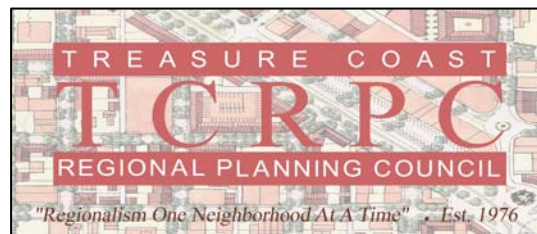


Volume 1-10 Treasure Coast Region Technical Data Report

CHAPTER III

Regional Behavioral Analysis Summary



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Table of Contents

CHAPTER III REGIONAL BEHAVIORAL ANALYSIS SUMMARY..... III-1

A. Background III-1

B. Methodology III-2

 1. Survey Methodology III-2

 2. Deriving Behavioral Assumptions III-3

C. Summary of Behavioral Results III-4

 1. Overview III-4

 2. Key Findings for the Treasure Coast Region III-5

D. Evacuation Scenarios III-9

 1. Storm Characteristics III-10

 2. Evacuation Timing III-11

E. Evacuation Behavior for Other Hazards III-12

 1. Wildfire III-13

 2. Freshwater Flooding III-14

 3. Hazardous Materials Spill III-15

 4. Nuclear Power Plant Incident III-16

F. Use of Survey Findings III-17

 1. Intended Responses III-17

 2. Actual Responses III-17

 3. Past Response in Other Locations III-18

 4. Statistical Predictors III-18

 5. Combining Information III-18

 6. Sample Size Considerations III-18

G. Planning Assumptions III-19

 1. Evacuation Rates III-20

 2. Out-of-County Trips III-21

 3. Type of Refuge III-21

 4. Percent of Available Vehicles III-22

 5. Evacuation Timing III-22

H. Planning Assumptions for Vacationers III-25

 1. Evacuation Rates III-25

 2. Type of Refuge III-25

 3. Destinations III-26

 4. Vehicle Use III-26

 5. Evacuation Timing III-26

I. Planning Assumptions Tables..... III-26

List of Tables

Table III-1: Sample Sizes in Treasure Coast Counties	III-3
Table III-2: Awareness of Evacuation Zones	III-6
Table III-3: The Percentages of All Households That Evacuated and the Most Popular Types of Destinations.....	III-6
Table III-4: Residents That Say They Intend to Evacuate Their Homes Even When the Evacuation Notice Does Not Apply Directly to Them	III-7
Table III-5: Household Members Need Assistance to Evacuate	III-9

List of Figures

Figure III-1: Evacuation Destinations by Type	III-8
Figure III-2: Evacuation Destinations by Location	III-8
Figure III-3: Response Curves for Evacuation Planning	III-23

Planning Assumptions Tables

1. Indian River County Planning Assumptions

Table PA 1a. Evacuation rate for site-built homes	III-27
Table PA 1b. Out-of-county trip rates for site-built homes.....	III-27
Table PA 1c. Percent of available vehicles to be used by site-built homes.....	III-27
Table PA 1d. Public shelter use rates for site-built homes.....	III-28
Table PA 1e. Friend and relative use rates for site-built homes.....	III-28
Table PA 1f. Hotel and motel use rates for site-built homes.....	III-28
Table PA 1g. Other refuge use rates for site-built homes.....	III-29
Table PA 1h. Evacuation rate for site-built homes.....	III-29
Table PA 1i. Out-of-county trip rates for mobile and manufactured homes.....	III-29
Table PA 1j. Percent of available vehicles to be used by mobile and manufactured homes.....	III-30
Table PA 1k. Public shelter use rates for mobile and manufactured homes.....	III-30
Table PA 1l. Friend and relative use rates for mobile and manufactured homes.....	III-30
Table PA 1m. Hotel and motel use rates for mobile and manufactured homes.....	III-31
Table PA 1n. Other refuge use rates for mobile and manufactured homes.....	III-31

2. Martin County Planning Assumptions

Table PA 2a. Evacuation rate for site-built homes.....	III-32
Table PA 2b. Out-of-county trip rates for site-built homes.....	III-32
Table PA 2c. Percent of available vehicles to be used by site-built homes.....	III-32
Table PA 2d. Public shelter use rates for site-built homes.....	III-33
Table PA 2e. Friend and relative use rates for site-built homes.....	III-33

Martin County Planning Assumptions (cont'd)

Table PA 2f. Hotel and motel use rates for site-built homes..... III-33
 Table PA 2g. Other refuge use rates for site-built homes..... III-33
 Table PA 2h. Evacuation rate for site-built homes..... III-34
 Table PA 2i. Out-of-county trip rates for mobile and manufactured homes..... III-34
 Table PA 2j. Percent of available vehicles to be used by mobile and
 manufactured homes..... III-34
 Table PA 2k. Public shelter use rates for mobile and manufactured homes..... III-35
 Table PA 2l. Friend and relative use rates for mobile and manufactured homes..... III-35
 Table PA 2m. Hotel and motel use rates for mobile and manufactured homes..... III-35
 Table PA 2n. Other refuge use rates for mobile and manufactured homes..... III-35

3. Palm Beach County Planning Assumptions

Table PA 3a. Evacuation rate for site-built homes..... III-36
 Table PA 3b. Out-of-county trip rates for site-built homes..... III-36
 Table PA 3c. Percent of available vehicles to be used by site-built homes..... III-36
 Table PA 3d. Public shelter use rates for site-built homes..... III-37
 Table PA 3e. Friend and relative use rates for site-built homes..... III-37
 Table PA 3f. Hotel and motel use rates for site-built homes..... III-37
 Table PA 3g. Other refuge use rates for site-built homes..... III-38
 Table PA 3h. Evacuation rate for site-built homes..... III-38
 Table PA 3i. Out-of-county trip rates for mobile and manufactured homes..... III-38
 Table PA 3j. Percent of available vehicles to be used by mobile and
 manufactured homes..... III-39
 Table PA 3k. Public shelter use rates for mobile and manufactured homes..... III-39
 Table PA 3l. Friend and relative use rates for mobile and manufactured homes..... III-39
 Table PA 3m. Hotel and motel use rates for mobile and manufactured homes..... III-40
 Table PA 3n. Other refuge use rates for mobile and manufactured homes..... III-40

4. St. Lucie County Planning Assumptions

Table PA 4a. Evacuation rate for site-built homes..... III-41
 Table PA 4b. Out-of-county trip rates for site-built homes..... III-41
 Table PA 4c. Percent of available vehicles to be used by site-built homes..... III-41
 Table PA 4d. Public shelter use rates for site-built homes..... III-42
 Table PA 4e. Friend and relative use rates for site-built homes..... III-42
 Table PA 4f. Hotel and motel use rates for site-built homes..... III-42
 Table PA 4g. Other refuge use rates for site-built homes..... III-42
 Table PA 4h. Evacuation rate for site-built homes..... III-43
 Table PA 4i. Out-of-county trip rates for mobile and manufactured homes..... III-43
 Table PA 4j. Percent of available vehicles to be used by mobile and
 manufactured homes..... III-43
 Table PA 4k. Public shelter use rates for mobile and manufactured homes..... III-44
 Table PA 4l. Friend and relative use rates for mobile and manufactured homes..... III-44
 Table PA 4m. Hotel and motel use rates for mobile and manufactured homes..... III-44
 Table PA 4n. Other refuge use rates for mobile and manufactured homes..... III-45

Chapter III

Regional Behavioral Analysis Summary

A. Background

For planners and emergency managers, one of the most elusive components of evacuation planning is anticipation of the behavior of our population. The behavioral analysis is one of the most important tasks in preparing hurricane evacuation plans. It includes the development of the necessary assumptions regarding the manner in which evacuees in and around the threatened area will react to the hurricane threat. Behavioral assumptions based on professional analysis of survey results are the final output of the behavioral component of this study. These assumptions regarding human behavior in an emergency situation become a critical tool in shelter planning, transportation modeling, evacuation decision-making and public information efforts.

The public responses having the greatest impact upon an evacuation are listed below. These tendencies and choices of potential evacuees must be quantified in the behavioral analysis:

1. **Evacuation Rates** - The percentage of population in evacuated and non-evacuated areas that will evacuate during a threat;
2. **Evacuation Timing** - When the evacuation population would leave their residences in response to a hurricane warning, watch, a given evacuation order or recommendation, and landfall;
3. **Vehicle Use** - The number of vehicles that evacuating households would use for evacuation;
4. **Type of Refuge** - The percentage of evacuees that will seek public shelter and other types of refuge such as the homes of friends and relatives, motel/hotels and other locations such as churches, workplaces, and second homes;
5. **Evacuation Destinations** - The location an evacuee travels to in the event of an evacuation. These destinations can include public shelters, homes of friends/relatives, hotels/motels, and destinations out of the region;
6. **Response by Vacationers** - The evacuation response by vacationers, including R.V. park visitors, encompassing evacuation rate, timing, public shelter use, and vehicle use.

Final behavioral assumptions for each county in the region are included near the end of this summary. Further discussion and a detailed explanation of the analysis used to derive primary behavioral assumptions are included in Volume 2 of the Regional Evacuation Study.

B. Methodology

1. Survey Methodology

To begin the behavioral analysis for the Statewide Regional Evacuation Study (SRES) program, new behavioral data was compiled from telephone responses to a survey instrument developed for the study by each regional planning council with input from local emergency managers. The wording of survey questions was further refined by Dr. Earl J. Baker of Hazards Management Group. Kerr-Downs Research Inc. administered the survey instrument via telephone interviews and assembled the results for each region as Volume 3 of the SRES. Volume 3 constitutes a compiled and complete listing of survey results and regional findings from the unprecedented 2007-2008 survey of Florida residents. Further analysis and planning assumptions were developed from the survey results by Hazards Management Group.

The primary aim of the survey was to provide data to assist in deriving evacuation related behavioral assumptions for transportation and shelter analyses. The main focus of the survey was hurricane evacuation, but questions were also asked about evacuation due to freshwater flooding, wildfires, hazardous material accidents, and nuclear power plant accidents. The survey instrument included questions that are important in developing accurate behavioral assumptions for transportation and shelter planning but also incorporated questions deemed useful by county emergency management officials. Meetings were held with county and regional planning council representatives to discuss the questionnaire and related survey issues.

In each non-coastal county of the state, 150 interviews were conducted randomly by telephone. In each coastal county of the state 400 interviews were conducted. The interviews were allocated among aggregations of hurricane evacuation zones (e.g., category 1-2) in the respective counties. The aggregation of evacuation zones and allocations of interviews among the evacuation zones were determined after input from county and regional representatives and varied among counties and regions. Respondents to the survey were also selected in order to reflect aggregations of evacuation zones currently used operationally and in public information materials by counties and to provide appropriate distributions of data that would be necessary to derive behavioral projections as required by the SRES program. Treasure Coast Region counties Indian River, Palm Beach and St. Lucie, responses from residents were aggregated by evacuation zones categories 1-2 and 3-5, whereas Martin County resident responses were aggregated by evacuation zone categories 1-3 and 4-5. All counties within the region surveyed residents in non-surge zones in order to ascertain numbers of non-vulnerable evacuating population during hurricane events. In order to ensure that respondents resided in the evacuation zones of interest, addresses were selected first and then matched with telephone numbers. Only residences with land-line telephones were called, as sampling was conducted by address. An overview of the survey sample and aggregation of responses is included below in Table 1.

Table III-1. Sample Sizes in Treasure Coast Counties

	Site-built Homes	Mobile Homes	SB + MH
Indian River Cat 1-2	198	1	199
Indian River Cat 3-5	86	12	98
Indian River Non-surge	94	5	99
Martin Cat 1-3	192	6	198
Martin Cat 4-5	93	7	100
Martin Non-surge	76	24	100
Palm Beach Cat 1-2	198	1	199
Palm Beach Cat 3-5	97	2	99
Palm Beach Non-surge	96	3	99
St. Lucie Cat 1-2	224	25	249
St. Lucie Cat 3-5	49	0	49
St. Lucie Non-surge	84	15	99
TOTAL	1487	101	1588

For hazards other than hurricanes, sample sizes are smaller. In most counties, one-third of the respondents were asked about freshwater flooding or wildfires or hazardous material accidents. In counties within the emergency planning zone for a nuclear power plant, one-fourth of the respondents were asked about one of the previously listed hazards or about nuclear power plants.

2. Deriving Behavioral Assumptions

Since each evacuation scenario is different and entirely unique, behavioral analysis for evacuation is predictive. The final products of behavioral analyses are basic assumptions that form the best available predictive information regarding likely human behavior. Regardless of how detailed, formal, or quantitative an evacuation plan appears, it contains assumptions about behaviors such as those discussed throughout this study. Every time a clearance time is calculated to determine the length of time required to complete an evacuation under a defined scenario, the model simulations include quantitative assumptions regarding behavioral factors. Behavioral assumptions are also employed in an effort to predict the needed capacity of shelters to house an unknown number of residents that will evacuate to a public shelter. Behavioral assumptions will change over time based on the level of public education regarding evacuation or the level of evacuation experience of a population. The issue is not whether such assumptions are or should be made; but what the assumptions should be.

There is no simple one-rule-fits-all technique for deriving behavioral assumptions for planning. The best solution is to employ the best available mix of indicators, relying most heavily on the best information available for each behavior and scenario in question.

A detailed listing and discussion of behavioral assumptions is included in Volume II of this SRES series. However, a few of the most fundamental and critical assumptions are included at the end of this summary.

C. Summary of Behavioral Results

1. Overview

a. Storm Events

As stated previously, the behavioral survey for the SRES program focused on the storm events of 2004 - 2005. Due to the varied impact area from the storm events, each of the 11 regional planning councils chose which storms the survey for their region would be based on. Most of the State of Florida was affected by Hurricanes Charley, Frances and Jeanne, in 2004, but other major storms in recent history such as Ivan (2004) and Wilma (2005) dealt regional impacts to other parts of the state. Allowing regions to choose which storm event to focus on lends greater confidence to the entire study. The relative value of survey results are strongly influenced by evacuation survey responses based on actual experience. Survey results from the Treasure Coast Region focus on experiences gained from Frances, Jeanne and Wilma.

During 2004, Hurricane Frances took a direct path along the northern Caribbean Islands and came ashore in Stuart, Florida, as a category 2 storm. The eye of this storm was much larger with a larger area of wind damage. Residents in the Treasure Coast Region experienced 105 mile per hour winds for several hours as the storm eye was roughly eighty miles across and the storm had slow forward motion. Damage to roadway, trees and homes was prevalent. Evacuation orders were issued for mobile homes and low lying areas in all four counties of the region.

Just three weeks later, Hurricane Jeanne made landfall just east of Sewall's Point, in Stuart as a category 3 storm exacerbating an already heavily impacted area. Jeanne hit the northern coasts of many of the Caribbean Islands before turning north where it appeared to be headed off into the Atlantic. However, Jeanne looped around and doubled back to head straight for Florida. Jeanne and Frances followed similar paths across the state. Impacts to the Treasure Coast Region were also similar with Jeanne being the more powerful of the two. Again, evacuation orders were issued for mobile homes and low lying areas and voluntary evacuation for the remaining areas in all four counties of the region. A comparison of the Frances and Jeanne storm events may illustrate changes in behavior learned from previous storm experience as the two scenarios were somewhat similar.

Hurricane Wilma occurred during the 2005 hurricane season and was unique in that this storm hovered over the Yucatan Peninsula for several days then made landfall on the southern west coast of Florida at Cape Romano as a category 3 storm. Wilma crossed the state in 4.5 hours as a category 2 storm and exited the east coast of Florida near Jupiter. Seventy-seven percent of Treasure Coast Region residents remained at home during the storm with only fourteen percent evacuating.

Compared to other parts of Florida, the Treasure Coast Region was heavily impacted by the 2004 and 2005 storm season with two direct landfalls from the east (Frances and Jeanne) and one direct landfall from the west (Wilma). With the majority of the coastal land areas in this region developed commercially and residentially and considered high

impact areas, evacuation rates resulting from these storm events are understandably higher with regional evacuation rates at thirty-two percent for Frances, twenty-seven percent for Jeanne and fourteen percent for Wilma.

b. Regional Characteristics

The following is a brief description of the region intended to add greater context and meaning relative to the findings of the behavioral survey. Coastal areas of the Treasure Coast Region promote resource-based tourism and activities such as fishing, park visitation and seasonal living. Coastal residential populations are relatively high and the resulting higher clearance time doesn't always allow emergency managers extra time for data gathering prior to issuing evacuation orders.

The average age of the population is a variable that may affect evacuation behaviors and behavioral survey responses/results in the Treasure Coast Region. Twenty-two percent of the regional population is over 65 years of age. In terms of evacuation, this demographic may be seen as a benefit allowing for a longer response curve that reduces the potential for traffic jams. However, another indication may be that there are greater medical needs and obstacles to evacuation based on mobility.

2. Key Findings for the Treasure Coast Region

a. Information and Awareness

One of the most valuable bits of information to emergency managers is to understand how people are accessing information about evacuation, and if they understand it. Previous surveys have repeatedly shown that most people look to their television for evacuation notices.

Three out of four Treasure Coast residents (76%) have access to the Internet. However, only three in ten residents with Internet access (29%) claim to have visited their county's website to search for information about hurricanes. Two out of three residents (66%) of the Treasure Coast Region maintain they have seen a map of their county showing areas that need to evacuate in case of hurricanes.

Nearly one in three residents (32%) of the coastal counties in the Treasure Coast Region believes that they live in an evacuation zone. Unfortunately, survey results indicate that the respondents had only limited knowledge about evacuation zones. Only 25% of the respondents in the Treasure Coast Region who live in evacuation zone 1 correctly identified themselves as living in evacuation zone 1. Similar results were found for other evacuation zones, with 61% of residents in evacuations 3 do not know they live there and 57% of residents in evacuation zone 5 are unaware they live in that zone. This finding illustrates the need for public information dissemination.

Table III-2. Awareness of Evacuation Zones

Evacuation Zone	Know Evacuation Zone in Which One Lives
Category 1	25%
Category 2	25%
Category 3	18%
Category 4	24%
Category 5	21%

The previous finding indicates a lack of knowledge of evacuation zones, and illustrates the need for dissemination of public information. However, a very high percentage of residents of coastal areas have confidence that Emergency Management officials will issue evacuation notices saying residents should leave their homes to seek safer locations when called for. Residents' confidence that emergency managers will issue evacuation notices rises for more severe storms. Response rates for non-surge and inland counties show a high confidence rate that evacuation orders will be issued when needed.

b. Evacuation Intent

Percentages of citizens who say they will follow mandatory evacuation notices vary depending on the strength of the storm. It makes sense that compliance with orders for evacuation increases linearly as hurricanes strengthen from category 1 or 2 to 3 to 4 or 5. However, percentages of respondents that claim their intent to evacuate are consistently higher than actual evacuation rates, especially when respondents were asked whether they intend to comply with evacuation orders. Due to the hypothetical nature of responses the trend is pointed out but actual numbers are not provided in this summary.

Table III-3. The Percentages of All Households That Evacuated and the Most Popular Types of Destinations

Storm	Evacuated	Neighborhood	County	Elsewhere In Florida	Outside Florida
Frances	32%	4%	7%	15%	5%
Jeanne	27%	4%	5%	15%	3%
Wilma	14%	3%	4%	6%	1%

Hurricanes Frances, Jeanne and Wilma impacted the Treasure Coast Region as category 2 and 3 intensity storms. Therefore, the evacuation participation rates are higher than other locations in Florida that were impacted less severely. The Treasure Coast Region has not been impacted by a Hurricane since Wilma (2005) but was heavily impacted by Tropical Storm Faye (2009) which dropped record rainfall, severe flooding and prolonged power outages.

As discussed earlier, survey results for hypothetical situations are not consistent with real behavior. Evacuation rates are further analyzed and organized by county, for Hurricanes Frances, Jeanne and Wilma, and are included with analysis in Volume II - Behavioral Analysis. The raw behavioral survey results and survey questionnaire are included in Volume III - Behavioral Survey Report.

Significant percentages of residents say they intend to evacuate their homes even when the evacuation notice does not apply directly to them. The term “shadow evacuation” applies to those residents that evacuate without having been told to evacuate. Shadow evacuation occurs for a wide variety of reasons and is difficult to quantify. Nevertheless, assumptions for shadow evacuation rates must be made to assess and model evacuation traffic patterns. Shadow evacuation rates increase as storm strength increases. The survey results shown below illustrate that shadow evacuation rates are higher in inland and non-surge areas.

Table III-4. Residents That Say They Intend to Evacuate Their Homes Even When the Evacuation Notice Does Not Apply Directly to Them

Evacuation Zone	Evacuation Notice for Zones 1 and 2	Evacuation Notice for Zones 1, 2 and 3	Evacuation Notice for Zones 1,2,3,4 and 5
Category 1	43%	73%	93%
Category 2	43%	73%	93%
Category 3	46%	67%	88%
Category 4	43%	61%	83%
Category 5	43%	61%	83%
Non-Surge	41%	56%	82%

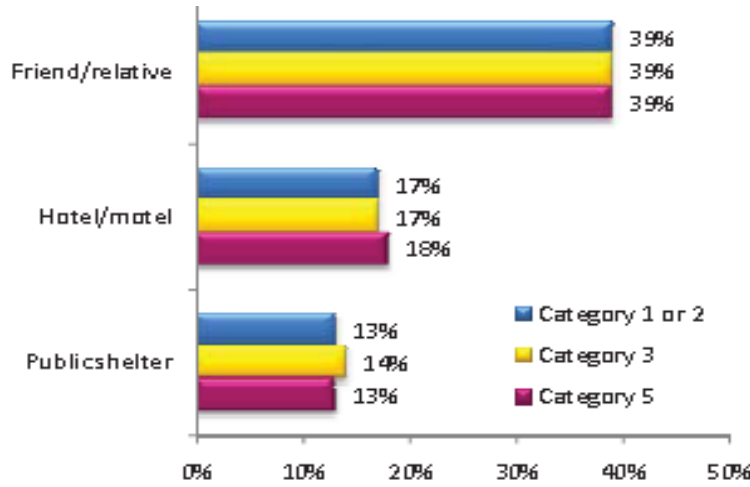
The table above reveals that non-surge evacuees constitute a significant portion of the overall evacuation effort. The potential evacuation concern is evacuation route congestion caused by evacuees that should otherwise stay home. As stated previously, the reasons for shadow evacuation are numerous; many of them are valid reasons. Educational initiatives encouraging each household to have an evacuation plan and to stock hurricane supplies may be an effective way to reduce shadow evacuation.

c. Evacuation Destination

Regardless of the hurricane strength, pluralities of residents of the Treasure Coast Region intend to go to friends or relatives if they evacuate. Very minor changes in evacuation destinations occur as hurricanes strengthen. Behavioral survey results indicated that approximately 39% of evacuees intend to find safety in the households of friends and family. Most residents (43%) intend to evacuate to other places in Florida, with 19% remaining within their own county and 17%-26% will seek shelter someplace outside Florida as depicted in Figure 2. The percentages of residents who intend to evacuate outside Florida increase considerably as hurricanes strengthen to category 5.

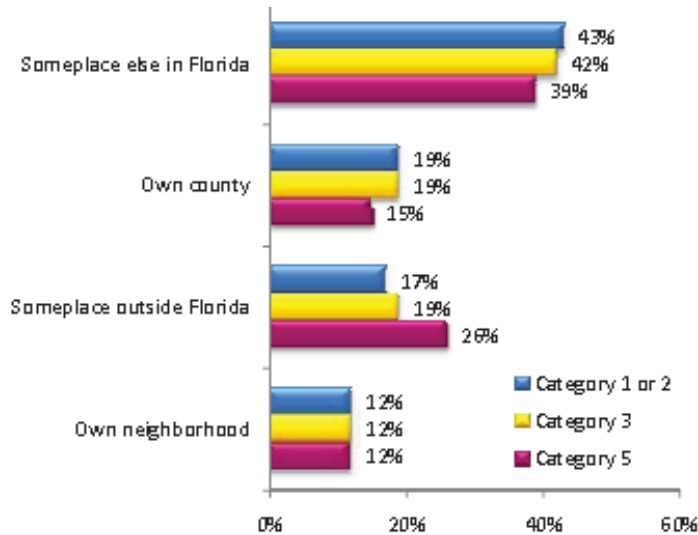
Most residents who intend to evacuate outside Florida will go to Georgia. Specific information regarding evacuation destinations are shown in the following two figures.

Figure III-1. Evacuation Destinations by Type



About 17% of evacuees plan to go to a motel. Survey responses indicate that approximately 13% of evacuees intend to go to public shelters; however, actual shelter records typically reveal a much lower number.

Figure III-2. Evacuation Destinations by Location



Additional evacuation destination information is provided for each county in the Planning Assumptions tables at the end of this behavioral summary. More specific information regarding the analysis that was used to derive the planning assumptions is found in Volume II - Behavioral Analysis. The behavioral survey results and survey questionnaire specifically detailing destination information are included in Volume III - Behavioral Survey Report.

d. Obstacles to Evacuation

Approximately 2% of Treasure Coast residents said they have no vehicle in their household that could be used for evacuation. Six percent of households contain an individual who requires assistance during evacuation. Over half of these households (65% - translating to 4% of all households) have special needs; an individual who is disabled, has a medical condition or requires some other type of special assistance beyond transportation assistance, 25% of special needs persons have transportation needs. Eighteen percent of these households (1% of all households) will require assistance from an outside agency. Only one in four (24%) households that require special assistance has registered with their county as needing special assistance. Therefore, the data indicates a need for county public education materials for evacuation to highlight special needs issues and encourage those that need evacuation assistance to register with the county.

Table III-5. Household Members Need Assistance to Evacuate

Evacuation Zone	Number	Yes	No	Not Sure
Treasure Coast Region	1600	6%	93%	1%
Category 1	392	5%	94%	0%
Category 2	392	5%	94%	0%
Category 3	151	8%	91%	1%
Category 4	133	8%	91%	1%
Category 5	132	8%	91%	1%
Non-Surge	400	5%	93%	2%

Almost half of residents (45%) in the Treasure Coast Region have pets: 85% of these residents plan to take their pets with them if they evacuate. Most residents with pets (95%) are aware that public shelters will not accept pets, and 6% of these residents claim they will not evacuate because of this fact.

Information on the location of pet friendly shelters should be disseminated with other public education materials. Pet owners need to include pets in their evacuation plans by actively seeking information on rules and procedures for sheltering pets.

D. Evacuation Scenarios

Evacuation behavior can be affected by a variety of external factors as illustrated throughout the behavioral survey results. Several of the most significant factors and likely behavioral responses are discussed in this section.

1. Storm Characteristics

a. Storm Severity

The 2007-2008 behavioral survey results for the Treasure Coast Region consistently show a marked difference in responses associated with hypothetical severe storms (Category 4 and Category 5). We should not be surprised by these results; higher evacuation participation rates make sense. In fact, responses to questions regarding severe storms shown above in Table 4 indicates that approximately 83% of the population intends to evacuate during a category 5 storm event, if ordered.

Storm severity also plays a significant role in evacuation destination especially with regard to out-of-county travel. Conclusions derived from Hurricanes Frances, Jeanne and Wilma participation rates cannot accurately predict the evacuation scenario for a large, highly destructive major storm. In Florida, evacuation during Hurricane Floyd is one of the best examples of multi-regional, multi-state evacuation caused by a large hurricane. The setting for Hurricane Floyd in 1999 should be taken into account when attempting to understand the reaction of the populous. Floyd was a strong category 4 storm that had moved on a path directly toward South Florida for several days. The storm was ominous, but forecasters guardedly predicted that Floyd would veer off into the Atlantic and not directly impact Florida. The storm continued to advance with huge press coverage and did not turn until finally, at the last safe distance, the storm altered its course and skirted the State. Floyd did, however, landfall in North Carolina as a category 2 storm, causing major damage along the Eastern Seaboard and initiating what Time Magazine described as the largest evacuation in history. The point here is to give an idea of how public response can be affected by an extreme storm.

Evacuation rates in non-coastal counties during Floyd ranged from 12% in the East Central Florida Region to 49% in the Charleston, SC Region. The average non-coastal county evacuation rate for all 11 regions studied was about 24%. Keep in mind that Floyd was a major storm and every storm is different. However, because of the scale of the Floyd evacuation, the chance of reoccurrence must be recognized. Results for coastal and non-coastal county evacuation need to be continually evaluated and validated by behavioral studies from other storms.

In sum, the Hurricane Floyd Assessment clearly showed that, in a major storm, people will get in their car and leave their home county. In fact, the 7,000 surveys from the Hurricane Floyd Assessment inferred that 75% of the nearly 3 million evacuees left their county. As stated throughout this study, every storm presents a unique and different scenario. However, storm severity has consistently been shown to be a significant factor in making the decision to evacuate. Multi-region clearance times are provided in Volume IV - Transportation Analysis.

b. Landfalling, Paralleling, and Exiting Storm Paths

Storm path can have a significant effect on any evacuation scenario especially with respect to out-of-county evacuation destinations. A comparison of these three storm path scenarios serves as a reminder that every storm is different. Therefore, studies

such as this one cannot predict operational decision making. However, a general discussion of potential scenarios can provide useful information to emergency managers for decision making.

- i. Landfalling storms are storms that impact the coastline directly. Generally, landfalling storms precipitate the highest surge values and most destructive winds. With regard to evacuation, landfalling storms allow for more alternative evacuation destinations. For example, a storm landfalling in the Treasure Coast Region would allow for evacuating populations to find safe destinations to the north or south of the storm path.
- ii. Paralleling storms, like the name suggests, typically travel along the coastline. On the Gulf Coast of Florida paralleling storms are potentially more destructive than on the Atlantic coast due to the counterclockwise spin of a tropical cyclone. Evacuation patterns are typically to the north and away from the storm path.
- iii. Exiting storms, as the name also suggests are storms that have made landfall and, after having travelled across land, are heading back to sea. In Florida, that typically means across the peninsula. Relative surge values and wind speeds are typically lower for exiting storms. However, Hurricanes Frances and Jeanne in 2004 and Wilma in 2005, demonstrated that evacuation of vulnerable areas during an exiting storm is often warranted due to the unpredictable nature of storm events. Each of the three storms created a different scenario with unique characteristics. Therefore, operational decisions cannot be made in advance. Discussion of storm scenarios only provides a theoretical frame of reference.

2. Evacuation Timing

a. Long and Short Response

The timeframe in which people respond to an evacuation order varies. The terms long response and short response refer to the time it takes for evacuees to mobilize following an evacuation notice. Evacuation studies typically express the temporal nature of evacuation response in a “response curve” that is derived from response curves documented in actual evacuation. Traffic modelers, in turn, load the response curve into the model to calculate evacuating traffic counts and predict potentials for traffic congestion during a future evacuation event.

The most significant factor affecting a long or short response is the urgency of the evacuation order. Response curves are also affected by the media. If a storm changes course unexpectedly or intensifies it usually becomes necessary to hasten evacuation. Urgency is sometimes inherent due to the relatively inaccurate science of hurricane forecasting.

b. Phased Evacuation

In urban areas or in areas with large at-risk populations, staged evacuation is a tool to allow for a more orderly evacuation. In this scenario, specific areas are given a time window in which to evacuate based on the capacity of the roadway to accommodate

the expected flow. Staged evacuation is commonly used in the Florida Keys due to the roadway characteristics that link this densely populated string of islands. The effectiveness of staged evacuation relies on accurate behavioral assumptions.

c. One-Way Evacuation Operation

One-way evacuation operation is an evacuation scenario where authorities change the direction of highway lanes to direct all lanes to flow in the same direction. The purpose is to hasten the evacuation of people during a major disaster. When a major hurricane is expected to make landfall, the Highway Patrol will implement one-way evacuation operations upon an Executive Order from the Governor.

Currently, only one highway segment is designated for potential one-way evacuation operations. The only one-way evacuation facility in the Treasure Coast Region is the Florida Turnpike northbound from Fort Pierce.

- [Florida's Turnpike northbound from Fort Pierce](#)

This highway segment relates to the likely evacuation routes that a significant number of residents living in Florida's largest metropolitan areas would travel in an evacuation scenario.

In situations where evacuation timing is critical and a few additional hours are needed for evacuation, reverse lane flow will speed up the evacuation of residents and tourists. However, one-way evacuation operations are counter-intuitive to the driving public and are only proposed to be implemented during daylight hours. Substantial numbers of public safety man-hours are needed to implement the traffic redirection at each interchange. Yet for all the preparation and man-hour resources needed for implementation, modeling efforts predict only a 33% increase in roadway capacity. Therefore, the applicability of one-way evacuation operation is limited to specific scenarios where the Governor recognizes the urgency for a temporary increase in evacuation route capacity.

E. Evacuation Behavior for Other Hazards

The behavioral survey administered for the SRES program included several questions regarding other disasters that may precipitate evacuation orders. Survey respondents were asked questions about their awareness of vulnerability and willingness to follow evacuation orders if issued. The following behavioral information is gathered from Volume 3 - Behavioral Survey Report.

Survey findings included here regarding other evacuation related hazards represent an initial investigation into potential behaviors associated with the hazards examined below. These findings have not been validated through comparison and correlation with similar studies. Additionally, responses to the survey are theoretical and sufficient actual response data is not available to be confident how well intentions match actual behavior. Therefore, these findings should be considered a starting point for future investigations and analysis.

1. Wildfire

The following questions were part of the survey. Responses and further discussion are below the question

- a. Do you believe that your home might ever be threatened by a wildfire?

Only one in five residents (18%) of the Treasure Coast Region believes that their area may be threatened by wildfire at some point in the future. This feeling is less prevalent in non-surge areas (19%) and most prevalent in evacuation zones 1 and 2 (24%). Residents in Martin County (31%) are much more likely to feel threatened by wildfires, while residents of Indian River County (15%), Palm Beach (14%), and St. Lucie (18%) counties have considerably less concern that wildfires may threaten their areas.

- b. If a wildfire threatened your community and public safety officials ordered you to evacuate, would you?

Over eight out of ten residents (84%) of the Treasure Coast Region claim they intend to evacuate if ordered to do so by public safety officials because of wildfire threats. Intent to evacuate if ordered to do so is highest in evacuation zones 1 and 2 (94%) and lowest in evacuation zones 3 through 5 (75%). Intent to evacuate varies somewhat across counties as 93% of Indian River County residents say they intend to evacuate because of wildfires if ordered to do so by public safety officials, while 78% of Martin County, 81% of Palm Beach County and 84% of St. Lucie County residents intend to evacuate.

- c. Where would you go if you evacuated because of a wildfire?

Just about one in six residents (16%) intends to go to public shelters if there is a need to evacuate because of wildfires. A plurality of residents (34%) intends to evacuate to friends and relatives, while two in ten (18%) plan to go to a hotel/motel. Inland and non-surge zone residents (21%) are more likely to go to public shelters; while residents in evacuation zone 2 (38%) are more likely to go to friends or relatives.

Responses to this question vary widely across counties. For example, 21% of Palm Beach County residents say they intend to evacuate to a public shelter, while fewer Martin (11%), Indian River (14%) and St. Lucie (12%) residents intend to do so. Indian River County residents (27%) are nearly twice as likely as residents in the other counties to seek shelter in a hotel or motel.

- d. Since you've been living in this location, have you ever evacuated your home because of a wildfire?

Less than 1% of residents in the Treasure Coast Region say they have experienced a wildfire while living in this area. At least one resident referenced 1990 and 1999 as years in which wildfires threatened their home. One resident who answered affirmatively to this question noted that they evacuated to friends or relatives, and the other evacuated to a public shelter.

2. Freshwater Flooding

Freshwater flooding in the Treasure Coast Region can occur for a variety of reasons including dam failure, riverine flooding and seasonal flooding from rainfall events. Please refer to the Hazards Analysis of this Technical Data Report for specific description of vulnerabilities. The questions below do not refer to any specific flooding scenario or situation.

- a. Do you believe that your home might ever be threatened by freshwater flooding?

One in five residents (19%) of the Treasure Coast Region says their home(s) might be threatened by freshwater flooding at some point. Inland and non-surge residents are slightly more likely as residents in evacuation zones to make this claim. Martin County (37%) and Indian River County (23%) residents are more likely to claim their homes might eventually be threatened by freshwater flooding, while comparatively few Palm Beach County (14%) and St. Lucie County (13%) residents make this claim.

- b. If freshwater flooding threatened your community and public safety officials ordered you to evacuate, would you?

Three in four residents in the Treasure Coast Region (77%) maintain they will evacuate their homes if ordered to do so by public safety officials because of freshwater flooding. This percentage is considerably higher (89%) in non-surge zones. One in five residents (20%) in evacuation zones 1 and 2 claim they will not evacuate because of freshwater flooding if ordered to do so. Residents living in non-surge (89%) areas are more likely to say they intend to evacuate for freshwater flooding if ordered to do so by public officials. St. Lucie (80%) and Palm Beach (77%) County residents are more likely to intend to evacuate because of freshwater flooding. Martin County residents (73%) and Indian River County residents (75%) say they will evacuate if ordered to do so because of freshwater flooding.

- c. Where would you go if you evacuated because of freshwater flooding?

A plurality of residents 48% intends to evacuate to friends or relatives if ordered to evacuate by public officials as a result of freshwater flooding. Residents living in evacuation zones 1 and 2 (49%) and non-surge areas (69%) are more likely to evacuate to friends and relatives. Over one in ten residents 13% maintains they will go to public shelters, while slightly more (14%) will go to hotels or motels. Residents of St. Lucie County (16%) are slightly more likely to seek out public shelters, and Palm Beach County residents (59%) are more likely to evacuate to friends and relatives. One in four Martin County residents (24%) and 16% of Indian River County residents does not know where they would evacuate if ordered due to freshwater flooding.

- d. Since you've been living in this location, have you ever evacuated your home because of freshwater flooding?

Few residents of the Treasure Coast Region (3%) indicate they have experienced freshwater flooding while living in this area. Residents in evacuation zones 1 through 3 (3%) and inland/non-surge area residents (11%) are more likely to indicate they have

experienced freshwater flooding. Variations between counties are major as no St. Lucie County residents claim to have evacuated because of freshwater flooding, while 16% of Martin County residents make this claim. Residents cited the following years when asked in which year freshwater flooding occurred: 1995; 1999; 2004 and 2005. Most residents sought shelter with friends and relatives during that event.

3. Hazardous Materials Spill

- a. Do you believe that your home might ever be threatened by a hazardous material accident?

One in six Treasure Coast Region residents (17%) believes they will be threatened by a hazardous material accident. Concern for this type of accident is stable across evacuation zones. Belief of future threats from a hazardous material accident is highest in St. Lucie (25%) and lowest in Indian River County (12%).

- b. If a hazardous material accident threatened your community and public safety officials ordered you to evacuate, would you?

While relatively few residents (17%) believes that they are threatened by a future hazardous material accident, a high percentage (92%) say they intend to evacuate their homes if public safety officials ask them to do so in response to this type of accident. Residents living in all evacuation zones are quite likely to evacuate if told to do so. Intention to evacuate in response to hazardous material accidents if told to do so by public safety officials peaks in St. Lucie (97%) and Indian River (95%) counties and is lowest in Martin County (86%).

- c. Where would you go if you evacuated because of a hazardous material accident?

Only 6% of residents in the Treasure Coast Region say they intend to go to a public shelter if they evacuate from a hazardous material accident. A plurality of residents (44%) intends to go to friends or relatives. One in four (25%) intends to evacuate to a hotel or motel. Residents living in evacuation zones 1 and 2 (26%) are comparatively more likely to seek safety at hotels and motels. St. Lucie County residents (53%) are more likely to go to friends and relatives, while Indian River County residents (41%) are more likely to seek safety at hotels and motels.

- d. Since you've been living in this location, have you ever evacuated your home because of a hazardous material accident?

No residents in the Treasure Coast Region say they have experienced a hazardous materials accident.

- e. Suppose there was a hazardous material accident but public safety officials advised you to close your windows and doors, turn off your air conditioner, and stay indoors rather than trying to evacuate. Would you stay indoors rather than trying to evacuate?

Eight out of ten residents in the Treasure Coast Region (80%) claim they will follow public safety officials' instructions to stay indoors rather than trying to evacuate. Reactions to this question were stable across evacuation zones. Willingness to stay indoors following a hazardous material accident is highest in Martin County (88%) and lowest in St. Lucie County (14%).

4. Nuclear Power Plant Incident

Florida Power and Light's St. Lucie Nuclear Power Plant is located in the Treasure Coast Region. The site is located on the Atlantic Coast in northern St. Lucie County near the City of Fort Pierce Municipal line within the county.

- i. Do you believe that your home might ever be threatened by radiation released as a result of an accident at St. Lucie Nuclear Power Plant?

Four in ten residents living in Martin and St. Lucie counties (43%) believes their homes may at some point be threatened by radiation released as a result of an accident at the St. Lucie Nuclear Power Plant. Concern for this type of disaster is highest among residents living in evacuation zones 1 and 2 (44%). St. Lucie County residents (47%) are significantly more concerned than Martin County residents (36%) about their homes being threatened by radiation being released as a result of an accident at the St. Lucie Nuclear Power Plant.

- ii. If an accident at the St. Lucie Nuclear Power Plant threatened your community and public safety officials ordered you to evacuate, would you?

A very high percentage of residents (93%) will evacuate if ordered to do so, if an accident at the St. Lucie Nuclear Power Plant threatened the community. Residents in evacuation zones 1 and 2 (94%) are more likely to evacuate under these circumstances. St. Lucie County residents (95%) are more likely to evacuate than are Martin County residents (90%).

- iii. Where would you go if you DID evacuate because of an accident at St. Lucie Nuclear Power Plant?

A plurality of residents (35%) in the Treasure Coast Region intends to go to friends and relatives in the event of a nuclear accident at the St. Lucie Nuclear Power Plant. Residents living in evacuation zones 1 and 2 (37%) are more likely to go to friends and relatives. Only 6% of the region's residents intend to go to a public shelter. Incidence of taking this action is much greater in St. Lucie County (10%) than in Martin County (1%). One in four Treasure Coast residents (25%) does not know what type of refuge they would seek.

- iv. Are you located within the 10-mile emergency planning zone for the St. Lucie Nuclear Power Plant?

One in three residents in the Treasure Coast Region (32%) believes they live within a 10-mile emergency planning zone for the St. Lucie Nuclear Power Plant; Only 13% of residents in evacuation zone 3 believes they live within the emergency planning zone.

- v. Do you have a brochure or other information telling you what you should do in case of an accident at the Crystal River Nuclear Power Plant?

Half of the residents in the Treasure Coast Region (50%) have brochures or some type of information telling them what to do in the event of an accident at the St. Lucie Nuclear Power Plant.

- vi. Suppose there was an accident at the St. Lucie Nuclear Power Plant but public safety officials advised you to close your windows and doors, turn off your air conditioner, and stay indoors rather than trying to evacuate. Would you stay indoors rather than trying to evacuate?

Seven out of ten residents (69%) are willing to follow public safety officials' directives to stay indoors in the event of an accident at the St. Lucie Nuclear Power Plant. Residents who live closer to the plant are more willing to stay indoors as directed.

F. Use of Survey Findings

Responses to individual survey questions alone are not usually good indicators of how residents will respond in actual threats. A mix of the following indicators was used in deriving behavioral assumptions to use in planning:

- Intended responses
- Responses in past threats
- Responses in past threats in other locations
- Factors usually correlated with actual response

1. Intended Responses

Some of the survey questions asked respondents what they would do in certain situations – whether they would evacuate, where they would go, and so forth. Answers to those questions constitute intended responses and they provide a very straightforward indicator of behavior. Unfortunately, intended responses often do not match actual responses. That is, people often don't do what they said they would do. In some cases there are statistical adjustments to intended responses that result in much closer matches to actual behavior. For example, in most locations actual use of public shelters is only about half the level indicated by intended response surveys.

2. Actual Responses

A number of survey questions asked interviewees how they responded in past hurricane threats. Survey participants from the Treasure Coast Region were asked about their evacuation behavior in Hurricanes Frances, Jeanne and Wilma. Earlier surveys in the region had provided actual response data about David, Andrew, and Floyd. Responses in past threats can be good predictors of future response, but only if the past threats are similar to future threats. In the Treasure Coast Region past threats from Hurricanes Frances, Jeanne and Wilma did not result in evacuation responses as great as threats that could be posed by future storms. Therefore, the evacuation participation rates observed in those storms are

not necessarily good indicators of what it is reasonable to plan for in future threats. For other behaviors such as type of refuge and destination, past responses can be compared for consistency from one evacuation to another and can be used as a comparison with intended responses.

3. Past Response in Other Locations

Although all places are different, responses and patterns observed in one set of locations are often good indicators of what can occur elsewhere, when conditions are similar. This is particularly useful when planning for threats for which there is no reliable response data for similar threats for the region. As part of the SRES program, twelve different hurricane threats were asked about in one county or another. In addition, public response has been documented in many other hurricane threats both in and out of Florida, some of which are relevant to planning in the Treasure Coast Region. For example, in the great majority of evacuations fewer than 15% of evacuees leave on their own, prior to an evacuation notice being issued by public officials. Due to the consistency of that finding, it is reasonable to apply it to the counties in the Treasure Coast Region.

4. Statistical Predictors

Data from other hurricane evacuation surveys like those described above have been statistically analyzed to identify factors that have been correlated with evacuation behavior. Certain variables have been found to predict actual response better than others. For example, perceived vulnerability, actual vulnerability (e.g., evacuation zone), housing type, and hearing evacuation orders are all good predictors of whether residents will evacuate. The SRES survey measured perceived vulnerability, evacuation zone, housing type, and expectation of being told to evacuate, and those factors were combined to provide an indication of whether interviewees would evacuate in certain storm threats, from certain locations, and from certain types of housing. Other variables were used to provide an indication of other evacuation behaviors.

5. Combining Information

There is no simple one-rule-fits-all technique for using the above information in deriving behavioral assumptions for planning. The best solution is to employ the best available mix of indicators, relying most heavily on the best information available for each behavior and scenario in question, for a particular county and storm threat. When good, reliable actual response information was available for a certain storm threat scenario, it was relied on more than other types of information. When actual response information was lacking, a combination of intended response, trends from other locations, and application of predictor variables was used.

6. Sample Size Considerations

SRES survey statistics were derived from the sample described previously (Table 1 in Section B.1. above). The sample provides an estimate of values for the population of people from which the sample was drawn. For example, a sample of Martin County residents was interviewed for the purpose of estimating how the larger population of Martin County residents would respond to the same questions.

The sampling plan used in the SRES survey was designed to provide statistically useful county-level data, given budgetary constraints. However, sample estimates become less statistically reliable when the responses are disaggregated, as they were in the analyses conducted as part of the SRES. When responses are broken down by evacuation zone within a county and then by housing type, population-level differences among zones and between housing types are not always as large as they might appear in the sample. This is because sampling error increases when sample size decreases. Therefore, differences in the sample might not be large enough to support a conclusion that similar differences exist in the population from which the sample was selected, due to sampling error.

Aggregating results across counties helps overcome zonal and housing disaggregation problems. However, county variations – if they exist – are masked when results are aggregated at the regional level. The analysis looked at survey results at both the county and regional levels, relying on county-level data to the extent that sample sizes justified that level of analysis, but relying more on regional data when county-level sample sizes were too small.

This is especially true for actual response data. Many SRES respondents were not living in their current county when past storm threats occurred, so they were not asked about their response in those storms. If a resident was living in the area at the time but didn't evacuate, that person couldn't be asked where he or she went (e.g., public shelter, out-of-county). Therefore, for certain actual response questions, regional statistics were more meaningful than county statistics.

G. Planning Assumptions

Specific Planning assumptions for residents are shown in the following tables. Appearing below each set of tables, there is a brief description of the content of the table. For a more in-depth analysis of the planning assumptions, refer to Volume II Behavioral Planning Assumptions.

For each coastal county there are 14 tables:

1. Evacuation rate for site-built homes
2. Out-of-county trip rates for site-built homes
3. Percent of available vehicles to be used by site-built homes
4. Public shelter use rates for site-built homes
5. Friend and relative use rates for site-built homes
6. Hotel and motel use rates for site-built homes
7. Other refuge use rates for site-built homes
8. Evacuation rate for site-built homes
9. Out-of-county trip rates for mobile and manufactured homes
10. Percent of available vehicles to be used by mobile and manufactured homes
11. Public shelter use rates for mobile and manufactured homes
12. Friend and relative use rates for mobile and manufactured homes
13. Hotel and motel use rates for mobile and manufactured homes
14. Other refuge use rates for mobile and manufactured homes

In each table for each county there are planning assumptions for six evacuation zones:

1. Areas needing to evacuate due to storm surge flooding from category 1 hurricanes
2. Areas needing to evacuate due to storm surge flooding from category 2 hurricanes
3. Areas needing to evacuate due to storm surge flooding from category 3 hurricanes
4. Areas needing to evacuate due to storm surge flooding from category 4 hurricanes
5. Areas needing to evacuate due to storm surge flooding from category 5 hurricanes
6. Areas not needing to evacuate due to storm surge flooding from hurricanes

Zones were defined relative to zones currently used by each county. In instances where counties currently aggregate zones, the planning assumptions were interpolated for intermediate zones. For example, if a county used zones 1-2, 3, and 4-5, trends across those zones were used to specify assumptions for zones 1, 2, 3, 4, and 5.

1. Evacuation Rates

Evacuation rates refer to the percentage of people who will leave their homes to go someplace safer during a hurricane threat. This is a critical variable for planning because it drives the number of vehicles on the roadways during an evacuation. Responses will vary even for hurricanes of the same intensity, depending on how great the threat appears to be to one's specific location, as well as other factors. Evacuation rates on the periphery of warning areas tend to be lower than in areas closest to the projected path of a threatening storm. A strong category 4 hurricane which has maintained its intensity for a day or more prior to landfall will elicit greater response than one which intensifies from a 2 to a 4 just six hours prior to landfall or one which weakens from a 4 to a 2 twelve hours prior to landfall. Both media attention and actions by public officials will vary from one strong category 4 hurricane to another due to similar considerations. A large category 4 storm will receive greater attention from media and officials than a small category 4 storm (e.g., Floyd, "Andrew's Big Brother"). Actions by public officials have a great impact on evacuation rate. People are much more likely to evacuate, especially in strong storms, when they believe they have been ordered to evacuate than when they believe they have received a recommendation to evacuate or haven't been told at all whether they should evacuate. A problem is that many people (often 30% in category 1 evacuation zones) fail to hear, comprehend, or believe that evacuation orders apply to them. The methods and aggressiveness used to disseminate evacuation notices affect evacuation rates.

The planning assumptions for evacuation rates are the *maximum probable rates*. They assume that a threatening storm of a given category poses its greatest threat to each county. That is,

- a. The storm's forecast track is over the county early and throughout at least a full day of the threat.
- b. The storm has been at the specified intensity for at least a day of the threat and remains at that intensity until landfall.
- c. The storm makes landfall in the county.

These conditions aren't met very often, and recent threats in the Treasure Coast Region have not generated evacuation rates as high as those in some of the planning assumptions. In fact in the 12 storms asked about in one county or another as part of the SRES the

highest evacuation rates observed for site-built homes in the category 1 evacuation zone in any county was 80% (Santa Rosa in Ivan and Nassau in Floyd). But evacuation rates over 90% have been documented in other threats (e.g., Escambia in Frederic, parts of Pinellas in Elena, most of coastal Georgia and southern South Carolina in Floyd, and Galveston, Texas in Rita).

Applying the county planning assumptions to the entire region overstates evacuation rate for the region, because not every county in the region will meet the conditions. However, one doesn't know in advance the county to which they will apply, if any.

The planning assumptions assume that officials issue mandatory evacuation orders for surge-related evacuation zones for hurricanes of corresponding intensities (e.g., everyone in the category 1 evacuation zone is ordered to evacuate in a category 1 hurricane). It also assumes that all mobile homes and residents of manufactured housing are ordered to evacuate for hurricanes of all intensities.

The planning assumptions include shadow evacuation – people leaving from areas and structures not ordered by officials to evacuate. These assumptions can add substantially to the total number of people evacuating and generating shelter demand, but the phenomenon exists, particularly when conditions such as those enumerated above apply (storm is forecast for an extended period to strike the county, maintains its intensity, and makes landfall in the county). One reason that shadow evacuation occurs is that many people have misconceptions about their vulnerability.

2. Out-of-County Trips

Many evacuees go farther than necessary to reach safety, and the planning assumptions indicate the percentage of evacuees who will go to destinations outside their own county. The Survey Data Report lists the actual destination (i.e., city) where intended evacuees said they would go and where actual evacuees have gone in the past, if they said they would go or went beyond their own neighborhoods. Going out-of-county can increase evacuation clearance times but has occurred in the past and will in the future until officials are more successful at dissuading evacuees from doing so. Very few out-of-county evacuees seek refuge in public shelters. The great majority go to the homes of friends and relatives or to hotels and motels. Because evacuation rates were low in recent storms, out-of-county trip rates are based on the minority of residents who evacuated and might not be the same if evacuation rates had been greater.

3. Type of Refuge

There are separate tables for the percentage of evacuees who will go to public shelters, the homes of friends and relatives, hotels and motels, and other types of refuge (such as churches, workplaces, and second homes). Survey respondents tend to overstate their likelihood of using public shelters and understate their likelihood of going to the homes of friends and relatives. Actual refuge use is the best indicator, but in the Treasure Coast Region there have been too few evacuees in recent hurricane threats included in the survey to provide highly-reliable estimates at the county level for future planning. Planning assumptions for the counties reflect a reduced value of the intended public shelter use figures unless actual response values were consistent with the intended behavior. The

ability of evacuees to actually go to their intended refuge or to the places they have gone in the past will depend of the availability of those refuges in future threats.

4. Percent of Available Vehicles

Many evacuating households tend to take only a portion of the vehicles available to them, mainly to avoid separating the family more than necessary. The planning assumptions indicate the percentage of vehicles available to households that will be used in an evacuation. The Survey Data Report includes the number of vehicles available to evacuating households and the number they would take. The percent-of-available figures are derived from those data. Although planners could use the number of vehicles per household from the SRES survey and reported in the Survey Data Report, census data should provide better statistical estimates of the number of vehicles available to households, to which the percent-of-available multipliers can be applied. The SRES survey asked only about intended vehicle use, but a large number of post-storm surveys have asked about actual vehicle use, and the intended use figures tend to match the actual use figures well.

5. Evacuation Timing

Not all evacuees leave at the same time. Some leave before public officials issue evacuation notices, some leave very soon following issuance of evacuation notices, and some wait until shortly before they expect the threatening storm to arrive.

a. Evidence from Past Evacuations

Many surveys documenting response following hurricane evacuations have asked evacuees to indicate the time and date when they departed their homes. The responses have been graphed to depict cumulative evacuation curves. The curves show how the evacuation (on the y-axis) grew over time (on the x-axis), typically with a few people leaving early and then increasing to the point at which 100% of the evacuees had eventually departed. The curves indicate when vehicles enter the evacuation network as evacuating vehicles, not when they reach their destinations or when they made other trips in the network prior to evacuating.

In general a graph of when evacuees depart often looks like the letter "S." In some evacuations the "S" is compressed laterally (i.e., over time) to appear thin and upright. Those curves occur when all departures occur in a relatively short period of time. They usually happen when evacuation notices were not issued early enough due to an unexpected change in a storm's track, forward speed, or intensity. By the time evacuation notices are issued, little time remains before anticipated landfall, so evacuees leave with a sense of urgency corresponding to the threat. This would be referred to as a relatively "fast" or "quick" response.

In other evacuations the "S" is stretched laterally and covers more of the length of the line on which it appears, with departures being distributed over a longer length of time. It looks "flatter." In those cases evacuation notices were issued well in advance of anticipated landfall of the storm, and residents were aware that they had the luxury of waiting longer before departing if they choose to do so. Some evacuees do wait longer

before leaving, but not all do. Departures are distributed over a longer period of time than in the first example. This might be referred to as a “slow” response.

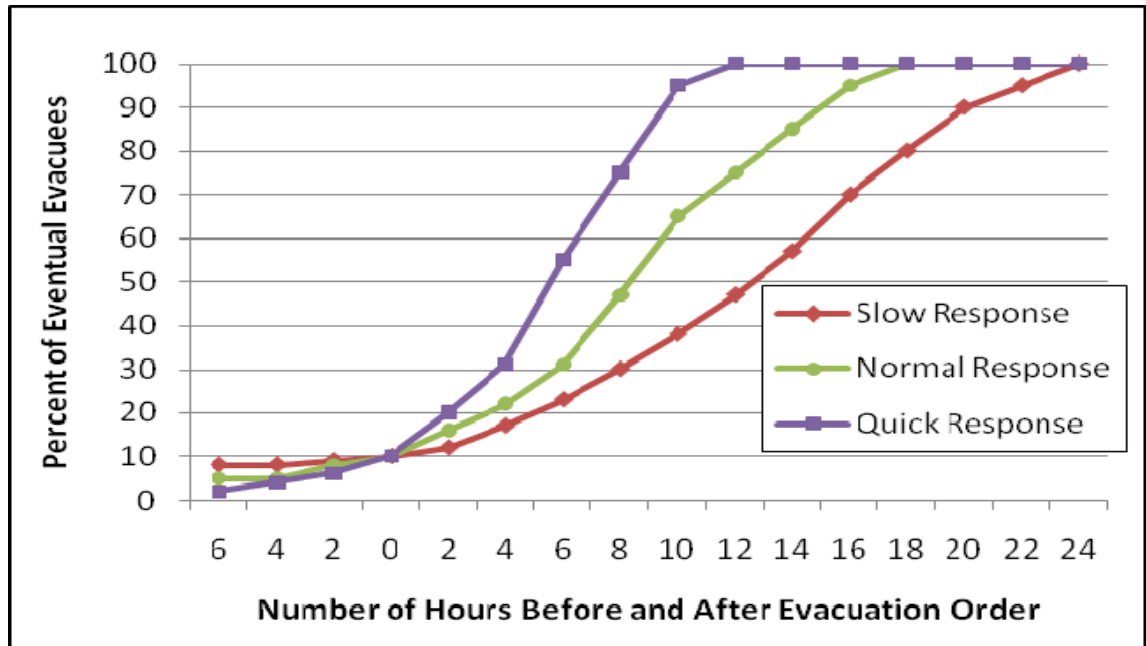
There are also evacuation timing curves that fall between those two, resulting in an “S” that is less compressed than the first, but less stretched than the second. This sort of evacuation results when evacuation notices are issued earlier than in the first example, but not as early as in the second case.

In all three scenarios evacuees collectively take as much time as they believe is available to them. Perceptions about the urgency of the evacuation account for variations in whether the evacuation is “quick,” “slow,” or in between (“normal”).

b. Response Curves for Planning

The three evacuation timing scenarios described above are depicted graphically in Figure 3, reflecting the three versions of the letter “S.” The slowest of the three curves assumes that evacuation notices were issued at least 24 hours before landfall. The fastest of the three assumes that evacuation notices were issued just 12 hours prior to the anticipated onset of hurricane conditions.

**Figure III-3
Response Curves for Evacuation Planning**



c. Variations in the Curves

The haste in which evacuees depart is mainly a function of the perceived urgency of leaving sooner rather than later. Variations from storm to storm are usually a function of forecasts. If a forecast changes to indicate that landfall will occur sooner than previously anticipated, more people will start leaving. If intensity of a storm increases, indicating that additional areas of a community need to evacuate, departures from those areas will increase. These changes influence public response primarily through evacuation notices and instructions provided by local officials. Officials can significantly affect the distribution of departures by when they issue evacuation notices and how they word the notices and related announcements.

In each threat scenario occupants of less vulnerable areas (e.g., inland) will tend to wait longer to evacuate than those living in more hazardous locations (e.g., beaches). Variation in the curves is a function of variation in the perceived urgency of evacuating promptly, not demographics.

People prefer not to evacuate at night but will do so if necessary. Examples are Eloise, Elena, and Opal. Relatively few people leave prior to the issuance of evacuation notices by officials. People are willing to leave before watches and warnings are posted by the National Hurricane Center if asked to do so by local officials.

d. Examples of Actual Response Curves

Respondents to the SRES survey were not asked when they departed in past evacuations because too much time had passed between the evacuations and the interviews to trust the accuracy of recollections. The questions would also have made the interviews unacceptably lengthy. There are ample actual response curves that have been documented in other surveys.

i Two-day Evacuations

If officials issue evacuation notices more than 24 hours prior to anticipated landfall, evacuation departures will be distributed over a period longer than 24 hours. Some evacuees will leave shortly after the evacuation notice during daylight hours, then departures will essentially stop on the evening of the first day, and then resume on the morning of the second day.

Most of the recent evacuations in Florida and elsewhere have taken place over a period of more than 24 hours. This has been the result of evacuation notices having been issued more than 24 hours prior to arrival of the storms. Curves were constructed for 11 different coastal regions in Florida, for example, including four regions in Florida, and all 11 curves were distributed over more than a 24-hour period. All four of the 2004 major hurricanes in Florida (Charley, Frances, Ivan, and Jeanne) had evacuations that covered more than 24 hours. In 2005, evacuation departures from Katrina in Mississippi and Louisiana and from Rita in Texas occurred over a period of two days or more. The same was true of Bertha and Fran in South Carolina in 1996, Georges in Florida in 1998, Lili in Texas and Louisiana in 2002, and Isabel in Virginia and Maryland in 2003.

ii. One-day Evacuations

The prevalence of two-evacuations stems from good forecasts and a precautionary approach by public safety officials, particularly in stronger storms. If the National Hurricane Center goes forward with plans to extend the lead times for Hurricane Watches and Warnings by 12 hours, early issuance of evacuation notices will probably continue.

However, good early forecasts won't always be the case, or for other reasons evacuation notices won't be issued early enough to afford the luxury of having two days in which to evacuate. In those instances, evacuations in certain areas will need to be rushed to completion following issuance of evacuation notices, and the duration of evacuations will be less than two days. If the goal of clearance time calculations is to estimate the minimum amount of time necessary to complete an evacuation safely, response curves of shorter duration than two days should be assumed.

The quickest of the one-day curves assumes that all evacuees depart within 12 hours of an evacuation notice being issued, with just 10% having left prior to the evacuation notice. Examples of approximately 12-hour response curves are Broward and Miami-Dade Counties for Andrew in 1992, Pinellas County for Elena in 1985, and Escambia County for Frederic in 1979. Storms in which evacuation departures were distributed over a 12 to 18 hour period include David in Miami-Dade in 1979 and Opal in northwest Florida in 1995. Eloise in northwest Florida in 1975 is a rare example of evacuation departures occurring over a period of just six hours, but in some locations as little as 45% of the public evacuated.

H. Planning Assumptions for Vacationers

Compared to residents, there is relatively little data documenting how vacationers respond to hurricane threats, and no SRES survey was conducted with vacationers to ascertain their intentions. Recommendations for behavioral assumptions for tourists are derived from intended-response survey findings with visitors to other locations and from existing data on how vacationers have responded in other locations, including the Carolinas.

1. Evacuation Rates

There is no evidence that vacationers are reluctant to evacuate when a hurricane interrupts their visit to a coastal community. Based on observations of vacationer behavior in other locations and surveys in other locations concerning intended responses, it is reasonable to assume that 90% to 95% of vacationers will evacuate their accommodations *if evacuation orders are issued*.

2. Type of Refuge

Officials sometimes report a large number of vacationers in public shelters, but they represent a very small percentage of the total visitor population. Fewer than 5% of the evacuating vacationers will go to public shelters. Between 25% and 50% will seek inland

hotels and motels. The remainder will return home or stay with friends and relatives in Florida, although the number returning home will depend on the distances traveled by tourists from home. Those most likely to return home live within a one-day drive of where they vacation.

3. Destinations

Up to 5% of tourist evacuees will stay within the county where their vacation accommodations were located or go to a nearby county to use a public shelter. At least half will go elsewhere in Florida to continue their vacation or wait out the storm. Up to half will return home, if they live within a one-day drive.

4. Vehicle Use

The great majority of tourists have a vehicle available to them when on vacation, often their own. Virtually all of the vehicles will be used in evacuating, either to other tourist destinations, home, or airports.

5. Evacuation Timing

Tourists leave at least as early as residents. The same curves used for residents should be used for tourists, unless officials order vacationers to evacuate earlier.

I. Planning Assumptions Tables

Planning assumptions for evacuation behavior form the final product of behavioral analysis and are subsequently used as inputs for the transportation modeling effort. Reasonable and accurate assumptions are an important element of any modeling process. Planning assumptions for the SRES program are derived using professional analysis of statewide survey results with a cross comparison of previous behavioral analyses. A more complete explanation of the methodology used to derive planning assumptions is in Volume II. A set of planning assumptions for each of the counties in the Treasure Coast Region is listed below.

Planning Assumptions for Indian River County

Table PA 1a. Indian River County evacuation rates for residents living in site-built homes

Indian River Evacuation Rates (%)	Storm Threat Scenario				
	Cat 1	Cat 2	Cat 3	Cat 4	Cat 5
Site-built Homes					
Cat 1 Surge Evacuation Zone	50	60	70	85	95
Cat 2 Surge Evacuation Zone	30	50	65	80	90
Cat 3 Surge Evacuation Zone	10	15	50	65	75
Cat 4 Surge Evacuation Zone	10	15	40	60	70
Cat 5 Surge Evacuation Zone	10	10	25	40	60
Inland of Surge Evacuation Zones	5	10	10	20	25

Evacuation rate indicates the percentage of residents who will leave their homes to go someplace safer from each zone in each storm threat scenario. Figures are based on the assumption that officials order evacuation for surge evacuation zones corresponding to storm category, plus all mobile homes and manufactured homes. Figures also assume that the actual storm track passes very close to the area being evacuated. Shaded cells indicate shadow evacuation – evacuation from areas not included in evacuation notices.

Table PA 1b. Indian River County out-of-county trip rates for residents living in site-built homes

Indian River Evacuation Rates (%)	Storm Threat Scenario				
	Cat 1	Cat 2	Cat 3	Cat 4	Cat 5
Site-built Homes					
Cat 1 Surge Evacuation Zone	50	60	70	85	95
Cat 2 Surge Evacuation Zone	30	50	65	80	90
Cat 3 Surge Evacuation Zone	10	15	50	65	75
Cat 4 Surge Evacuation Zone	10	15	40	60	70
Cat 5 Surge Evacuation Zone	10	10	25	40	60
Inland of Surge Evacuation Zones	5	10	10	20	25

Out-of-county trip rate indicates the percent of evacuees from each zone who travel to destinations out of their own county of residence in each storm threat scenario.

Table PA 1c. Indian River County vehicle use rates for residents living in site-built homes

Indian River Evacuation Rates (%)	Storm Threat Scenario				
	Cat 1	Cat 2	Cat 3	Cat 4	Cat 5
Site-built Homes					
Cat 1 Surge Evacuation Zone	50	60	70	85	95
Cat 2 Surge Evacuation Zone	30	50	65	80	90
Cat 3 Surge Evacuation Zone	10	15	50	65	75
Cat 4 Surge Evacuation Zone	10	15	40	60	70
Cat 5 Surge Evacuation Zone	10	10	25	40	60
Inland of Surge Evacuation Zones	5	10	10	20	25

Vehicle use rate indicates of percentage of vehicles available to the evacuating household from each zone that will be used in evacuation in each storm threat scenario.

Table PA 1d. Indian River County public shelter use rates for residents living in site-built homes

Indian River Evacuation Rates (%)	Storm Threat Scenario				
	Cat 1	Cat 2	Cat 3	Cat 4	Cat 5
Site-built Homes					
Cat 1 Surge Evacuation Zone	50	60	70	85	95
Cat 2 Surge Evacuation Zone	30	50	65	80	90
Cat 3 Surge Evacuation Zone	10	15	50	65	75
Cat 4 Surge Evacuation Zone	10	15	40	60	70
Cat 5 Surge Evacuation Zone	10	10	25	40	60
Inland of Surge Evacuation Zones	5	10	10	20	25

Public shelter use rate indicates the percent of evacuees from each zone who will seek refuge in public shelters, in each storm threat scenario.

Table PA 1e. Indian River County friend/relative refuge use rates for residents living in site-built homes

Indian River Evacuation Rates (%)	Storm Threat Scenario				
	Cat 1	Cat 2	Cat 3	Cat 4	Cat 5
Site-built Homes					
Cat 1 Surge Evacuation Zone	50	60	70	85	95
Cat 2 Surge Evacuation Zone	30	50	65	80	90
Cat 3 Surge Evacuation Zone	10	15	50	65	75
Cat 4 Surge Evacuation Zone	10	15	40	60	70
Cat 5 Surge Evacuation Zone	10	10	25	40	60
Inland of Surge Evacuation Zones	5	10	10	20	25

Friend/relative rate indicates the percent of evacuees from each zone who will seek refuge in the homes of friends and relatives, in each storm threat scenario.

Table PA 1f. Indian River County hotel/motel refuge use rates for residents living in site-built homes

Indian River Evacuation Rates (%)	Storm Threat Scenario				
	Cat 1	Cat 2	Cat 3	Cat 4	Cat 5
Site-built Homes					
Cat 1 Surge Evacuation Zone	50	60	70	85	95
Cat 2 Surge Evacuation Zone	30	50	65	80	90
Cat 3 Surge Evacuation Zone	10	15	50	65	75
Cat 4 Surge Evacuation Zone	10	15	40	60	70
Cat 5 Surge Evacuation Zone	10	10	25	40	60
Inland of Surge Evacuation Zones	5	10	10	20	25

Hotel/motel rate indicates the percent of evacuees from each zone who will seek refuge in hotels and motels, in each storm threat scenario.

Table PA 1g. Indian River County other refuge use rates for residents living in site-built homes

Indian River Evacuation Rates (%)	Storm Threat Scenario				
	Cat 1	Cat 2	Cat 3	Cat 4	Cat 5
Site-built Homes					
Cat 1 Surge Evacuation Zone	50	60	70	85	95
Cat 2 Surge Evacuation Zone	30	50	65	80	90
Cat 3 Surge Evacuation Zone	10	15	50	65	75
Cat 4 Surge Evacuation Zone	10	15	40	60	70
Cat 5 Surge Evacuation Zone	10	10	25	40	60
Inland of Surge Evacuation Zones	5	10	10	20	25

Other refuge rate indicates the percent of evacuees from each zone who will seek refuge in locations such as churches, second homes, and workplaces, in each storm threat scenario.

Table PA 1h. Indian River County evacuation rates for residents living in mobile and manufactured homes

Indian River Evacuation Rates (%)	Storm Threat Scenario				
	Cat 1	Cat 2	Cat 3	Cat 4	Cat 5
Site-built Homes					
Cat 1 Surge Evacuation Zone	50	60	70	85	95
Cat 2 Surge Evacuation Zone	30	50	65	80	90
Cat 3 Surge Evacuation Zone	10	15	50	65	75
Cat 4 Surge Evacuation Zone	10	15	40	60	70
Cat 5 Surge Evacuation Zone	10	10	25	40	60
Inland of Surge Evacuation Zones	5	10	10	20	25

Evacuation rate indicates the percent of residents who will leave their homes to go someplace safer from each zone in each storm threat scenario. Figures are based on the assumption that officials order evacuation for surge evacuation zones corresponding to storm category, plus all mobile homes and manufactured homes. Figures also assume that the actual storm track passes very close to the area being evacuated.

Table PA 1i. Indian River County out-of-county trip rates for residents living in mobile and manufactured homes

Indian River Evacuation Rates (%)	Storm Threat Scenario				
	Cat 1	Cat 2	Cat 3	Cat 4	Cat 5
Site-built Homes					
Cat 1 Surge Evacuation Zone	50	60	70	85	95
Cat 2 Surge Evacuation Zone	30	50	65	80	90
Cat 3 Surge Evacuation Zone	10	15	50	65	75
Cat 4 Surge Evacuation Zone	10	15	40	60	70
Cat 5 Surge Evacuation Zone	10	10	25	40	60
Inland of Surge Evacuation Zones	5	10	10	20	25

Out-of-county trip rate indicates the percent of evacuees from each zone who travel to destinations out of their own county of residence in each storm threat scenario.

Table PA 1j. Indian River County vehicle use rates for residents living in mobile and manufactured homes

Indian River Evacuation Rates (%)	Storm Threat Scenario				
	Cat 1	Cat 2	Cat 3	Cat 4	Cat 5
Site-built Homes					
Cat 1 Surge Evacuation Zone	50	60	70	85	95
Cat 2 Surge Evacuation Zone	30	50	65	80	90
Cat 3 Surge Evacuation Zone	10	15	50	65	75
Cat 4 Surge Evacuation Zone	10	15	40	60	70
Cat 5 Surge Evacuation Zone	10	10	25	40	60
Inland of Surge Evacuation Zones	5	10	10	20	25

Vehicle use rate indicates of percentage of vehicles available to the evacuating household from each zone that will be used in evacuation in each storm threat scenario.

Table PA 1 k. Indian River County public shelter use rates for residents living in mobile and manufactured homes

Indian River Evacuation Rates (%)	Storm Threat Scenario				
	Cat 1	Cat 2	Cat 3	Cat 4	Cat 5
Site-built Homes					
Cat 1 Surge Evacuation Zone	50	60	70	85	95
Cat 2 Surge Evacuation Zone	30	50	65	80	90
Cat 3 Surge Evacuation Zone	10	15	50	65	75
Cat 4 Surge Evacuation Zone	10	15	40	60	70
Cat 5 Surge Evacuation Zone	10	10	25	40	60
Inland of Surge Evacuation Zones	5	10	10	20	25

Public shelter use rate indicates the percent of evacuees from each zone who will seek refuge in public shelters, in each storm threat scenario.

Table PA 1l. Indian River County friend/relative refuge use rates for residents living in mobile and manufactured homes

Indian River Evacuation Rates (%)	Storm Threat Scenario				
	Cat 1	Cat 2	Cat 3	Cat 4	Cat 5
Site-built Homes					
Cat 1 Surge Evacuation Zone	50	60	70	85	95
Cat 2 Surge Evacuation Zone	30	50	65	80	90
Cat 3 Surge Evacuation Zone	10	15	50	65	75
Cat 4 Surge Evacuation Zone	10	15	40	60	70
Cat 5 Surge Evacuation Zone	10	10	25	40	60
Inland of Surge Evacuation Zones	5	10	10	20	25

Friend/relative rate indicates the percent of evacuees from each zone who will seek refuge in the homes of friends and relatives, in each storm threat scenario.

Table PA 1m. Indian River County hotel/motel refuge use rates for residents living in mobile and manufactured homes

Indian River Hotel/Motel Use Rates (%)	Storm Threat Scenario				
	Cat 1	Cat 2	Cat 3	Cat 4	Cat 5
Mobile and Manufactured Homes					
Cat 1 Surge Evacuation Zone	15	15	15	15	15
Cat 2 Surge Evacuation Zone	15	15	15	15	15
Cat 3 Surge Evacuation Zone	15	15	15	15	15
Cat 4 Surge Evacuation Zone	15	15	15	15	15
Cat 5 Surge Evacuation Zone	15	15	15	15	15
Inland of Surge Evacuation Zones	15	15	15	15	15

Hotel/motel rate indicates the percent of evacuees from each zone who will seek refuge in hotels and motels, in each storm threat scenario.

Table PA 1n. Indian River County other refuge use rates for residents living in mobile and manufactured homes

Indian River Hotel/Motel Use Rates (%)	Storm Threat Scenario				
	Cat 1	Cat 2	Cat 3	Cat 4	Cat 5
Mobile and Manufactured Homes					
Cat 1 Surge Evacuation Zone	15	15	15	15	15
Cat 2 Surge Evacuation Zone	15	15	15	15	15
Cat 3 Surge Evacuation Zone	15	15	15	15	15
Cat 4 Surge Evacuation Zone	15	15	15	15	15
Cat 5 Surge Evacuation Zone	15	15	15	15	15
Inland of Surge Evacuation Zones	15	15	15	15	15

Other refuge rate indicates the percent of evacuees from each zone who will seek refuge in locations such as churches, second homes, and workplaces, in each storm threat scenario.

Planning Assumptions for Martin County

Table PA 2a. Martin County evacuation rates for residents living in site-built homes

Martin Evacuation Rates (%)	Storm Threat Scenario				
	Cat 1	Cat 2	Cat 3	Cat 4	Cat 5
Site-built Homes					
Cat 1 Surge Evacuation Zone	50	55	65	80	90
Cat 2 Surge Evacuation Zone	35	50	60	75	90
Cat 3 Surge Evacuation Zone	20	25	50	65	75
Cat 4 Surge Evacuation Zone	10	15	30	60	70
Cat 5 Surge Evacuation Zone	10	15	20	30	60
Inland of Surge Evacuation Zones	5	10	10	20	25

Evacuation rate indicates the percentage of residents who will leave their homes to go someplace safer from each zone in each storm threat scenario. Figures are based on the assumption that officials order evacuation for surge evacuation zones corresponding to storm category, plus all mobile homes and manufactured homes. Figures also assume that the actual storm track passes very close to the area being evacuated. Shaded cells indicate shadow evacuation – evacuation from areas not included in evacuation notices.

Table PA 2b. Martin County out-of-county trip rates for residents living in site-built homes

Martin Evacuation Rates (%)	Storm Threat Scenario				
	Cat 1	Cat 2	Cat 3	Cat 4	Cat 5
Site-built Homes					
Cat 1 Surge Evacuation Zone	50	55	65	80	90
Cat 2 Surge Evacuation Zone	35	50	60	75	90
Cat 3 Surge Evacuation Zone	20	25	50	65	75
Cat 4 Surge Evacuation Zone	10	15	30	60	70
Cat 5 Surge Evacuation Zone	10	15	20	30	60
Inland of Surge Evacuation Zones	5	10	10	20	25

Out-of-county trip rate indicates the percent of evacuees from each zone who travel to destinations out of their own county of residence in each storm threat scenario.

Table PA 2c. Martin County vehicle use rates for residents living in site-built homes

Martin Evacuation Rates (%)	Storm Threat Scenario				
	Cat 1	Cat 2	Cat 3	Cat 4	Cat 5
Site-built Homes					
Cat 1 Surge Evacuation Zone	50	55	65	80	90
Cat 2 Surge Evacuation Zone	35	50	60	75	90
Cat 3 Surge Evacuation Zone	20	25	50	65	75
Cat 4 Surge Evacuation Zone	10	15	30	60	70
Cat 5 Surge Evacuation Zone	10	15	20	30	60
Inland of Surge Evacuation Zones	5	10	10	20	25

Vehicle use rate indicates of percentage of vehicles available to the evacuating household from each zone that will be used in evacuation in each storm threat scenario.

Table PA 2d. Martin County public shelter use rates for residents living in site-built homes

Martin Evacuation Rates (%)	Storm Threat Scenario				
	Cat 1	Cat 2	Cat 3	Cat 4	Cat 5
Site-built Homes					
Cat 1 Surge Evacuation Zone	50	55	65	80	90
Cat 2 Surge Evacuation Zone	35	50	60	75	90
Cat 3 Surge Evacuation Zone	20	25	50	65	75
Cat 4 Surge Evacuation Zone	10	15	30	60	70
Cat 5 Surge Evacuation Zone	10	15	20	30	60
Inland of Surge Evacuation Zones	5	10	10	20	25

Public shelter use rate indicates the percent of evacuees from each zone who will seek refuge in public shelters, in each storm threat scenario.

Table PA 2e. Martin County friend/relative refuge use rates for residents living in site-built homes

Martin Evacuation Rates (%)	Storm Threat Scenario				
	Cat 1	Cat 2	Cat 3	Cat 4	Cat 5
Site-built Homes					
Cat 1 Surge Evacuation Zone	50	55	65	80	90
Cat 2 Surge Evacuation Zone	35	50	60	75	90
Cat 3 Surge Evacuation Zone	20	25	50	65	75
Cat 4 Surge Evacuation Zone	10	15	30	60	70
Cat 5 Surge Evacuation Zone	10	15	20	30	60
Inland of Surge Evacuation Zones	5	10	10	20	25

Friend/relative rate indicates the percent of evacuees from each zone who will seek refuge in the homes of friends and relatives, in each storm threat scenario.

Table PA 2f. Martin County hotel/motel refuge use rates for residents living in site-built homes

Martin Evacuation Rates (%)	Storm Threat Scenario				
	Cat 1	Cat 2	Cat 3	Cat 4	Cat 5
Site-built Homes					
Cat 1 Surge Evacuation Zone	50	55	65	80	90
Cat 2 Surge Evacuation Zone	35	50	60	75	90
Cat 3 Surge Evacuation Zone	20	25	50	65	75
Cat 4 Surge Evacuation Zone	10	15	30	60	70
Cat 5 Surge Evacuation Zone	10	15	20	30	60
Inland of Surge Evacuation Zones	5	10	10	20	25

Hotel/motel rate indicates the percent of evacuees from each zone who will seek refuge in hotels and motels, in each storm threat scenario.

Table PA 2g. Martin County other refuge use rates for residents living in site-built homes

Martin Evacuation Rates (%)	Storm Threat Scenario				
	Cat 1	Cat 2	Cat 3	Cat 4	Cat 5
Site-built Homes					
Cat 1 Surge Evacuation Zone	50	55	65	80	90
Cat 2 Surge Evacuation Zone	35	50	60	75	90
Cat 3 Surge Evacuation Zone	20	25	50	65	75
Cat 4 Surge Evacuation Zone	10	15	30	60	70
Cat 5 Surge Evacuation Zone	10	15	20	30	60
Inland of Surge Evacuation Zones	5	10	10	20	25

Other refuge rate indicates the percent of evacuees from each zone who will seek refuge in locations such as churches, second homes, and workplaces, in each storm threat scenario.

Table PA 2h. Martin County evacuation rates for residents living in mobile and manufactured homes

Martin Evacuation Rates (%)	Storm Threat Scenario				
	Cat 1	Cat 2	Cat 3	Cat 4	Cat 5
Site-built Homes					
Cat 1 Surge Evacuation Zone	50	55	65	80	90
Cat 2 Surge Evacuation Zone	35	50	60	75	90
Cat 3 Surge Evacuation Zone	20	25	50	65	75
Cat 4 Surge Evacuation Zone	10	15	30	60	70
Cat 5 Surge Evacuation Zone	10	15	20	30	60
Inland of Surge Evacuation Zones	5	10	10	20	25

Evacuation rate indicates the percent of residents who will leave their homes to go someplace safer from each zone in each storm threat scenario. Figures are based on the assumption that officials order evacuation for surge evacuation zones corresponding to storm category, plus all mobile homes and manufactured homes. Figures also assume that the actual storm track passes very close to the area being evacuated.

Table PA 2i. Martin County out-of-county trip rates for residents living in mobile and manufactured homes

Martin Out-of-county Trip Rates (%)	Storm Threat Scenario				
	Cat 1	Cat 2	Cat 3	Cat 4	Cat 5
Mobile and Manufactured Homes					
Cat 1 Surge Evacuation Zone	60	60	60	60	60
Cat 2 Surge Evacuation Zone	60	60	60	60	60
Cat 3 Surge Evacuation Zone	60	60	60	60	60
Cat 4 Surge Evacuation Zone	60	60	60	60	60
Cat 5 Surge Evacuation Zone	60	60	60	60	60
Inland of Surge Evacuation Zones	60	60	60	60	60

Out-of-county trip rate indicates the percent of evacuees from each zone who travel to destinations out of their own county of residence in each storm threat scenario.

Table PA 2j. Martin County vehicle use rates for residents living in mobile and manufactured homes

Martin Out-of-county Trip Rates (%)	Storm Threat Scenario				
	Cat 1	Cat 2	Cat 3	Cat 4	Cat 5
Mobile and Manufactured Homes					
Cat 1 Surge Evacuation Zone	60	60	60	60	60
Cat 2 Surge Evacuation Zone	60	60	60	60	60
Cat 3 Surge Evacuation Zone	60	60	60	60	60
Cat 4 Surge Evacuation Zone	60	60	60	60	60
Cat 5 Surge Evacuation Zone	60	60	60	60	60
Inland of Surge Evacuation Zones	60	60	60	60	60

Vehicle use rate indicates of percentage of vehicles available to the evacuating household from each zone that will be used in evacuation in each storm threat scenario.

Table PA 2k. Martin County public shelter use rates for residents living in mobile and manufactured homes

Martin Out-of-county Trip Rates (%)	Storm Threat Scenario				
	Cat 1	Cat 2	Cat 3	Cat 4	Cat 5
Mobile and Manufactured Homes					
Cat 1 Surge Evacuation Zone	60	60	60	60	60
Cat 2 Surge Evacuation Zone	60	60	60	60	60
Cat 3 Surge Evacuation Zone	60	60	60	60	60
Cat 4 Surge Evacuation Zone	60	60	60	60	60
Cat 5 Surge Evacuation Zone	60	60	60	60	60
Inland of Surge Evacuation Zones	60	60	60	60	60

Public shelter use rate indicates the percent of evacuees from each zone who will seek refuge in public shelters, in each storm threat scenario.

Table PA 2l. Martin County friend/relative refuge use rates for residents living in mobile and manufactured homes

Martin Out-of-county Trip Rates (%)	Storm Threat Scenario				
	Cat 1	Cat 2	Cat 3	Cat 4	Cat 5
Mobile and Manufactured Homes					
Cat 1 Surge Evacuation Zone	60	60	60	60	60
Cat 2 Surge Evacuation Zone	60	60	60	60	60
Cat 3 Surge Evacuation Zone	60	60	60	60	60
Cat 4 Surge Evacuation Zone	60	60	60	60	60
Cat 5 Surge Evacuation Zone	60	60	60	60	60
Inland of Surge Evacuation Zones	60	60	60	60	60

Friend/relative rate indicates the percent of evacuees from each zone who will seek refuge in the homes of friends and relatives, in each storm threat scenario.

Table PA 2m. Martin County hotel/motel refuge use rates for residents living in mobile and manufactured homes

Martin Out-of-county Trip Rates (%)	Storm Threat Scenario				
	Cat 1	Cat 2	Cat 3	Cat 4	Cat 5
Mobile and Manufactured Homes					
Cat 1 Surge Evacuation Zone	60	60	60	60	60
Cat 2 Surge Evacuation Zone	60	60	60	60	60
Cat 3 Surge Evacuation Zone	60	60	60	60	60
Cat 4 Surge Evacuation Zone	60	60	60	60	60
Cat 5 Surge Evacuation Zone	60	60	60	60	60
Inland of Surge Evacuation Zones	60	60	60	60	60

Hotel/motel rate indicates the percent of evacuees from each zone who will seek refuge in hotels and motels, in each storm threat scenario.

Table PA 2n. Martin County other refuge use rates for residents living in mobile and manufactured homes

Martin Out-of-county Trip Rates (%)	Storm Threat Scenario				
	Cat 1	Cat 2	Cat 3	Cat 4	Cat 5
Mobile and Manufactured Homes					
Cat 1 Surge Evacuation Zone	60	60	60	60	60
Cat 2 Surge Evacuation Zone	60	60	60	60	60
Cat 3 Surge Evacuation Zone	60	60	60	60	60
Cat 4 Surge Evacuation Zone	60	60	60	60	60
Cat 5 Surge Evacuation Zone	60	60	60	60	60
Inland of Surge Evacuation Zones	60	60	60	60	60

Other refuge rate indicates the percent of evacuees from each zone who will seek refuge in locations such as churches, second homes, and workplaces, in each storm threat scenario.

Planning Assumptions for Palm Beach County

Table PA 3a. Palm Beach County evacuation rates for residents living in site-built homes

Palm Beach Evacuation Rates (%)	Storm Threat Scenario				
	Cat 1	Cat 2	Cat 3	Cat 4	Cat 5
Site-built Homes					
Cat 1 Surge Evacuation Zone	50	55	65	80	90
Cat 2 Surge Evacuation Zone	20	50	60	80	90
Cat 3 Surge Evacuation Zone	10	15	50	75	75
Cat 4 Surge Evacuation Zone	10	10	30	60	70
Cat 5 Surge Evacuation Zone	10	5	20	25	60
Inland of Surge Evacuation Zones	5	5	10	15	20

Evacuation rate indicates the percentage of residents who will leave their homes to go someplace safer from each zone in each storm threat scenario. Figures are based on the assumption that officials order evacuation for surge evacuation zones corresponding to storm category, plus all mobile homes and manufactured homes. Figures also assume that the actual storm track passes very close to the area being evacuated. Shaded cells indicate shadow evacuation – evacuation from areas not included in evacuation notices.

Table PA 3b. Palm Beach County out-of-county trip rates for residents living in site-built homes

Palm Beach Evacuation Rates (%)	Storm Threat Scenario				
	Cat 1	Cat 2	Cat 3	Cat 4	Cat 5
Site-built Homes					
Cat 1 Surge Evacuation Zone	50	55	65	80	90
Cat 2 Surge Evacuation Zone	20	50	60	80	90
Cat 3 Surge Evacuation Zone	10	15	50	75	75
Cat 4 Surge Evacuation Zone	10	10	30	60	70
Cat 5 Surge Evacuation Zone	10	5	20	25	60
Inland of Surge Evacuation Zones	5	5	10	15	20

Out-of-county trip rate indicates the percent of evacuees from each zone who travel to destinations out of their own county of residence in each storm threat scenario.

Table PA 3c. Palm Beach County vehicle use rates for residents living in site-built homes

Palm Beach Evacuation Rates (%)	Storm Threat Scenario				
	Cat 1	Cat 2	Cat 3	Cat 4	Cat 5
Site-built Homes					
Cat 1 Surge Evacuation Zone	50	55	65	80	90
Cat 2 Surge Evacuation Zone	20	50	60	80	90
Cat 3 Surge Evacuation Zone	10	15	50	75	75
Cat 4 Surge Evacuation Zone	10	10	30	60	70
Cat 5 Surge Evacuation Zone	10	5	20	25	60
Inland of Surge Evacuation Zones	5	5	10	15	20

Vehicle use rate indicates of percentage of vehicles available to the evacuating household from each zone that will be used in evacuation in each storm threat scenario.

Table PA 3d. Palm Beach County public shelter use rates for residents living in site-built homes

Palm Beach Evacuation Rates (%)	Storm Threat Scenario				
	Cat 1	Cat 2	Cat 3	Cat 4	Cat 5
Site-built Homes					
Cat 1 Surge Evacuation Zone	50	55	65	80	90
Cat 2 Surge Evacuation Zone	20	50	60	80	90
Cat 3 Surge Evacuation Zone	10	15	50	75	75
Cat 4 Surge Evacuation Zone	10	10	30	60	70
Cat 5 Surge Evacuation Zone	10	5	20	25	60
Inland of Surge Evacuation Zones	5	5	10	15	20

Public shelter use rate indicates the percent of evacuees from each zone who will seek refuge in public shelters, in each storm threat scenario.

Table PA 3e. Palm Beach County friend/relative refuge use rates for residents living in site-built homes

Palm Beach Evacuation Rates (%)	Storm Threat Scenario				
	Cat 1	Cat 2	Cat 3	Cat 4	Cat 5
Site-built Homes					
Cat 1 Surge Evacuation Zone	50	55	65	80	90
Cat 2 Surge Evacuation Zone	20	50	60	80	90
Cat 3 Surge Evacuation Zone	10	15	50	75	75
Cat 4 Surge Evacuation Zone	10	10	30	60	70
Cat 5 Surge Evacuation Zone	10	5	20	25	60
Inland of Surge Evacuation Zones	5	5	10	15	20

Friend/relative rate indicates the percent of evacuees from each zone who will seek refuge in the homes of friends and relatives, in each storm threat scenario.

Table PA 3f. Palm Beach County hotel/motel refuge use rates for residents living in site-built homes

Palm Beach Evacuation Rates (%)	Storm Threat Scenario				
	Cat 1	Cat 2	Cat 3	Cat 4	Cat 5
Site-built Homes					
Cat 1 Surge Evacuation Zone	50	55	65	80	90
Cat 2 Surge Evacuation Zone	20	50	60	80	90
Cat 3 Surge Evacuation Zone	10	15	50	75	75
Cat 4 Surge Evacuation Zone	10	10	30	60	70
Cat 5 Surge Evacuation Zone	10	5	20	25	60
Inland of Surge Evacuation Zones	5	5	10	15	20

Hotel/motel rate indicates the percent of evacuees from each zone who will seek refuge in hotels and motels, in each storm threat scenario.

Table PA 3g. Palm Beach County other refuge use rates for residents living in site-built homes

Palm Beach Evacuation Rates (%)	Storm Threat Scenario				
	Cat 1	Cat 2	Cat 3	Cat 4	Cat 5
Site-built Homes					
Cat 1 Surge Evacuation Zone	50	55	65	80	90
Cat 2 Surge Evacuation Zone	20	50	60	80	90
Cat 3 Surge Evacuation Zone	10	15	50	75	75
Cat 4 Surge Evacuation Zone	10	10	30	60	70
Cat 5 Surge Evacuation Zone	10	5	20	25	60
Inland of Surge Evacuation Zones	5	5	10	15	20

Other refuge rate indicates the percent of evacuees from each zone who will seek refuge in locations such as churches, second homes, and workplaces, in each storm threat scenario.

Table PA 3h. Palm Beach County evacuation rates for residents living in mobile and manufactured homes

Palm Beach Evacuation Rates (%)	Storm Threat Scenario				
	Cat 1	Cat 2	Cat 3	Cat 4	Cat 5
Site-built Homes					
Cat 1 Surge Evacuation Zone	50	55	65	80	90
Cat 2 Surge Evacuation Zone	20	50	60	80	90
Cat 3 Surge Evacuation Zone	10	15	50	75	75
Cat 4 Surge Evacuation Zone	10	10	30	60	70
Cat 5 Surge Evacuation Zone	10	5	20	25	60
Inland of Surge Evacuation Zones	5	5	10	15	20

Evacuation rate indicates the percent of residents who will leave their homes to go someplace safer from each zone in each storm threat scenario. Figures are based on the assumption that officials order evacuation for surge evacuation zones corresponding to storm category, plus all mobile homes and manufactured homes. Figures also assume that the actual storm track passes very close to the area being evacuated.

Table PA 3i. Palm Beach County out-of-county trip rates for residents living in mobile and manufactured homes

Palm Beach Evacuation Rates (%)	Storm Threat Scenario				
	Cat 1	Cat 2	Cat 3	Cat 4	Cat 5
Site-built Homes					
Cat 1 Surge Evacuation Zone	50	55	65	80	90
Cat 2 Surge Evacuation Zone	20	50	60	80	90
Cat 3 Surge Evacuation Zone	10	15	50	75	75
Cat 4 Surge Evacuation Zone	10	10	30	60	70
Cat 5 Surge Evacuation Zone	10	5	20	25	60
Inland of Surge Evacuation Zones	5	5	10	15	20

Out-of-county trip rate indicates the percent of evacuees from each zone who will seek refuge outside their own county of residence.

Table PA 3j. Palm Beach County vehicle use rates for residents living in mobile and manufactured homes

Palm Beach Evacuation Rates (%)	Storm Threat Scenario				
	Cat 1	Cat 2	Cat 3	Cat 4	Cat 5
Site-built Homes					
Cat 1 Surge Evacuation Zone	50	55	65	80	90
Cat 2 Surge Evacuation Zone	20	50	60	80	90
Cat 3 Surge Evacuation Zone	10	15	50	75	75
Cat 4 Surge Evacuation Zone	10	10	30	60	70
Cat 5 Surge Evacuation Zone	10	5	20	25	60
Inland of Surge Evacuation Zones	5	5	10	15	20

Vehicle use rate indicates of percentage of vehicles available to the evacuating household from each zone that will be used in evacuation in each storm threat scenario.

Table PA 3k. Palm Beach County public shelter use rates for residents living in mobile and manufactured homes

Palm Beach Evacuation Rates (%)	Storm Threat Scenario				
	Cat 1	Cat 2	Cat 3	Cat 4	Cat 5
Site-built Homes					
Cat 1 Surge Evacuation Zone	50	55	65	80	90
Cat 2 Surge Evacuation Zone	20	50	60	80	90
Cat 3 Surge Evacuation Zone	10	15	50	75	75
Cat 4 Surge Evacuation Zone	10	10	30	60	70
Cat 5 Surge Evacuation Zone	10	5	20	25	60
Inland of Surge Evacuation Zones	5	5	10	15	20

Public shelter use rate indicates the percent of evacuees from each zone who will seek refuge in public shelters, in each storm threat scenario.

Table PA 3l. Palm Beach County friend/relative refuge use rates for residents living in mobile and manufactured homes

Palm Beach Evacuation Rates (%)	Storm Threat Scenario				
	Cat 1	Cat 2	Cat 3	Cat 4	Cat 5
Site-built Homes					
Cat 1 Surge Evacuation Zone	50	55	65	80	90
Cat 2 Surge Evacuation Zone	20	50	60	80	90
Cat 3 Surge Evacuation Zone	10	15	50	75	75
Cat 4 Surge Evacuation Zone	10	10	30	60	70
Cat 5 Surge Evacuation Zone	10	5	20	25	60
Inland of Surge Evacuation Zones	5	5	10	15	20

Friend/relative rate indicates the percent of evacuees from each zone who will seek refuge in the homes of friends and relatives, in each storm threat scenario.

Table PA 3m. Palm Beach County hotel/motel refuge use rates for residents living in mobile and manufactured homes

Palm Beach Evacuation Rates (%)	Storm Threat Scenario				
	Cat 1	Cat 2	Cat 3	Cat 4	Cat 5
Site-built Homes					
Cat 1 Surge Evacuation Zone	50	55	65	80	90
Cat 2 Surge Evacuation Zone	20	50	60	80	90
Cat 3 Surge Evacuation Zone	10	15	50	75	75
Cat 4 Surge Evacuation Zone	10	10	30	60	70
Cat 5 Surge Evacuation Zone	10	5	20	25	60
Inland of Surge Evacuation Zones	5	5	10	15	20

Hotel/motel rate indicates the percent of evacuees from each zone who will seek refuge in hotels and motels, in each storm threat scenario.

Table PA 3n. Palm Beach County other refuge use rates for residents living in mobile and manufactured homes

Palm Beach Evacuation Rates (%)	Storm Threat Scenario				
	Cat 1	Cat 2	Cat 3	Cat 4	Cat 5
Site-built Homes					
Cat 1 Surge Evacuation Zone	50	55	65	80	90
Cat 2 Surge Evacuation Zone	20	50	60	80	90
Cat 3 Surge Evacuation Zone	10	15	50	75	75
Cat 4 Surge Evacuation Zone	10	10	30	60	70
Cat 5 Surge Evacuation Zone	10	5	20	25	60
Inland of Surge Evacuation Zones	5	5	10	15	20

Other refuge rate indicates the percent of evacuees from each zone who will seek refuge in locations such as churches, second homes, and workplaces, in each storm threat scenario.

Planning Assumptions for St. Lucie County

Table PA 4a. St. Lucie County evacuation rates for residents living in site-built homes

St. Lucie Evacuation Rates (%)	Storm Threat Scenario				
	Cat 1	Cat 2	Cat 3	Cat 4	Cat 5
Site-built Homes					
Cat 1 Surge Evacuation Zone	50	55	65	80	90
Cat 2 Surge Evacuation Zone	40	50	60	75	90
Cat 3 Surge Evacuation Zone	20	30	50	65	75
Cat 4 Surge Evacuation Zone	10	20	45	60	70
Cat 5 Surge Evacuation Zone	10	20	25	40	60
Inland of Surge Evacuation Zones	5	10	10	20	25

Evacuation rate indicates the percent of residents who will leave their homes to go someplace safer from each zone in each storm threat scenario. Figures are based on the assumption that officials order evacuation for surge evacuation zones corresponding to storm category, plus all mobile homes and manufactured homes. Figures also assume that the actual storm track passes very close to the area being evacuated. Shaded cells indicate shadow evacuation – evacuation from areas not included in evacuation notices.

Table PA 4b. St. Lucie out-of-county trip rates for residents living in site-built homes

St. Lucie Out-of-county Trip Rates (%)	Storm Threat Scenario				
	Cat 1	Cat 2	Cat 3	Cat 4	Cat 5
Site-built Homes					
Cat 1 Surge Evacuation Zone	70	70	75	75	75
Cat 2 Surge Evacuation Zone	70	70	75	75	75
Cat 3 Surge Evacuation Zone	50	50	55	60	60
Cat 4 Surge Evacuation Zone	55	55	55	60	60
Cat 5 Surge Evacuation Zone	55	55	55	60	60
Inland of Surge Evacuation Zones	60	60	60	60	60

Out-of-county trip rate indicates the percent of evacuees from each zone who will seek refuge outside their own county of residence in each storm threat scenario.

Table PA 4c. St. Lucie County vehicle use rates for residents living in site-built homes

St. Lucie Vehicle Use Rate (%)	Storm Threat Scenario				
	Cat 1	Cat 2	Cat 3	Cat 4	Cat 5
Site-built Homes					
Cat 1 Surge Evacuation Zone	75	75	75	75	75
Cat 2 Surge Evacuation Zone	75	75	75	75	75
Cat 3 Surge Evacuation Zone	75	75	75	75	75
Cat 4 Surge Evacuation Zone	75	75	75	75	75
Cat 5 Surge Evacuation Zone	75	75	75	75	75
Inland of Surge Evacuation Zones	80	80	80	80	80

Vehicle use rate indicates of percentage of vehicles available to the evacuating household from each zone that will be used in evacuation in each storm threat scenario.

Table PA 4d. St. Lucie County public shelter use rates for residents living in site-built homes

St. Lucie Public Shelter Use Rates (%)	Storm Threat Scenario				
	Cat 1	Cat 2	Cat 3	Cat 4	Cat 5
Site-built Homes					
Cat 1 Surge Evacuation Zone	8	8	8	8	8
Cat 2 Surge Evacuation Zone	8	8	8	8	8
Cat 3 Surge Evacuation Zone	12	12	12	12	12
Cat 4 Surge Evacuation Zone	12	12	12	12	12
Cat 5 Surge Evacuation Zone	12	12	12	12	12
Inland of Surge Evacuation Zones	10	10	10	10	10

Public shelter use rate indicates the percent of evacuees from each zone who will seek refuge in public shelters, in each storm threat scenario.

Table PA 4e. St. Lucie County friend/relative refuge use rates for residents living in site-built homes

St. Lucie Friend/Relative Use Rates (%)	Storm Threat Scenario				
	Cat 1	Cat 2	Cat 3	Cat 4	Cat 5
Site-built Homes					
Cat 1 Surge Evacuation Zone	60	60	60	60	60
Cat 2 Surge Evacuation Zone	60	60	60	60	60
Cat 3 Surge Evacuation Zone	60	60	60	60	60
Cat 4 Surge Evacuation Zone	60	60	60	60	60
Cat 5 Surge Evacuation Zone	60	60	60	60	60
Inland of Surge Evacuation Zones	60	60	60	60	60

Friend/relative rate indicates the percent of evacuees from each zone who will seek refuge in the homes of friends and relatives, in each storm threat scenario.

Table PA 4f. St. Lucie County hotel/motel refuge use rates for residents living in site-built homes

St. Lucie Hotel/Motel Use Rates (%)	Storm Threat Scenario				
	Cat 1	Cat 2	Cat 3	Cat 4	Cat 5
Site-built Homes					
Cat 1 Surge Evacuation Zone	15	15	15	15	15
Cat 2 Surge Evacuation Zone	15	15	15	15	15
Cat 3 Surge Evacuation Zone	15	15	15	15	15
Cat 4 Surge Evacuation Zone	15	15	15	15	15
Cat 5 Surge Evacuation Zone	15	15	15	15	15
Inland of Surge Evacuation Zones	15	15	15	15	15

Hotel/motel rate indicates the percent of evacuees from each zone who will seek refuge in hotels and motels, in each storm threat scenario.

Table PA 4g. St. Lucie County other refuge use rates for residents living in site-built homes

St. Lucie Other Refuge Use Rates (%)	Storm Threat Scenario				
	Cat 1	Cat 2	Cat 3	Cat 4	Cat 5
Site-built Homes					
Cat 1 Surge Evacuation Zone	17	17	17	17	17
Cat 2 Surge Evacuation Zone	17	17	17	17	17
Cat 3 Surge Evacuation Zone	13	13	13	13	13
Cat 4 Surge Evacuation Zone	13	13	13	13	13
Cat 5 Surge Evacuation Zone	13	13	13	13	13
Inland of Surge Evacuation Zones	15	15	15	15	15

Other refuge rate indicates the percent of evacuees from each zone who will seek refuge in locations such as churches, second homes, and workplaces, in each storm threat scenario.

Table PA 4h. St. Lucie County evacuation rates for residents living in mobile and manufactured homes

St. Lucie Evacuation Rates (%)	Storm Threat Scenario				
	Cat 1	Cat 2	Cat 3	Cat 4	Cat 5
Mobile and Manufactured Homes					
Cat 1 Surge Evacuation Zone	75	80	90	95	100
Cat 2 Surge Evacuation Zone	75	80	90	95	95
Cat 3 Surge Evacuation Zone	65	75	85	90	95
Cat 4 Surge Evacuation Zone	65	75	85	90	90
Cat 5 Surge Evacuation Zone	65	75	85	85	90
Inland of Surge Evacuation Zones	60	70	80	85	90

Evacuation rate indicates the percent of residents who will leave their homes to go someplace safer from each zone in each storm threat scenario. Figures are based on the assumption that officials order evacuation for surge evacuation zones corresponding to storm category, plus all mobile homes and manufactured homes. Figures also assume that the actual storm track passes very close to the area being evacuated.

Table PA 4i. St. Lucie County out-of-county trip rates for residents living in mobile and manufactured homes

St. Lucie Out-of-county Trip Rates (%)	Storm Threat Scenario				
	Cat 1	Cat 2	Cat 3	Cat 4	Cat 5
Mobile and Manufactured Homes					
Cat 1 Surge Evacuation Zone	60	60	60	60	60
Cat 2 Surge Evacuation Zone	60	60	60	60	60
Cat 3 Surge Evacuation Zone	60	60	60	60	60
Cat 4 Surge Evacuation Zone	60	60	60	60	60
Cat 5 Surge Evacuation Zone	60	60	60	60	60
Inland of Surge Evacuation Zones	60	60	60	60	60

Out-of-county trip rate indicates the percent of evacuees from each zone who will seek refuge outside their own county of residence in each storm threat scenario.

Table PA 4j. St. Lucie County vehicle use rates for residents living in mobile and manufactured homes

St. Lucie Vehicle Use Rate (%)	Storm Threat Scenario				
	Cat 1	Cat 2	Cat 3	Cat 4	Cat 5
Mobile and Manufactured Homes					
Cat 1 Surge Evacuation Zone	85	85	85	85	85
Cat 2 Surge Evacuation Zone	85	85	85	85	85
Cat 3 Surge Evacuation Zone	85	85	85	85	85
Cat 4 Surge Evacuation Zone	85	85	85	85	85
Cat 5 Surge Evacuation Zone	85	85	85	85	85
Inland of Surge Evacuation Zones	85	85	85	85	85

Vehicle use rate indicates of percentage of vehicles available to the evacuating household from each zone that will be used in evacuation in each storm threat scenario.

Table PA 4k. St. Lucie County public shelter use rates for residents living in mobile and manufactured homes

St. Lucie Public Shelter Use Rates (%)	Storm Threat Scenario				
	Cat 1	Cat 2	Cat 3	Cat 4	Cat 5
Mobile and Manufactured Homes					
Cat 1 Surge Evacuation Zone	8	8	8	8	8
Cat 2 Surge Evacuation Zone	8	8	8	8	8
Cat 3 Surge Evacuation Zone	8	8	8	8	8
Cat 4 Surge Evacuation Zone	8	8	8	8	8
Cat 5 Surge Evacuation Zone	8	8	8	8	8
Inland of Surge Evacuation Zones	8	8	8	8	8

Public shelter use rate indicates the percent of evacuees from each zone who will seek refuge in public shelters, in each storm threat scenario.

Table PA 4l. St. Lucie County friend/relative refuge use rates for residents living in mobile and manufactured homes

St. Lucie Friend/Relative Use Rates (%)	Storm Threat Scenario				
	Cat 1	Cat 2	Cat 3	Cat 4	Cat 5
Mobile and Manufactured Homes					
Cat 1 Surge Evacuation Zone	55	55	55	55	55
Cat 2 Surge Evacuation Zone	55	55	55	55	55
Cat 3 Surge Evacuation Zone	55	55	55	55	55
Cat 4 Surge Evacuation Zone	55	55	55	55	55
Cat 5 Surge Evacuation Zone	55	55	55	55	55
Inland of Surge Evacuation Zones	55	55	55	55	55

Friend/relative rate indicates the percent of evacuees from each zone who will seek refuge in the homes of friends and relatives, in each storm threat scenario.

Table PA 4m. St. Lucie County hotel/motel refuge use rates for residents living in mobile and manufactured homes

St. Lucie Hotel/Motel Use Rates (%)	Storm Threat Scenario				
	Cat 1	Cat 2	Cat 3	Cat 4	Cat 5
Mobile and Manufactured Homes					
Cat 1 Surge Evacuation Zone	30	30	30	30	30
Cat 2 Surge Evacuation Zone	30	30	30	30	30
Cat 3 Surge Evacuation Zone	30	30	30	30	30
Cat 4 Surge Evacuation Zone	30	30	30	30	30
Cat 5 Surge Evacuation Zone	30	30	30	30	30
Inland of Surge Evacuation Zones	30	30	30	30	30

Hotel/motel rate indicates the percent of evacuees from each zone who will seek refuge in hotels and motels, in each storm threat scenario.

Table PA 4n. St. Lucie County other refuge use rates for residents living in mobile and manufactured homes

St. Lucie Other Refuge Use Rates (%)	Storm Threat Scenario				
	Cat 1	Cat 2	Cat 3	Cat 4	Cat 5
Mobile and Manufactured Homes					
Cat 1 Surge Evacuation Zone	7	7	7	7	7
Cat 2 Surge Evacuation Zone	7	7	7	7	7
Cat 3 Surge Evacuation Zone	7	7	7	7	7
Cat 4 Surge Evacuation Zone	7	7	7	7	7
Cat 5 Surge Evacuation Zone	7	7	7	7	7
Inland of Surge Evacuation Zones	7	7	7	7	7

Other refuge rate indicates the percent of evacuees from each zone who will seek refuge in locations such as churches, second homes, and workplaces, in each storm threat scenario.