. Therefore, if the through trips is assumed to be distributed through a twelve hour travel day, a factor can be calculated as a percentage of road capacity for twelve hours that can be used to factor up the evacuation stream. For example, if roadway capacity for several county roads was 5,000 trips per hour, the twelve hour capacity is 60,000 trips. If background traffic was 6,000 trips per day, only 54,000 trips remain for evacuation. This expressed as a factor of 1.1. Table III-6 represents the multi-county loading times from Table III-5, factored to represent the background traffic from Table III-2, and the roadway capacities from Map III-2.

TABLE III-6
MULTI-COUNTY LOADING TIMES
WITH BACKGROUND TRAFFIC

COUNTY COMBINATION	BACKGROUND FACTOR	CATEGORY 1	CATEGORY 2	CATEGORY 3
C/L	1.25	(J) 13.5 (15.0)	(J) 23.1 (24.1)	(J) 30.4 (33.8)
		(N) 17.5 (19.6)	(N) 28.8 (31.5)	(N) 34.9 (39.0)
C/L/G/H		(J) 14.3 (15.8)	(J) 23.9 (24.9)	(J) 31.1 (34.5)
		(N) 18.8 (20.9)	(N) 30.0 (32.8)	(N) 36.1 (40.3)
C/L/CH	1.25	(J) 15.5 (17.0)	(J) 28.0 (30.2)	(J) 37.5 (40.9)
		(N) 21.3 (23.4)	(N) 33.9 (36.6)	(N) 42.4 (45.1)
C/L/CH/G/H		(J) 16.3 (17.8)	(J) 28.8 (31.0)	(J) 38.2 (41.6)
		(N) 22.5 (24.6)	(N) 35.1 (37.9)	(N) 43.6 (46.4)
C/L/CH/S	1.3	(J) 21.1 (22.6)	(J) 34.6 (36.9)	(J) 45.4 (48.9)
		(N) 29.5 (31.6)	(N) 42.8 (45.6)	(N) 52.5 (56.7)
C/L/CH/S/G/H		(J) 21.8 (23.4)	(J) 35.4 (37.7)	(J) 46.2 (49.7)
		(N) 30.8 (32.9)	(N) 44.1 (46.9)	(N) 53.8 (58.0)

TABLE III-6 (Continued)
MULTI-COUNTY LOADING TIMES
WITH BACKGROUND TRAFFIC

COUNTY COMBINATION	BACKGROUND FACTOR		CATEGORY 1		CATEGORY 2		CATEGORY 3
L/CH/S	1.3	(J)	17.6	(J)	28.3	(J)	36.1
		(N)	25.4	(N)	35.2	(N)	41.7
L/CH/S/G/H		(J)	18.3	(J)	29.4	(J)	36.9
		(N)	26.7	(N)	36.5	(N)	43.0
CH/S	1.3	(J)	7.5	(J)	10.5	(J)	13.8
		(N)	10.0	(N)	12.5	(N)	16.3
CH/S/G/H		(J)	8.3	(J)	11.3	(J)	15.9
		(N)	11.3	(N)	14.2	(N)	17.6

As the table demonstrates, background traffic can even further hinder the success of a multi-county evacuation. A category 3 time of 53.8 hours cannot be expected to be a success, but this is suspected without background traffic; what was not expected is that a Category 1 landfalling six-county scenario has a 30.8 hour time for November; this time is also too lengthy to expect that an evacuation will be successful. Yet, without more local public and private shelters, this time is needed. Consequently, more work is needed to keep as many evacuees in their home county as is possible.

Chapter IV (Critiques and Elaborations) provides alternatives that can reduce these times. These include more public shelters, more staged evacuations (tropical storm or barrier island scenarios), and more on-site preparedness activities. In addition to these activities, the Council will undertake community-specific assessments from local (or state) requests to determine other activities to reduce inter-county evacuation times and to improve local preparedness.

PART IV. CRITIQUE AND ELABORATIONS

This section examines alternatives to certain approaches taken in Parts II (Counties) and III (Regional Summary) and the impacts these alternatives would have. This section also provides assumptions on critical actions that local and other governmental agencies should undertake to improve evacuation times.

Behavior - Destinations Change

Part I summarizes other area's behavioral studies regarding destination desires i.e., public shelter, friend-relative, hotel, and out-of-county. Part II, however, based the destination desires on local capacities to provide public or private sheltering. This section assesses the regional impacts that are mitigated should each County satisfy the sheltering needs of 66% of its evacuating population. This would include sheltering by public shelters, private shelters, friends, relatives, and rental shelter outside of the hurricane flood zone.

Should each coastal county keep within its 66% of evacuees, the major impact will be a reduction of vehicle loading on interregional roadways, and thus a reduction of loadings in counties having evacuees pass through to other destinations. The reduction in out-of-county vehicle loadings is depicted in Table IV-1.

TABLE IV-1
REVISED LOADINGS, 34% Evacuees Leaving County

COUNTY	CATEGORY	ORIGINAL LOADINGS JULY	ORIGINAL LOADINGS NOVEMBER	REVISED LOADINGS JULY	REVISED LOADINGS NOVEMBER
Collier	1	26,729	34,721	12,466	15,292
	2	39,066	47,550	15,535	18,330
	3	58,192	68,072	21,116	24,701
Lee	1	48,750	64,672	28,927	34,303
	2	86,743	111,549	37,618	46,650
	3	109,155	127,218	41,054	47,272
Charlotte	1	16,931	19,520	8,579	9,342
	2	25,387	26,852	10,203	10,703
	3	37,529	39,730	13,361	14,086
Sarasota	1	17,311	25,959	11,678	15,061
	2	23,130	31,780	13,773	17,372
	3	35,335	46,470	18,039	21,913

This reduction has a positive impact on intercounty evacuation times. This is depicted in Table IV-2, which is a revision of Table III-4, to reflect reduced single-county loading times. It is also depicted in Table IV-3, which is a revision of Table III-5, which reflects reduced multi-county traffic loading times.

TABLE IV-2
REVISED SINGLE-COUNTY LOADING TIMES

COUNTY		STORM CATEGORY 1		STORM CATEGORY 2		STORM CATEGORY 3
Collier	(J)	1.5 (2.1)	(J)	1.9 (2.6)	(J)	2.6 (3.6)
	(N)	1.9 (2.6)	(N)	2.2 (3.1)	(N)	3.0 (4.2)
Lee (Quick)	(J)	4.5	(J)	5.8	(J)	6.3
	(N)	5.2	(N)	7.2	(N)	7.3
Charlotte	(J)	1.3	(J)	1.6	(J)	2.0
	(N)	1.4	(N)	1.6	(N)	2.1
Sarasota	(J)	2.1	(J)	2.5	(J)	3.3
	(N)	2.8	(N)	3.2	(N)	4.0
Hendry	(J)	0.4	(J)	0.4	(J)	0.4
	(N)	0.7	(N)	0.7	(N)	0.7
Glades	(J)	0.2	(J)	0.2	(J)	0.2
	(N)	0.3	(N)	0.3	(N)	0.3

Parenthesis denotes the time if eastern or southern evacuation routes are closed due to a "crossing" storm.

TABLE IV-3
REVISED MULTI-COUNTY LOADING TIMES

COUNTY COMBINATION		STORM CATEGORY 1	STORM CATEGORY 2	STORM CATEGORY 3
C/L	(J)	6.0 (6.6)	7.7 (8.3)	8.9 (9.9)
	(N)	7.1 (7.9)	9.4 (10.3)	10.3 (11.5)
C/L/G/H	(J)	6.6 (7.2)	8.3 (8.9)	9.5 (10.5)
	(N)	8.1 (8.9)	10.4 (11.3)	11.3 (12.5)
C/L/CH	(J)	7.3 (7.9)	9.3 (9.9)	11.9 (12.9)
	(N)	8.5 (9.3)	11.0 (11.9)	12.4 (13.6)
C/L/CH/G/H	(J)	7.9 (8.5)	9.9 (10.5)	12.5 (13.5)
	(N)	9.5 (10.3)	12.0 (12.9)	13.4 (14.6)
C/L/CH/S	(J)	9.4 (10.0)	11.8 (12.4)	15.2 (16.2)
	(N)	11.3 (12.1)	14.2 (15.1)	16.4 (17.6)
C/L/CH/S/ G/H	(J)	10.0 (10.6)	12.4 (13.0)	15.8 (16.8)
	(N)	12.3 (13.1)	15.2 (16.1)	17.4 (18.6)
L/CH/S	(J)	7.9	9.9	11.6
	(N)	9.4	12.0	13.4
L/CH/S/G/H	(J)	8.5	10.5	12.2
	(N)	10.4	13.0	14.4
CH/S	(J)	3.4	4.1	5.3
	(N)	4.2	4.8	6.1
CH/S/G/H	(J)	4.0	4.7	5.9
	(N)	5.2	5.8	7.2

The positive benefit the reduction in loadings has is that multi-county evacuation becomes feasible. This is true even if background factors are considered, increasing time by 30%.

It should be noted that background factors can be reduced through a public policy limiting "casual" traffic entering counties ordered to undergo an evacuation. An example of this policy would be that, if Lee and Collier Counties had to evacuate, Miami to Tampa traffic (and vice versa) would be blocked from using I-75 in Dade and Charlotte Counties and routed towards US 27 (or I-4/I-95).

Behavior - Response Times

The biggest contribution to the speed in which residents make the decision to evacuate is the urgency imparted by those giving the order the public hears or sees. An order informing residents that they have to evacuate and informing them that they have several hour to do so has less urgency than an order that tells them to leave immediately for their safety. The County estimates in Part II assume a less urgent order and a set of circumstances that has the last of the evacuees starting their evacuation seven hours after the evacuation order is issued. This provides time for people to return home, purchase materials, load up goods, make destination arrangements, household arrangements and go.

This section assumes the impact of an urgent or "quick" order. This presupposes a set of circumstances that has all affected persons warned at approximately the same time, access to the area being severely restricted, and the warning imparting information that the storms effects are imminent. For this type of order, a response time of two hours is assumed, reflecting time to dress appropriately, gather supplies, and go. It does not provide time for purchasing goods, doing much "about the house" preparations, or taking the household pet to the veterinarian. Using the 2-hour estimate, few zones regionwide have intermittent evacuation streams, providing room for other zones to enter the traffic flow. Overing effects will be much greater than for the seven hour estimate. Table IV-3 depicts the changes in effected zones regionwide. There is no impact in reducing evacuating times for any coastal county responding to a category 2 or 3 storm. Inland Counties, however, have reduced times.

TABLE IV-4
DECISION TIMES (Quick), Seven and Two Hours

County	Zone	Based on "Seven-hour" Response June	November	"Two-Hour" Response June	November
Collier					
	Everglades	7.0	7.0	2.0	2.0
	Goodland	7.0	7.0	2.0	2.0
	S. Naples	7.0	7.0	5.0	5.9
	Naples Beach	7.0	7.0	5.7	6.2
	East Naples	7.0	7.0	2.6	3.0
	Fakahatchee	7.0	7.0	2.0	2.0
	North Naples	7.0	7.0	5.2	5.8
	Golden Gate	7.0	7.0	2.0	2.0
Lee					
	Pine Island	7.0	7.0	4.8	5.4
	N.Ft.Myers/River	7.0	7.0	3.3	3.4
	North River	7.0	7.0	2.0	2.0
	N.E.River/Alva	7.0	7.0	3.5	4.1
	Iona	7.0	7.0	4.4	5.1
	Bonita Beach	7.0	7.0	5.6	6.8
	Old Ft. Myers	7.0	7.0	2.0	2.0
	Bonita Springs	7.0	7.0	2.6	3.2
	San Carlos Park	7.0	7.0	2.0	2.0
	Central Ft. Myers	7.0	7.0	2.0	2.1
	W.S. Ft. Myers	7.0	7.0	2.0	2.0
	Summerlin	7.0	7.0	2.0	2.0
	Tice	7.0	7.0	2.2	2.4
	Orange River	7.0	7.0	2.0	2.0
	E.S. Ft. Myers	7.0	7.0	2.0	2.0
	Page Field	7.0	7.0	2.0	2.0
	Six Mile Cypress	7.0	7.0	2.0	2.0
	N.Ft. Myers	7.0	7.0	3.3	5.0
Charlotte					
	Myakka River	7.0	7.0	2.0	2.0
	Barrier Islands	7.0	7.0	5.8	6.2
	Cape Haze	7.0	7.0	2.0	2.0
	Port Charlotte	7.0	7.0	4.3	4.4
	Peace River	7.0	7.0	3.9	4.1
	Punta Gorda	7.0	7.0	2.7	3.1
	South County	7.0	7.0	2.0	2.0
	Cape Haze (2)	7.0	7.0	2.6	3.1
	Port Charlotte(2)	7.0	7.0	3.7	3.9
	Shell Creek	7.0	7.0	2.0	2.0
	Punta Gorda(2)	7.0	7.0	2.0	2.0
	South County(2)	7.0	7.0	2.0	2.0
	Cape Haze(3)	7.0	7.0	2.0	2.0
	Shell Creek(3)	7.0	7.0	2.0	2.0
	Punta Gorda(3)	7.0	7.0	2.0	2.0

TABLE IV-4 (Continued)
DECISION TIMES (Quick), Seven and Two Hours

County	Zone	Based on "Seven-hour" Response June	November	"Two-Hour" Response June	November
Sarasota					
	Longboat Key	7.0	7.0	5.5	6.5
	Siesta Key	7.0	7.0	5.7	6.7
	Casey Key	7.0	7.0	2.0	2.0
	Manasota Key	7.0	7.0	2.0	2.0
	Myakka Floodplain	7.0	7.0	2.0	2.0
	Englewood Bayfront	7.0	7.0	2.7	2.0
	Venice/Osprey	7.0	7.0	2.0	2.0
	Sarasota Bayfront	7.0	7.0	3.3	3.7
	Myakka (2)	7.0	7.0	2.0	2.0
	Inland (2)	7.0	7.0	4.2	6.0
	South Myakka	7.0	7.0	2.0	2.0
	North Port	7.0	7.0	3.1	3.4
	Inland (3)	7.0	7.0	2.6	3.1
Hendry	All Zones	7.0	7.0	2.0	2.0
Glades	All Zones	7.0	7.0	2.0	2.0

It should be noted that, unless the intercounty loading times decline to those levels indicated in Table IV-3, behavioral response time reductions have no real positive impact beyond a movement to public or private shelters in the local community.

Shelters and Shelter Space

The County evacuation scenarios are based on the use of identified public shelters, providing 20 square feet per evacuee. Assuming that satisfying the sheltering needs of 66% of the County's evacuees through either public or private resources remains a goal, each County has two options, increasing shelter space or reducing the square foot allocation for each evacuee. (A third combination combining both is also possible.)

Each County has the capacity for increasing shelter space through the further designation as shelter or refuges certain additional public and private buildings. Further, private sheltering efforts can be expected and are being promoted for different neighborhoods such as DRIs and mobile home parks. If a more indepth review of private resources is undertaken, and such effort incorporated into public plans, the shelter needs of residents will be more closely met and out-of-county evacuation estimates made in Part II can be reduced. The volume of in-county shelter needs that is yet unmet varies from county to county and storm category to storm category. This is depicted in Table IV-5.

TABLE IV-5
UNMET IN-COUNTY PUBLIC OR PRIVATE SHELTER DEMAND

County	Category	Number of Evacuees with Unmet Needs July	Number of Evacuees with Unmet Needs November	Space Need (000) July	Space Need (000) November
Collier	1	31,112	42,389	622	847
	2	50,208	63,752	1,004	1,275
	3	80,885	94,740	1,618	1,895
Lee	1	64,376	87,974	1,287	1,758
	2	120,404	145,864	2,410	2,917
	3	150,681	176,391	3,021	3,521
Charlotte	1	18,305	23,036	366	461
	2	33,336	38,273	667	765
	3	50,053	56,510	1,001	1,130
Sarasota	1	11,266	21,795	225	435
	2	18,715	29,839	374	597
	3	34,592	49,112	692	982

Excludes 34% of evacuees as "out of county" bound due to own desires

Providing more space is one option. Reducing space for each evacuee is another option. Some areas propose less than our Region's 20-square feet per person (enclosed, including sanitary, kitchen, recreation, medical, and administration facilities), going as low as 10-square feet or lower. Whereas there has been some discussion in other areas to use a 10 square-foot standard, that has been proposed for only very short times and often excludes sanitary, kitchen, and administrative facilities.

If the approach of using a lower standard is undertaken, this report analyzes <u>only</u> the impact of funnelling 24% of evacuees to public shelters on a county-wide basis. This 24% reflects those with a stated desire in 1981 to go to a shelter. It leaves totally unaccounted for the 21% of "don't know" respondents who are apt to follow a public official's direction as to the best approach to follow. Table IV-6 depicts the impact on shelter space of 24% going to the existing declared shelters.

TABLE IV-6
THE REDUCED SPACE OPTION

County	Category	Public Shelter Bound Evacuees July	Public Shelter Bound Evacuees November	Square Footage Available	Per Person Average July	Per Person Average November
Collier	1	19,195	23,550	244,000	12.7	10.4
	2	23,398	28,229	144,000	6.2	5.1
	3	32,519	37,959	144,000	4.4	3.8

TABLE IV-6 (Continued)
THE REDUCED SPACE OPTION

County	Category	Public Shelter Bound Evacuees July	Public Shelter Bound Evacuees November	Square Footage Available	Per Person Average July	Per Person Average November
Lee	1	45,108	53,689	1,193,400	26.5	22.2
	2	60,280	69,539	907,400	15.1	13.0
	3	63,368	72,717	471,600	7.4	6.5
Charlotte	1	12,960	14,782	247,060	19.0	16.7
	2	15,969	17,905	153,140	9.6	8.6
	3	19,533	21,910	65,040	3.3	3.0
Sarasota	1	16,487	21,263	401,900	24.0	18.9
	2	19,444	24,525	401,900	20.6	16.4
	3	25,466	30,937	401,900	15.8	13.0

In comparison, the Black Hole of Calcutta housed 140 disciplined persons at 1.8 square feet per person overnight, with 85% fatalities due to suffocation. If 10 square feet per person is assumed to be the absolute minimum size (which has not been determined) shelter space without adverse impacts on people, then only Sarasota County can meet this for 1-3 storm categories, and Lee for 1-2 categories.

Roadway Levels of Service

The clearance of evacuation times contained in Parts II and III presume an average roadway generating standard of "D." It is possible in tightly controlled traffic movement programs to achieve service level "E" conditions, which increased roadway vehicle capacity by up to 40%, according to the 1985 Highway Capacity Manual. This reduces clearance times be a similar amount. However, normal traffic movement combined with normal traffic control usually causes service level "E" traffic loads to enter service level "F" conditions, reducing roadway vehicle capacity and increasing evacuation times. Depending upon the event(s) causing level "F" conditions, (a stalled vehicle on a bridge blocking a lane of traffic for example) traffic volumes may severely decrease beyond level D, C or even B loads. Some "F" conditions are associated with according like traffic movement, removal of the event does not remove the condition for some time. Consequently, "E" service conditions cannot be expected on the overall county or regional road network. It is possible, however, to impose strict traffic movement programs on certain selected roadway links that create the greatest clearance time. Table IV-7 depicts how county evacuation times are improved with traffic control to "E" service levels on selected links.

TABLE IV-7
ROADWAY SERVICE LEVEL REDUCTIONS, SELECTED LINKS (Quick Response)

County	Category	Season	Link	Capacity "D"	Capacity "E"	Time "D"	Time "E"
Collier	1	J	SR 951	1,036	1,728	7.4	4.4
		N				9.3	5.6
	2	J	CR 951	1,022	1,703	10.0	6.1
		N				12.3	7.4
	3	J	CR 951	1,022	1,703	10.0	6.1
		N				12.3	7.4
Lee	1	J	SR 78 &	1,624	2,662	10.2	6.2
		N	Hunter			11.5	7.0
	2	J	SR 78	812	1,331	18.0	11.0
		N				20.1	12.3
	3	J	SR 78	812	1,331	18.0	11.0
		N				20.1	12.3
Charlotte	1	J	SR 776	1,022	1,703	7.1	4.3
		N				9.7	4.7
	2	J	SR 776	1,022	1,703	7.1	4.3
		N				9.7	4.7
	3	J	Kings Hwy.	792	1,298	9.6	5.9
		N				10.4	6.3
Sarasota	1	J	SR 758	1,005	1,647	5.7	3.5
		N				6.7	4.1
	2	J	US 41	1,828	2,997	8.1	4.9
		N				10.0	6.1
	3	J	US 41	1,828	2,997	8.1	4.9
		N				10.0	6.1

Mobile Home Park Self Sufficiency

Mobile homes and recreational vehicle residents are commonly expected to evacuate regardless of whether or not their park or residential site is expected to flood. This is because the home itself is less safe from winds than conventional structures.

A technique currently in use in some Southwest Florida communities is to require mobile home parks outside of the minimum storm flood area (Category 1) to have adequate on-site shelter space for all residents. This section assesses the impact this would have if 66% of all mobile home residents stayed on site.

a. Shelter Impacts

If all mobile home residents desiring to shelter in the community were able to stay on site, there would be more spaces available to coastal residents evacuating due to flood waters. Table IV-8 indicates the spaces that become available should the approach be taken. The storm category represents all residents in that zone and greater; the shelter space impact is on those spaces available for the

next lesser storm (i.e., Category 2 residents not going to Category 1 shelters).

TABLE IV-8
INCREASED PUBLIC SHELTER SPACE
WITHOUT MOBILE HOME RESIDENTS

County	Category	Equivalent Shelter Space Increase Number	Percent (June Only)
Collier	2	610	5
	3	194	2.7
Lee	2	5,250	8.8
	3	1,679	3.7
Charlotte	2	902	7.3
	3	291	3.8
Sarasota	2	4,300	21.4
	3	1,828	9.1

The table indicates the greatest benefits are felt in Sarasota and the least in Charlotte.

This issue is not relevant for Glades and Hendry County since virtually all evacuees are mobile home residents.

b. Evacuation Time Impacts

The report has the assumption that 34% of all residents in the area will want to leave the area, regardless of whether or not there is local space available. This section assumes that is true for mobile home residents also. However, on-site sheltering then reduces the out-of-county (and in county) loading times. These forecasts provided in Table III-4 and III-5 can be reduced through the on-site sheltering option. Table IV-9 depicts the reduction by county in hours and percent that the on-site mobile home option can have.

TABLE IV-9
REDUCTION IN LOADING TIMES, MOBILE HOME ON-SITE SHELTERING

County	Storm Category	Hours	Percent
Collier	1	0.2	5
	2	0.1	2.7
	3	0.1	<1
Lee	1	0.6	8.8
	2	0.4	3.7
	3	0.1	<1
Charlotte	1	0.2	7.3
	2	0.1	3.8
	3	0.1	<1

TABLE IV-9 (Continued)
REDUCTION IN LOADING TIMES, MOBILE HOME ON-SITE SHELTERING

County	Storm Category	Hours	Percent
Sarasota	1	0.6	21.4
	2	0.4	9.1
	3	0.2	4.5

These reductions also include the impact of fewer "conventional" evacuees leaving because there is more shelter space available.

Individually, the impacts on each county are somewhat significant, particularly for Sarasota and Lee. Collectively, overall times achieve minor reductions, for the greater storms, but significant reductions for lesser storms.

Early Tourist Evacuation

It is suspected that some tourists (hotel/motel residents only) would leave rather than experience a hurricane. This possibility can be more assured if public policy encouraged tourists to leave prior to the general public being told to evacuate. This section tests whether such action improves the community's ability to evacuate and shelter persons. In effect, shelter space availability and inter-county loading times will be examined with the assumption that there will be no "hotel/motel" residents. Tables IV-10 and IV-11 indicate the improvement in area shelter and evacuation times that such a policy would have.

TABLE IV-10
INCREASE IN SHELTER SPACE (Public and Commercial)
EQUIVALENT WITH NO HOTEL/MOTEL RESIDENTS

County	Category	Spaces	Percent (June Only)
Collier	1	1,188	8.9
	2	542	7.0
	3	242	3.1
Lee	1	4,801	7.4
	2	2,842	5.9
	3	298	0.1
Charlotte	1	906	6.8
	2	706	8.4
	3	46	0.1
Sarasota	1	5,027	20.0
	2	4,100	16.9
	3	2,955	12.8

TABLE IV-11
DECREASE IN EVACUATION TIMES, NO HOTEL/MOTEL RESIDENTS

County	Category	Hours	Percent (June Only)
Collier	1	0.4	10.6
	2	0.4	8.4
	3	0.4	5.9
Lee	1	0.6	8.6
	2	0.5	4.0
	3	0.6	3.4
Charlotte	1	0.1	3.4
	2	0.1	2.6
	3	0.1	1.7
Sarasota	1	0.3	9.8
	2	0.3	7.7
	3	0.3	5.4

Having hotel/motel residents leave the area early has significant improvements in the shelter space and evacuation times of several counties. Regarding space, the best improvements occur for the largest counties; as far as times, it improves significantly for the Southern most two and for Sarasota, even for Category 3 storms.

Survey Data and Use; the Feedback Loop

The Original Hurricane Study made use of a newspaper survey to solicit responses on how people will behave. Since the original study there have been a number of pre- and post- storm surveys. These have estimated how persons will behave and have assessed how they did behave. There is not a strong relationship. What did become evident, however, was that the evacuees tended to follow the advice given by public officials: if the officials told them to go to locally available public shelter, they were more likely to do so than if the officials told them to get out of the area. What is becoming evident is that there is a training loop. When the original Hurricane Study was developed the popular doctrine was that there was adequate shelter for evacuees. The study disproved that, and pointed out that there were shortages for the number of evacuees estimated from the surveys. Since then, some public officials have been encouraging residents that they should as a first option seek shelter elsewhere. This will undoubtably reduce shelter demand -- but moves the problem to an out of region road network which is too deficient for successful evacuations of the more severe storm categories. This problem can only be reduced through either road improvements beyond those needed for daily use, or more county self containment. Consequently, it is not possible to predict what residents will do, but current shelter and roadway conditions are inadequate for either the high shelter or high out of county behavioral response for Collier, Lee, and Charlotte Counties.

Vehicle generation was the other element of the survey in which data was prepared. This led to the conclusion that an average of 1.1. vehicles per household would be used in an evacuation. To date, there has been no information developed anywhere that would disprove this assumption. What has been added is a background traffic estimate of vehicles "on the road" that are not included in evacuees' vehicle estimates. This is an improvement over previous studies vehicle movement estimates.

Impact of Evacuation Orders

Again, the influence of training and information is being felt. The original survey and study broke new ground in emergency management and preparedness. The managers today are better informed and educated then they were previously. This has led to improvements in actions and planning methodologies that this study has tried to incorporate. The greatest factor as yet inadequately assessed is the impact in which nature, the manner, the urgency, and the timing of an order given by an evacuation manager will have on an evacuees decisions and actions. The preceeding section of Part IV have tried to give some options to reflect this (more versus less shelter being sought locally; 2 vs 7 hour decision times, D vs E road loadings early evacuation of tourists). However, there can only be approximations. Different orders given to different localities will have different results. Future updates, and more specialized studies for limited geographic areas may develop better approaches to deal with this issue.

TECHNICAL APPENDIX

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i. In the event the county jail must be evacuated, the first option for the approximately 50 people would be to transfer to an adjoining county. The small facilities in the old jail, located first floor in the County Courthouse could also be used.

j. Evacuated areas must remain clear of people until the Sheriff declares it safe to reenter. The Board of County Commissioners will announce this entry clearance to the public from the EOC.

k. Bull horn evacuation alert to areas except mobile home parks covered by fire department.

l. Shelter security problems are to be resolved by the Sheriff's Department.

Punta Gorda Police Department: The police department is available for traffic control and crime prevention duties. At any given time, the department expects to have 12 men available for duty.

The Florida Highway Patrol, or the National Guard can be moved in for traffic direction or looter control, if so requested through State EOC.

The U.S. Coast Guard: U.S. Coast Guard may make the U.S. Coast Guard Auxiliary available for waterborne help.

The Coast Guard should, with DOT, keep bridges open for vehicle traffic only after a hurricane warning is set.

Florida Department of Transportation: DOT local staff has agreed to help in state highway problems during an evacuation. This would be arranged through State EOC.

COLLIER COUNTY

In Collier County, the Collier County Sheriff's Department is in charge of evacuation traffic control and law enforcement. The department is supported by the Naples Police Department. The Sheriff's Department is responsible for all law enforcement, traffic control, and the department assists in rescue efforts. As in Charlotte County, the Sheriff's Department can receive assistance from various State and Federal agencies.

GLADES COUNTY

In Glades County, the Glades County Sheriff's Department is in overall command of traffic and law enforcement responsibilities in the event an evacuation is ordered. If assistance is required, the county can request aid from the Florida Highway

TECHNICAL APPENDIX
A. PUBLIC SAFETY POLICIES

Each county in the region currently has in place some mechanism for dealing with traffic control along evacuation routes. In each county, traffic flow is likely to severely stress road capacities during the evacuation process. Hazardous wind and rain conditions, and possibly tidal flooding, are likely to make this task all the more difficult. Traffic will probably require rerouting around flooded or blocked roads as the storm worsens. High-standing vehicles (high trucks, vans, trailers, etc.) may need to be removed from the routes because of wind conditions. Drivers and passengers in those vehicles will require alternate transportation. One lane of all evacuation routes is reserved strictly for emergency vehicles.

In each county, law enforcement agencies have the following functions, equipment and facilities.

CHARLOTTE COUNTY

Sheriff (Public Safety Building, Punta Gorda - 13 ft. MSL: Englewood Annex - 8 ft. MSL: City of Punta Gorda Police - 8 ft. MSL)

a. The Sheriff or his principal assistant will be located in the EOC with the operations staff.

b. Stations traffic controllers to be used during a full evacuation of low-lying areas. A partial use of the pre-agreed plan would be activated for traffic controllers in reduced scope evacuations.

c. Makes maximum use of automobile and aircraft public address systems to announce Board of County Commissioners' directed evacuation.

d. When the EOC is manned, the Sheriff shall coordinate major evacuation orders through the EOC as directed by the Board of County Commissioners.

e. Provides local liaison with Florida Highway Patrol or National Guard personnel if used after such assistance has been arranged through CEFA. The Board of County Commissioners is overall authority for local use.

f. Provides looter control over evacuated areas.

g. Operates as the senior law enforcement agency in the county, operating under overall authority of the Board of County Commissioners.

h. For hurricane evacuation, vans, boats, large trailer trucks, or mobile homes including R.V.s, will not be permitted on the evacuation routes due to high winds of 40 mph or more.

Patrol, the U.S. Forestry Service, the Florida Division of Forestry, the National Guard and various other State and Federal agencies.

HENDRY COUNTY

In Hendry County, the Sheriff's Department is in charge of traffic control and law enforcement duties in evacuations. The department may call upon the agencies mentioned for Glades County.

LEE COUNTY

Inventory of Available Resources for Implementation

1. City Police Department

   a. Location of Office

      (1) Fort Myers - 1530 Heitman Street
      Fort Myers, FL 33901

      (2) Cape Coral - 815 Nicholas Parkway
      Cape Coral, FL 33904

      (3) Sanibel - P.O. Box 438
      Palm Ridge Road
      Sanibel, FL 33957

   b. Number of Personnel

      (1) Fort Myers - 102
      (2) Cape Coral - 42
      (3) Sanibel - 26

   c. Number of Vehicles (type)

      (1) Fort Myers - 11 marked
      2 trucks
      2 vans
      12 unmarked
      5 leased unmarked

      (2) Cape Coral - 6 patrol cars
      2 administrative cars
      4 investigation cars

      (3) Sanibel - 4 patrol cars (includes 2 four-wheel drive vehicles)

2. Lee County Sheriff's Department

   a. Location of Office: 2055 Anderson Avenue
   Fort Myers, FL 33901

b. Location of Jail: 2085 Second Street
Fort Myers, FL 33901

c. Location of Stockade: 2501 Ortiz Avenue
Fort Myers, FL 33905

d. Number of Personnel: 240

e. Number of Vehicles:
33 patrol cars (marked)
7 special vehicles (marked) vans, etc.
1 helicopter
46 unmarked cars
5 motorcycles

Traffic control and security (anti-looting, etc.) will be performed by the Lee County Sheriff's Department, the Fort Myers Police Department, the Cape Coral Police Department, and the Sanibel Police Department. Security and anti-looting enforcement of evacuation areas will be performed utilizing the emergency lanes of evacuation routes. State law enforcement assistance, when needed, will be requested through the State Division of Emergency Management and coordinated by the Florida Highway Patrol.

SARASOTA COUNTY

1. The Sarasota County Sheriff is the Chief of Sarasota County Law Enforcement Service. He will coordinate all law enforcement activities Sarasota County (cities and incorporated municipalities), business and industrial law enforcement services, and private and volunteer forces, including deputized and special officers.

2. The Chief of Law Enforcement Services will operate in accordance with the procedures set forth in Florida Statutes No. 31, and Chapter No. 252.09, to assist and support the Department of Emergency Management organizational plans and programs of the County.

3. Chiefs of the municipal law enforcement departments in the County will serve as deputies for the law enforcement services and will exercise command control over their own units.

4. The Sarasota County Sheriff shall assign a Liaison Officer who shall coordinate law enforcement activities between the Sheriff and the Florida Highway Patrol. The Liaison Officer, on direction from the Sheriff, shall request assistance from the Florida Highway Patrol for manpower and equipment as required.

5. Control levels:

a. Florida Division of Emergency Management
b. County
c. Municipalities

B. CONCEPT OF OPERATIONS

A. During the increased readiness period, the Sarasota County Law Enforcement Service shall take the following actions to increase the service's readiness to carry out its mission as required.

1. The Law Enforcement Alerting List

2. The Public Safety Annex

3. The Emergency Plan for care of prisoners

4. The plans for protection of vital facilities

5. The plans for assignment of law enforcement personnel, including reserve or auxiliaries.

B. The actions stated do not preclude the taking of any other actions that the Chief of Law Enforcement services shall deem necessary to carry out the mission assigned to the police service.

C. The law enforcement facilities, equipment and supplies should be checked for readiness.

1. Readiness of departmental and emergency headquarters and/or support EOC should be checked.

2. Law enforcement emergency vehicles, communications, and all special equipment, such as crowd and traffic control devices.

3. Check availability or gasoline and all other essential supplies.

D. Alert Law Enforcement Personnel:

1. Both on-duty and off-duty law enforcement personnel and auxiliary personnel should be alerted. All personnel should be briefed on their emergency assignments and departments. Personnel should also be briefed on shelters available.

2. Cancel all leave for regular personnel and direct auxiliary personnel to standby for duty.

3. All personnel should review shelter and survival plans for their families.

E. Station uniformed law enforcement officers and pre-position traffic control devices as required to facilitate movement to shelters, such as signs, barricades and cones along movement routes as necessary.

EXECUTION

A. Inform all law enforcement personnel of the situation and put on standby notice consistent with every day operations.

B. Alert reserves and auxiliaries.

C. Test and check all equipment for operational readiness.

D. Review emergency plans.

RESPONSIBILITIES

A. The Sarasota County Sheriff, as head of the Sarasota County Law Enforcement services, will serve as a staff officer to the Executive Director of the Department of Emergency Management stationed at the Sarasota County Emergency Operating Center or alternate control points.

B. Communications for the law enforcement services shall be as outlined in the Communications Plan, Annex IV to Sarasota County Peacetime Emergency Plan.

C. Transportation units normally assigned to components of law enforcement services will be retained by that service in execution of the mission.

The above information was adopted from the various counties' peace-time emergency plans and the Lee County Flood Evacuation Plan.

C. DEBRIS REMOVAL

During a hurricane evacuation, the region will likely experience high winds and heavy rains. Trees, branches, signs, various natural and man-made objects and trash will be swept or washed onto roadways. This debris will tend to obstruct evacuation routes unless some mechanism is in place for its removal. All the counties in the region currently have some plan for the clearing of blocked evacuation routes. The following is an overview of county plans.

CHARLOTTE COUNTY

The Charlotte County fire departments have heavy-duty 6 X 6 trucks for use in road clearing operations. The County Public Works Department has heavy equipment which can be used for road work. This equipment and its operators are placed on alert in the event of a hurricane warning. In certain situations, the

Civil Air Patrol may be available for monitoring of evacuation routes. The Charlotte County MOPED Organization has offered help in monitoring conditions in hard to reach areas. Volunteers have also made ten 4-wheel drive vehicles available for debris removal, among other uses.

COLLIER COUNTY

In Collier County, the County Engineer has ultimate responsibility for debris cleanup activities. He can ask assistance from the county fire departments. Heavy equipment and multi-drive vehicles are available for cleanup work in both agencies.

GLADES AND HENDRY COUNTIES

The two counties have discussed the possibility of pre-positioning road equipment or heavy fire vehicles for use in debris removal, but no definite plans have been put in place. Both counties have heavy equipment and fire trucks which could be available for road clearing activities. Since most highways in these counties are State or Federal roads, the Florida DOT may be available for road clearing.

LEE COUNTY

Lee County debris removal responsibility is shared among the Lee County Department of Transportation, the Lee County Parks and Recreation Department and the equivalent municipal agencies in the three cities. Each agency will be alerted during a hurricane warning and will standby to begin cleanup operations within its particular jurisdiction. The Florida Department of Transportation may be able to provide assistance along State and Federal roads.

SARASOTA COUNTY

Ultimate responsibility for debris removal in Sarasota County belongs to the County Transportation Department. Besides its own staff and equipment, the department can call upon private contractors to provide their own workers and machinery for debris removal. The Florida Department of Transportation is available for assistance on State and Federal roads. In the event of an evacuation order, municipal transportation departments are under county control. The County Transportation Director also advises the County Sheriff and the County Chief of Emergency Services on the availability or blockage of certain routes, so that evacuation traffic can be maintained.

D. ACCIDENTS AND VEHICLE STRANDINGS

The evacuation process is likely to be long and involved. Despite the best efforts of law enforcement agencies, accidents will occur. A large number of vehicles are likely to simply breakdown along the route because of pre-existing mechanical

problems or inadequate preparation (failure or inability to fuel vehicle or make necessary service to it). Each regional county has mechanisms to remove stranded vehicles and rescue injured or stranded motorists.

CHARLOTTE COUNTY

As the senior law enforcement and traffic control official in the County, the County Sheriff coordinates accident and rescue activities during a hurricane evacuation. For this task, he can call upon the Florida Highway Patrol and National Guard units (requests must be made through the County Commission). In order to limit the number of accidents on county evacuation routes, the county does not allow the use of vans, boats (or trailers) large trailer trucks, mobile homes or R.V.s during an evacuation. These vehicles must evacuate before a hurricane warning is given or not at all. This is because of the danger that high winds will blow these vehicles over causing accidents or route closings.

The Charlotte County fire departments have the authority to evacuate mobile home parks and share responsibility for traffic control in these places. The Charlotte County School Board provides five 66-passenger school buses, which might, in some cases, be able to pick up stranded motorists. Coast Guard and Coast Guard auxiliary units can aid in rescue efforts if requested by the County Commission. The Peace River Power Squadron is available for water-borne or shoreline operations. The Civil Air Patrol, if weather permits, will monitor routes and can provide instructions (by P.A. system) to stranded or trapped individuals. Once again Moped and four-wheel drive organizations will volunteer their services in hard-to-reach areas. The Charlotte County Police and Fire Departments have heavy machinery and rescue equipment available for rescue operations. The El Jobean fire department will make available a tow-vehicle for the use of clearing the El Jobean Bridge, if necessary. Of course, County Ambulance and Paramedics Services will be on full alert.

COLLIER COUNTY

The Collier County Sheriff directs communications with regard to rescue and vehicle removal operations. He coordinates these activities with the County Engineering Department which has machinery and manpower responsibilities. The Ambulance Service Director oversees the operation of ambulances during the evacuation process. He also is backup coordinator for rescue operations. The County Fire Departments assist in rescues and strandings, particularly in hard-to-reach areas.

GLADES AND HENDRY COUNTIES

These counties will undertake accident and stranding responsibilities in very much the same way as Collier. However,

the rural nature of these counties, as well as the volume of traffic they may receive from the rest of the region, may require the assistance of Florida Highway Patrol, FDOT and other state and federal agencies. If these counties are forced to handle traffic from neighboring regions, then the state will almost certainly need to step in.

LEE COUNTY

Lee County accident and stranding procedures are virtually the same as those described under Debris Removal. The County will recommend that high vehicles such as vans, buses, trailers, boats (with trailers), mobile homes and R.V.s, evacuate during the hurricane watch period. They may not be allowed on the road during evacuation.

SARASOTA COUNTY

In Sarasota County, supreme authority, regarding accidents and vehicle removal, rests with the County Sheriff. However, much of the actual rescue, towing and vehicle removal work is actually by the County Transportation Director. It is this person's job to assure that the responsbilities are actually met. During the increased readiness period, the Sarasota County Director of Transportation shall take the following actions:

Coordinate and direct the removal of all debris and incapacitated private vehicles blocking the evacuation routes and coordinate and direct other emergency functions requiring heavy equipment.

Position people and equipment at critical places along the evacuation routes.

Advise the County Sheriff and the Chief of Fire Services of all roads suitable for evacuation routes.

The heads of the municipal Public Works Departments, construction companies, and of Public Utilities Organizations in the County will serve as assistants and exercise control over their own units.

The Sheriff's Department and Emergency Medical Services will aid in the rescue and transportation of injured persons. The highway patrol and other state law enforcement agencies may be used along State and Federal roads.

The Florida National Guard may be used to supplement the Sheriff's forces in accordance with their Standard Operating Procedures for hurricane emergencies.

The Civil Air Patrol may be used to conduct aerial surveillance of the evacuation proceedings and search and rescue operations after the hurricane has passed.

E. SPECIAL EVACUATION PROVISIONS

In each county, there is a certain percentage of residents who do not possess, or have access to, an automobile. There are also prisoners, handicapped residents, hospital patients and infirm persons who require some special evacuation provisions. Each county is required to have some mechanism for transporting all of these people to safety.

CHARLOTTE COUNTY

In Charlotte County, all evacuation activities are under the direct authority of the Disaster Preparedness Coordinator. He is aided by the following officers and agencies in the following manner.

Sheriff -

When the EOC is manned, the Sheriff shall coordinate major evacuation orders through the EOC as directed by the Board of County Commissioners.

Provide local liaison with Florida Highway Patrol or National Guard personnel if used after such assistance has been arranged through State EOC. The Board of County Commissioners has overall authority for local use.

In the event the county jail must be evacuated, the first location for the approximately 50 people would be to transfer to an adjoining county. The small facilities in the old jail, located first floor in the County Courthouse could also be used.

County School Board (9 ft. MSL)

Make shelters available to the American Red Cross

Provide five 66-passenger buses with drivers available at each of these locations concurrent with the setting of a hurricane WARNING:

Englewood Palm Plaza Shopping Center
Gardens of Gulf Cove (1)(Optional)
Port Charlotte Cultural Center
Promenades Shopping Center
County Airport

U.S. Coast Guard Auxiliary

Flotilla 98 (Port Charlotte/Punta Gorda) and Flotilla 89 and 87 (Englewood) cover the county. Flotilla 98 provides a marine radio and operator in the EOC where a desk and antenna with coax cable are available. Use of the Coast Guard Auxiliary for warning, search & rescue, evacuation or assistance for disaster victims would communicate these

needs to the U.S. Coast Guard in Fort Myers Beach to obtain authorization for their actual involvement.

Peace River Power Squadron

Operate with the Coast Guard Auxiliary for similar assistance.

Civil Air Patrol

Provide volunteer overflight of disaster or evacuation areas for information reporting. Airborne public address system can be used for evacuation warnings and other communications as necessary. Weather conditions, as well as availability of the CAP and its one single engine aircraft, will control their use.

MOPED Organization

This organization will be helpful to gain access to hard to get to locations. Their continued help to confirm the list of disabled persons will make the list much more accurate and at a low cost.

Mud Tuggers

The 10 4-wheel drive vehicles from volunteer groups in both the Port Charlotte and Englewood areas may be requested to assist stranded evacuees and help in a variety of emergency uses.

The State Division of Emergency Management provides advice and assistance as needed for evacuation problems and danger threats.

DOT local staff has agreed to help in state highway problems during an evacuation. This would be arranged through State EOC.

HRS operates with the local Welfare Office to assist evacuation victims with a one-stop disaster center in the PCU Senior Lounge and/or Memorial Auditorium. These centers would be set up after a Presidential Disaster Declaration.

U.S. Coast Guard may make the U.S. Coast Guard Auxiliary available for waterborne help.

County Public Works Department

Provide rescue and heavy equipment as necessary to help keep evacuation routes open. Place all vehicles and heavy equipment in readiness concurrent with a hurricane WARNING in resource staging areas. (See III (7).)

County Fire Departments

Individual fire departments remain on station until ordered to evacuate by the station fire chief, keeping the EOC informed.

The El Jobean Fire Department has agreed to make a tow vehicle available for emergency removal of disabled vehicles at the El Jobean Bridge during evacuations.

County Health Department

Review plans with local hospitals for the handling of victims.

Establish communications with the EOC to advise availability of medical services.

Be prepared to handle evacuees medical problems, especially disease control and potable water testing.

Public Medical Facilities

The possible evacuation of one or all hospitals, ACLFs and care centers should be considered. At this time, a mutual aid agreement between care centers has been negotiated.

County Welfare Office

Coordinate with HRS and American Red Cross for emergency clothing, feeding, lodging, social services and registration/inquiry of disaster victims.

Emergency Medical Service

In addition to normal emergency medical service act as transportation coordinator for disabled evacuation. ERB Building volunteers to provide a 5 KW electric generator for disabled shelters.

Disabled Persons

F.S. 252.355 mandates that the Disaster Preparedness Office maintain a list of those disabled who volunteer to participate in a program to help them in an emergency evacuation.

All agencies within the county dealing in anyway with the disabled persons will be asked to provide a listing of these people to the Disaster Preparedness Office. Some of these agencies are:

County Welfare	Upjohn Healthcare Services
Congregate Meals	Health Plus (Meals on Wheels)
Area Agency on Aging	Florida Home Health Services

HRS	Senior Services
Tele-Care Program	Home Health Service Inc. of Charlotte
Florida Power & Light	Charlotte County Council on Aging
Redicare	
STAT Medical	

The list of disabled persons will be maintained in the computer for easy access and updating.

The ambulance service will transport special cases. A joint effort with the ambulance service will keep this list current.

Disabled shelters are located, one for each evacuee staging area, at: PCU, Port Charlotte Junior High School and Charlotte Senior High School. A small medical staff and food supplies will be available in these American Red Cross operated shelters.

The list of disabled persons will be updated no later than June 1 of each year. The billing contracts with the public through the Florida Power and Light Co. is recognized in the Florida Statutes as a means of alerting the public to the procedures for maintaining the list of disabled.

Identification tags on disabled showing name and address as a shelter control method will be used.

System to return disabled home after a disaster is the same as their pick up, taking care that their home utilities function.

COLLIER COUNTY

Collier County divides all evacuation responsibilities among the members of an Operations Group, make up of county officials. The Operations Group is coordinated by, and advises, the Emergency Preparedness Coordinator (EPC). Under the EPC for evacuation purposes, are the County Manager and various county officers. Responsibilities with regard to special evacuation are as follows:

Sheriff: Responsible for all law enforcement, traffic control, and assists in rescue efforts.

County Health Officer: Staffs shelter facilities as needed, obtains medical data and supplies, disseminates medical and health bulletins to public through the Public Information Officer (PIO). Supplies medically trained personnel.

Ambulance Service Director: Supervises all ambulances that will be used for transporting ill or injured or handicapped. Will be backup for communications to shelters and rescue efforts.

Superintendent of Schools: In charge of opening and closing of shelters and assisting in food supplies.

Red Cross Disaster Chairman: Will furnish staff for manning shelters, food, and assist in medical efforts.

The County can seek assistance from the Florida Highway Patrol, National Guard, and various State and Federal agencies.

GLADES AND HENDRY COUNTIES

Almost all residents of Glades and Hendry Counties live in mobile homes and will have to be evacuated in the event of a hurricane. The counties keep lists of people requiring special services during an evacuation, but these individuals must inform the county if they require help in evacuation. Help is usually provided by the counties' fire and Sheriff's Departments.

LEE COUNTY

In Lee County, all evacuations are under the ultimate authority of the Emergency Management Director. The County has special provisions for dealing with handicapped, elderly and pedestrian residents.

Several public and private institutions within the county would require special evacuation procedures and assistance in transporting patients or residents out of endangered areas. The following is a listing of the major establishments and an estimate of the number of persons requiring transportation. Individual evacuation plans for these establishment should follow general directional routes for the evacuation zones in which they are located.

Establishment	Evacuees
Beacon-Donegan Manor	150
Lee Convalescent Center	140
Shady Rest Nursing Home	105
Shell Point Nursing Pavilion	160
Serenity House/Cottage	24
God's Missionary Church & Mission	20
Lee County Detox. Center	20

The movement of these persons may require the use of buses provided by the Lee County School Board. However, if buses or other high-standing vehicles are utilized, it is recommended that they move only during the watch period or when winds are less than 40 mph. The movement of buses or other high-standing vehicles during the general evacuation within the warning period would present a potentially dangerous hazard through possible

overturning. In view of the limitations of vehicles available to evacuate those institutions, consideration should be given to the relocation of those elements of the population prior to the evacuation of the general population.

1980 U.S. Census of Housing data show that approximately 5.4 percent of all dwelling units in Lee County did not have access to an automobile. Simple projection of dwelling unit increase since 1970 would seem to indicate the number of dwelling units currently without automobiles in Lee County is at lease 8,516. A system for the identification and evacuation of these dwelling units should be established.

Inventory of Available Resources for Implementation are listed on pages 3 and 4.

It is recommended that all transportation of persons by bus shall take place during the watch period, not the warning period.

To ensure the evacuation of those threatened residents lacking transportation, it is recommended that the Lee County Department of Emergency Management compile and retain a countywide on-going listing of those households without private transportation. Any future dissemination of public preparedness information should contain a request for the names and addresses of those residents needing transportation if an evacuation situation should arise. This could be accomplished by a simple telephone call to the Department of Emergency Management. The listing could then be transformed into a map showing the locations of such households. Emergency bus routes could then be planned from this map.

SARASOTA COUNTY

Overall evacuation responsibility in Sarasota County is entrusted to the Executive Director of the Department of Emergency Management. He and the other county officials have the following duties with regard to special evacuations.

The Executive Director of the Department of Emergency Management shall:

Alert government officials, departments and agencies in accordance with S.O.P.

Exercise liaison with American Red Cross.

Coordinate countywide emergency operations.

Maintain liaison with American Red Cross officials and assist in coordination of emergency services to disaster victims.

The Sarasota County Administrator shall:

Coordinate the activities of all Department Heads as required.

The Sarasota County Sheriff shall:

Control established evacuation routes and coordinate any evacuation with the Police forces of each municipality.

Call upon the National Guard for assistance as required.

Provide security (one officer/shift) to each public shelter opened during the disaster.

Inform the Executive Director of the Department of Emergency Management of non-functional vehicles or defective radio equipment.

Control and coordinate evacuation of critical areas.

Establish safe routes for mass evacuation based on location of areas to be evacuated and availability of shelters.

The Sarasota County Chief of Fire Services shall:

Inspect first aid and other rescue supplies and fire fighting equipment and augment as required.

Inform the Executive Director of the Department of Emergency Management of non-functional vehicles or defective radio equipment.

Assist with any evacuation as required.

Telephone the Registered Inform requiring ambulance transportation to the Special Care facility and place on alert to be moved. Prepare equipment needed for the evacuation.

Coordinate the evacuation of Inform and Handicapped and persons without transportation with the Medical Director and School Board Director of Transportation.

Coordinate the return of handicapped and infirmed citizens to their homes with the Medical Director and School Board Transportation Director.

Establish mutual support agreements with neighboring communities and counties to provide personnel, supplies, and equipment as needed.

Request assistance from the Division of Forestry, as needed.

The Director of the Sarasota County Department of Transportation shall:

Designate and equip emergency standby repair and rescue crews.

Inform the Executive Director of the Department of Emergency Management of non-functional vehicles or defective radio equipment.

Provide radio equipped vehicles and operators to be dispatched through the Sarasota County Area Transportation office in conjunction with SCAT and School Board buses to pick up Inform, Handicapped, and non-driving public, at risk.

Make necessary repairs to essential facilities as required.

Provide auxiliary power units to critical installations as required.

Dispatch all other available resources as required.

Shall advise the American Red Cross of the suitability of buildings for shelter use including the height of structures above level and its vulnerability due to flooding in heavy rains.

Assign personnel with radio equipped cars to American Red Cross Public shelters.

The Director of the Sarasota County Parks and Recreation Department shall:

The Directors of the Parks and Recreation and the Building Construction Departments shall assist the Sheriff and the Chief of Fire Services as required. They shall appoint members of their Departments to the Handicapped Evacuation Team and assign personnel with radio equipped cars to evacuate citizens to American Red Cross Public Shelters as coordinated by the EOC.

The Director of Sarasota County Environmental Services Department shall:

Inform the Executive Director of Emergency Management of any non-functional vehicles or defective radio equipment.

Restore potable water and sanitary sewer services as required.

Assist the Sheriff and the Chief of Fire Services as required.

Appoint members of his Department to the Sarasota County Handicapped Evacuation Team and assign personnel with radio equipped cars to evacuate citizens to American Red Cross Public Shelters as coordinated by the Sarasota County Emergency Operations Center.

The Medical Director of the Sarasota County Health Department shall:

Inspect and replenish necessary serums and other health and sanitation supplies to meet anticipated needs.

Prepare for the news media, radio and television stations appropriate public announcements and emergency instructions.

If local hospital facilities become overburdened in a mass casualty situation, authorize and control the use of locally available packaged disaster hospital components located at the Sarasota County Vocational-Technical Center.

Provide the necessary inspection personnel and other specialized health service teams, as required by the situation.

Provide nurses for duty in the Sarasota County Emergency Operations Center when it is manned for emergencies.

The Director of the Sarasota County Social Services Department shall:

Support and cooperate with the American Red Cross in providing food, clothing, and other supplies necessary to the welfare of persons within the disaster area.

Sarasota County Area Transportation Department shall:

Prepare to deliver SMATS buses and communications' liaison personnel and equipment to the Director of Transportation and Communications of the Sarasota County School Board for use in evacuating infirm and handicapped and people without transportation.

Assign all radio equipped vehicles operators to the Emergency Operations Center for dispatch by the SMATS Department for pickup of citizens without transportation.

The Emergency Medical Director shall:

Contact private medical and wheelchair transport companies for vehicle and personnel availability during evacuation and repopulation. Sign Memorandum of Understanding with such companies establishing run rate prior to need. Provide the Executive Director of Emergency Management with copies of the Memorandums of Understanding.

Provide radio equipped vehicles and operators at pre-assigned public shelters and establish radio communication between the shelters and the Sarasota County Emergency Operations Center. Provide the Executive Director of the Department of Emergency Management with a list of the personnel assigned for this purpose.

The Director of the Sarasota County Social Services Department shall:

Coordinate emergency plans with the American Red Cross to confirm procedures and mutual assistance for providing emergency feeding, clothing, and the sheltering of disaster victims.

The Superintendent of Schools shall:

Have the Directors of Transportation and Communications establish liaison with:

The American Red Cross for the opening of public shelters.

The Sarasota/Metropolitan Area Transportation Service for the use of SMATS buses in evacuating inform and handicapped and people without transportation.

The Sarasota County Chief of Fire Services for the coordinated pickup and delivery of inform and handicapped and people without transportation.

Designate public school buildings available as Emergency Shelters, in accordance with agreement executed with the American Red Cross.

Close schools, send children home, and report identity of schools to be opened as shelters to the Disaster Chairman of the American Red Cross.

Private supervisory, food service, and custodial personnel for each activated emergency shelter as per prior agreement.

Assure that school buses and drivers are ready and available for movement of families and individuals to emergency shelters as required by the Sarasota County Department of Emergency Management or for mass evacuation as required.

The Director of the Sarasota County Central Services Department shall:

Staff vehicle maintained facilities for emergency repair.

The Administrators of the Sarasota, Venice, Englewood, Doctors, and Sarasota Palms Hospitals, and Nursing Homes shall:

Review their emergency procedures, augment emergency room personnel, if necessary, and check supplies based on anticipated requirements.

Inform the Medical Director of the Sarasota County Health Department of available hospital beds.

Prepare to discharge non-critical patients.

Prepare to receive patients requiring critical care from medical facilities requiring evacuation.

Sarasota County Friendship Center shall:

Prepare to deliver Friendship Center buses to the School Board Director of Transportation and Communications for use in evacuating inform and handicapped and people without transportation.

The Disaster Chairman of the American Red Cross shall:

Determine, in consultation with Emergency Management, if and when emergency public Red Cross shelters will be opened and to provide necessary operating staff. Request ratio stations to publicize availability of Emergency Shelters through the Emergency Management Public Information Officer.

Open and man public shelters and conduct in-shelter operations during the emergency.

Provide food and water for evacuees in public shelters and special support shelters.

Establish reception and care centers for disaster victims and inform the Executive Director of the Department of Emergency Management of the victims location(s). Open and man shelters as needed after the emergency.

Continue to provide food, clothing, shelter, and necessary supplemental medical and nursing service for disaster victims, as required.

Determine and announce closing of public shelters following a hurricane in coordination with the Executive Director of the Department of Emergency Management.

Make arrangements for out-of-county reception centers for families and individuals evacuated from neighboring counties.

Arrange transportation, as required, for movement of persons to and from emergency shelters and to hospitals in instances

not required by ambulance. This does not apply to mass movement from areas being evacuated.

Provide for individual and family assistance.

The Florida National Guard shall:

Alert all personnel.

Support the Sarasota County Sheriff as required.

The Sarasota County Radio Club shall:

As volunteers, supply radio equipped vehicles and drivers to support departments or agencies in disaster operations as required.

As volunteers, supply radio communications and operators for use in emergency shelters as required by the American Red Cross.

The Commanding Officer of the local Civil Air Patrol shall perform aerial reconnaissance and assist relief agencies in the distribution of medicines and other vital supplies to the disaster areas as required.

F. DRAWBRIDGE OPERATIONS

Many of the region's barrier islands and coastal areas are connected to the mainland by drawbridges. Early in the evacuation process, these bridges may be open to boat traffic, to allow owners to take their vessels to safe anchorages. As the evacuation progresses, bridges are usually closed to boat traffic to allow for evacuation of motor vehicles. Drawbridge policies of the different counties in the region are described below:

CHARLOTTE COUNTY
Special Provisions for Drawbridges

Special Consideration for Unstepping Sailboat Masts:

In order to assist large sailboats to unstep masts for passage up the Peace or Myakka River in search of safe hurricane mooring, a service for this has been planned. The "shrimp boat" side of Fisherman's Village and the Punta Gorda Boat Club are staging areas for this service. Boaters would negotiate payment directly with the crane operator and arrange for restepping service after the storm.

The El Jobean Fire Department has agreed to make a tow vehicle available for emergency removal of disabled vehicles at the El Jobean Bridge during evacuations.

The Coast Guard should, with DOT, keep bridges open for vehicle traffic only after a hurricane warning is set.

COLLIER COUNTY

The County Hurricane Evacuation Plan has no special provisions for drawbridges.

GLADES AND HENDRY COUNTIES

There are drawbridges along the Okeechobee Waterway located at Belle Glade (on SR 71), Moore Haven (US 27), and LaBelle (SR 29). Since primary danger to these counties will come from high winds and heavy rains, it is unlikely that these bridges will be under any particular pressure to open for vessels. These bridges will need to be closed to vessels during dangerous (40 mph<) wind conditions.

LEE COUNTY

It should be mentioned that Lee County has had one recent experience with a drawbridge mechanism malfunctioning during a hurricane warning. This was during the abortive alert for Hurricane Floyd, in October of 1987. The Edison bridge draw (Old US 41) failed to close after some vessels had been let through. A recommendation is that the span should not be opened to vessels during a hurricane warning period. Vessels wishing to evacuate should do so during watch periods only.

Special Provisions for Drawbridges

Lee County has drawbridges at Alva (between SR 78 and SR 80), Olga (SR 31), Edison Memorial (Old US 41), and at the Sanibel Causeway. Of these, the Alva bridge will probably be blocked during an evacuation, so that it could remain open to vessels. Bridge provisions for evacuation are as follows:

It is recommended that no draw or swing bridges be operated during the warning period to prevent wind-caused malfunctions which might block vehicle evacuation routes. They may be raised during the watch period if sustained winds are not exceeding 40 mph.

SARASOTA COUNTY

Sarasota County has the following drawbridges:

Stickney Point Bridge
New Pass Bridge
Blackburn Point Road Bridge
Albee Road Bridge
Intracoastal Waterway Bridge at US 41, Venice
Manasota Key Bridge over Intracoastal Waterway
Ringling Bridge
Siesta Key Bridge

Hatchett Creek Bridge
Venice Avenue Bridge

Sarasota County drawbridge openings or closings in a hurricane evacuation are based on the following evacuation schedule:

The order of priority of evacuation

i. All infirm, and handicapped people without transportation from all areas.

ii. All residents of all keys.

iii. All coastal residents on the mainland.

iv. All mobile home parks on the mainland.

v. All residents of low-lying areas on the mainland.

Drawbridges are open to vessel traffic only during a hurricane watch period. Drawbridges are closed at the point when island residents are ordered to evacuate, and are not open until after the emergency has passed. The Director of the Sarasota County Transportation Department has the responsibility (with the U.S. Coast Guard) to order the closing of all County maintained drawbridges over navigable waterways along the evacuation routes between the keys and the mainland, and order all bridge tenders to secure their facilities and leave for safer quarters.

At this point, the Director of the State Emergency Management Division shall request the closing of all state-managed draw bridges in the county to vessel traffic. He also makes requests to the appropriate municipal governments for the closing of drawbridges over navigable waterways between the keys and the mainland, and in Venice to boat traffic.

During the evacuation process, the transportation director has the responsibility to see that vehicle traffic across bridges is unobstructed. This involves keeping bridges free from debris and stalled/wrecked vehicles. When the storm is over, the Transportation Director reopens county drawbridges, and the Emergency Management Director requests reopening of state-managed bridges.

General Drawbridge Rules

All drawbridges throughout the region should be locked in the "down" position during a hurricane warning. Boat owners in each coastal county must be made aware of existing flotilla plans and understand that vessels must be secured in safe harbor prior to or during the hurricane watch.

The United States Coast Guard has authority over the operation of drawbridges and navigable waterways. Working in cooperation with

state and local civil defense officials, the Coast Guard District Commander will order the opening of a drawbridge only under extreme circumstances during an evacuation.

It is strongly recommended that appropriate U.S. Coast Guard Regulations and Florida Department of Transportation procedures be researched and implemented to allow each county emergency management/civil defense director to assume authority to modify normal bridge openings during a hurricane evacuation.

G. Evacuation of R.V. Parks and Tourists

In the majority of counties in the region, there are no special provisions for evacuating tourists. Tourist establishments; such as hotels, R.V. parks, camping grounds, and resorts; are required by law to inform their guests of hurricane watch and hurricane warning alerts. It is hoped that visitors to the region will begin plans for early evacuation at such time as they learn of the alert. County governments encourage high-topped vehicles (vans, trucks, trailers, campers) to leave during the watch period, as winds may endanger these vehicles during the hurricane warning period. In any case, R.V.s are required to evacuate during any hurricane warning and shelters and evacuation mechanisms will need to cope with any extra need created by tourists and R.V. owners.

The following table represents an estimate of the 1987 R.V. traffic for each county for both July and November. The percentage of traffic represented by R.V.s is also included. An R.V. is considered to be any privately-owned vehicle used as, and equipped for, a housing unit. This includes travel trailers, customized vans and campers.

County	July Total	July %	November Total	November %
Charlotte	124	.29	310	.66
Collier	3,571	5.4	7,582	9.9
Glades	337	N/A	1,667	N/A
Hendry	232	N/A	529	N/A
Lee	2,635	2.1	6,006	4.1
Sarasota	334	.30	759	.70

SPECIFIC COUNTY POLICIES

CHARLOTTE COUNTY

Residential vehicles represent only a very small percentage of the Charlotte County evacuation traffic (0.29% - 0.66%). Even so, a stalled trailer, or a turned-over camper, in the right place, could backup traffic for miles in an evacuation. Ideally, the county hopes to evacuate R.V.s and mobile home residents some nine hours before the arrival of gale force winds.

Tourist population, including campers and recreational vehicle users, peaks between November and April. Thus, tourists and R.V.s would be more of a consideration in a late-season storm than in a summer hurricane. All of the county's R.V.s would be ordered to evacuate in any hurricane or tropical storm, because of the possibility of wind damage. Most of the county's R.V. parks have no shelter capacity, and this will require residents to seek public shelter (or hotels) or travel outside the county.

It is hoped that R.V. drivers will leave sometime before evacuation is actually ordered. During the actual evacuation process, R.V. evacuation may not be allowed. The County rule is that:

> For hurricane evacuation, vans, boats, large trailer trucks, or mobile homes including R.V.s, will not be permitted on the evacuation routes due to high winds of 40 mph or more.

COLLIER COUNTY

Of particular concern in Collier County are the large number of tourists or winter residents staying on the Naples and Marco beaches. This will reach its hurricane season peak in November. Because of congestion of the Naples streets, the increased traffic volume may be a problem. Certainly, U.S. 41 through Naples will become the heaviest traffic concentration in the County.

5.4 to 9.9% of Collier evacuation traffic is likely to be composed of recreational vehicles. This is enough to seriously clog routes should accidents occur. The County will order that all R.V. residents evacuate during a hurricane evacuation. R.V. residents should follow the county suggestions:

> Trailer or mobile home owners should disconnect electricity at the pole or outside connection. Take indoors or tie down all loose objects in your yard. Remember any special medicines, baby formulas or personal items must be taken to the shelter with you.

For those who intend to leave the area in advance of the storm:

> Tie down or place indoors, all loose objects from your yard and prepare your home for high winds by lowering hurricane awnings, closing shutters, taping windows, etc. Turn off gas and oil supplies. If you live in a trailer or mobile home, make sure it is securely anchored. All trailer or mobile home owners should disconnect electricity at the pole or outside connection and turn off oil and gas supplies before you leave. If you are taking your trailer or mobile home with you, leave as early as possible - if evacuation is officially ordered, trailers of any sort will not be permitted on evacuation routes.

GLADES AND HENDRY COUNTIES

Most of the population of the two inland counties live in mobile homes or R.V.s. This group is virtually the only one to require shelter in these counties. A very large proportion of the evacuation traffic in these counties is likely to be R.V.s or travel trailers. In Hendry County, the largest number of these will be around LaBelle. In Glades County, most of the R.V. traffic will be in the lakeside resort areas.

Tourists (excluding R.V.s) are most likely to be located (in both counties) along the lakeshore. These residents should be encouraged to leave the area in the event of a hurricane watch or hurricane warning scenario. This will reduce evacuation traffic, and make it easier for local mobile home residents to seek shelter.

LEE COUNTY

As in Collier County, Lee County has a large tourist flux along its beaches. Most of this tourist influx is toward Sanibel and Fort Myers Beach. A lesser, but significant, amount of tourist traffic is toward Bonita Beach, and the urban areas of Cape Coral, Fort Myers and Lehigh.

Tourist activity in the County tends to peak around July 4 and Labor Day every year. This is offset by a large influx of winter residents from October to February. In fact, the County hurricane season population is highest in November. Occupancies of R.V. parks are highest in this month, also.

The County provides tourist establishments with information pamphlets, on hurricane preparation and evacuation, to distribute to their guests. It is hoped that in this manner, County visitors will be alerted to take the proper precautions during the evacuation process. In general, tourists and visitors are advised to evacuate the area during the hurricane watch period.

The evacuation of all travel trailer and R.V. residents is recommended in any hurricane or tropical storm warning. High-velocity winds caused by the storm would also create problems for the movement of vehicles during the evacuation. Large trucks, trailers, buses, and other high-standing vehicles may be easily overturned by hurricane winds either while moving or parked.

Lee County will have a fairly significant percentage of R.V.s in its evacuation traffic. Vehicle estimates put R.V. percentages between 2.1% and 4.1%. The possibility of these vehicles turning over, as described above, is a very real one. Such accidents could jeopardize traffic on County evacuation routes. It is thus recommended, that R.V. owners wishing to evacuate in these vehicles do so during watch period, or prior to the arrival of 40 mph winds. Consideration should also be given to the relocation of this traffic prior to ordered evacuations.

Lee County Emergency Management recommends:

> that those persons requiring evacuation using travel trailers, campers, or other high-standing, wind-resistant, vehicles should evacuate during the watch period, not during the warning period when high winds (>40 mph) might overturn such vehicles. Upon notice from the National Hurricane Center (NHC) that Lee County is under "watch" conditions, the Lee County Emergency Management Coordinator should announce those zones which may require evacuation if the "watch: becomes a "warning." At this time, those potentially threatened residents using high-standing vehicles should begin evacuation.

SARASOTA COUNTY

In Sarasota County, the tourist influx tends toward the barrier islands, the North Port area and the cities of Sarasota and Venice. Tourist activity peaks during the summer of each year. However, by mid-November, there is a significant influx of winter visitors and seasonal residents. In most cases, this influx in the winter is greater than the summer influx.

It is the responsibility of managers or owners to notify guests of motels, hotels, apartments, condominiums, and R.V./trailer parks of impending hurricanes (or other disasters). Ideally, this notification should be during a hurricane watch period. However, it is extremely likely, particularly in November, that a large number of visitors will be involved in the evacuation process.

During a Category 1, or greater, hurricane, Sarasota County will order the evacuation of all Recreational Vehicle facilities. It is expected that this population will be at its peak in November, and will be less significant in July. In general, it is recommended that R.V. owners evacuate during the watch period (prior to the actual evacuation order). Shelters will be open at this time for those persons wishing to use them, but R.V. owners are encouraged to leave the county.

In a Sarasota County evacuation, .30% - .70% of the traffic is likely to be composed of R.V.s. It is essential that evacuation of these vehicles begins in the watch period. In a large category storm, this large number of vehicles (in high winds) could present a very serious hindrance to traffic movement.

Some combined mobile home/R.V. parks have private shelters. If flooding from tidal surge is not expected in the area, then residents of the park may use their private shelter. In fact, they will be ordered to do so. However, if such private shelters are not available, then park residents must either evacuate the county (during the water period) or leave their residences for a public shelter. As in the other counties, Sarasota R.V.s will not be allowed on evacuation routes during the evacuation process.

H. EVACUATION CONTROL

No successful evacuation ever resulted from mass stampede toward safe areas. If the evacuation process is to secure the safety of regional residents and visitors, then it must be ordered and regulated. In order to achieve safe evacuations, each county has selected certain routes which appear safest in hurricane conditions, and closed other routes which would tend to result in slow or unsafe travelling conditions in a hurricane evacuation.

CHARLOTTE COUNTY

As has been shown in Chapter II, Charlotte County is divided into three separate areas by the Peace and Myakka Rivers. Thus, the County's main evacuation routes must all cross large stretches of water, and are subject to flooding. An orderly evacuation process is essential if residents of endangered areas are to reach safety before tidal or rainfall flooding makes routes unusable.

The County will station radio-equipped school buses at the following points:

Palm Plaza Shopping Center in Englewood
Port Charlotte Cultural Center
Promenades Shopping Center - Port Charlotte
County Airport - Punta Gorda

Initially, five buses are to be on station with others available. These buses will not only provide transportation to shelters, but will also act as a means of monitoring evacuation conditions.

The Charlotte County Sheriff and County Policy Departments will position traffic controllers at certain points on the evacuation route system. The following is a list of traffic control points and route directios at each point:

1. Duncan Road (US 17) and SR 70 (northeast on US 17 or east on SR 70)

2. Taylor Road and Airport Road (east on Airport Road or northwest on Taylor Road)

3. SR 771 and SR 775 (only northeast on SR 771 shall be allowed)

4. SR 775 and SR 776 (only east on SR 776 shall be allowed)

5. SR 771 and SR 776 (northeat on SR 776)

6. I-75 and SR 776 (Harborview Road) (west on SR 776 or north on I-75)

7. US 41 and Melbourne Street (north on Melbourne Street)

8. SR 776 (Harborview Road) and Kings Highway (north on Kings Highway only)

9. US 41 and SR 776 (Harborview Road) (east on SR 776)

10. US 41 and Harbor Boulevard (north on Harbor or southeast on US 41)

11. US 41 and Olean Boulevard (east on Olean Boulevard)

12. Olean Boulevard and Kings Highway (north on Kings Highway)

13. Harbor Boulevard and Coulton Avenue (north on Harbor)

14. Harbor Boulevard and Midway Boulevard (only west on Midway shall be allowed)

15. Midway Boulevard and Kings Highway (north on Kings Highway)

16. Midway Boulevard and Edgewater Drive (only north on Midway will be allowed)

17. Midway Boulevard and US 41 (only west on Midway shall be allowed)

18. SR 776 and US 41 (only southwest on US 41 will be allowed)

19. US 41 and Locust Street (north on Locust or southwest on US 41)

Certain general evacuation plans will be followed. Staging areas will be the Charlotte County Airport and the Port Charlotte Cultural Center. All evacuation traffic north of the Peace River is collected only Kings Highway and eventually I-75. If Kings Highway becomes impassible, traffic will be moved to high ground in north Port Charlotte and people will be asked to either remain in their cars or find public shelter.

The US 41 bridge on the Peace River shall be closed to normal traffic. Emergency vehicles will be able to use this bridge, however. Only emergency traffic will be allowed to cross into Lee or Sarasota Counties. However, Boca Grande residents will be ordered to evacuate into Charlotte County, and Englewood residents will be allowed access to shelters in Sarasota County.

If the approaches to the Myakka River bridge at El Jobean should flood, Sheriff's deputies will reroute evacuees in appropriate directions. All traffic on evacuation routes is required to stay in the designated lane (or lanes). Any remaining lanes are reserved strictly for emergency vehicles.

All draw bridges will be closed to boaters during the evacuation order. It is expected that private automobiles will be the main traffic during the evacuation process. In order to ensure the

safe evacuation of the endangered populace, this traffic must be carefully controlled. However, individual freedom of movement will be permitted as long as it does not interfere with emergency traffic.

COLLIER COUNTY

In Collier County, there are now only three main evacuation routes available for the use of county residents. These are US 41 and I-75 north to Lee County and SR 846 east to Immokalee. US 41 is likely to be quickly rendered unusable because of traffic from Naples and Bonita Springs. Thus, the county's main evacuation arteries will be I-75 and SR 846. All county evacuation traffic will be routed toward these two routes, whenever possible.

This routing will be accomplished by the stationing of Collier County Sheriff's deputies at all major intersections. Collier County evacuees will be directed to travel north on I-75 through Lee County to SR 82. At this point, they may seek shelter in the Fort Myers area or continue northward. Evacuees on SR 846 will be sent toward Immokalee. If conditions warrant, evacuees can find shelter in Immokalee, or they may then travel north on SR 29. However, these evacuees should be warned that shelter will probably not be available in Hendry or Glades Counties. This will force evacuees to either seek shelter in Lee, or perhaps along US 27 in Highlands County.

GLADES COUNTY

Most evacuation traffic in Glades County will consist of residents living in mobile homes or RVs. There is little danger of the county being threatened by anything other than high winds or rainfall flooding. Each of the county's population centers has at least one available public shelter. Therefore, all county evacuation control efforts will be directed towar the movement of evacuees to these shelters. The county Sheriff's Department will likely refuse shelter to out-of-county evacuees. County plans call for residents of other counties to be routed north, on US 27, to Highlands County.

HENDRY COUNTY

As in Glades, most evacuation traffic in Hendry will be from mobile home/RV dwellers. The county has adequate shelter space for its own evacuees, but is not prepared to provide shelter to evacuees from outside the county. Out-of-county traffic will be sent north on SR 29 to US 27. They will probably have to continue on to, at least, Lake Placid before finding shelter. Evacuees passing through Glades and Hendry Counties should be advised to consider travelling to hotel/motel facilities in the lake country or Orlando areas.

LEE COUNTY

The largest portion of the Lee County transportation system is within the low-lying coastal plain. This includes five of the county's major evacuation routes (US 41, SR 767, SR 865, and SR 867). The two main inland routes (SR 78 and SR 80) both lie along the Caloosahatchee River and are subject to flooding in heavy rains. The third major inland route (SR 82) is likely to be crowded with evcuees from Collier County. Therefore, it is important that county evacuation traffic be moved safely and efficiently along these routes, and along I-75, before storm flooding or heavy traffic make roads impassable.

The county hopes to be able to stagger zone evacuations so as to be able to avoid cross-impacts on major arteies. However, in a late-warning or fast-moving storm situation, staggering might not be possible. The county's main object will be to move traffic towards I-75 (in the western portion of the county) and towards SR 78 and SR 80 (in the eastern portion). The following is a list of traffic control points in Lee County.

1. Bonita Beach Road and US 41: Traffic will be allowed to move north on US 41.

2. Estero Boulevard and San Carlos Boulevard: Traffic will be allowed to move north towards the Matanzas Pass Bridge.

3. Summerlin Road and Gladiolus Drive: Traffic will be directed either east on Gladiolus or north on Summerlin.

4. Cypress Lake Drive and McGregor Boulevard: Traffic will be directed north on McGregor or east on Cypress Lake.

5. Cypress Lake Drive and Summerlin Road: Traffic may move east on Cypress Lake or north on Summerlin.

6. College Parkway and McGregor Boulevard: Traffic may move north on McGregor or east on College.

7. College Parkway and Summerlin Road: Traffic may move north on Summerlin or east on College.

8. Summerlin Road and McGregor Boulevard: Traffic may travel northeast on McGregor or east on Summerlin.

9. Summerlin Road and San Carlos Boulevard: Traffic will only be allowed to travel east on Summerlin.

10. Stringfellow Road and SR 78 (Pine Island): Traffic will travel east on SR 78.

11. Matlacha Bridge: Regulation of traffic onto bridge.

12. Gladiolus Drive and US 41: Traffic will be routed east on Six Mile Cypress.

13. Cypress Lake Drive and US 41: Traffic will be allowed to travel north on US 41 or east on Daniels Road.

14. College Parkway and US 41: Traffic will be routed north on US 41.

The Lee County Division of Emergency Management may place Sheriff's deputies or traffic control devices at the following points, depending on local evacuation conditions and route availability.

1. Alva Bridge: In all likelihood, the Alva Bridge will be closed to road traffic during an evacuation.

2. SR 80 and Joel Boulevard: Traffic will be routed west on SR 80.

3. Bonita Beach Road and Old US 41: Traffic will be routed east (towards I-75) on Bonita Beach Road.

4. US 41 and Old US 41: Traffic will be routed north on US 41.

5. SR 31 and Bayshore Road (SR 78): Traffic will be routed north on SR 31.

6. SR 31 and North River Road (SR 78): Traffic will be routed north on SR 31 or east on North River Road.

7. Blind Pass Bridge: Traffic will be routed south on San Cap Road.

8. Big San Carlos Pass Bridge: In all likelihood, the Big San Carlos Pass Bridge will be closed during an evacuation. However, this depends on rainfall flooding at the approach to the Matanzas Bridge.

9. SR 80 and SR 31: Traffic will be allowed to travel north on SR 31 or east on SR 80.

10. McGregor Boulevard and Gladiolus Road: Traffic will be routed northeast on McGregor or east on Gladiolus.

11. Cypress Lake Drive and Winkler Drive: Traffic will be routed north on Winkler or east on Cypress Lake.

12. Sanibel Tollbooth: Traffic will be routed east on Summerlin Road.

13. SR 78 and Burnt Store Road: Traffic will be allowed north on Burnt Store or east on SR 78.

14. SR 78 and US 41: Traffic will be routed north on US 41.

15. Pondella Road and US 41: Traffic will be allowed north on US 41 or east on Pondella.

16. Hancock Bridge Parkway and US 41: Traffic will be routed north on US 41.

17. US 41 and Business 41 (north of the River): Traffic will be routed north on US 41.

18. SR 80 and Ortiz Avenue: Traffic will be routed east on SR 80.

19. SR 82 and Ortiz Avenue: Traffic may travel north on Ortiz or east on SR 82.

Cape Coral Police Department

The Cape Coral Police Department will maintain traffic control, during an evacuation, at the following points:

1. Hancock Bridge Parkway and Del Prado Boulevard: Traffic will be routed east on Hancock Bridge Parkway.

2. SR 78 and Del Prado Boulevard: Traffic will be routed northeast on SR 78.

3. SR 78 and Skyline Boulevard: Traffic will be routed northeast on SR 78.

4. SR 78 and Santa Barbara Boulevard: Traffic will be routed northeast on SR 78.

5. SR 78 and Chiquita Boulevard: Traffic will be routed northeast on SR 78, or north on Chiquita to shelter.

6. Cape Coral Parkway and Del Prado Boulevard: Traffic will be routed north on Del Prado.

7. Cape Coral Parkway and Chiquita Boulevard: Traffic will be allowed north on Chiquita or east on Cape Coral.

8. Cape Coral Parkway and Skyline Boulevard: Traffic will be routed east on Cape Coral Parkway.

9. Cape Coral Parkway and Santa Barbara Boulevard: Traffic will be routed north on Santa Barbara or east on Cape Coral Parkway.

Fort Myers Police Department

The Fort Myers Police Department will maintain traffic control at the following points during an evacuation:

1. McGregor Boulevard and Anderson Avenue: Traffic will be routed east on Anderson Avenue.

2. Palm Beach Boulevard and Fowler Avenue: Traffic will be routed northeast on Palm Beach Boulevard (The Edison Bridge will probably be closed at some point in the evacuation process.)

3. Anderson Avenue and Fowler Avenue: Traffic will be routed east on Anderson or north on Fowler.

4. First Street and Monroe Street: Traffic will be routed northeast on First Street to Palm Beach Boulevard.

5. Main Street and Monroe Street: Traffic will be routed north on Monroe.

6. Edison Bridge: The Edison Bridge will likely be closed to road traffic at some point in the evacuation process.

7. Caloosahatchee Bridge: The Caloosahatchee Bridge will probably be closed during an evacuation.

8. US 41 and Hanson Street: Traffic will be routed north on US 41.

9. Fowler Avenue and Hanson Street: Traffic will be routed north on Fowler.

10. US 41 and Colonial Boulevard: Traffic will be routed east on Colonial.

11. Colonial Boulevard and Ortiz Avenue: Traffic will be routed north on Ortiz.

12. Colonial Boulevard and Summerlin Road: Traffic will be routed east on Colonial.

13. McGregor Boulevard and Colonial Boulevard: Traffic may travel north on McGregor or east on Colonial.

14. Colonial Boulevard and Fowler Avenue: Traffic may travel north on Fowler or east on Colonial.

15. Metro Parkway and Hanson Street: Traffic will be routed west on Hanson.

16. Metro Parkway and Colonial Boulevard: Traffic will be routed east on Colonial.

Sanibel Police Department

During an evacuation, the Sanibel Police Department will maintain the following traffic control points:

1. Periwinkle Way and Lindgren Boulevard: Traffic will be routed east on Periwinkle.

2. Periwinkle Way and Tarpon Bay Road: Traffic will be routed southeast on Periwinkle.

3. Periwinkle Way and Donax Street: Traffic will be routed east on Periwinkle.

4. Periwinkle Way and Bailey Road: Traffic will be routed east on Periwinkle.

5. Causeway Road and New Bailey Road Connector: Traffic will be routed north onto the Sanibel Causeway.

SARASOTA COUNTY

During an evacuation, Sarasota County Sheriff's deputies will be positioned at all major intersections, and traffic lights will be turned off to allow the officers to direct traffic.

Evacuation traffic will be directed in the following directions:

Longboat Key

Sarasota County residents will travel south on Gulf of Mexico Drive to Ringling Boulevard and then to US 41.

Lido Key

Residents south of St. Armand's Circle will move north on Franklin Drive, or Boulevard of the Presidents, to Ringling Boulevard, and then to US 41. Residents north of St. Armand's Circle will travel south to Ringling Boulevard and over to US 41.

Bird Key

Bird Key residents will take Bird Key Drive to Ringling Boulevard and US 41.

Coon Key

Coon Key residents will take Ringling Boulevard to US 41.

Siesta Key

Residents north of the junction of Higel Avenue and Midnight Pass Road, will take Higel Avenue to Siesta Drive, and then travel

east to US 41. Residents living south of the junction shall travel south on Midnight Pass Road, Ocean Boulevard or Beach Road, to Stickney Point Road, and then travel east to US 41.

Casey Key

Residents living north of Blackburn Point Road will move south on Casey Key Road to Blackburn Point Road and on to US 41. Residents north of 3300 Casey Key Road, but south of Blackburn Point Road, shall proceed north to Blackburn Point Road, and east to US 41. Residents south of 3300 Casey Key Road will move south to Albee Road and then east to US 41. All residents south of Albee Road will proceed east on Albee to US 41.

Venice

Residents between Roberts Bay/Curry Creek and Center Road (and within 1/4 mile of the water) will take US 41 and/or the Venice ByPass to Venice Avenue, and then east to Venice Farms Road and Everglades Boulevard. They shall then travel north on Everglades Boulevard to I-75. They may take I-75 to Clark Road, Bee Ridge Road or Fruitville Road. If wishing to leave the county, evacuees should stay on I-75.

South Venice

Residents of the area between Center Road and Manasota Road/5th Street (and within 1/4 mile of the waterfront) should proceed to US 41 and then north to Center Road, and then east on Center Road.

Manasota Key

Those residents living north of Manasota Road shall travel south to Manasota Key Road to Manasota Road, and then east to SR 775 and north to US 41. Residents between Manasota Road and Blind Pass will move north on Manasota Key Road to Mansota Road and then east to SR 775 and north to US 41. Residents living south of Blind Pass will travel south on Manasota Key Road to SR 776, via Beach Road, then northeast to SR 775 and north to US 41.

Englewood

All Sarasota County residents living within endangered flood categories will proceed as directed by Sheriff's deputies.

North Port

All Category 1 and 2 zone residents will proceed according to instructions from Sheriff's deputies.

Sarasota County Sheriff's deputies may redirect traffic in any manner necessary to ensure a safe, efficient evacuation.

I. DEBRIS REMOVAL PROBLEMS

CHARLOTTE COUNTY

Charlotte County Disaster Preparedness does not expect significant debris to accumulate along evacuation routes except routes except in three areas. These are State Road 776, between El Jobean and Murdock; US 17, between Shell Creek and the DeSoto County Line; and on SR 74, from US 17 to SR 31. County road equipment will be used to facilitate debris removal, along with private contractors.

COLLIER COUNTY

The only likely debris problem in Collier County is on SR 846, about 3/4 of the way to Immokalee. The area is a heavily forested Pine Flatwoods, close to the road. Other than this, the County expects no particular debris problem areas.

GLADES COUNTY

Information not available at this time.

HENDRY COUNTY

Information not available at this time.

LEE COUNTY

The debris problem during a hurricane evacuation in Lee County would consist mainly of trees and/or billboards. The County Division of Emergency Management foresees debris removal problems at the following locations:

1. Sanibel/Captiva Islands: The entire length of San Cap Road and Periwinkle Way.

2. Boca Grande: The entire route towards Charlotte County.

3. Stringfellow Road on Pine Island: The entire road length.

4. SR 78: From Stringfellow Road to Chiquita Boulevard.

5. The Sanibel Causeway: The entire length.

6. CR 865: From US 41 in Bonita Springs to McGregor Boulevard.

7. Summerlin Road: From the Sanibel Causeway to San Carlos Boulevard.

8. McGregor Boulevard: The entire length.

9. Cape Coral Parkway: The entire length.

10. Del Prado Boulevard: From Cape Coral Parkway to SR 78. This is due to the heavy concentration of billboards on this road.

11. US 41: From Gladiolus Drive to the Caloosahatchee Bridge. This is also mainly due to the billboard concentration.

12. US 41: From the bridge north to Charlotte County.

13. Business 41: From the Edison Bridge to US 41.

14. Palm Beach Boulevard: From McGregor to I-75.

15. SR 78: From Del Prado Boulevard to US 41.

16. SR 78: SR 31 to the Hendry County line.

SARASOTA COUNTY

In Sarasota County, the principal debris removal problems (during an evacuation) will occur along John Ringling Causeway. The road is heavily lined by Austrialian Pines. This route is the only road from the north county barrier islands.

J. DWELLING UNIT SURVEY

REGIONAL AVERAGES

	APT.	CONDO	HOTEL/MOTEL	RV PARK	MOBILE HOME
# OF ESTABLISHMENTS	41	68	71	6	44
# OF UNITS	2,909	9,491	6,447	1,737	16,323
AVERAGE # OF UNITS PER ESTABLISHMENT	71	140	91	290	371

AVERAGE OCCUPANCY RATE (%)

J	N	J	N	J	N	J	N	J	N
70	78	51	64	40	50	18	41	43	75

In attempting to determine the size of the affected population it is necessary to examine the occupancy/vacancy rates for the various types of dwelling units.

The actual rate of occupied units (estimated by the complex owner/manager) by season is given in Table A. The actual count of complexes contacted is given in Table B.

TABLE A
% OCCUPANCY SEASONALITY

APARTMENT JULY/NOV.	CONDO JULY/NOV.	HOTEL/MOTEL JULY/NOV.	RV PARK JULY/NOV.	MOBILE HOME JULY/NOV.
		CHARLOTTE COUNTY		
50/70	65/70	35/55	20/30	40/80
		COLLIER COUNTY		
71/83	42/61	52/64	40/72	35/66
		LEE COUNTY		
78/80	53/62	5/20	3/21	43/75
		SARASOTA COUNTY		
80/80	44/61	68/62	NR	54/77

TABLE B
ESTABLISHMENTS CONTACTED BY TYPE

COUNTY	APARTMENT	CONDO	HOTEL/MOTEL	RV PARK	MOBILE HOME
Charlotte	3	9	9	2	8
Collier	11	14	22	3	6
Lee	10	27	13	1	14
Sarasota	17	18	27	0*	16
SUBTOTAL	41	68	71	6	44

ACTUAL UNITS BY DWELLING UNIT TYPE

Charlotte	33	1,570	692	291	533
Collier	589	1,962	3,519	242	873
Lee	1,109	4,191	411	1,204	6,684
Sarasota	1,178	1,768	1,825	0	8,235
SUBTOTAL	2,909	9,491	6,447	1,737	16,323

*No response from the few listed in the telephone directory.

NOTE: There is some built-in inaccuracy in the tables above. For example, in Collier County, there is a complex with the name Bonita Beach Apartments and Motel. Because of the name, the units have been divided between the apartment and hotel/motel categories when, in actuality, because of their location and use, all the units should probably have been listed under hotel/motel only.

This problem occurred in all counties and most often near the coast where seasonal rates are able to command higher prices.

Likewise, the line between mobile home parks and RV parks is sometimes blurred. Many RV and mobile home parks also had answering machines indicating the parks were only open in high season (Nov./Dec. to March).

K. THE SAFFIR/SIMPSON HURRICANE SCALE

The Saffir/Simpson Hurricane Scale is used by the National Weather Service to give public safety officials a continuing assessment of the potential for wind and storm surge damage from a hurricane in progress. Scale numbers are made available to public safety officials when a hurricane is within 72 hours of landfall. Scale assessments are revised regularly as new observations are made, and public safety organizations are kept informed of new estimates of the hurricane's disaster potential.

Scale numbers range from 1 to 5. Scale No. 1 begins with hurricanes in which the maximum sustained winds are at least 74 mph, or which will produce a storm surge 4 to 5 feet above normal water level, while Scale No. 5 applies to those in which the maximum sustained winds are 155 mph or more, which have the potential of producing a storm surge more than 18 feet above normal.

The scale was developed by Herbert Saffir, Dade County, Florida consulting engineer, and Dr. Robert H. Simpson, former National Hurricane Center director, and projects scale assessment categories as follows:

> Category No. 1 - Winds of 74 to 95 mph. Damage primarily to shrubbery, trees, foliage, and unanchored mobile homes. No real damage to other structures. Some damage to poorly constructed signs. Storm surge 4 to 5 feet above normal. Low-lying coastal roads inundated, minor pier damage, some small craft in exposed anchorage torn from moorings.
>
> Category No. 2 - Winds of 96 to 110 mph. Considerable damage to shrubbery and tree foliage; some trees blown down. Major damage to exposed mobile homes. Extensive damage to poorly constructed signs. Some damage to roofing materials of buildings; some window and door damage. No major damage to buildings. Storm surge 6 to 8 feet above normal. Coastal roads and low-lying escape routes inland cut by rising water two to four hours before arrival of hurricane center. Considerable damage to piers. Marinas flooded. Small craft in unprotected anchorages torn from moorings. Evacuation of some shoreline residences and low-lying island areas required.
>
> Category No. 3 - Winds of 111 to 130 mph. Foliage torn from trees; large trees blown down. Practically all poorly constructed signs blown down. Some damage to roofing materials of buildings; some window and door damage. Some structural damage to small buildings. Mobile homes

destroyed. Storm surge 9 to 12 feet above normal. Serious flooding at coast and many smaller structures near coast destroyed; large structures near coast damaged by battering waves and floating debris. Low-lying escape routes inland cut by rising water three to five hours before hurricane center arrives. Flat terrain 5 feet or less above sea level flooded inland 8 miles or more. Evacuation of low-lying residences within several blocks of shoreline possibly required.

Category No. 4 - Winds of 131 to 155 mph. Shrubs and trees blown down; all signs down. Extensive damage to roofing materials, windows, and doors. Complete failure of roofs on many small residences. Complete destruction of mobile homes. Storm surge 13 to 18 feet above normal. Flat terrain 10 feet or less above sea level flooded inland as far as six miles. Major damage to lower floors to structures near shore due to flooding and battering by waves and floating debris. Low-lying escape routes inland cut by rising water three to five hours before hurricane center arrives. Major erosion of beaches. Massive evacuation of all residences within 500 yards of shore possibly required, and of single-story residences on low ground within two miles of shore.

Category No. 5 - Winds greater than 155 mph. Shrubs and trees blown down; considerable damage to roofs of buildings; all signs down. Complete failure of roofs on many residences and industrial buildings. Extensive shattering of glass in windows and doors. Some complete building failures. Small buildings over-turned or blown away. Complete destruction of mobile homes. Storm surge greater than 18 feet above normal. Major damage to lower floors of all structures less than 15 feet above sea level within 500 yards of shore. Low-lying escape routes inland cut by rising water three to five hours before hurricane center arrives. Massive evacuation of residential areas on low ground within five to ten miles of shore possibly required.

Dr. Neil Frank, present National Hurricane Center Director, has adapted atmospheric pressure ranges to the Saffir/Simpson Scale. These pressure ranges, along with a numerical break-down of wind and storm surge ranges are:

Scale Number	Central Pressures Millibars	Inches	Winds (mph)	Surge (ft.)	Damage
1	980	28.94	74-95	4-5	Minimal
2	965-979	28.5- 28.91	96-110	6-8	Moderate
3	945-964	27.91-28.47	111-130	9-12	Extensive
4	920-944	27.17-27.88	131-155	13-18	Extreme
5	920	27.17	155+	18+	Catastrophic

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