Volume 1-5

Withlacoochee Region Technical Data Report

CHAPTER VI

EVACUATION TRANSPORTATION ANALYSIS

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TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

CHAPTER VI
EVACUATION TRANSPORTATION ANALYSIS

The evacuation transportation analysis discussed in this volume documents the methodology, analysis, and results of the transportation component of the Statewide Regional Evacuation Study Program (SRESP). Among the many analyses required for the SRESP study, transportation analysis is probably one of the most important components in the process. By bringing together storm intensity, transportation network, shelters, and evacuation population, transportation analysis explicitly links people's behavioral responses to the regional evacuation infrastructure and helps formulate effective and responsive evacuation policy options. Due to the complex calculations involved and numerous evacuation scenarios that need to be evaluated, the best way to conduct the transportation analysis is through the use of computerized transportation simulation programs, or transportation models.

A. Background and Purpose

Over the years, different planning agencies have used different modeling approaches with varying degrees of complexity and mixed success. Some have used full-blown conventional transportation models such as the standard Florida model FSUTMS; others have used a combination of a simplified conventional model and a spreadsheet program, such as the Abbreviated Transportation Model (ATM). These models have different data requirements, use different behavioral assumptions, employ different traffic assignment algorithms, and produce traffic analysis results with different levels of detail and accuracy. These differences make it difficult for planning agencies to share information and data with each other. They also may produce undesirable conditions for staff training and knowledge sharing.

One of the objectives of the SRESP is to create consistent and integrated regional evacuation data and mapping, and by doing so, to facilitate knowledge sharing between state, regional, county, and local partners. To achieve this objective, it is important for all Regional Planning Councils to adopt the same data format and to use the same modeling methodologies for their transportation analyses. The primary purpose of the transportation component of the SRESP is to develop a unified evacuation transportation modeling framework that can be implemented with the data collected by the Regional Planning Councils.

B. Study Area

The study area for this analysis includes the five county Withlacoochee Regional Planning Council area. The transportation modeling methodology includes some processes that are performed at the statewide level, in order to determine the impacts of evacuations from other regions impacting the evacuation clearance times in the Withlacoochee region. While the impact of other regions is included in the Withlacoochee analysis, it is important to note that the results of the transportation analysis presented in this document are only reported for the five counties included in the Withlacoochee RPC. Transportation analysis results for other regions and counties are reported in the corresponding Volume 4 report for those regions.

C. Input and Coordination

The development of the transportation methodology and framework required coordination and input from all eleven regional planning councils in Florida, along with the Division of Emergency Management, Department of Transportation, Department of Economic Opportunity, and local county emergency management teams. At the statewide level, the transportation consultant, CDM Smith Associates, participated in SRESP Work Group Meetings which were typically held on a monthly basis to discuss the development of the transportation methodology and receive feedback and input from the State agencies and RPCs.

At the local and regional level, CDM Smith Associates conducted a series of four regional meetings to coordinate with and receive input from local county emergency management, the regional planning council, local transportation planning agencies and groups, as well as other interested agencies.

D. Study Comparisons

It is important to note that this study contains significant updates and revisions in comparison to the 2010 SRESP study for the Withlacoochee region. These revisions include updates to population projections based on the 2010 census, modifications to the roadway network due to recently completed and planned construction projects, and changes to the location and size of available shelters. These revisions have significant impacts on evacuating vehicle behavior for the region and caused changes to the calculated clearance times in each county. These updates and revisions make comparisons to the previous 2010 study difficult.

E. Evacuation Modeling Methodology and Framework

The evacuation modeling methodology and framework was developed during 2008 and 2009 in coordination with all eleven Regional Planning Councils and the Division of Emergency Management. The methodology used in the Withlacoochee RPC Evacuation Transportation Analysis is identical to the methodology used for all eleven Regional Planning Councils and includes the following components:

- **Behavioral Assumptions** – In 2008, the Statewide Regional Evacuation Study Program (SRESP) commissioned a survey of Florida residents. The purpose of this survey was to develop an understanding of the behavior of individuals when faced with the prospect of an impending evacuation. These data were used to develop a set of "planning assumptions" that describe the way people respond to an order to evacuate and are an important input to the SRESP Evacuation Model. The behavioral data provides insights into how people respond to the changing conditions leading up to and during an evacuation. The primary application of the survey data was to help anticipate how people would respond with respect to five behaviors:

    - How many people would evacuate?
    - When they would leave?
    - What type of refuge they would seek?

- Where they would travel for refuge?
- How many vehicles would they use?

These evacuation behaviors are distinguished based on several descriptive variables as listed below:

- Type of dwelling unit (site-built home versus mobile home);
- The evacuation zone in which the evacuee reside; and,
- The intensity of the evacuation that has been ordered.

- **Zone System and Highway Network** - The SRESP evacuation model relies upon data that covers the entire State of Florida as well as areas covering the States of Georgia, Alabama, Mississippi, South Carolina, North Carolina, and Tennessee. While the primary focus of the model is with evacuation behavior within Florida, areas outside of the state had to be considered in order to allow a more precise routing of evacuation traffic. This allows the model to measure the flow of traffic across the state line if needed.

  The data included in this system contain the demographic information crucial to modeling evacuation traffic. The demographic information is labeled as "small area data". These data provide population and dwelling unit information that will identify where the individuals in the region reside. The planning assumptions developed from the behavioral analysis conducted for this study were applied to these demographic data. The result is a set of evacuation trips generated by the evacuation model. The number of these trips will vary depending on the hazard conditions that prompt the evacuation. Small area data geographies were aggregated into larger units known as Traffic Evacuation Zones (TEZ). These TEZ form the basic unit of analysis in the evacuation model. The final TEZ system for the State of Florida has 17,328 zones. This number provides sufficient detail to accurately accommodate the assignment of evacuation trips onto an evacuation network.

- **Background Traffic** - The traffic that consumes the roadway capacity of a transportation system during an evacuation can be divided into two groups. The first group is the evacuation traffic itself. Once the evacuation demand is determined, this information is converted into a number of vehicles evacuating over time. These evacuation trips are then placed on a representation of the highway network by a model. The model determines the speed at which these trips can move and proceeds to move the evacuation trips accordingly. The result is a set of clearance times.

  The second group of traffic is known as background traffic. Background traffic, as its name implies, is not the primary focus of an evacuation transportation analysis and is accounted for primarily to impede the movement of evacuation trips through the network. These trips represent individuals going about their daily business mostly unconcerned with the evacuation event. For the most part, background traffic represents trips that are relatively insensitive to an order to evacuate and are thus said to be occurring in the "background." Even though background traffic is relatively insensitive to evacuation orders, it is important to account for background traffic since it

can have a dramatic impact on available roadway capacity. This in turn can severely affect evacuation clearance times.

- **Evacuation Traffic** - The model flow for the evacuation model is divided into a total of eight modeling steps. The following eight steps are represented graphically in the flowchart in Figure VI-1:

    1. Identify evacuation conditions and initialize model;
    2. Determine number of evacuation trips;
    3. Split trips into destination purposes;
    4. Distribute trips throughout study area;
    5. Factor trip tables into time segment matrices;
    6. Adjust background traffic;
    7. Load trips onto highway network; and,
    8. Post process model outputs.

Figure VI-1 General Model Flow

- **Dynamic Traffic Assignment** - Dynamic traffic assignment (DTA) was utilized in the evacuation methodology because it is sensitive to individual time increments. DTA works by assigning a certain number of vehicles to the highway network in a given interval of time. The model then tracks the progress of these trips through the network over the interval. Another set of vehicles is assigned during the following time interval. The model then tracks the progress of these trips through the network along with the progress of the trips loaded in the previous time interval. As vehicles begin to arrive at the same segments of roadway, they interact with one another to create congestion. When vehicles that were loaded to the network in subsequent intervals of time arrive at the congested links, they contribute to the congestion as well. This results in a slowing down of the traffic and eventually spill-backs and queuing delays. It is this time dependent feature of DTA that makes it well suited to evacuation modeling. By dynamically adjusting the travel times and speeds of the vehicles moving through the network as they respond to congestion the model is able to do the following:

    - The evacuation model is able to estimate the critical clearance time statistics needed for this study;
    - The model takes into account the impact of compounded congestion from multiple congestion points;
    - The model is able to adjust the routing of traffic throughout the network as a function of congestion as it occurs throughout the evacuation; and,
    - The model is capable of adjusting its capacities from time segment to time segment, making it possible to represent such phenomena as reverse lane operations and background traffic.

- **Prototype Model Development** - CDM Smith Associates developed a prototype model to test the modeling methodology used to calculate evacuation clearance times. The prototype model demonstrated the viability of the methodology developed for this study. This included the use of dynamic traffic assignment, background traffic curves, regional sub-area trip balancing, the use of survey rates, the use of 100% participation rates, response curves, and county-by-county phasing of evacuations. The prototype model served as the backbone for all regional evacuation models that have been developed for this study. The models implemented for each RPC use a structure similar to the prototype with identical methodology.

F. Regional Model Implementation

The regional model developed for the Withlacoochee Region used a series of input data provided by the RPC, including the following:

- **Regional Model Network** - The regional model network consists of the RPC designated evacuation routes as well as a supporting roadway network that facilitates movement of evacuation traffic. The 2005 Florida Department of Transportation (FDOT) Statewide Model Network was used as a basis for developing the regional model network, while the evacuation routes were obtained from the Withlacoochee RPC. The RPC relied on the emergency managers of its constituent counties to provide it with information on which roads were to be included as evacuation routes. The resulting model network was updated to 2010 conditions and is referred to as the base model network. **Figure VI-2** identifies the model network and evacuation routes for the WRPC. County level details of the regional model network are provided in the Volume 5-5 report. The regional model network for the Withlacoochee region includes key roadways within the five county region, including I-75, Florida's Turnpike, Suncoast Parkway, US 19, US 98, US 27, US 301, US 19, US 41, SR 24, SR 40, SR 44, and SR 50.

- **Regional Zone System** - The regional zone system is based on Traffic Evacuation Zones (TEZ) and contains the regional demographic information, which includes housing and population data that is essential to modeling evacuation traffic. There are 363 TEZs located within the five county Withlacoochee region, as illustrated in **Figure VI-3**. In the Withlacoochee region, Marion County has the largest number of TEZs with 151, and Hernando follows with 71 TEZs. Sumter County has 60 TEZs, while Citrus and Levy Counties have the lowest number of TEZs within the RPC with 55 and 26 zones, respectively. The larger number of TEZs generally reflect counties with denser urban structure and higher population densities.

- **Regional Demographic Characteristics** - Demographic data were developed for the following years: 2010, 2015, and 2020. A snapshot of the key demographic data for each county in the Withlacoochee RPC for 2010, 2015, and 2020 is summarized in **Table VI-1**. The tables list the number of occupied dwelling units for site built homes, the permanent population in site-built homes, as well as the number of occupied dwelling units for mobile homes and the permanent population in mobile homes. The mobile home category includes RVs and boats and the permanent population in those housing options. The demographic characteristics summary also includes hotels and motels because many of these units are in vulnerable areas, and the proportion of

seasonal units and hotel/motel units that are occupied at any point in time will have an important impact on the total population that may participate in an evacuation.

Figure VI-2 Withlacoochee Regional Model Network

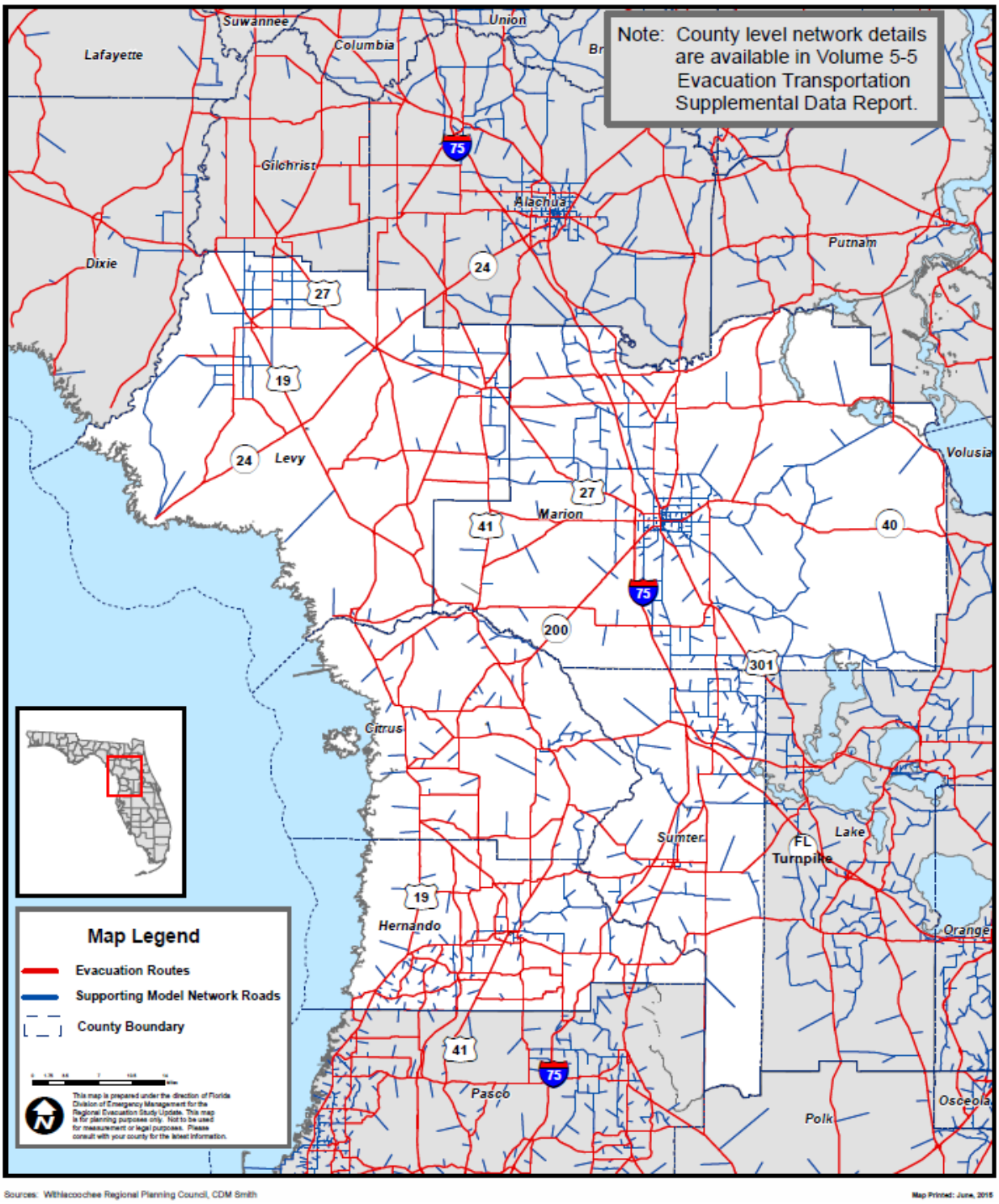
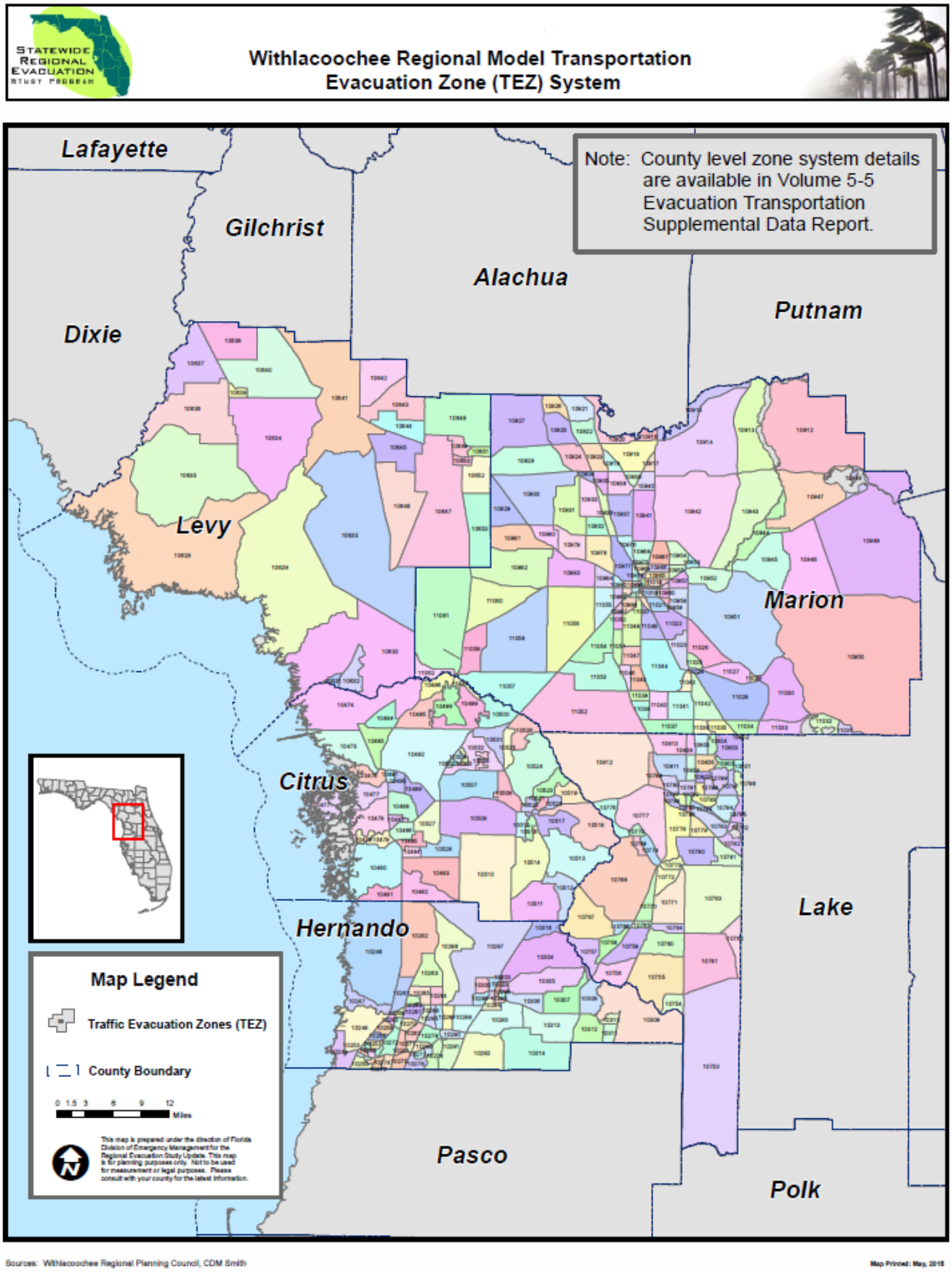


Figure VI-3 Withlacoochee Regional Model Traffic Evacuation Zone Map



Marion County has the largest population in the region during all three time periods. The county is expected to reach approximately 400,000 people by 2020. Hernando County has the second largest population in the region is forecasted to have almost 200,000 people by 2020. Citrus is projected to have the third largest population in the region, exceeding 150,000 by 2020. Sumter County falls just below Citrus at almost 120,000. Of all the counties, Levy County has the smallest population for all three time periods and may reach more than 43,000 people by 2020.

Marion County has the highest number of mobile homes followed by Citrus and Hernando. Levy County has the smallest number of mobile homes in the Withlacoochee region, but these homes, in fact, make up 46% of the total homes in the county.

Table VI-1 Withlacoochee Demographic Characteristic Summary

County	Characteristic	Year		
		2010	2015	2020
Citrus	Occupied site-built homes	48,570	50,073	53,715
	Population in site-built homes	104,237	107,457	115,243
	Occupied mobile homes	14,734	15,186	16,296
	Population in mobile homes	34,748	35,824	38,474
	Hotel/motel units	2,155	2,185	2,218
Hernando	Occupied site-built homes	59,704	63,012	69,461
	Population in site-built homes	145,546	153,599	169,294
	Occupied mobile homes	12,041	12,707	14,006
	Population in mobile homes	25,404	26,822	29,591
	Hotel/motel units	3,090	3,102	3,116
Levy	Occupied site-built homes	8,823	9,020	9,595
	Population in site-built homes	21,053	21,520	22,890
	Occupied mobile homes	7,581	7,753	8,243
	Population in mobile homes	19,113	19,547	20,786
	Hotel/motel units	944	950	957
Marion	Occupied site-built homes	108,660	114,869	126,249
	Population in site-built homes	256,001	270,594	297,420
	Occupied mobile homes	29,066	30,730	33,769
	Population in mobile homes	67,058	70,901	77,919
	Hotel/motel units	12,327	12,627	12,936
Sumter	Occupied site-built homes	34,402	40,875	48,748
	Population in site-built homes	70,026	83,212	99,236
	Occupied mobile homes	6,959	8,271	9,867
	Population in mobile homes	14,442	17,160	20,475
	Hotel/motel units	1,748	1,784	1,819

Source: Withlacoochee Regional Planning Council

- **Planned Roadway Improvements** - To correspond to the three different sets of demographic data, three model networks were ultimately developed. The base 2010 network and two future year networks to correspond to the 2015 demographic data and the 2020 demographic data. The 2010 base model network was updated to reflect roadway capacity improvement projects completed between 2010 and 2015 to create the 2015 network. The 2015 network was then updated to reflect planned roadway capacity improvement projects expected to be implemented between 2016 and 2020 to create the 2020 network.

  The planned roadway improvements that were added to the network generally include only capacity improvement projects such as additional through lanes. **Table VI-2** identifies capacity improvement projects completed between 2010 and 2015 that were included in the 2015 network. Likewise, **Table VI-3** identifies capacity improvement projects planned for implementation between 2016 and 2020. The tables identify each roadway that will be improved as well as the extent of the improvement. For example, by the end of 2015 in Citrus County, CR 486 from SR 44 to Ottawa Ave will be widened to 4 lanes.

  It is important to note that Tables VI-2 and VI-3 are not intended to be all inclusive of every transportation improvement project completed within the region. The tables only identify key capacity improvement projects that impact the evacuation model network and are anticipated to have an impact on evacuation clearance times.

- **Behavioral Assumptions** - For the Withlacoochee Region, three of the counties within the region have evacuation zones corresponding to five categories of storm surge. Evacuation rates for site-built homes and mobile/manufactured homes are provided by county and summarized in **Figure VI-4** through **Figure VI-9**. Other rates, such as out of county trip rates, vehicle use rates, public shelter use rates, friend/relative refuge use rates, hotel/motel refuge use rates, and other refuge use rates, are detailed by county, storm threat, and evacuation zone in Volume 5-5.

  A review of the evacuation rates for the Withlacoochee region illustrates that evacuation participation rates increase as the evacuation level increases, and participation rates for persons living in mobile/manufactured homes are generally higher than for persons living in site-built homes. It should be noted that a certain percentage of the population evacuates, even when they are not living in an area that is ordered to evacuate. These people are commonly referred to as shadow evacuees. Shadow evacuation rates are also included in Figure VI-4 through Figure VI-9.

- **Shelters** - In order for the transportation model to accurately assign public shelter trips to the correct location, a complete list of available public shelters needs to be available. The shelters were categorized as either primary or other, with primary indicating that the shelter is compliant with American Red Cross standards for a shelter and other indicating all other shelters. In the five county region there are a total of 124 shelters, including 27 in Citrus County, 41 in Marion County, 20 in Hernando County, 22 in Sumter County, and 14 in Levy County. All together, the 124 shelters located within the five county region can host over 29,000 persons during an evacuation event. Detailed lists of the available public shelters by county are included in Volume 5-5.

Table VI-2 Withlacoochee Region Roadway Improvements, 2015

County	Roadway	From	To	Number of Lanes
Citrus	CR 486	SR 44	Ottawa Ave	4
	US 19 (SR 55)	W Cornflower Dr	W Foss Grove Path	6
Hernando	SR 50 (Cortez Blvd)	US 19 (SR 55)	W of Mariner Blvd	6
	I-75 (SR 93)	N of SR 50	Hernando/Sumter County Lines	6
	I-75 (SR 93)	S of US 98/SR 50/Cortez	N of US 98/SR 50/Cortez	6
	I-75 (SR 93)	Pasco/Hernando County Lines	S of US 98/SR 50/Cortez	6
	SR 50 (Cortez Blvd)	W of Mariner Blvd	SR 589 (Suncoast Pwy)	6
Marion	SW 42nd St	Overpass from SR 200	SW 27th Ave	2
	SR 40	CR 328	SW 80th Ave	4
	SR 35 (Baseline Rd)	S CR 464 (Maricamp Rd)	SR 40	4
	SR 500 (US 27)	N of CR 464B	N of CR 225A	4
Sumter	SR 35 (US 301)	N of CR 466A	CR 214	4
	CR 468	CR 466A	CR 466	4
	Turnpike at CR 468			N/A
	I-75/Turnpike Interchange (SR 44)			8
	I-75 (SR 93)	N of SR 50	Hernando/Sumter County Lines	6

Sources: FDOT SIS First Five Year Plan, FDOT SIS Second Five Year Plan, Withlacoochee Regional Planning Council
Note: Projects included in this table are roadway improvement projects completed between 2010 and 2015 on roadways that are included in the regional transportation model network. Only projects which added roadway capacity, such as additional through lanes, were included. The list is not intended to be all inclusive of every transportation improvement project completed within the region. A list of historical projects completed during the last five years was included in this report because the base regional network developed for the study, along with the base demographic data, is for the year 2010.

Table VI-3 Withlacoochee Planned Roadway Improvements, 2020

County	Roadway	From	To	Number of Lanes
Citrus	US 19 (SR 55)	W Green Acres St	W Jump Ct	6
	US 19 (SR 55)	W Jump Ct	W Fort Island Trl	6
Hernando	Suncoast Pkwy	US 98	Hernando/Citrus County Lines	4
	SR 50	Lockhart Rd	E of Remington Rd	6
Sumter	I-75	CR 470	SR 91 (Turnpike)	6
	I-75	Hernando County Line	CR 470	6

Sources: FDOT SIS First Five Year Plan, FDOT SIS Second Five Year Plan, Withlacoochee Regional Planning Council
Note: Projects included in this table are roadway improvement projects planned for completion between 2016 and 2020 on roadways that are included in the regional transportation model network. Only projects which are planned to add roadway capacity, such as additional through lanes, were included. The list is not intended to be all inclusive of every transportation improvement project planned for completion within the region.

Figure VI-4 Evacuation Participation Rates: Citrus County - Site-Built Homes

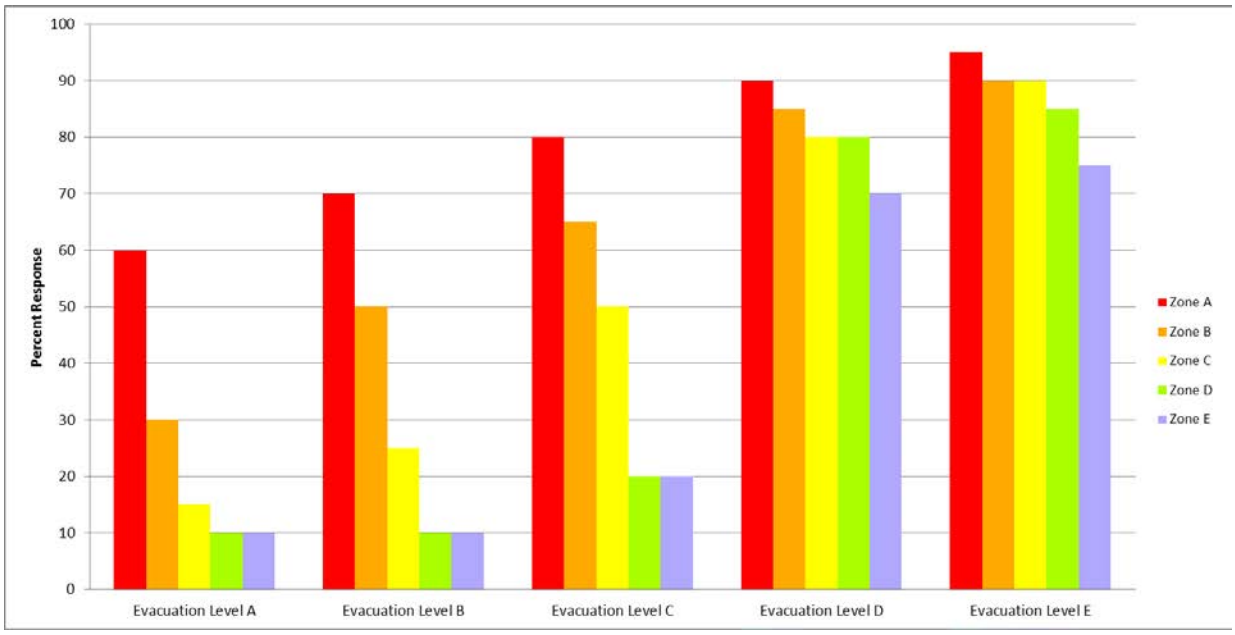


Figure VI-5 Evacuation Participation Rates: Citrus County - Mobile Homes

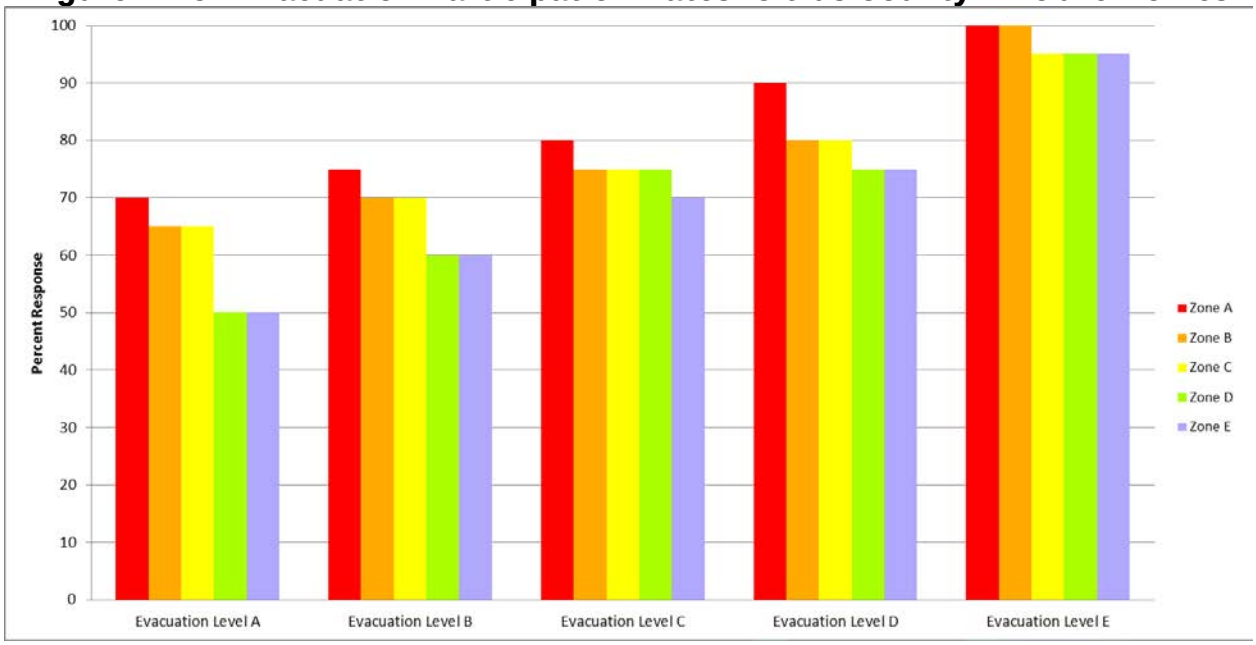


Figure VI-6 Evacuation Participation Rates: Hernando County - Site Built Homes

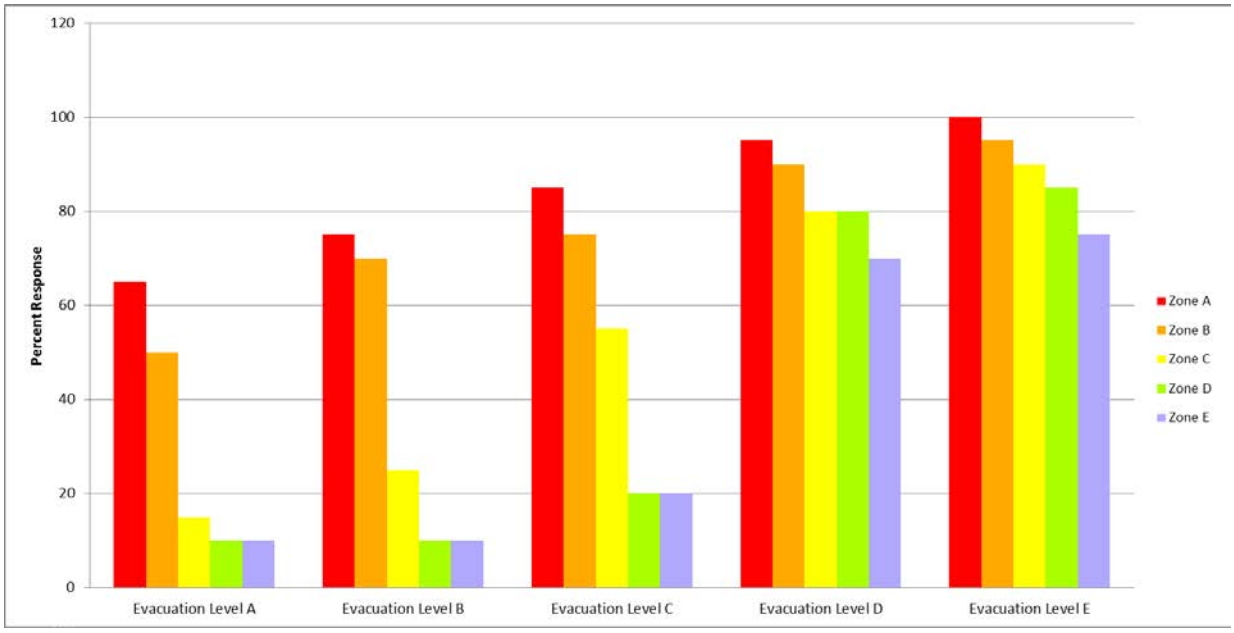


Figure VI-7 Evacuation Participation Rates: Hernando County - Mobile Homes

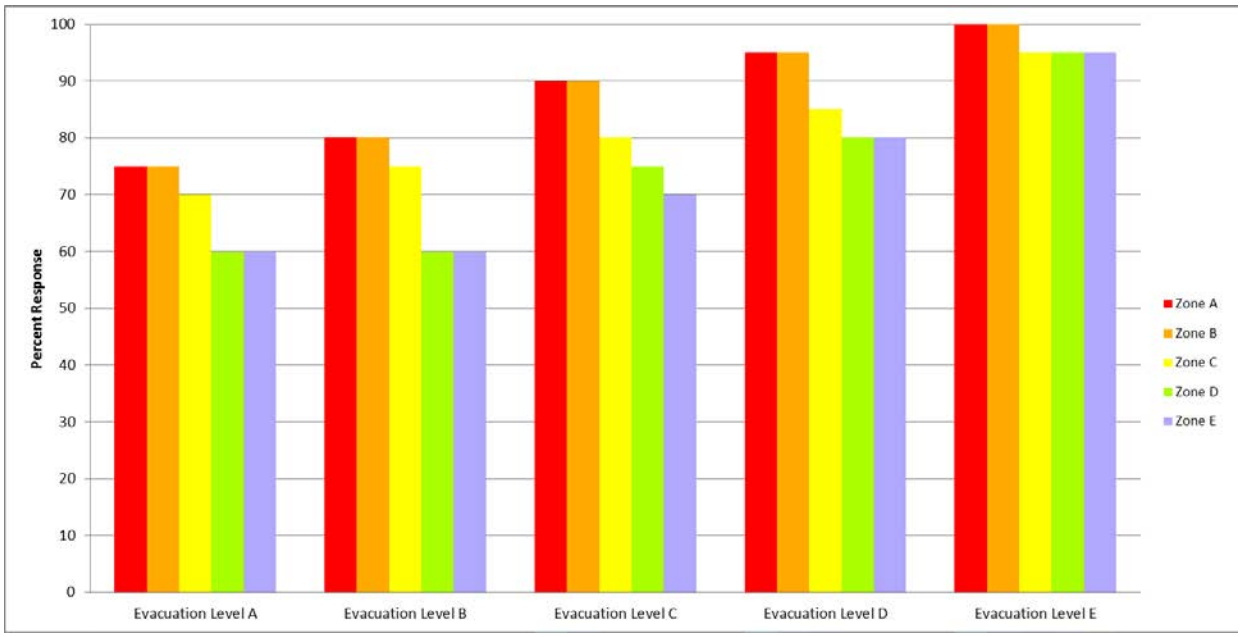


Figure VI-8 Evacuation Participation Rates: Levy County - Site Built Homes

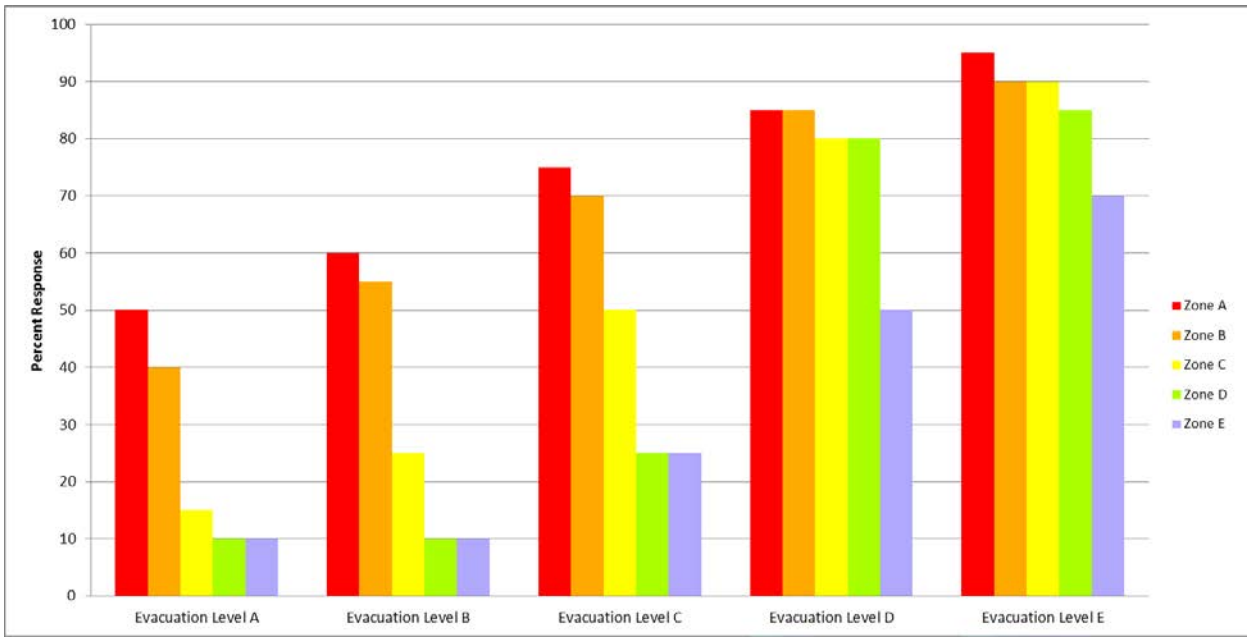
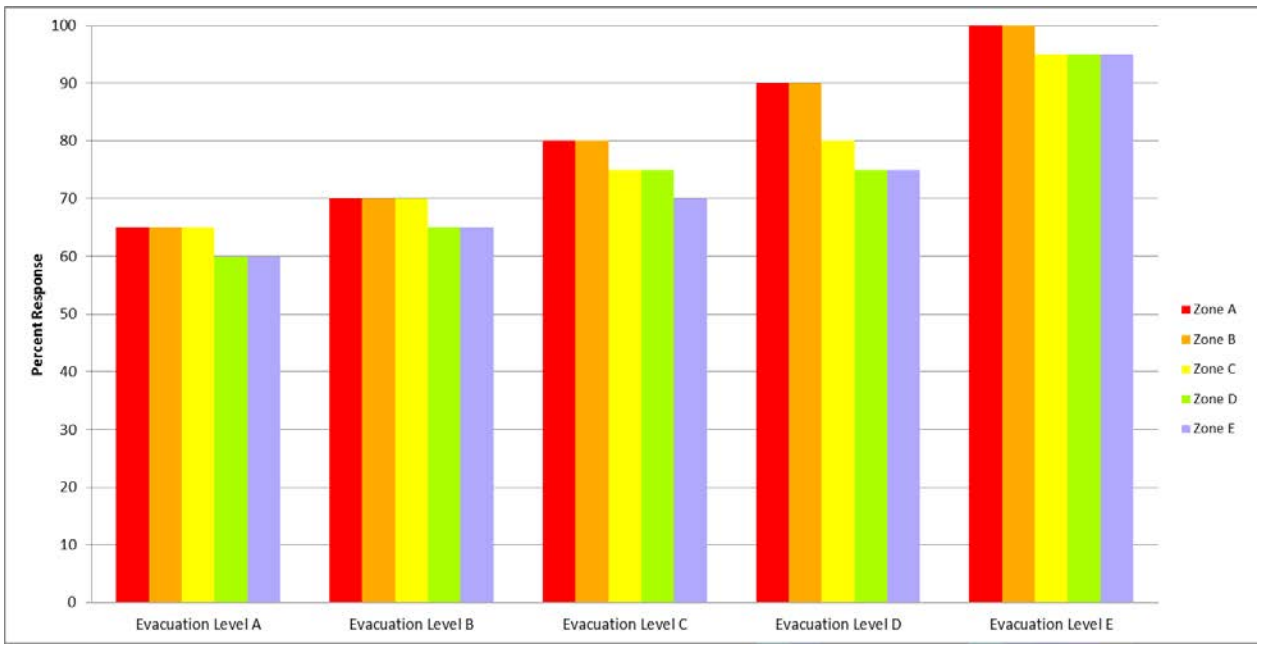


Figure VI-9 Evacuation Participation Rates: Levy County - Mobile Homes



- **Evacuation Zones** - The final input variable that is needed to complete the transportation evacuation model is the delineation of evacuation zones for all coastal counties. Local county emergency managers have the responsibility of identifying and defining evacuation zones for their county. Citrus, Hernando, and Levy Counties within the Withlacoochee region had established their evacuation zones based on the results of the new data and information collected as part of the SRESP in 2010. County level evacuation zones are included in Volume 5-5.

G. TIME User Interface

CDM Smith Associates developed the Transportation Interface for Modeling Evacuations (TIME) to make it easier for RPC staff and transportation planners to use the model and implement the evacuation methodology. The TIME interface is based on an ArcGIS platform and is essentially a condensed transportation model, which provides a user friendly means of modifying input variables that would change the clearance times for various evacuation scenarios.

The evacuation model variables include a set of distinguishing characteristics that could apply to evacuation scenarios as selection criteria. These following variables may be selected using the TIME interface and allow the user to retrieve the best results from various evacuation alternatives:

- Analysis time period;
- Highway network;
- Behavioral response;
- One-way evacuation operations;
- University population;
- Tourist occupancy rates;
- Shelters;
- Counties evacuating;
- Evacuation level;
- Response curve hours; and,
- Evacuation Phasing.

H. Vulnerable Population

Using a combination of the demographic data, behavioral assumptions, and evacuation zones, the vulnerable population in each county could be determined by evacuation level. For the purposes of the transportation analysis, the vulnerable population, or population-at-risk, is defined as the total population living within the county designated evacuation zones for each evacuation level. This population is living in an area that is at risk for severe flooding during a storm event. The vulnerable population for the Withlacoochee Region for 2015 is identified in **Table VI-4**, summarized by evacuation zone and split between site-built homes and mobile/manufactured homes. Vulnerable population for 2020 is summarized in **Table VI-5**.

Table VI-4 Vulnerable Population in the Withlacoochee Region for 2015

	Evacuation Zone A	Evacuation Zone B	Evacuation Zone C	Evacuation Zone D	Evacuation Zone E
Citrus County					
Site-built Homes	13,058	7,446	1,309	4,131	2,234
Mobile/Manuf. Homes	5,726	4,815	959	1,139	916
TOTAL	18,784	12,261	2,268	5,271	3,149
Hernando County					
Site-built Homes	4,235	1,836	3,097	8,001	32,410
Mobile/Manuf. Homes	511	136	316	1,224	1,906
TOTAL	4,746	1,972	3,413	9,225	34,315
Levy County					
Site-built Homes	1,493	1,111	446	320	1,398
Mobile/Manuf. Homes	1,031	1,047	701	382	1,616
TOTAL	2,523	2,158	1,147	702	3,014

Note: Vulnerable population determined using SRESP behavioral data and county provided evacuation zones. Vulnerable population numbers are not inclusive, meaning population numbers listed for a higher zone are not included in the lower zone. For example, vulnerable population listed for Evacuation Zone B does not include vulnerable population listed for Evacuation Zone A.

Table VI-5 Vulnerable Population in the Withlacoochee Region for 2020

	Evacuation Zone A	Evacuation Zone B	Evacuation Zone C	Evacuation Zone D	Evacuation Zone E
Citrus County					
Site-built Homes	14,009	7,987	1,403	4,429	2,393
Mobile/Manuf. Homes	6,141	5,168	1,030	1,226	986
TOTAL	20,150	13,155	2,433	5,655	3,379
Hernando County					
Site-built Homes	4,668	2,024	3,415	8,819	35,721
Mobile/Manuf. Homes	563	149	347	1,349	2,103
TOTAL	5,231	2,174	3,761	10,168	37,824
Levy County					
Site-built Homes	1,589	1,181	475	341	1,488
Mobile/Manuf. Homes	1,095	1,113	745	405	1,717
TOTAL	2,684	2,294	1,219	746	3,205

Note: Vulnerable population determined using SRESP behavioral data and county provided evacuation zones. Vulnerable population numbers are not inclusive, meaning population numbers listed for a higher zone are not included in the lower zone. For example, vulnerable population listed for Evacuation Zone B does not include vulnerable population listed for Evacuation Zone A.

In addition, based again on the demographic data, behavioral assumptions, and evacuation zones, the planned destinations of vulnerable population in each county could be determined by evacuation level. Destinations include friends and family, hotel/motel, public shelter, and other locations. Vulnerable population destinations for the Withlacoochee Region are identified in **Table VI-6** for 2015 and in **Table VI-7** for 2020.

The vulnerable shadow population is provided in **Table VI-8** for both 2015 and 2020. The vulnerable shadow population was determined using the behavioral assumptions for evacuating shadow population and is based on evacuation level (storm category), not evacuation zone.

Table VI-6 Vulnerable Population by Destination for 2015

	Evacuation Zone A	Evacuation Zone B	Evacuation Zone C	Evacuation Zone D	Evacuation Zone E
Citrus County					
To Friends and Family	11,923	7,729	1,426	3,369	2,001
To Hotel/ Motel	2,531	1,598	292	791	472
To Public Shelter	1,226	854	201	387	224
To Other Destination	3,104	2,080	349	724	451
Hernando County					
To Friends and Family	3,085	1,282	2,218	5,996	22,305
To Hotel/ Motel	712	296	512	1,384	5,147
To Public Shelter	288	112	279	762	2,783
To Other Destination	661	282	403	1,082	4,080
Levy County					
To Friends and Family	1,336	1,134	596	367	1,577
To Hotel/ Motel	430	376	207	124	533
To Public Shelter	178	160	150	89	382
To Other Destination	579	487	194	121	522

Note: Vulnerable population destinations determined using SRESP behavioral data and county provided evacuation zones. Vulnerable population numbers are not inclusive, meaning population numbers listed for a higher zone are not included in the lower zone. For example, vulnerable population listed for Evacuation Zone B does not include vulnerable population listed for Evacuation Zone A.

Table VI-7 Vulnerable Population by Destination for 2020

	Evacuation Zone A	Evacuation Zone B	Evacuation Zone C	Evacuation Zone D	Evacuation Zone E
Citrus County					
To Friends and Family	12,790	8,292	1,530	3,614	2,147
To Hotel/ Motel	2,715	1,715	313	848	507
To Public Shelter	1,315	916	215	416	241
To Other Destination	3,330	2,232	374	777	484
Hernando County					
To Friends and Family	3,400	1,413	2,445	6,609	24,586
To Hotel/ Motel	785	326	564	1,525	5,674
To Public Shelter	318	124	308	840	3,068
To Other Destination	728	311	444	1,193	4,497
Levy County					
To Friends and Family	1,422	1,206	633	390	1,677
To Hotel/ Motel	457	400	220	132	567
To Public Shelter	189	170	159	95	406
To Other Destination	616	518	207	129	555

Note: Vulnerable population destinations determined using SRESP behavioral data and county provided evacuation zones. Vulnerable population numbers are not inclusive, meaning population numbers listed for a higher zone are not included in the lower zone. For example, vulnerable population listed for Evacuation Zone B does not include vulnerable population listed for Evacuation Zone A.

Table VI-8 Vulnerable Shadow Evacuation Population

	Evacuation Level A	Evacuation Level B	Evacuation Level C	Evacuation Level D	Evacuation Level E
2015					
Citrus County	42,489	35,806	39,118	46,416	51,889
Hernando County	42,346	41,868	50,012	73,954	60,351
Levy County	21,218	19,891	20,174	21,741	21,976
Marion County	111,434	124,958	138,482	152,006	152,006
Sumter County	29,617	33,772	37,927	42,081	46,236
2020					
Citrus County	45,569	38,383	41,935	49,751	55,616
Hernando County	46,709	46,164	55,148	81,537	66,495
Levy County	22,522	21,103	21,406	23,072	23,320
Marion County	122,448	137,312	152,176	167,040	167,040
Sumter County	35,328	40,282	45,235	50,189	55,143

Note: Vulnerable shadow population determined using SRESP behavioral data and county provided evacuation zones.

I. Evacuation Model Scenarios

There are literally thousands of possible combinations of variables that can be applied using the evacuation transportation model, which will result in thousands of possible outcomes. For the purposes of this analysis, two distinct sets of analyses were conducted using the SRESP evacuation transportation model, including one set of analysis for growth management purposes and one set of analysis for emergency management purposes. The two sets of analysis include the following:

- **Base Scenarios** – The base scenarios were developed to estimate a series of worst case scenarios and are identical for all eleven RPCs across the State. These scenarios assume 100 percent of the vulnerable population evacuates and includes impacts from counties outside of the RPC area. These scenarios are generally designed for growth management purposes, in order to ensure that all residents that choose to evacuate during an event are able to do so. The base scenarios for the Withlacoochee region are identified in **Table VI-9**; and,

- **Operational Scenarios** – The operational scenarios were developed by the RPCs in coordination with local county emergency managers and are designed to provide important information to emergency management personnel to plan for different storm events. These scenarios are different from region to region and vary for each evacuation level. The operational scenarios for the Withlacoochee region are identified in **Table VI-10**.

Because of the numerous possible combinations of variables that can be applied in the model, the evacuation transportation model is available for use through the Withlacoochee RPC to continue testing combinations of options and provide additional information to emergency managers.

J. Clearance Time Results

Each of the ten base scenarios and ten operational scenarios were modeled for the Withlacoochee Region using the regional evacuation model. Results were derived from the model to summarize the evacuating population, evacuating vehicles, clearance times, and critical congested roadways. Detailed results are discussed in Chapter IV. Clearance times are presented in this executive summary since the determination of clearance time is one of the most important outcomes from the evacuation transportation analysis.

Calculated clearance times are used by county emergency managers as one input to determine when to recommend an evacuation order. This calculation can include the population-at-risk, shadow evacuees, as well as evacuees from other counties anticipated to pass through the county. Clearance time is developed to include the time required for evacuees to secure their homes and prepare to leave, the time spent by all vehicles traveling along the evacuation route network, and the additional time spent on the road caused by traffic and road congestion. Clearance time does not relate to the time any one vehicle spends traveling along the evacuation route network, nor does it guarantee vehicles will safely reach their destination once outside the County. The four clearance times that are calculated as part of the evacuation transportation analysis include the following:

Table VI-9 Base Scenarios

	Scenario 1 Level A 2015	Scenario 2 Level B 2015	Scenario 3 Level C 2015	Scenario 4 Level D 2015	Scenario 5 Level E 2015
Demographic Data	2015	2015	2015	2015	2015
Highway Network	2015	2015	2015	2015	2015
One-Way Operations	None	None	None	None	None
University Population	Fall/Spring	Fall/Spring	Fall/Spring	Fall/Spring	Fall/Spring
Tourist Rate	Default	Default	Default	Default	Default
Shelters Open	Primary	Primary	Primary	Primary	Primary
Response Curve	12-hour	12-hour	12-hour	12-hour	12-hour
Evacuation Phasing	None	None	None	None	None
Behavioral Response	100%	100%	100%	100%	100%
Evacuation Zone	A	B	C	D	E
Counties Evacuating	Citrus Hernando Levy Marion Sumter Dixie Pasco	Citrus Hernando Levy Marion Sumter Dixie Pasco	Citrus Hernando Levy Marion Sumter Dixie Pasco	Citrus Hernando Levy Marion Sumter Dixie Pasco	Citrus Hernando Levy Marion Sumter Dixie Pasco
	Scenario 6 Level A 2020	**Scenario 7 Level B 2020**	**Scenario 8 Level C 2020**	**Scenario 9 Level D 2020**	**Scenario 10 Level E 2020**
Demographic Data	2020	2020	2020	2020	2020
Highway Network	2020	2020	2020	2020	2020
One-Way Operations	None	None	None	None	None
University Population	Fall/Spring	Fall/Spring	Fall/Spring	Fall/Spring	Fall/Spring
Tourist Rate	Default	Default	Default	Default	Default
Shelters Open	Primary	Primary	Primary	Primary	Primary
Response Curve	12-hour	12-hour	12-hour	12-hour	12-hour
Evacuation Phasing	None	None	None	None	None
Behavioral Response	100%	100%	100%	100%	100%
Evacuation Zone	A	B	C	D	E
Counties Evacuating	Citrus Hernando Levy Marion Sumter Dixie Pasco	Citrus Hernando Levy Marion Sumter Dixie Pasco	Citrus Hernando Levy Marion Sumter Dixie Pasco	Citrus Hernando Levy Marion Sumter Dixie Pasco	Citrus Hernando Levy Marion Sumter Dixie Pasco

Table VI-10 Operational Scenarios

	Scenario 1 Level A 2015	Scenario 2 Level B 2015	Scenario 3 Level C 2015	Scenario 4 Level D 2015	Scenario 5 Level E 2015
Demographic Data	2015	2015	2015	2015	2015
Highway Network	2015	2015	2015	2015	2015
One-Way Operations	None	None	None	None	None
University Population	Default	Default	Default	Default	Default
Tourist Rate	Default	Default	Default	Default	Default
Shelters Open	Primary	Primary	All	All	All
Response Curve	6-hour, except Marion and Sumter with 12-hour	12-hour	12-hour, except Dixie, Hernando, Citrus, at 6-hour and Levy, Manatee, Pasco, Pinellas at 9-hour	12-hour	6-hour
Evacuation Phasing	None	None	None	None	None
Behavioral Response	Planning	Planning	Planning	Planning	Planning
Evacuation Zone	A	B except as noted below	C except as noted below	D except as noted below	E except as noted below
Counties Evacuating	Citrus Hernando Levy Marion Sumter Hillsborough Manatee Pasco Pinellas	Citrus Hernando Levy Marion Sumter Hillsborough (C) Manatee (C) Pasco (C) Pinellas (C) Lake Orange Osceola Polk	Citrus Hernando Levy Marion Sumter Manatee (A) Pasco (B) Pinellas (B) Dixie (B) Lake (B) Alachua (B) Gilchrist (B)	Citrus Hernando Levy Marion Sumter Hillsborough Manatee Pasco Pinellas Alachua (B) Lake (B) Polk (B)	Citrus Hernando Levy Marion Sumter Dixie (D) Hillsborough (D) Manatee (B) Pasco (D) Pinellas (D) Alachua (D) Gilchrist (D) Lake (C) Orange (B)
	Scenario 6 Level A 2020	**Scenario 7 Level B 2020**	**Scenario 8 Level C 2020**	**Scenario 9 Level D 2020**	**Scenario 10 Level E 2020**
Demographic Data	2020	2020	2020	2020	2020
Highway Network	2020	2020	2020	2020	2020
One-Way Operations	None	None	None	None	None
University Population	Default	Default	Default	Default	Default
Tourist Rate	Default	Default	Default	Default	Default
Shelters Open	Primary	Primary	All	All	All
Response Curve	6-hour, except Lake, Marion, Orange, Polk, and Sumter at 9-hour	6-hour, except Marion and Sumter at 12-hour	6-hour, except Alachua, Lake, Marion, Polk, and Sumter at 12-hour	12-hour, except Lake, Marion, Orange, Osceola, Polk, and Sumter at 18-hour	12-hour, except Alachua, Gilchrist, Lake, Marion, Polk, and Sumter at 18-hour
Evacuation Phasing	None	None	None	None	None
Behavioral Response	Planning	Planning	Planning	Planning	Planning
Evacuation Zone	A	B	C except as noted below	D except as noted below	E except as noted below
Counties Evacuating	Citrus Hernando Levy Marion Sumter	Citrus Hernando Levy Marion Sumter	Citrus Hernando Levy Marion Sumter	Citrus Hernando Levy Marion Sumter	Citrus Hernando Levy Marion Sumter

	Hillsborough Manatee Pasco Pinellas Lake Orange Polk	Hillsborough Manatee Pasco Pinellas	Hillsborough Manatee Pasco Pinellas Lake (A) Alachua (A) Polk (A)	Hillsborough (E) Manatee (E) Pasco (E) Pinellas (E) Lake (C) Orange (B) Osceola (B) Polk (C)	Dixie Hillsborough Manatee Pasco Pinellas Alachua (D) Gilchrist (D) Lake (C) Polk (C)

- **Clearance Time to Shelter** - The time necessary for all in-County trips to have reached their destination within the County. This does not mean all traffic movement in the County has ended; rather it means that everyone going to a point of safety AND that point is in the County, has reached their shelter. While this is primarily a growth management number, it gives emergency managers information about how long it will take for shelters to fill-up once an evacuation order is given. Key points to remember for clearance time to shelter include:
  - o All in-county trips reach their destination within the county; and,
  - o This definition does not include any out of county trips.

- **In-County Clearance Time** - The time necessary for all in-County trips to have reached their destination AND all out of county trips have left the Evacuation Zone AND traffic originating from outside the County that passes through the Evacuation Zone has also cleared the Zone. This does not mean all traffic movement in the County has ended; rather it means that everyone going to a point of safety AND that point is in the County, has reached their shelter AND the Evacuation Zone is clear. This gives you vital planning information regarding how long it will take to clear the most vulnerable zones once an evacuation order is given. Key points to remember for in-county clearance time include:
  - o All in-county trips reach their destination within the county;
  - o All out of county trips exit the evacuation zone, but may still be located in the county; and,
  - o This definition does not include out-of-county pass-through trips from adjacent counties, unless they evacuate through an evacuation zone.

- **Out of County Clearance Time** - The time necessary for all in-County trips to have reached their destination AND all out of county trips have left the County AND traffic originating from outside the County that pass through the County has also cleared the County. This does not mean all traffic movement in the County has ended; rather it means that everyone going to a point of safety has reached their shelter or left the County. Key points to remember for out of county clearance time include:
  - o The roadway network within the county is clear;
  - o All out of county trips exit the county, including out of county pass-through trips from adjacent counties; and,
  - o All in-county trips reach their destination.

- **Regional Clearance Time** - The time that is the highest time for any County Clearance time in the designated region. Calculated from last vehicle assigned an external destination exits the region . Key points to remember for regional clearance

time include:

- The roadway network within the RPC is clear;
- All out of county trips exit the RPC, including out of county pass-through trips from adjacent counties;
- All in-county trips reach their destination; and,
- Regional clearance time is equal to the largest out of county clearance time for a given scenario for any of the counties within the RPC, since the out of county clearance time includes out of county pass through trips from adjacent counties.

Calculated clearance times are used by county emergency managers as one input to determine when to recommend an evacuation order. Clearance times for each of the base scenarios are summarized in **Table VI-11** and **VI-12**, while clearance times for each of the operational scenarios are summarized in **Table VI-13** and **Table VI-14.** Clearance time includes several components, including the mobilization time for the evacuating population to prepare for an evacuation (pack supplies and personal belongs, load their vehicle, etc.), the actual time spent traveling on the roadway network, and the delay time caused by traffic congestion.

Base Scenarios

In-county clearance times for the base scenarios range from 12.5 hours in Hernando County for evacuation level A to 30 hours in Citrus County for evacuation level E in 2015. Clearance Time to Shelter shows a similar pattern, with clearance times for the base scenarios ranging from 12.5 hours for evacuation level A in Sumter and Hernando Counties to 16.5 hours for evacuation level E in Citrus and Sumter Counties in 2015.

In 2020, in-county clearance times for the base scenarios remain consistent, between 12.5 hours for the evacuation level A in Hernando County and 29.5 hours in Levy County for evacuation level E. Clearance Time to Shelter shows a similar pattern, with clearance times for the base scenarios ranging from 12.5 hours in Hernando and Sumter Counties for evacuation level A, to 16.5 hours in Citrus and Sumter Counties for evacuation level E in 2020.

Out of county clearance times for the 2015 base scenarios range from 15 hours in Levy County for the base evacuation level A scenario to 36 hours in Marion County for the evacuation level E scenario. Out of county clearance times for the 2020 base scenarios range from 15 hours in Levy County for the base evacuation level A scenario to 39 hours in Marion County for the evacuation level E scenario.

Regional clearance time for the five county WRPC region ranges from 22 hours to 36 hours in 2015. This time increases to between 23 and 39 hours in 2020.

Operational Scenarios

In-county clearance times for the 2015 operational scenarios range from 7.5 hours to 33.5 hours depending upon the scenario. Clearance Time to Shelter shows a similar pattern, with clearance times for the operational scenarios ranging from 6.5 hours to 26.5 hours depending upon the county and the scenario.

In 2020, in-county clearance times for the operational scenarios vary from 8 hours to 54 hours for the level E evacuation. The 2020 level D and E scenarios include vehicle trips evacuating from Tampa for a large storm event (approximately 1.45 million evacuating vehicles in the

model network), which cause a large increase in clearance times. Clearance Time to Shelter shows a similar pattern to the 2015 scenarios, with clearance times for the base scenarios ranging from 6.5 hours to 49.5 hours depending upon the scenario.

Out of county clearance times for the 2015 operational scenarios range from 14.5 hours to 35.5 hours, depending upon the scenario. Out of county clearance times show a similar pattern in 2020 to between 15 and 56 hours depending upon the scenario. Regional clearance time for the five county Withlacoochee region ranges from 18 hours to 39.5 hours in 2015. This time increases to between 19 and 56 hours in 2020.

Table VI-11 2015 Clearance Times for Base Scenario

	Evacuation Level A Base Scenario	Evacuation Level B Base Scenario	Evacuation Level C Base Scenario	Evacuation Level D Base Scenario	Evacuation Level E Base Scenario
Clearance Time to Shelter					
Citrus County	13.0	13.0	14.0	15.0	16.5
Hernando County	12.5	13.0	13.0	13.0	14.0
Levy County	13.0	13.0	13.0	13.0	13.0
Marion County	13.0	13.0	13.0	13.0	13.5
Sumter County	12.5	12.5	12.5	15.0	16.5
In-County Clearance Time					
Citrus County	14.0	17.0	23.0	28.0	30.0
Hernando County	12.5	16.0	22.5	23.5	25.5
Levy County	14.0	17.0	23.5	24.5	27.0
Marion County	13.5	13.5	13.5	13.5	26.0
Sumter County	13.0	13.0	13.0	15.5	17.0
Out of County Clearance Time					
Citrus County	21.0	24.0	31.5	33.0	35.0
Hernando County	15.0	17.5	24.0	25.0	27.0
Levy County	22.0	26.0	32.5	34.0	36.0
Marion County	21.5	25.0	32.0	33.5	35.5
Sumter County	17.5	23.5	31.5	33.0	34.5
Regional Clearance Time					
Withlacoochee	22.0	26.0	32.5	34.0	36.0

Table VI-12 2020 Clearance Times for Base Scenario

	Evacuation Level A Base Scenario	Evacuation Level B Base Scenario	Evacuation Level C Base Scenario	Evacuation Level D Base Scenario	Evacuation Level E Base Scenario
Clearance Time to Shelter					
Citrus County	13.0	13.0	13.5	16.0	16.5
Hernando County	12.5	13.0	13.0	13.5	14.5
Levy County	13.0	13.0	13.0	13.0	13.0
Marion County	13.0	13.0	13.5	13.5	13.5
Sumter County	12.5	12.5	12.5	14.5	16.5
In-County Clearance Time					
Citrus County	14.0	17.5	23.0	25.0	29.0
Hernando County	12.5	17.0	22.5	24.5	28.0
Levy County	14.0	17.5	23.0	25.0	29.5
Marion County	13.5	13.5	14.0	14.0	29.0
Sumter County	13.0	13.0	13.0	15.0	17.0
Out of County Clearance Time					
Citrus County	21.5	22.0	31.0	33.0	38.0
Hernando County	22.0	25.0	31.5	34.0	38.0
Levy County	15.0	18.5	24.0	26.0	29.5
Marion County	23.0	26.0	32.5	35.0	39.0
Sumter County	22.5	25.5	32.0	34.5	38.5
Regional Clearance Time					
Withlacoochee	23.0	26.0	32.5	35.0	39.0

Table VI-13 2015 Clearance Times for Operational Scenarios

	Evacuation Level A Operational Scenario	Evacuation Level B Operational Scenario	Evacuation Level C Operational Scenario	Evacuation Level D Operational Scenario	Evacuation Level E Operational Scenario
Clearance Time to Shelter					
Citrus County	10.5	22.5	11.0	22.5	26.5
Hernando County	7.5	15.5	8.0	21.0	26.5
Levy County	6.5	13.0	10.0	13.0	7.0
Marion County	14.0	16.0	15.5	15.5	10.0
Sumter County	14.5	17.5	19.0	19.0	10.0
In-County Clearance Time					
Citrus County	12.5	24.0	18.5	28.5	33.5
Hernando County	7.5	19.0	14.0	26.0	26.5
Levy County	13.0	24.5	19.5	27.5	34.5
Marion County	14.5	16.5	16.0	16.0	33.5
Sumter County	15.0	18.0	19.5	19.5	10.5
Out of County Clearance Time					
Citrus County	14.5	27.0	20.5	32.5	33.5
Hernando County	14.5	27.5	18.5	33.5	27.0
Levy County	16.5	29.5	24.5	36.5	34.5
Marion County	18.0	32.0	25.5	39.5	35.5
Sumter County	15.0	28.0	22.5	34.0	34.5
Regional Clearance Time					
Withlacoochee	18.0	32.0	25.5	39.5	35.5

Table VI-14 2020 Clearance Times for Operational Scenarios

	Evacuation Level A Operational Scenario	Evacuation Level B Operational Scenario	Evacuation Level C Operational Scenario	Evacuation Level D Operational Scenario	Evacuation Level E Operational Scenario
Clearance Time to Shelter					
Citrus County	13.5	13.5	14.0	21.5	27.5
Hernando County	8.0	9.0	11.5	32.0	49.5
Levy County	6.5	6.5	7.0	13.0	13.0
Marion County	14.5	16.5	16.5	22.0	21.5
Sumter County	12.5	16.5	17.0	28.5	27.0
In-County Clearance Time					
Citrus County	15.0	15.5	25.0	42.0	53.5
Hernando County	8.0	13.0	17.0	32.0	49.5
Levy County	15.5	16.0	27.5	42.5	54.0
Marion County	15.0	17.0	17.0	22.5	53.5
Sumter County	13.0	17.0	17.5	29.0	27.5
Out of County Clearance Time					
Citrus County	17.0	17.0	27.0	43.5	55.0
Hernando County	15.0	17.0	23.5	40.5	53.5
Levy County	18.0	20.0	28.0	44.0	54.5
Marion County	19.0	20.0	28.0	46.5	56.0
Sumter County	15.5	18.0	26.5	44.0	55.0
Regional Clearance Time					
Withlacoochee	19.0	20.0	28.0	46.5	56.0

K. Maximum Evacuating Population Clearances

From an emergency management standpoint, it is important to get an understanding of the maximum proportion of the evacuating population that can be expected to evacuate at various time intervals during an evacuation. Should storm conditions change during an evacuation, emergency managers will need to be able to estimate what portion of the evacuating population is estimated to still remain within the county trying to evacuate.

Using the base scenarios, which assume 100% of the vulnerable population is evacuating, along with shadow evacuations and evacuations from adjacent counties, an estimate was made of the evacuating population actually able to evacuate out of each county by the time intervals of 12, 18, 24, and 36 hours. The estimated maximum evacuating population by time interval for 2015 is identified in **Table VI-15** and for 2020 in **Table VI-16**.

It is important to note that these estimates take into account many variables, including roadway capacity, in-county evacuating trips, out of county evacuating trips, evacuating trips from other counties, and background traffic that is impeding the evacuation trips. For this reason, the

maximum evacuation population by time interval will vary slightly between evacuation level and either increase or decrease from one evacuation level to the next.

L. Sensitivity Analysis

As discussed previously, there are literally thousands of possible combinations of variables that can be applied using the evacuation transportation model, which will result in thousands of possible outcomes. As part of the analysis process, a sensitivity analysis was conducted using the prototype model to evaluate the effect of different response curves on the calculated evacuation clearance times. Calculated clearance times will never be lower than the designated response time, since some evacuating residents will wait to evacuate until near the end of the response time window. For example, using a 12-hour response curve in the analysis means that all residents will begin their evacuation process within 12-hours, and some residents will choose to wait and begin evacuating more than 11.5 hours from when the evacuation was ordered. This will generate a clearance time of more than 12 hours.

The sensitivity analysis identified that clearance times will vary by scenario and by any of the numerous parameters that can be chosen in a particular scenario model run (demographics, student population, tourist population, different counties that are evacuating, response curve, phasing, shadow evacuations, etc.). A few general rules of thumb did emerge from the sensitivity analysis that can provide some guidance to the region regarding the sensitivity of the response curve to the calculated clearance times:

- For low evacuation levels A and B, clearance time will vary by as much as 40 percent depending on the response curve. Low evacuation levels A and B have fewer evacuating vehicles that can be accommodated more easily on the transportation network. In most cases, clearance times typically exceed the response curve by one to two hours. Thus, a 12 hour response curve may yield a clearance time of 13 or 14 hours while an 18 hour response curve may yield a clearance time of 19 or 20 hours. This leads to a higher level of variability than larger evacuations;

Table VI-15 Maximum Evacuating Population by Time Interval for 2015

	Evacuation Level A	Evacuation Level B	Evacuation Level C	Evacuation Level D	Evacuation Level E
Estimated Evacuating Population Clearing Citrus County					
12-Hour	42,016	34,137	27,593	30,909	32,564
18-Hour	61,273	51,205	41,389	46,364	48,846
24-Hour		66,851	55,186	61,818	65,128
36-Hour			72,431	85,000	93,622
Estimated Evacuating Population Clearing Hernando County					
12-Hour	26,910	24,293	22,911	33,931	39,093
18-Hour	40,365	36,440	34,367	50,896	58,639
24-Hour	47,092	48,586	45,822	67,861	78,186
36-Hour			60,142	93,309	114,021
Estimated Evacuating Population Clearing Levy County					
12-Hour	18,993	16,849	13,001	13,570	14,008
18-Hour	23,741	24,572	19,502	20,354	21,013
24-Hour			26,002	27,139	28,017
36-Hour				28,270	31,519
Estimated Evacuating Population Clearing Marion County					
12-Hour	60,782	57,673	51,132	53,649	50,669
18-Hour	91,173	86,509	76,698	80,474	76,003
24-Hour	111,434	115,346	102,264	107,298	101,337
36-Hour		124,958	138,482	152,006	152,006
Estimated Evacuating Population Clearing Sumter County					
12-Hour	16,530	16,211	14,223	15,074	15,629
18-Hour	24,796	24,316	21,334	22,611	23,444
24-Hour	29,617	32,421	28,445	30,148	31,258
36-Hour		33,772	37,927	42,081	46,236

Note: These estimates take into account many variables, including roadway capacity, in-county evacuating trips, out of county evacuating trips, evacuating trips from other counties, and background traffic that is impeding the evacuation trips. For this reason, the maximum evacuation population by time interval will vary between evacuation level and either increase or decrease from one evacuation level to the next.

Table VI-16 Maximum Evacuating Population by Time Interval for 2020

	Evacuation Level A	Evacuation Level B	Evacuation Level C	Evacuation Level D	Evacuation Level E
Estimated Evacuating Population Clearing Citrus County					
12-Hour	36,680	39,103	30,067	33,143	31,701
18-Hour	55,021	58,654	45,100	49,715	47,552
24-Hour	65,719	71,688	60,134	66,287	63,403
36-Hour			77,673	91,144	100,388
Estimated Evacuating Population Clearing Hernando County					
12-Hour	28,331	25,713	25,262	36,307	39,680
18-Hour	42,496	52,120	37,893	54,461	59,520
24-Hour	51,940	49,447	50,524	72,615	79,360
36-Hour		53,568	66,313	102,871	125,653
Estimated Evacuating Population Clearing Levy County					
12-Hour	20,165	16,918	13,802	13,854	13,615
18-Hour	25,206	25,377	20,703	20,780	20,422
24-Hour		26,082	27,604	27,707	27,229
36-Hour				30,016	33,469
Estimated Evacuating Population Clearing Marion County					
12-Hour	63,886	63,375	56,188	57,271	51,397
18-Hour	95,829	95,062	84,282	85,906	77,095
24-Hour	122,448	126,750	112,376	114,542	102,794
36-Hour		137,312	152,176	167,040	167,040
Estimated Evacuating Population Clearing Sumter County					
12-Hour	18,842	18,956	16,963	17,457	17,187
18-Hour	28,262	28,434	25,445	26,186	25,781
24-Hour	35,328	37,912	33,926	34,914	34,375
36-Hour		40,282	45,235	50,189	55,143

Note: These estimates take into account many variables, including roadway capacity, in-county evacuating trips, out of county evacuating trips, evacuating trips from other counties, and background traffic that is impeding the evacuation trips. For this reason, the maximum evacuation population by time interval will vary between evacuation level and either increase or decrease from one evacuation level to the next.

- For mid-level evacuations such as C and sometimes D, clearance time varied by as much as 25 percent during the sensitivity analysis. The number of evacuating vehicles is considerably higher than for levels A and B, and lower response curves tend to load the transportation network faster than longer response curves. The variability in clearance times is less in these cases than for low evacuation levels; and,

- For high-level evacuations such as some level D evacuations and all E evacuations, clearance time variability is reduced to about 10 to 15 percent. Large evacuations involve large numbers of evacuating vehicles, and the sensitivity test identified that clearance times are not as dependent on the response curve as lower level evacuations since it takes a significant amount of time to evacuate a large number of vehicles.

The counties within the Withlacoochee Region are encouraged to test additional scenarios beyond what has been provided in this study. Each model run will provide additional information for the region to use in determining when to order an evacuation. Due to advancements in computer technology and the nature of the developed transportation evacuation methodology, this study includes a more detailed and time consuming analysis process than used in previous years studies. Counties interested in testing various response curves for each scenario can easily do so using the TIME interface to calculate clearance times for different response curves.

M. Summary and Conclusions

Through a review of the results of the 20 different scenarios (10 base and 10 operational), several conclusions could be reached regarding the transportation analysis, including the following:

- Critical transportation facilities within the WRPC region include I-75, US 19, US 301, and portions of SR 200 and US 41. For large storm events, such as level D and E evacuations, other State facilities also play an important role in evacuations;

- During the level A and B evacuation scenarios, the roadway segments with the highest vehicle queues are primarily concentrated along the major Interstate and State Highway system. During these levels of evacuation, State and County officials should coordinate personnel resources to provide sufficient traffic control at interchanges and major intersections along these routes;

- In contrast, for the higher level C, D, and E evacuation scenarios, many other roadway facilities, both within and outside of the region, will require personnel resources for sufficient traffic control at interchanges and major intersections;

- The WRPC counties, in coordination with the State, should continue public information campaigns to clearly define those that are vulnerable and should evacuate verses those who choose to evacuate on their own. During large storm events, evacuations by the vulnerable population are impacted by shadow evacuations occurring in other parts of the region;

- WRPC counties play a major role even when evacuations occur in other parts of the State, especially with Tampa Bay area storm events. For example, for the 2020 operational scenarios for level D and level E which include a major Tampa Bay region evacuation, total evacuating vehicles along I-75 in Sumter County totaled to around 81,000 vehicles. WRPC counties should continue their coordination efforts with the State and provide assistance even when WRPC counties are not evacuating;

- The Florida Department of Transportation should continue to work with local counties on implementing intelligent transportation system (ITS) technology, which will provide enhanced monitoring and notification systems to provide evacuating traffic with up to date information regarding expected travel times and alternate routes;

- The State can use the data and information provided in this report (specifically the

evacuating vehicle maps in Volume 5-5) to estimate fuel and supply requirements along major evacuation routes to aid motorists during the evacuation process;

- For major evacuation routes that have signalized traffic control at major intersections, traffic signal timing patterns should be adjusted during the evacuation process to provide maximum green time for evacuating vehicles in the predominate north and west directions; and,

- The counties within the Withlacoochee Region are encouraged to test additional transportation scenarios beyond what has been provided in this study. Each model run will provide additional information for the region to use in planning for an evacuation. Counties interested in testing various response curves for each scenario can easily do so using the TIME interface to calculate clearance times for different evacuation conditions, such as different evacuation levels, different behavioral response assumptions, and different response curves.