THE TAMPA BAY CATASTROPHIC PLAN

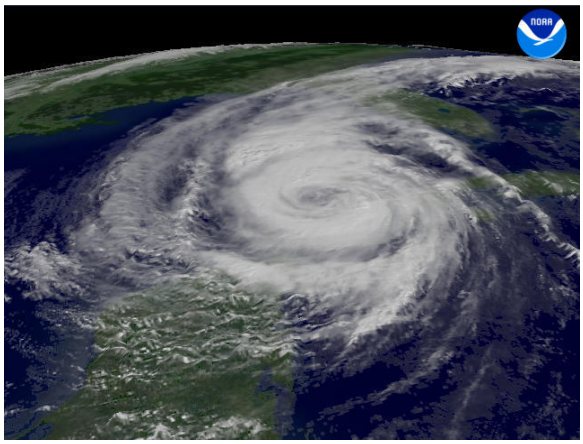
SCENARIO INFORMATION AND CONSEQUENCE REPORT

WWW.TAMPABAYCATPLAN.ORG

Produced by the Tampa Bay Regional Planning Council - January 2010

THIS PAGE INTENTIONALLY LEFT BLANK

1.0 SCENARIO INFORMATION FOR CATASTROPHIC PLAN DEVELOPMENT



1.1 Introduction

The Tampa Bay Regional Planning Council, along with our partners from government, business, and social services communities, is developing a plan to identify and address the multitude of issues that would arise should a catastrophic event occur in the Tampa Bay area. For this plan, the Tampa Bay area is defined as the following counties:

- Citrus
- Hardee
- Hernando
- Hillsborough
- Manatee
- Pasco
- Pinellas
- Polk
- Sumter

Hurricane Phoenix is a fictitious storm created to simulate the effects of a worst-case scenario. With input from Tampa Bay area emergency management agencies and the local office of the National Weather Service (NWS), a simulated storm was developed with a track and intensity that would devastate the entire Tampa Bay region. The NWS generated National Hurricane Center advisories, local hurricane statements, and data files that simulate the hurricane's location and intensity from its formation in the Caribbean Sea, through landfall in Pinellas County, to the hurricane's exit from the east coast of Florida into the Atlantic Ocean. The maps and information presented in this packet are based upon the data files developed for this simulated storm.

The simulated parameters of Hurricane Phoenix were input into HAZUS-MH, the risk assessment tool that uses the Federal Emergency Management Agency (FEMA) standard methodology to measure the effects of real and simulated hazard events like hurricane winds and flooding. As one might expect, a storm of the size and strength of Hurricane Phoenix would create almost unthinkable damage to the area's homes, businesses, infrastructure, overall economy, and social systems that are currently in place. The goal of this planning process is to develop strategies that will help the Tampa Bay region to recover and rebuild after such a devastating catastrophe.

1.2 Scenario Timeline for Hurricane Phoenix

October 7 – A tropical depression forms west of the Lesser Antilles, moving generally westward.

October 9 – The depression reaches tropical storm strength…named Tropical Storm Phoenix.

October 10 – Phoenix reaches hurricane intensity south of Jamaica…forecast to strengthen slightly as it moves generally west and west-northwest into the Yucatan Straits. The storm is forecast to be over open water in the central Gulf of Mexico in 5 days. The entire eastern Gulf coast from New Orleans to the Florida Keys is on the edge of the 5-day error cone (Forecast Map 1). Forecasters, as well as the public, have a wait-and-see attitude for a "minor" hurricane that hasn't yet set its sights on particular location for landfall in the U.S.

October 12 – The Tampa Bay region's hurricane preparation kicks into high gear as the forecast track turns more to the east with each National Hurricane Center (NHC) forecast/advisory.

October 13 – Hurricane Phoenix approaches the Yucatan Straits as a Category 2 storm. A Hurricane Watch is posted for a large stretch of the west central coast of Florida with the 11 am NHC advisory. The forecast track shows a recurving of the storm back to the north-northeast after it enters the Gulf of Mexico (Forecast Map 2). Phoenix is forecast to be Cat 5 storm approaching the west coast of Florida in two days. Tampa Bay is now at the center of the bull's-eye for the hurricane's forecast landfall.

October 14 – A Hurricane Warning replaces the Watch, starting with the 5 am NHC advisory. Phoenix has brushed the western tip of Cuba, and is moving north-northeast into the open waters of the Gulf of Mexico (Forecast Map 3). Sustained winds have reached 120 mph. Wind and waves gradually increase as the day progresses. Tropical-storm force winds reach coastal sections of Manatee and Pinellas Counties just before midnight, and spread inland through the wee hours of the morning of the 15th.

October 15 - Morning:
At daybreak, Phoenix is a strong Category 4 hurricane with 150 mph sustained winds. The center of the storm is just over 100 miles southwest of Saint Pete Beach, moving toward the Tampa Bay area. Hurricane-force winds reach the coast around 8 am. Seas start the day a foot or two above the normal tide level, but rise 5-10 feet by mid-morning.

October 15 - Midday:

Phoenix continues to intensify through the morning. By 11 am, sustained winds reach 160 mph as the wall of the 45-mile wide eye enters the mouth of Tampa Bay (Forecast Map 4). The center of the eye makes landfall at Indian Rocks Beach just before noon.

Afternoon:

Storm surge of 11-16 feet above normal tide levels has completely overtopped barrier islands from Longboat Key to Clearwater Beach. The storm continues to push a massive volume of water into Tampa Bay, and by early afternoon surge levels climb to at least 20 feet above normal at St. Petersburg, 23 feet at Oldsmar, 24 feet at Apollo Beach, and 26 feet above the normal tide level near Downtown Tampa. Storm surge pushes water from the bay up the Hillsborough, Alafia, Lower Manatee, Braden, and Manatee Rivers and the Tampa Bypass Canal, flooding areas well inland.

All three bridges that traverse Tampa Bay and the Courtney Campbell Causeway sustain either structural damage or have their approaches washed away by water and waves. For a time on the afternoon of the 15th, the parts of central St. Petersburg and mid-Pinellas County that are not inundated by storm surge become two islands, each surrounded by water on all sides.

The intense winds of Phoenix damage or destroy numerous buildings that are not inundated by storm surge flooding. Homes and businesses are flattened along a wide swath many miles inland following the hurricane's path. Structural damage is caused by wind alone, windborne debris, or trees that fall onto building roofs. Most windows are blown out of high-rise structures.

Evening:

The hurricane holds a steady course to the northeast as it decimates the entire Tampa Bay area. The storm weakens slowly after landfall. By 5 pm, the center of Phoenix is located in eastern Hernando County. Sustained winds are still 130 mph. Hurricane-force winds continue in Tampa until around 7 pm. That's around 10 straight hours of sustained winds greater than 74 mph.

Phoenix accelerates to the northeast during the evening, exiting the east coast of Florida around midnight at St. Augustine. The storm has maintained hurricane strength throughout its track across the entire width of the Florida peninsula. Sustained winds are 105 mph as Phoenix enters the Atlantic.

October 16 – Search-and-rescue operation begin as soon as winds abate, with massive amounts of debris and roadway damage making ground-based travel nearly impossible and severely hampering attempts at recovery. Casualties are numerous. Survivors that

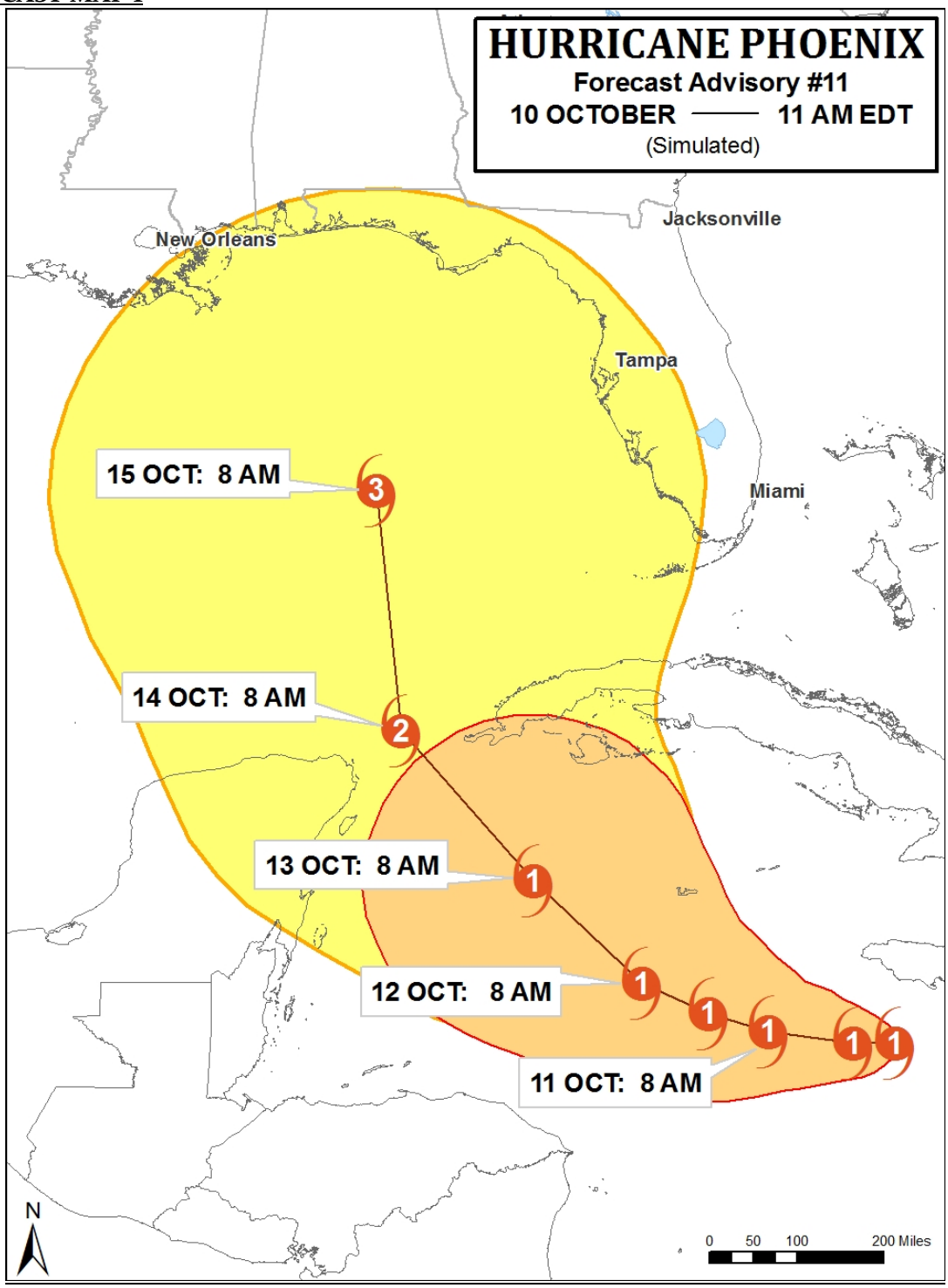
are uninjured are dazed, some in shock at the amount of devastation that has occurred.

Oct. 17-18 – Search-and-rescue operations continue. Some outside help/resources begins to trickle into the region, but damage to the transportation infrastructure, and the fact that the storm cut a swatch across the entire state, slow the influx of recovery personnel and supplies into the area. Most hospitals have sustained damage, and are overwhelmed by number of injured. Essential services are mostly non-existent. Civil unrest is possible as human needs (water, food, shelter) are scarce, local law enforcement resources have been damaged/destroyed, and outside resources are stymied by massive amounts of storm debris and damage to transportation infrastructure.

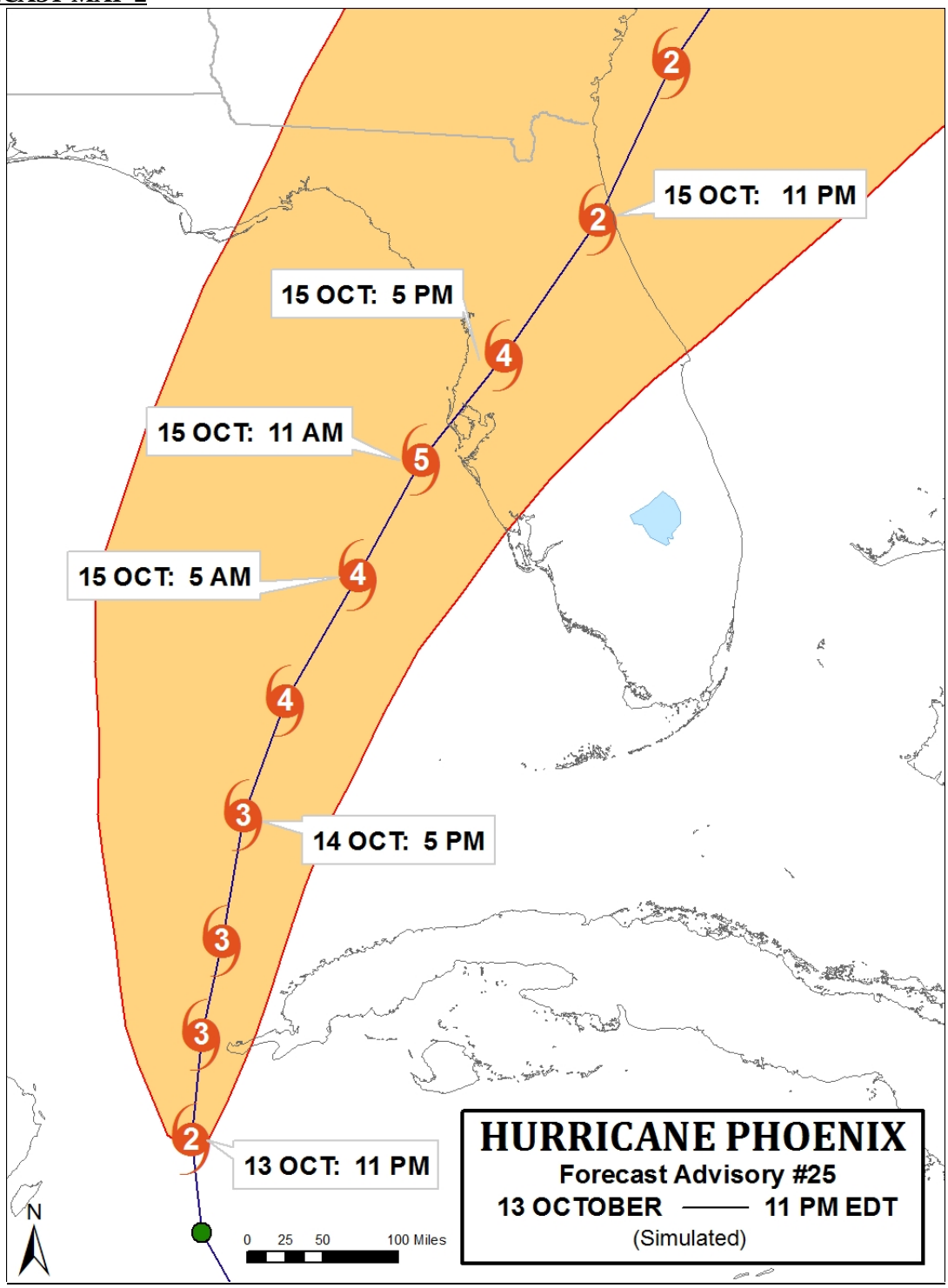
Oct. 19-31 – Search-and-rescue operations are completed. Post-storm evacuation to host communities begins for survivors whose homes or neighborhoods were destroyed. Recovery personnel and supplies flow into the region more rapidly as temporary repairs to transportation infrastructure are performed. Where possible, emergency repairs are made to structures to make them suitable for habitation. Post-disaster damage assessment begins.

Going forward – Infrastructure needs are prioritized and repairs are made. Repair and reconstruction of homes and businesses move forward. The region's economy, which has taken a tremendous blow immediately after the storm, begins to grow as post-disaster construction and other recovery industries begin to flourish. Demographics of the region possibly change as some of displaced population does not return, and others are drawn to the area by construction and other recovery jobs.

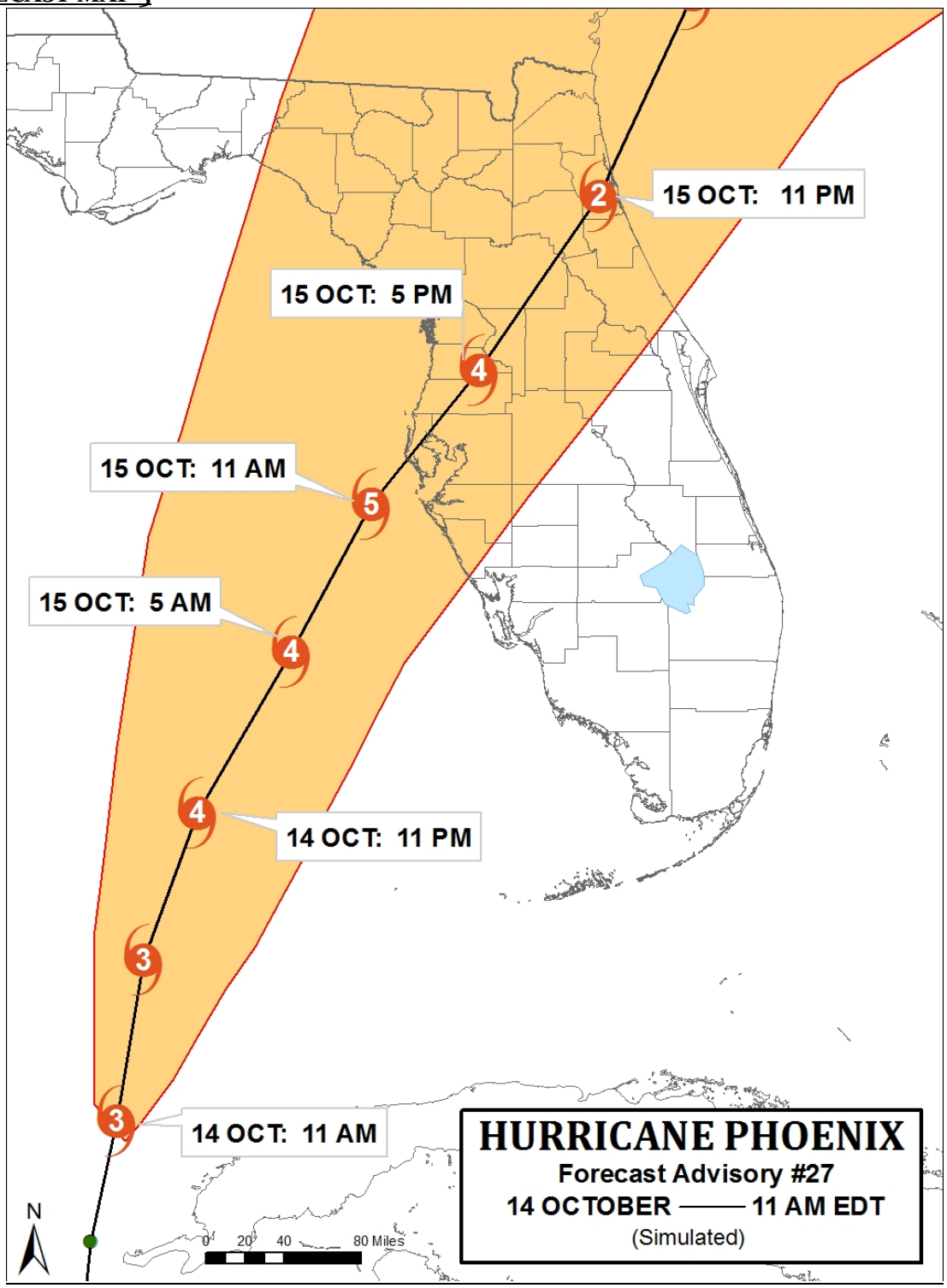
FORECAST MAP 1



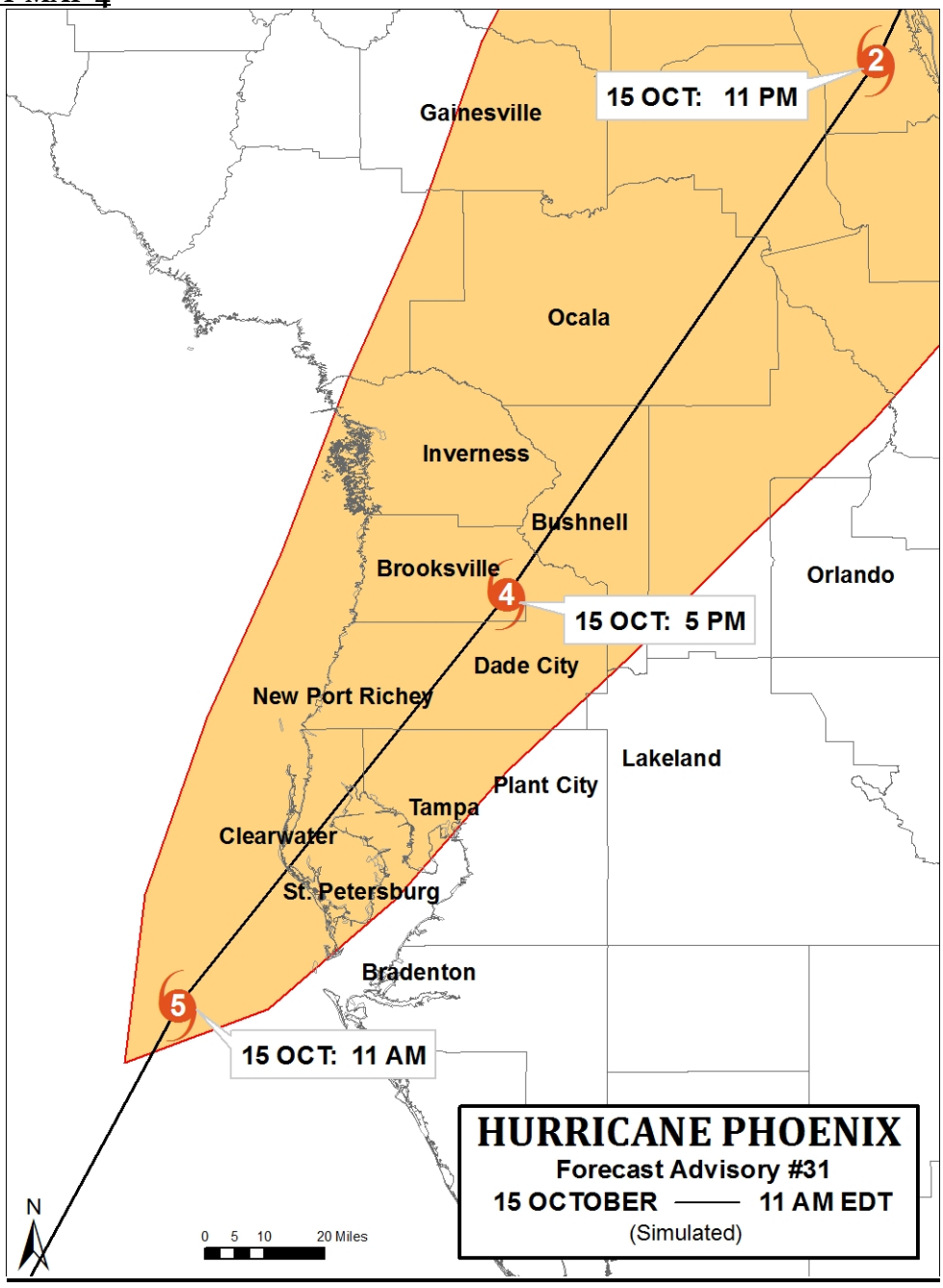
FORECAST MAP 2



FORECAST MAP 3



FORECAST MAP 4



2.0 DAMAGE SCENARIO DEVELOPMENT

The Catastrophic Scenario was developed by combining some of the more prevalent models for hurricanes. HAZUS-MH is a standardized loss estimation methodology developed by the Federal Emergency Management Agency (FEMA) and the National Institute of Building Sciences (NIBS)[1]. The methodology is built upon an integrated GIS platform (see **Figure 2**) to conduct analysis at an aggregate level (i.e., not on a structure-by-structure basis). The HAZUS-MH risk assessment methodology is parametric, in that distinct hazard and inventory parameters (e.g., flood depths and building types) were modeled using the HAZUS-MH software to determine the impact of the coastal flood and severe winds on the built environment.[2]

In order to leverage recently collected topographic data and impacts from a single event, a custom SLOSH (Sea, Lake, and Overland Surge from Hurricanes) model run was created. The results of this model were imported as an input to Hazus®MH MR4 Flood (Coastal) Module. Hazus®MH MR4 (released August 2009) was used to model the coastal flood hazard at the county level based on the hypothetical storm scenario. [3]

SLOSH (Sea, Lake and Overland Surges from Hurricanes) is a computerized model run by the National Hurricane Center (NHC) to estimate storm surge heights and winds resulting from historical, hypothetical, or predicted hurricanes by taking into account pressure, size, forward speed, track, and winds. Graphical output from the model displays color coded storm surge heights (See **Figure 3**) for a particular area in feet above the model's reference level, the National Geodetic Vertical Datum (NGVD), which is the elevation reference for most maps.

The calculations are applied to a specific locale's shoreline, incorporating the unique bay and river configurations, water depths, bridges, roads and other physical features. If the model is being used to estimate storm surge from a predicted hurricane (as opposed to a hypothetical one), forecast data must be put in the model every 6 hours over a 72-hour period and updated as new forecasts become available.

---

[1] Loss estimates produced by software models such as HAZUS-MH are to be used with a certain degree of caution. Uncertainty within these types of results can be introduced from a number of sources, including the use of national datasets to represent local conditions, simplifications within the model introduced to allow the model to have flexibility with Level 1 users, and errors introduced as part of the mathematical processing within the software code. As a planning tool however, the consistency and value of the results developed by HAZUS-MH cannot be understated.

[2] These products represent a hypothetical scenario intended to encourage discussion for the Tampa Bay Catastrophic Planning Project. Consequence projections are derived from the scenario using scientific methods based on research. They will continue to be updated and refined as new information from the Catastrophic Planning effort becomes available and specific planning needs are defined.

[3] This study represents a Level 2 HAZUS analysis in that it utilizes user-supplied flood depth grids. The effective date of the user-supplied SLOSH data is September 2009.

FIGURE 1. CONCEPTUAL MODEL OF HAZUS-MH METHODOLOGY

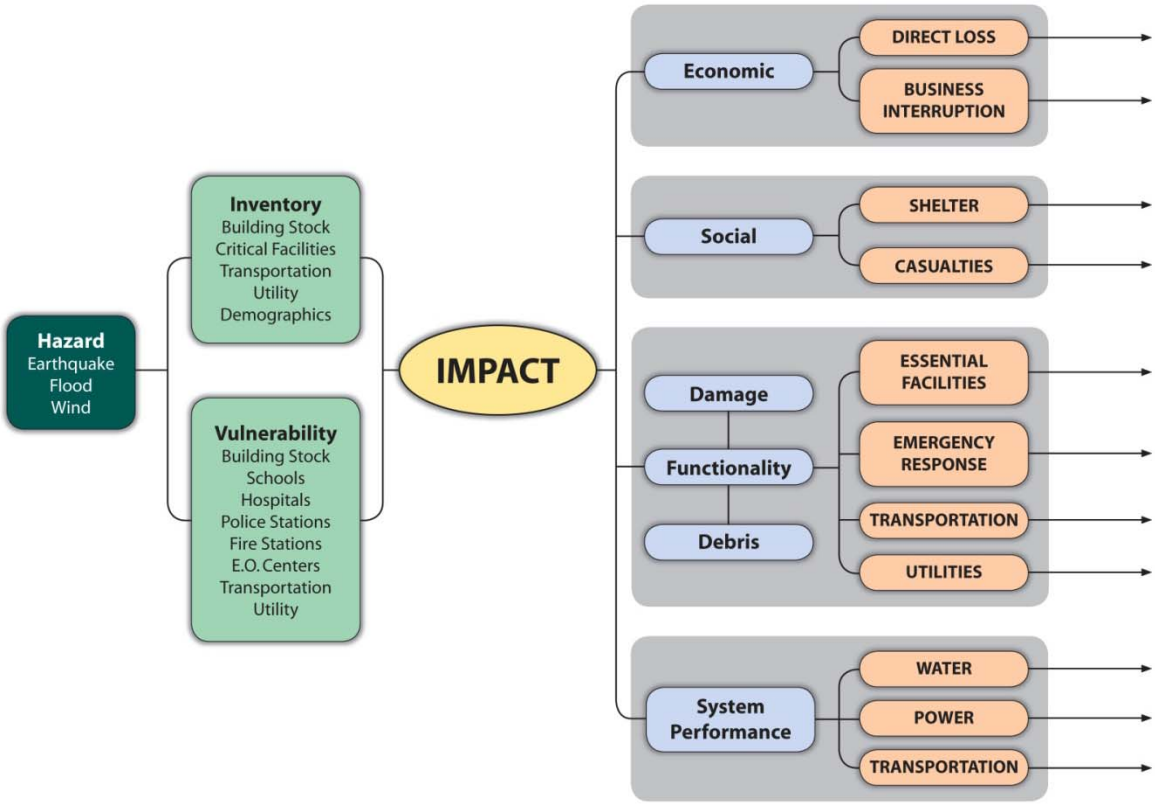
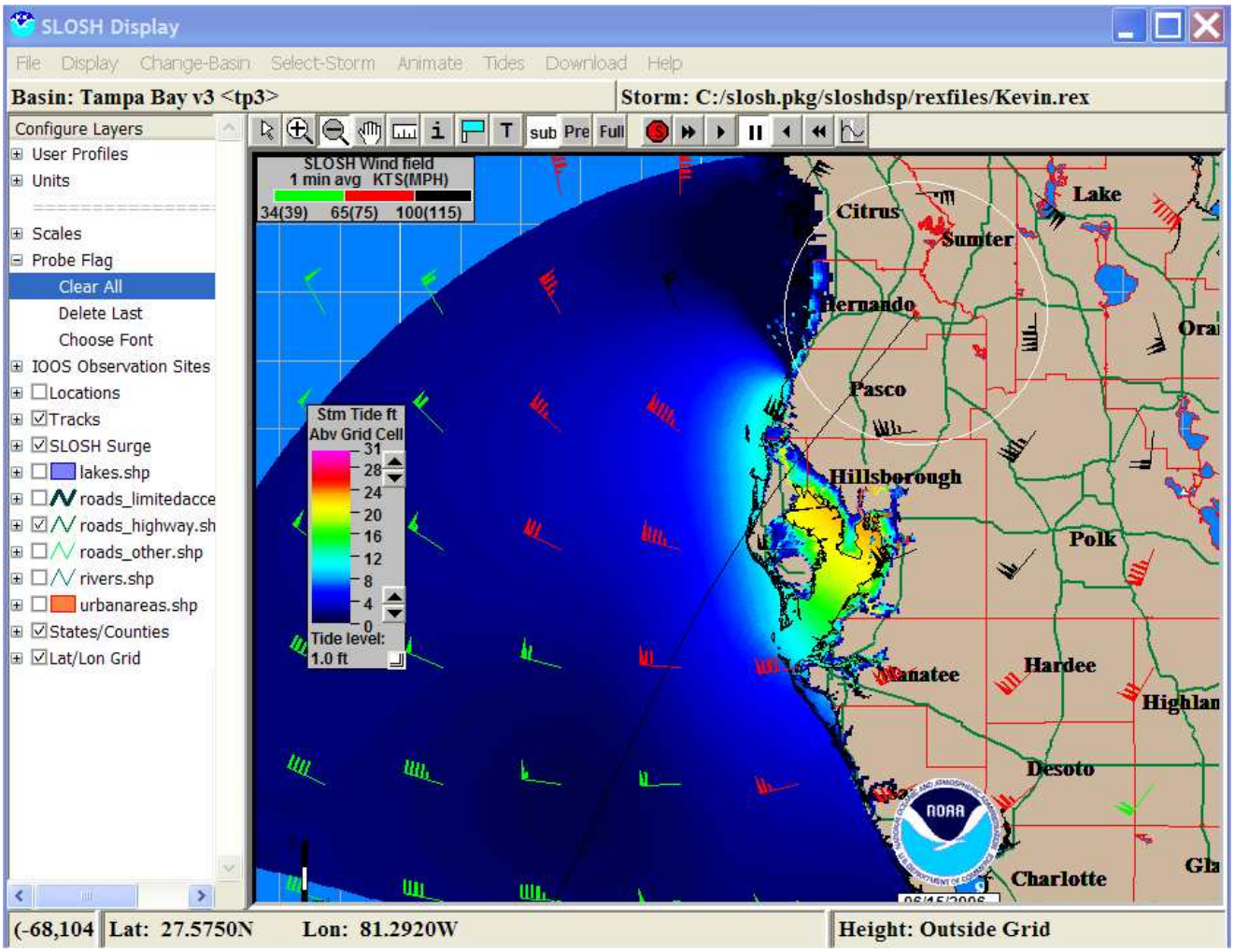


FIGURE 2. SAMPLE FRAME FROM CATATSTROPHIC STORM ANIMATION WITHIN SLOSH DISPLAY



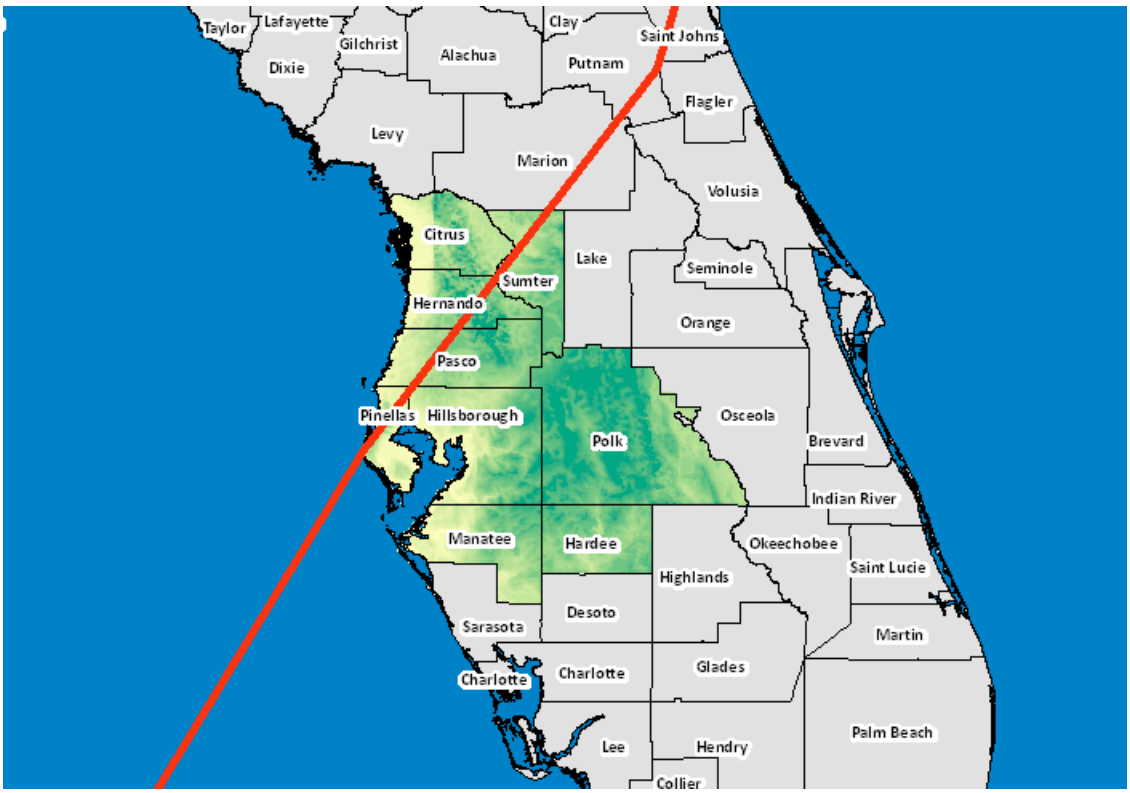
While the HAZUS-MH flood model is generally based on depth damage functions, the hurricane wind model within HAZUS is based on a hazard-load-resistance-loss methodology. Per the *HAZUS-MH MR4 Technical Manual for the Multi-hazard Loss Estimation Methodology for the Hurricane Model,* "the approach is based on a hazard-load-resistance-damage-loss methodology developed from an individual risk framework. The basic model components (hazard model, load model, resistance models, etc.) are developed separately. Each model component is, wherever possible, separately validated using full scale data, model scale data, or experimental data. A major factor driving the use of a first principles-based hazard-load-resistance-loss model, rather than the simple wind speed dependent loss models traditionally used, is the ability for the approach to be extended to model the effects of code changes and mitigation strategies on reduction in damage and loss. Furthermore, since economic damage (loss) is modeled separately from physical damage to a building, estimates of both building damage and loss are separately modeled and predicted".

HAZUS-MH MR4 uses Census 2000 for demographic data; Census 2000 and Dun & Bradstreet 2006 for general building stock inventory; 2006 RS Means for building valuation; and 2006 Dun and Bradstreet for commercial data. Other details and supporting documentation regarding the sources and treatment of the default datasets used in this analysis are available in the *HAZUS-MH MR4 Technical Manuals for the Multi-hazard Loss Estimation Methodology for the Flood Model and for the Hurricane Model* available on www.fema.gov.

3.0 CONSEQUENCES ANALYSIS

The goal of this scenario was to estimate the direct physical damages, social impacts, and direct economic losses that could result from the storm surge and wind of this catastrophic hurricane using recently developed user-supplied SLOSH data. For the purposes of this study, direct physical damages consist of estimated impacts to the county's general building stock (i.e., residential, commercial, industrial, and agricultural buildings), essential facilities (i.e., schools, fire stations, police stations, medical care facilities, and emergency operations centers as applicable), and agricultural products. Social impacts consist of estimated shelter requirements (in terms of households and individual persons displaced by the event). Economic losses consist of direct economic impacts (not indirect losses).

FIGURE 3. REGIONAL MAP WITH PATH OF STORM



The hazard impacts depicted in this report intend to show regional estimates of consequences from surge and wind as generated from the HAZUS-MH Model. It is important to note that uncertainties are inherent in any loss estimation methodology, arising in part from incomplete scientific knowledge concerning natural hazards and their effects on the built environment. Uncertainties also result from approximations and simplifications that are necessary for a comprehensive analysis (such as abbreviated inventories, demographics, or economic parameters).

Figure 4 provides a graphical representation of the multi-county study region created and maximum flood depths created from the modeled catastrophic event. The multi-county region was composed of Citrus, Hardee, Hernando, Hillsborough, Manatee, Pasco, Pinellas, Polk, and Sumter counties. The counties of Hardee, Polk, and Sumter did not have storm surge analyses performed for them and thus their HAZUS' estimates of impacts are strictly from the wind model. Although modeling of inland flooding was not a part of this project, traditional areas of flooding such as lowlands, and FEMA 100- and 500-year flood hazard areas should also be considered when planning for catastrophic events.

As mentioned earlier in this report, the HAZUS wind model was also run to estimate regional impacts from the modeled event. The storm path and expected wind gusts are depicted in **Figure 5** and is intended to mimic Hurricane Katrina's intensity prior to landfall when the storm was still identified as a Category 5. The radius to maximum winds was made to vary between 25 and 40 miles in order to create ideal conditions for the modeled storm to push maximum water into Tampa Bay. The minimum central pressure was set to 918 mBars. The estimated impacts to the population and built environment are provided throughout the rest of this document.

FIGURE 4. REGION MAP WITH STORM SURGE FLOOD DEPTHS

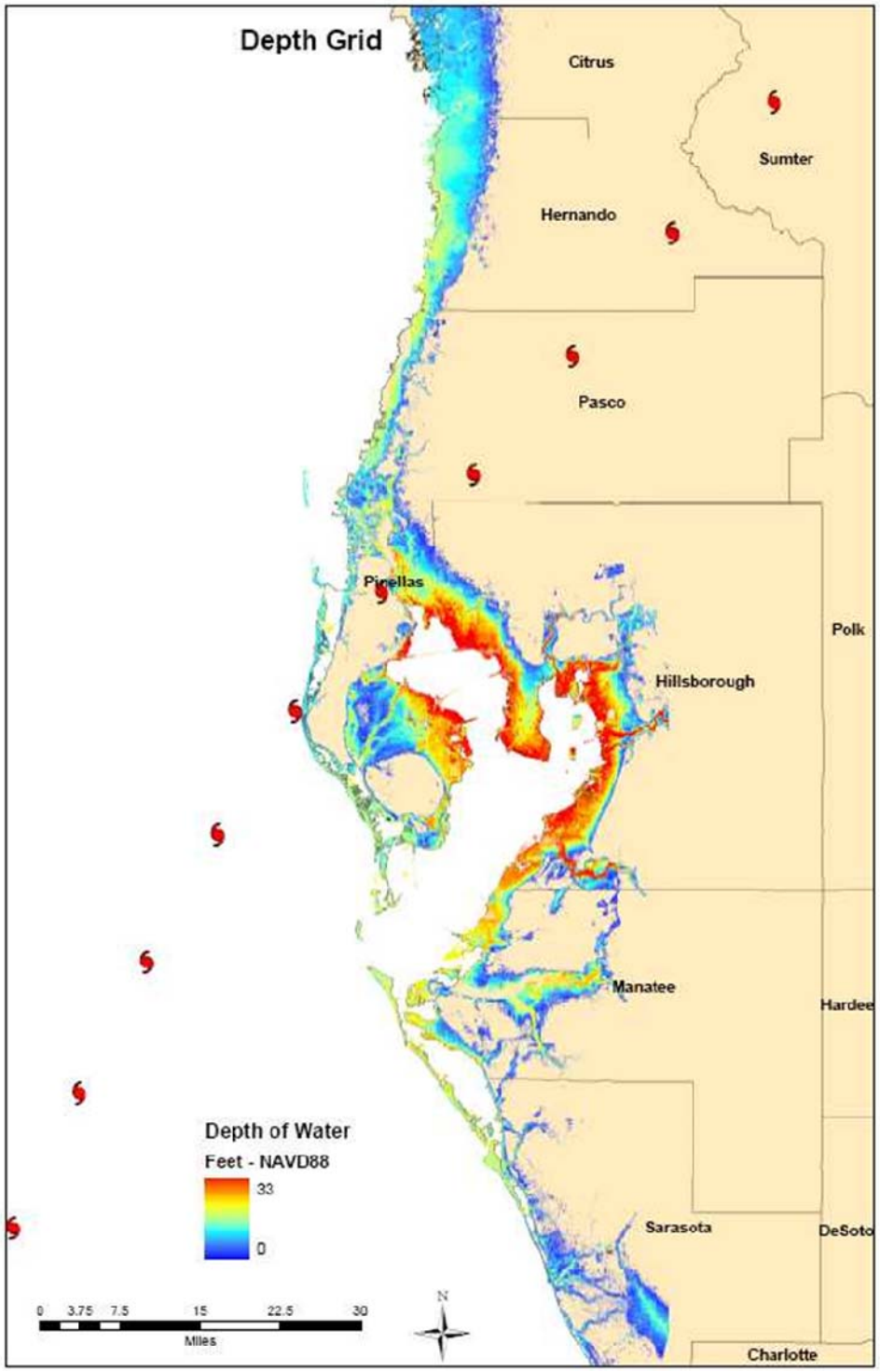
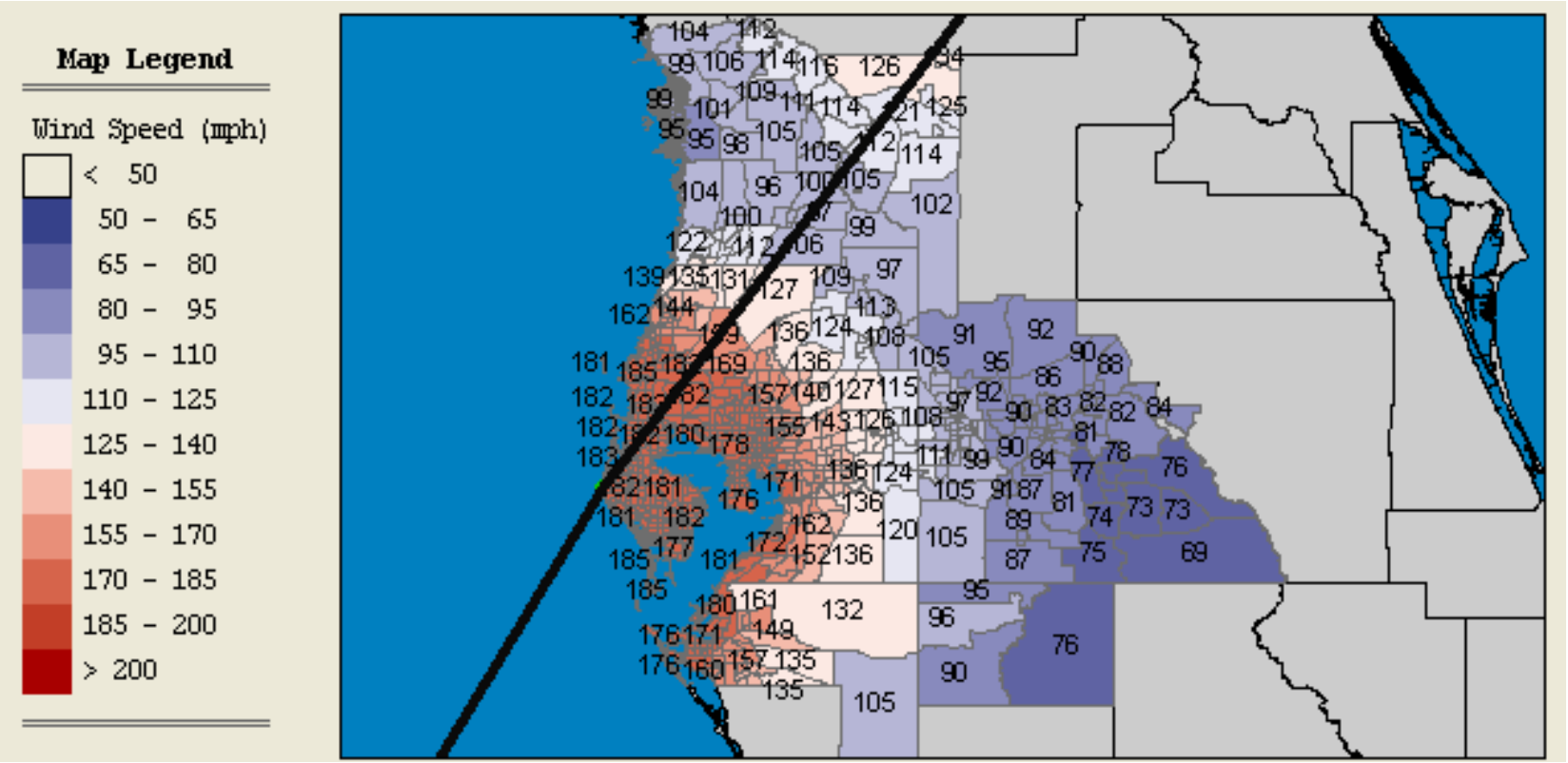


FIGURE 5. REGION MAP WITH PATH OF STORM AND MAXIMUM WINDS (1-Second Gusts)



4.0 DIRECT PHYSICAL DAMAGES

4.1 Wind Damage

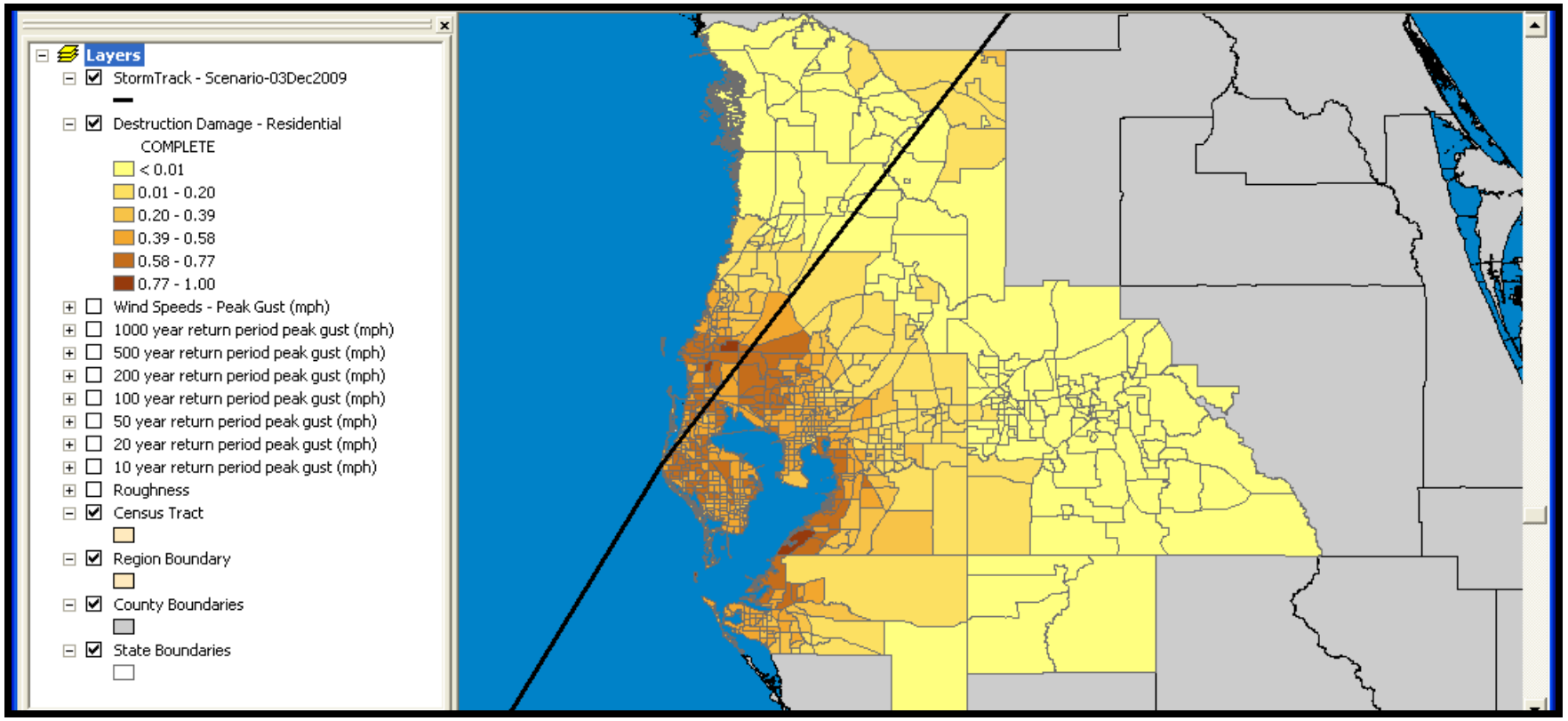
The analysis conducted to determine direct physical damages to the general building stock was performed at the census tract level (outputs aggregated to the county level) and focuses on residential, commercial, industrial, and agricultural building occupancy types as defined by HAZUS-MH. **Table 1** shows damage probabilities for these selected occupancy types for the modeled, coastal event.

TABLE 1.
DAMAGED BUILDING COUNTS FROM WIND BY OCCUPANCY TYPE

Occupancy Type	Total in 9-County Region	Number of Buildings in Each Damage Percentage Range					Total Damaged Per Type
		None	Minor	Moderate	Severe	Destruction	
Residential	1,438,227	360,345	121,365	165,169	320,831	470,528	**1,077,882**
Commercial	85,481	17,378	4,936	9,369	43,724	10,074	**68,103**
Industrial	24,577	5,403	1,453	2,335	13,748	1,638	**19,174**
Other	17,642	4,411	1,356	1,953	7,916	1,995	**13,231**
TOTAL BUILDINGS	**1,565,927**	**387,537**	**129,110**	**178,826**	**386,219**	**484,235**	**1,178,390**

Figure 6 shows the distribution of those areas estimated to be completely destroyed by providing percentages of complete destruction by census tract for residential structures.

FIGURE 6: RESIDENTIAL DAMAGE
(PERCENTAGE OF COMPLETE DAMAGE DESTRUCTION PER CENSUS TRACT)



4.2 Storm Surge Damage

The analysis conducted to determine direct physical damages to the general building stock was performed at the census tract level (outputs aggregated to the county level) and focuses on residential, commercial, industrial, and agricultural building occupancy types as defined by HAZUS-MH. **Table 2** shows damage levels (minor, moderate, major) by county for the modeled, coastal event.

Figure 4 shows the depths of inundation from storm surge in the coastal counties and indicates those areas estimated to be significantly impacted.

TABLE 2
NUMBER OF BUILDINGS BY STORM SURGE DAMAGE CATEGORY

Counties	Total Structures	Number With Minor Damage	Number With Moderate Damage	Number with Severe Damage or Destroyed	Number With More Than Minor Damage
Citrus	71,711	1	3,012	1,301	4,313
Hernando	69,266	0	1,480	398	1,878
Hillsborough	405,461	67	42,678	38,252	80,930
Manatee	132,349	19	19,470	9,271	28,741
Pasco	183,387	7	11,653	6,626	18,279
Pinellas	425,113	70	85,265	36,979	122,244
Total	**1,287,287**	**164**	**163,558**	**92,827**	**256,385**

4.3 Combined Damage (Storm Surge and Wind)

TABLE 3 COMBINED DAMAGE
The following table summarizes the combined damage from wind and storm surge flooding.

Counties	Pre-Storm Building Stock Value (Millions of $)	Total Structural Damage from Wind (Millions of $)	Percent of Pre-Storm Building Stock Value Loss from Wind	Total Structural Damage from Storm Surge (Millions of $)	Percent of Pre-Storm Building Stock Value Loss from Storm Surge	Total Combined Structural Damage (Millions of $)	Total Combined Percent of Pre-Storm Building Stock Value Loss
Citrus	7,808	168	2.2%	278	3.6%	440	5.6%
Hardee	1,231	7	0.1%	0	0.0%	7	0.1%
Hernando	8,637	367	4.2%	132	1.5%	494	5.7%
Hillsborough	78,949	48,276	61.1%	10,893	13.8%	52,508	66.5%
Manatee	20,681	12,900	62.4%	2,620	12.7%	13,886	67.1%
Pasco	23,006	10,715	46.6%	1,789	7.8%	11,671	50.7%
Pinellas	70,489	54,287	77.0%	12,824	18.2%	57,235	81.2%
Polk	32,084	313	1.0%	0	0.0%	313	1.0%
Sumter	2,931	527	18.0%	0	0.0%	527	18.0%
Total	**244,585**	**127,553**	**52.2%**	**28,536**	**11.7%**	**141,207**	**57.7%**

5.0 DAMAGE TO ESSENTIAL FACILITIES

The analysis conducted for essential facilities focuses on schools, fire stations, police stations, medical care facilities, and emergency operations centers (EOCs), as identified by HAZUS-MH default inventories. It is important to note that default essential facilities data in the current version of HAZUS-MH may not be complete and represents best readily available data for use with this scenario.

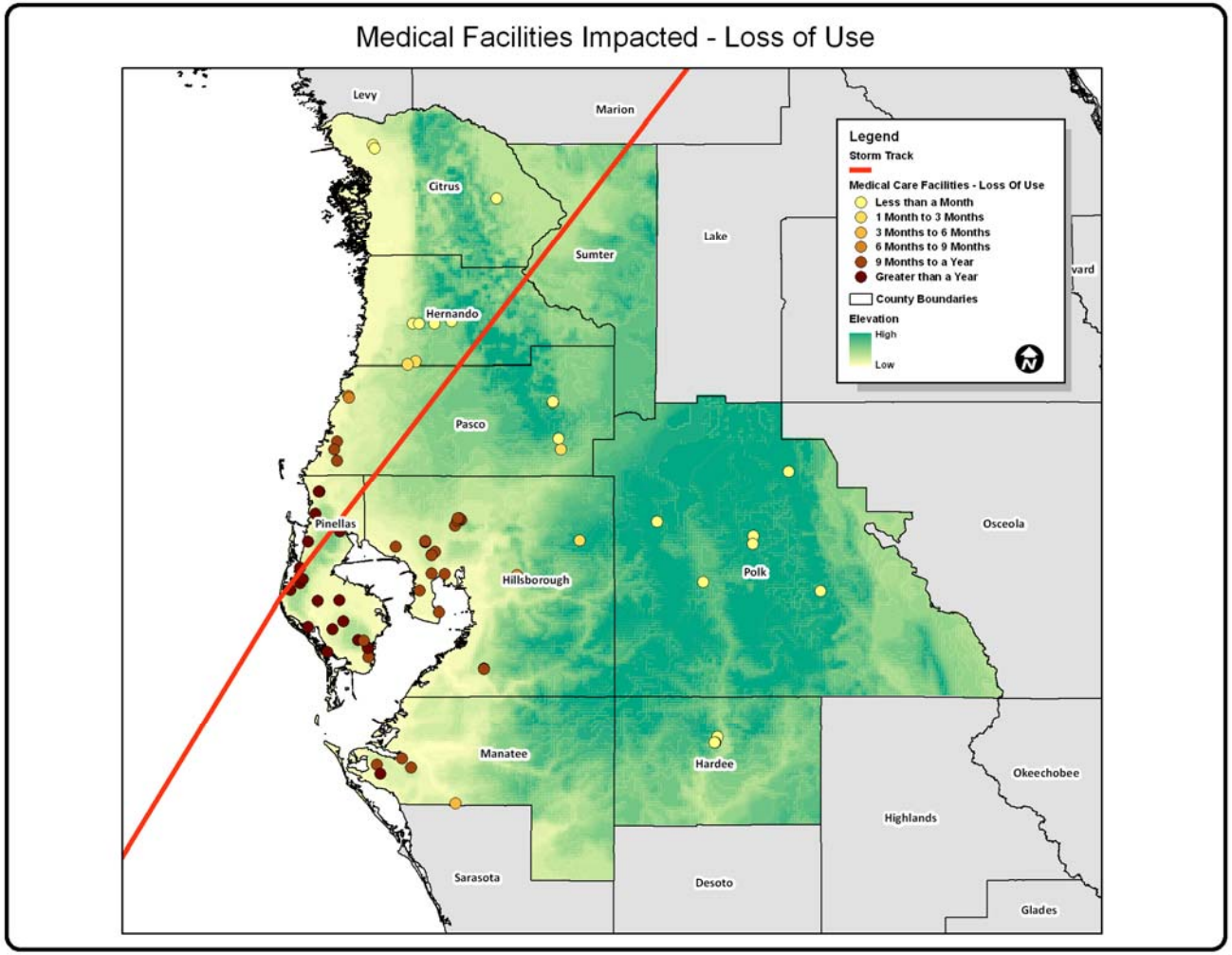
Tables 4 and 5 show expected damage from wind to essential facilities in terms of the capacity. For each essential facility type (with the exception of hospitals which HAZUS calculates bed availability in days after the event), HAZUS will estimate the percentage of facilities functional.

Figure 8 provides an illustration of expected recovery for the hospital/medical sector in terms of loss of use (days).

TABLE 4. EXPECTED DAMAGE TO ESSENTIAL FACILITIES FROM WIND

Type of Facility	Total Number of Facilities	Percentage of Facilities Functional Within the Region
EOC	13	31%
Fire Station	356	13%
Hospital/Medical	80	See **Table 3** Below
Police Station	220	14%
School	1,026	10%
TOTAL FACILITIES	**1,695**	**Varies per Type**

FIGURE 8. DAMAGE TO HOSPITALS/MEDICAL FACILITIES



5.0 DEBRIS CALCULATIONS

Debris calculations were performed using the HAZUS regional database.

TABLE 5 DEBRIS SUMMARY REPORT
All values are in tons.

County	Brick, Wood and Other	Reinf. Concrete and Steel	Eligible Tree Debris	Total
Citrus	40,162	808	75,263	116,233
Hardee	1,550	8	7,388	8,946
Hernando	85,74	8 5,085	66,003	156,836
Hillsborough	11,271,935	1,399,417	894,284	13,565,636
Manatee	3,785,148	568,359	190,620	4,544,127
Pasco	3,272,094	472,985	298,409	4,043,488
Pinellas	15,529,750	2,161,617	737,575	18,428,942
Polk	64,127	958	90,387	155,472
Sumter	138,833	16,398	40,685	195,916
Total	**34,189,347**	**4,625,635**	**2,400,613**	**41,215,595**

Note: The U.S. Army Corps of Engineers estimates that Hurricane Andrew generated approximately 15 million cubic yards of debris and Hurricane Katrina generated more than 118 million cubic yards.

6.0 CRITICAL INFRASTRUCTURE

6.1 Transportation Facilities

- Interstate 75 (I-75), Interstate 275 (I-275), and Interstate 4 (I-4) are expected to be the primary routes used to transport goods and people into and out of the affected zone during a response and recovery effort within the nine-county West Central Florida area.

- Interstates and major highways generally have a wide right-of-way and trees about 50–100 feet away from the shoulders, so most of the debris on these roads would consist of poles, signs, and small vegetative debris.

- According to Florida Department of Transportation (FDOT) engineers, non-interstate/turnpike evacuation routes in the nine-county area are generally at-grade with the surrounding ground. As such, routes shown on maps depicting flooding due to storm surge can generally be assumed to be flooded if the adjacent land is inundated.

- Interstates are the Florida Department of Transportation's top priority for debris clearance; FDOT plans to reopen major roads within 8–24 hours after the hurricane has passed, provided all bridges are operating at full or near capacity.

- Significant impacts on the region's bridges - especially the approaches - are expected on all causeways including the Courtney Campbell Causeway, Howard Frankland Bridge, Gandy Bridge and the Skyway Bridge.

- Bridges and roads subject to additional flooding due to the storm will have to be inspected before reopening. This is of particular concern on the three causeways connecting Hillsborough and Pinellas County, the bridges connecting the barrier island communities as well as those connecting downtown with Harbor Island, Davis Island and the 22nd St. Bridge providing access to the Port of Tampa. Bridges over the Manatee River in Manatee and the Pithlachascotee River in Pasco will also require engineering survey.

- FDOT could impose a vehicle weight restriction or use a temporary bridge if the bridges are damaged. FDOT typically has 10,000 linear feet of such bridges available in non-emergency times.

6.1.1 Other Transportation Notes

- Runaway barges and other large debris could be a threat to bridges during the storm, particularly those spanning the Intracoastal Waterway. Two moveable bridges over the

Intracoastal Waterway were damaged in this way during Hurricane Wilma. As a result, these bridges had to be closed to motor-vehicle traffic.

- Train services in areas along the Atlantic coast may not be available because of debris on the railways.

- The Florida Department of Transportation's goal is to open (with at least one lane available for emergency vehicles) all State roads to traffic one day after the hurricane has passed.

- Hurricane Phoenix will destroy traffic control devices (lights, signs), resulting in dangerous uncontrolled intersections post-landfall.

- Many of the buses and other public transit vehicles left in the storm's path will be destroyed and unavailable post-landfall.

6.1.2 Ports

Florida's sea- and airports are essential resources for providing goods and services to residents and critical economic engines that generate millions of dollars and thousands of jobs for local communities. The state contains two of the top twenty importing and four of the top twenty exporting seaports in the United States, and Tampa International Airport is one of the busiest in the world. As a result, ports will likely be vital to response and recovery efforts following a catastrophic hurricane in Tampa Bay.

6.1.2.1 Airports: Profiles

The Tampa International Airport serves 21 passenger air carriers and nine cargo-only airlines. It manages over 18 million passengers per year and 108,000 tons of cargo, including 12,000 tons of mail per year. The estimated replacement cost of the airport's land and facilities is $2.3 billion.41

The St. Petersburg-Clearwater International Airport is located 10 miles east of Tampa International and serves as a charter destination for several air carriers, including a few from Canada. The airport provides over 3,000 jobs and contributes an economic benefit of $400 million annually to the Tampa Bay area.

TABLE 6 HURRICANE PHOENIX IMPACTS ON MAJOR AIRPORTS

Major Airports	Storm Category of Maximum Sustained Wind	Storm Surge Flooding Depth (ft) (Flooding over land)
Tampa International	5/181	South end of Runway 36L is 15 ft deep, terminal building is 7 ft, NE corner of property is dry
St. Petersburg/Clearwater	5/180	NW end of Runway 22 is 17 feet, terminal is 10 ft
Sarasota Manatee Airport	5/160	Dry

6.1.2.2 Seaports: Profiles

The Port of Tampa is the largest of the Florida ports, as measured by tonnage, and handles approximately 50 million tons of cargo per year. The Tampa Bay region is the largest metropolitan market in Florida, and it is the 10th largest consumer market in the U.S., with nearly 7 million people within 100 miles of the port. The port contributes to the creation of 96,000 jobs in the region and generates a regional annual economic impact of nearly $8 billion. Tampa is also the closest full service U.S. port to the Panama Canal.

Port Manatee is among Florida's largest deepwater seaports. The port oversees over 9.3 million tons of shipping, and is Fresh Del Monte Produce's second largest U.S. port facility, used for importing Central American fruit and exporting fruit from Florida. It is also the southeast's leading forestry product import facility.

TABLE 7 HURRICANE PHOENIX IMPACTS ON MAJOR PORTS

	Storm Category of Maximum Sustained Wind/ Peak Wind Gust	Storm Surge Flooding Depth (ft)
Port of Tampa	5/ 180	12 to 26 ft . . . Port Authority bldg is 17 ft.
Port Manatee	5 / 170	6-12 feet

Note: Ports Preparation

As with airplanes and airports, many ships leave seaports prior to the arrival of a hurricane. The Port of Tampa, for example, mandates that any ship larger than 500 gross tons be out of port by twenty-four hours prior to the onset of hurricane-force winds (confirm). All potential flying debris or sources of contamination should be removed from dockside areas. The Coast Guard is responsible for establishing "Safety Zones" around the port to prevent ships entering unsafe conditions as well as to prevent unlawful salvage or looting following the storm.

6.2 Electricity Infrastructure

6.2.1 Generation Capacity

The local power plants in the nine-county areas are located along the coast in areas vulnerable to storm surge. All facilities would have been impacted by the sustained 160-180 mph winds. Therefore; it is assumed all local generation operations would be suspended until the damage is assessed and repairs could be made. Once the distribution systems start coming back online, most generation would be purchased from outside of the affected region.

6.2.2 Residential Impacts

- Weatherheads, which connect homes to the electrical lines, are often damaged and need to be repaired by an electrician.
- Approximately 5,000 weatherheads were damaged following Hurricane Wilma. This figure could easily exceed 50,000 for a storm like Phoenix.
- Electricians would be required from outside of the state to handle the demand after this type of emergency.
- Electrical repairs normally need county inspection before reconnection, but this requirement is sometimes waived.

6.2.3 Transmission Infrastructure

- Distribution facility damage throughout the nine counties would be extensive.

TABLE 8
NUMBER OF CUSTOMERS WITHOUT POWER

County	Number of Customers (Residential and Commercial)	Total Structures Affected	Initial Power Outage	Number of Customers W/O Power 3-7 days	Number of Customers w/o Power 7-15 days	Number of Customers w/o Power 15-30 days	Number of Customers w/o Power 30-60 days[4]
Citrus	71,714	18,996	75%	18,996	4,382	5606	154
Hardee	10,968	822	10%	822	109	8	3
Hernando	69,266	25,278	98%	25,278	8,397	1,960	526
Hillsborough	405,461	388,798	90%	388,798	356,095	287,859	151,185
Manatee	132,349	129,637	20%	129,637	121,930	99,887	54,459
Pasco	183,387	150,589	98%	150,589	126,109	93,305	50,738
Pinellas	425,113	424,291	100%	424,291	418,725	382,165	224,994
Polk	240,300	25,079	30%	25,079	4,720	548	208
Sumter	27,373	14,906	99%	14,906	8,817	4,164	1,971
Regional Total	**1,565,931**	**1,178,393**		**1,178,393**	**1,049,284**	**870,456**	**484,238**

- Customers are approximately 88% residential, 11% commercial, and 1% industrial.

- Effect on Casualties:
  - Electrocution by downed power lines
  - Asphyxiation due to improper use of portable generators

6.2.4 Recovery Time

- Recovery time will be affected by the amount of outside assistance that Florida Power & Light can get from other utilities. Tampa Electric & Florida Progress will also likely be seeking assistance. Utilities along the Gulf Coast may need assistance (or be hesitant to give up their own crews) due to damage there as well.

[4] Housing severely damaged. Can not accept power.

- Order of Repairs:
    1. Feeder circuits serving critical infrastructure facilities (hospitals, 911 centers, Police/fire stations) would be restored first.
    2. Remaining feeder circuits would then be restored.
    3. Neighborhood restoration would then take place, ultimately resulting in individual service wires to each impacted home being repaired.

Note: In Hurricanes Charley, Frances, Jeanne, and Katrina, approximately 75–80% of South Florida customers were restored by Day 3, with all South Florida customers receiving full power within 8–13 days. For Wilma, approximately 40% were restored by Day 3, and approximately 60% by Day 5. All power was restored within 18 days. However, recovery time for Phoenix would likely be much longer than in these storms, lasting for weeks or months. Repairs to infrastructure or homes in inundated areas could not occur until the floodwaters have subsided.

6.2.5 *Nuclear Power Plant Recovery*

Nuclear Regulatory Commission (NRC) policy states that any nuclear power plant that will be affected by hurricane force winds must be shut down. Restart requires NRC permission that involves the following:

- Inspecting the power plant for damage
- Inspecting local infrastructure for its capability to support nuclear power output
- Inspecting the surrounding 10-mile radius for alert and evacuation capabilities

Note: Hurricane Andrew hit Turkey Point in 1992. The onsite damage included loss of all offsite power for more than five days, complete loss of communication systems, closing of the access road, and damage to the fire protection and security systems and warehouse facilities. However, onsite damage was limited to fire protection, security, and several non-safety-related systems and structures. There was no damage to the safety-related systems and no radioactive release to the environment. The units remained in stable condition and functioned as designed.

6.2.6 *Effects of Damage on Utility Employees*

Florida Power & Light, TECO Energy, and Progress Energy have measures in place to minimize the effect that damage to employees' homes will have on the recovery process. "Ramp up" of the repair process may be a little slower due to evacuation of some employees. Experiences with damage from recent storms, like Wilma, may make this effect stronger than it has been in the past.

6.3 Telecommunications

6.3.1 *Landline Telephone Service*

Loss of landline telephone service and jammed circuits will reduce the ability of residents to call for help or information.

6.3.2 Cell Phone Infrastructure

- Power outage will cause isolation and degradation.
  - Cell phone sites that operate on battery backup will lose power in about eight hours.
  - Sites with generator power will have power for several days as long as they are not flooded.
- The cell phone structure will be barely operational because of wind damage to microwave units and some flooding damage. Microwave units may be ripped off or be out of alignment.
- The cell phone system may be isolated from the cell phone infrastructure outside of the hurricane impact area.
- Individual geographical sections of the system will be isolated from each other so that customers will only be able to reach other customers within the same area.
- Floodwaters can damage circuits and replacements, and drown generator units.
- Repairs cannot be made in areas where water remains. The areas where water recedes will be eligible for immediate repairs and replacements.
- Because landline phone service will be limited, remnants of the cell phone system will be overloaded.

6.3.3 Television

- Most broadcast stations have at least one generator. For the most part, these stations have been able to continue broadcasting without interruption during past hurricanes.
- In three recent cases, stations switched to 24-hour weather coverage and did not broadcast with closed captioning, which is against FCC regulations.
- Most stations feel that a Category 5 strike could damage their antennae, and few or none have backup or portable antennae.
- Power loss would interrupt broadcasts of cable television and limit the ability of viewers to operate their televisions.

6.4 Water and Waste Water Systems

- Approximately 30% of water treatment facilities are located in the storm surge zone.
- Storm surge will inundate extant water systems, including wells and water mains, causing breakage and contamination. Loss of electricity will prevent water and sewage pumping in much of the Tampa Bay Area.
- All water for human and pet use will require boiling. Public health authorities will have to coordinate public notification of boil water notices. Considerable gastrointestinal illness may be observed if contaminated water is consumed.

- Potable water production and distribution may be affected by the dike break, but also by commercial power outages, if generator power does not exist or is insufficient.

7.0 SOCIAL IMPACTS

7.1 Displaced Households

The analysis conducted to determine shelter requirements estimates that 840,000 households will be displaced due to the modeled storm. (Displacement includes households evacuated from within or very near to the impacted area and may not be a direct reflection of residential building damage within a particular census block.) Assuming a regional average of 2.32 persons per household, more than 58% of the individual persons within the region would be impacted (out of a total population of 3.3 million people). Approximately 220,000 of those would seek temporary shelter in public shelter facilities (see **Table 9**).

TABLE 9: ESTIMATED SOCIAL IMPACTS

9-County Region	Population	Number of Households or Persons in Each Category		
		Households Displaced[5]	Individual Persons Displaced	Short Term Shelter (# People)
Citrus	118,055	287	666	75
Hardee	26,938	6	14	2
Hernando	130,802	951	2,206	244
Hillsborough	998,948	289,941	672,663	77,013
Manatee	264,002	88,228	204,689	22,573
Pasco	344,765	77,221	179,153	20,291
Pinellas	921,482	383,213	889,054	98,666
Polk	483,924	459	1,065	122
Sumter	53,345	3,088	7,164	725
Total	**3,342,261**	843,394	1,956,674	219,711

[5] The term, "Displaced household" refers to a dwelling that has been damaged to the extent that it becomes uninhabitable. This is not a permanent displacement, but one that would take weeks/months to rebuild the house back to habitability. The reason for the calculation is the type of shelter needed (i.e. short term, long term) and number of spaces needed at the shelter. Evacuated populations refers to those people leaving during the hurricane/flood/earthquake event, but able to return to their homes afterwards.

7.2 Animal Issues

- Between 60–70% of U.S. households have pets. The majority of pet owners consider their pets to be family members, feeling the same sense of responsibility for their safety as they do any other family member.
- Survey results from 2004 storms showed that 50–60% of residents in the affected area had pets and 30–40% said pets affected their evacuation decision.
- The *Pet Evacuation Transportation Standards Act of 2006* requires that State and local governments include household pets in emergency evacuation plans. The act authorizes the use of funds to "procure, construct, or renovate emergency shelter facilities and materials that will temporarily accommodate people with pets and service animals," as well as provide "rescue, care, shelter, and essential needs…to such pets and animals."

TABLE 10: ESTIMATED NUMBER OF PETS

9-County Region	Displaced Households	Estimated Number of Pets in Displaced Households			
		Households with Cats	Total Cats	Households with Dogs	Total Dogs
Citrus	287	98	234	112	190
Hardee	6	2	5	2	4
Hernando	951	323	776	371	631
Hillsborough	289,941	98,580	236,592	113,077	192,231
Manatee	88,228	29,998	71,994	34,409	58,495
Pasco	77,221	26,255	63,012	30,116	51,198
Pinellas	383,213	130,292	312,702	149,453	254,070
Polk	459	156	375	179	304
Sumter	3,088	1,050	2,520	1,204	2,047
Total	843,394	286,754	688,210	328,924	559,170

8.0 VOLUNTEER AND DONATIONS MANAGEMENT

Types of Volunteers

- Affiliated: Trained first responders (e.g., Red Cross, Salvation Army, United Way, Faith-based, etc.)
- Unaffiliated: Untrained volunteers who arrive hoping to help
    - Often require shelter and food

Past Volunteer Figures

2004 Hurricane Season:

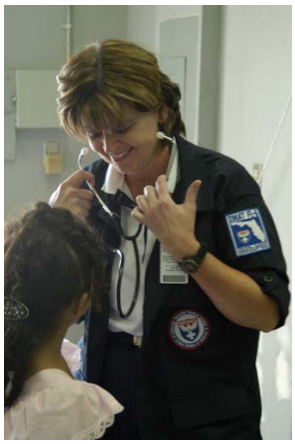
- Volunteer Florida handled 120,000 volunteers overall (both affiliated and unaffiliated)
- The American Red Cross:
    - Overall: 35,000 volunteers
    - Charley: 1,400 volunteers
    - Frances: 4,100 volunteers and staff
    - The American Red Cross had 1,900 initial volunteers and staff and 250 vehicles for Katrina.

Past Donations

- Katrina, Rita, and Wilma: Over $2 billion
    - Relief organizations received more clothing than they could manage.
    - September 11, 2001 terrorist attacks: $2.2 billion

Other Issues

- Wilma caused $6.5 million in losses to Florida nonprofits, with at least 100 nonprofits affected



9.0 MEDICAL ISSUES

9.1 Casualties [6]

The number of casualties was estimated based on the following assumptions:

- Non-evacuation of certain portions of the population-at-risk in storm surge vulnerable evacuation zones and mobile homes. Based on the 2006 behavioral surveys, up to 30% of the vulnerable population would not evacuate even with the threat of a catastrophic hurricane.
- Approximately 10% of the population on the barrier islands has indicated that they feel safe in a major storm.
- Post-storm deaths
    - Common hurricane-related causes of death include: drowning, electrocution, crushing, head trauma, and natural causes exacerbated by the storm (storm stress-induced heart attack).
    - Improper use of portable generators has led to excess morbidity and mortality following hurricanes. During the period of power outages related to the four major Florida hurricanes in 2004, 167 persons were treated for accidental carbon monoxide poisoning as a result of improper use of portable generators. Six deaths were reported.
- Approximately 1,957,000 people will be affected by this catastrophic storm scenario. Of these residents, approximately 1,957 (.001) could loose their lives as a direct result of the storm (primarily due to non-evacuation of storm surge vulnerable areas and mobile homes). An additional 200 additional people (.0001) could loose their lives following the storm.

[6] Note: The number of directly attributable hurricane deaths from major hurricanes in the United States since 1989 ranges from a low of 5 for Hurricane Jeanne (2004, Category 3 at landfall in Florida) to a high of 1,817 for Hurricane Katrina (2005, Category 1 at landfall in Florida, Category 3 at landfall in Louisiana). The mean number of fatalities occurring in major storms since 1989 is 194.9; however, without Hurricane Katrina included, the mean number of deaths drops to 37.1.

TABLE 11: ESTIMATED CASUALTIES

9-County Region	Total Population	Number of Households or Persons in Each Category		
		Affected Population	Estimated Direct Casualties	Estimated Casualties Post-Storm
Citrus	118,055	666	**1**	0
Hardee	26,938	14	**0**	0
Hernando	130,802	2,206	**2**	0
Hillsborough	998,948	672,663	**673**	67
Manatee	264,002	204,689	**205**	20
Pasco	344,765	179,153	**179**	18
Pinellas	921,482	889,054	**889**	89
Polk	483,924	1,065	**1**	0
Sumter	53,345	7,164	**7**	1
Total	**3,342,261**	1,956,674	**1,957**	**196**

9.2 Injuries

- Injuries and illnesses observed in previous Florida hurricane events include blunt trauma, lacerations, muscle strains and pulls, insect and animal bites, puncture wounds, burns, infections, gastrointestinal illnesses, sunburns, exposure, psychosocial distress, and carbon monoxide exposure.

9.3 Additional Medical Topics

9.3.1 Environmental Health

- Storm surge can inundate extant water systems, including wells and water mains, causing breakage and contamination. Loss of electricity will prevent water and sewage pumping in much of Tampa Bay. All water for human and pet use will require boiling. Public health authorities will have to coordinate public notification of boil water notices. Excess gastrointestinal illnesses may be observed if contaminated water is consumed.

- While stressful and disturbing, the presence of corpses in floodwaters or in storm debris does not create a risk of infectious disease epidemics in flood- or storm-affected areas. However, according to the World Health Organization, should dead bodies enter the water supply there is a small risk of contamination that could lead to gastrointestinal

infections. Health officials must work with the media to educate the public on these issues.

9.3.2 Medical Records

- Loss of medical records resulting in patient treatment challenges is likely as a result of hurricane events.

9.3.4 Prescription Drugs

- Although access to traditional prescription drug outlets will be disrupted, access to prescription drugs will be provided by emergency response teams, mobile medical units, and private/voluntary organizations such as AmeriCares and others that focus on distributing prescription drugs and medical equipment following disasters.
- Drugs may have been lost in the event or left behind while evacuating. People will have difficulty refilling prescriptions and collecting the cost of replacing them from their insurance companies.
- Special needs patients on multiple medications may have difficulty recalling specific medications and doses. Lack of accessible medical records will make it difficult to look up medication information for patients. Medical intervention will be required to determine patients' prescription needs.

9.3.5 Mental Health

- Following all hurricane events, members of the affected population will experience some level of distress. While most people return to normal levels of psychological functioning, some will exhibit symptoms of Post Traumatic Stress Disorder, depression, or other illnesses. Psychosocial support will be one of the most lasting needs.

9.3.6 Health Insurance Portability and Accountability Act

- To facilitate patient treatment, Health Insurance Portability and Accountability Act elements will be suspended or modified as provided for within the act's policy. There may be confusion about what elements of the act must be maintained in an emergency.

9.3.7 Medical Licensing

- Planned and spontaneous medical volunteers, including doctors and nurses, will require reciprocal licensing. This will be an urgent need.

10.0 DIRECT ECONOMIC LOSSES

The analysis conducted to estimate direct economic losses includes (for the purposes of this study) direct damage to the building (contents and inventory losses are not factored into the analysis) for the residential, commercial, industrial, and agricultural occupancy types (see **Table 12**).

TABLE 12: BUILDING-RELATED ECONOMIC LOSS ESTIMATES
(Thousands Of Dollars)

Category	Area	Residential	Commercial	Industrial	Others	Total
Property Damage						
	Building	98,469,000	20,812,000	4,503,000	3,776,000	127,560,000
	Content	44,382,400	18,748,000	4,945,600	3,187,000	71,263,000
	Inventory	00	399,500	907,800	42,900	1,350,100
	Subtotal	142,851,400	39,959,500	10,356,400	7,005,900	200,173,100
Business Interruption loss						
	Income	230,300	4,243,900	85,900	57,900	4,618,100
	Relocation	11,555,700	3,217,500	228,100	704,500	15,706,000
	Rental	4,857,800	2,182,100	52,800	100,300	7,193,000
	Wage	542,400	4,445,100	142,900	230,000	5,360,400
	Subtotal	17,186,200	14,088,600	509,700	1,092,700	32877500
Total		**160,037,500**	**54,048,000**	**10,866,100**	**8,098,500**	**233,050,073**

TABLE 13: DIRECT ECONOMIC IMPACTS

Loss Type	Economic Loss ($ Millions)
Residential Buildings	$142,851
Commercial Buildings	$39,959
Other Buildings	$17,362
Business Interruption	$32,877
TOTAL FOR ALL LOSSES	**$233,050**

- Regional economic losses from damages to the Port of Tampa and Port Manatee are not directly factored in, but can be assumed to have major impacts with delays of commodities and supplies that will only aggravate an already tense economic and physical environment.

- Short- and long-term impacts to the environment (and indirectly tourism) are not factored in to the physical model but may be exercised during the catastrophic planning event.

11.0 SUMMARY

With close to $250 billion in expected economic losses (physical structure damage and loss of use for commercial entities), the modeled storm will create unprecedented challenges for the Tampa Bay Area. This catastrophic scenario will force the emergency managers, first responders, and other professionals from all levels of government, the private sector and the faith-based and volunteer agencies as well as our citizens to consider many recovery and post-disaster options that might not have been feasible before but may be a necessity to respond to this event. Short-term housing, public safety, insurance mechanisms, financial mechanisms for logistics and responders (among other items) will need to be addressed in order to help the communities recover.

APPENDIX A
SIMULATED PUBLIC ADVISORIES FOR HURRICANE PHOENIX

THIS PAGE INTENTIONALLY LEFT BLANK

APPENDIX A
SIMULATED PUBLIC ADVISORIES FOR HURRICANE PHOENIX

Simulated Public Advisory for Hurricane Phoenix

Created 10/27/2009 by NWS Ruskin
ALL INFORMATION AND DATA CREATED FOR SIMULATION PURPOSES

ZCZC MIATCPAT4 ALL
TTAA00 KNHC DDHHMM
BULLETIN
HURRICANE PHOENIX ADVISORY NUMBER 11
NWS TPC/NATIONAL HURRICANE CENTER MIAMI FL
11 AM EDT FRI OCT 10 2014

...PHOENIX BECOMES THE 9TH HURRICANE OF THE SEASON AS IT HEADS INTO THE WESTERN CARIBBEAN...

AT 11 AM EDT...THE GOVERNMENT OF THE CAYMAN ISLANDS HAS ISSUED A TROPICAL STORM WARNING AND A HURRICANE WATCH FOR ALL OF THE CAYMAN ISLANDS.

A TROPICAL STORM WARNING REMIANS IN EFFECT FOR JAMAICA.

A TROPICAL STORM WARNING MEANS THAT TROPICAL STORM CONDITIONS ARE EXPECTED WITHIN THE WARNING AREA WITHIN THE NEXT 24 HOURS. A HURRICANE WATCH MEANS THAT HURRICANE CONDITIONS ARE POSSIBLE WITHIN THE WATCH AREA...GENERALLY WITHIN 36 HOURS.

AT 11 AM EDT...1500Z...THE CENTER OF HURRICANE PHOENIX WAS LOCATED NEAR LATITUDE 16.8 NORTH... LONGITUDE 77.8 WEST OR ABOUT 90 MILES... 145 KM... SOUTHWEST OF KINGSTON JAMAICA.

PHOENIX WAS MOVING TOWARD THE WEST NEAR 7 MPH ...11 KM/HR. PHOENIX IS EXPECTED TO CONTINUE TO MOVE WEST DURING THE NEXT 24 HOURS.

MAXIMUM SUSTAINED WINDS ARE NEAR 75 MPH...120 KM/HR...WITH HIGHER GUSTS. PHOENIX IS A CATEGORY ONE HURRICANE ON THE SAFFIR-SIMPSON SCALE.

HURRICANE FORCE WINDS EXTEND OUTWARD UP TO 30 MILES... 50 KM... FROM THE CENTER...AND TROPICAL STORM FORCE WINDS EXTEND OUTWARD UP TO 130 MILES... 210 KM.

ESTIMATED MINIMUM CENTRAL PRESSURE IS 985 MB...29.08 INCHES.

PHOENIX IS EXPECTED TO PRODUCE STORM TOTAL ACCUMULATIONS 5 TO 10 INCHES...WITH LOCAL AMOUNTS OF 15 INCHES...ACROSS THE CAYMAN ISLANDS AND JAMAICA THROUGH MONDAY.

REPEATING THE 11 AM EDT POSITION...16.8 N... 77.8 W. MOVEMENT TOWARD...WEST NEAR 7 MPH. MAXIMUM SUSTAINED WINDS...75 MPH.

MINIMUM CENTRAL PRESSURE... 985 MB.

$$
FORECASTER NOAH

Simulated Forecast Advisory for Hurricane Phoenix

Created 10/27/2009 by NWS Ruskin
ALL INFORMATION AND DATA CREATED FOR SIMULATION PURPOSES

ZCZC MIATCMAT2 ALL
TTAA00 KNHC DDHHMM
HURRICANE PHOENIX FORECAST/ADVISORY NUMBER 11
NWS TPC/NATIONAL HURRICANE CENTER MIAMI FL
1500Z FRI OCT 10 2014

AT 11 AM EDT...1500Z... THE GOVERNMENT OF THE CAYMAN ISLANDS HAS ISSUED A TROPICAL STORM WARNING AND A HURRICANE WATCH FOR ALL OF THE CAYMAN ISLANDS. A TROPICAL STORM WARNING MEANS THAT TROPICAL STORM CONDITIONS ARE EXPECTED WITHIN THE WARNING AREA WITHIN THE NEXT 24 HOURS. A HURRICANE WATCH MEANS THAT HURRICANE CONDITIONS ARE POSSIBLE WITHIN THE WATCH AREA...GENERALLY WITHIN 36 HOURS.

A TROPICAL STORM WARNING REMIANS IN EFFECT FOR JAMAICA.

HURRICANE CENTER LOCATED NEAR 16.8N 77.8W AT 10/1500Z
POSITION ACCURATE WITHIN 15 NM

PRESENT MOVEMENT TOWARD THE WEST OR 265 DEGREES AT 6 KT

ESTIMATED MINIMUM CENTRAL PRESSURE 985 MB
EYE DIAMETER 20 NM
MAX SUSTAINED WINDS 65 KT WITH GUSTS TO 80 KT.
64 KT..... 30NE 20SE 10SW 10NW.
50 KT..... 50NE 40SE 30SW 40NW.
34 KT.....120NE 110SE 60SW 90NW.
12 FT SEAS..110NE 130SE 80SW 60NW.
WINDS AND SEAS VARY GREATLY IN EACH QUADRANT. RADII IN NAUTICAL MILES ARE THE LARGEST RADII EXPECTED ANYWHERE IN THAT QUADRANT.

REPEAT...CENTER LOCATED NEAR 16.8N 77.8W AT 10/1500Z
AT 26/1200Z CENTER WAS LOCATED NEAR 16.8N 77.5W

FORECAST VALID 11/0000Z 16.8N 78.5W
MAX WIND 70 KT...GUSTS 90 KT.
64 KT... 30NE 20SE 20SW 20NW.
50 KT... 50NE 40SE 30SW 40NW.
34 KT...120NE 110SE 60SW 90NW.

FORECAST VALID 11/1200Z 17.0N 79.9W
MAX WIND 70 KT...GUSTS 90 KT.
64 KT... 30NE 20SE 20SW 20NW.
50 KT... 50NE 40SE 30SW 40NW.

```
34 KT...120NE 110SE  60SW  90NW.

FORECAST VALID 12/0000Z 17.3N  80.9W
MAX WIND  70 KT...GUSTS 90 KT.
64 KT... 30NE  20SE  20SW  20NW.
50 KT... 60NE  50SE  40SW  50NW.
34 KT...120NE 110SE  60SW  90NW.


FORECAST VALID 12/1200Z 17.8N  82.0W
MAX WIND  75 KT...GUSTS 95 KT.
64 KT... 40NE  30SE  30SW  30NW.
50 KT... 70NE  60SE  50SW  60NW.
34 KT...130NE 130SE  70SW 100NW.

FORECAST VALID 13/1200Z 19.5N  83.8W
MAX WIND 75 KT...GUSTS 95 KT.
64 KT... 40NE  30SE  30SW  30NW.
50 KT... 70NE  60SE  50SW  60NW.
34 KT...130NE 130SE  70SW 100NW.

EXTENDED OUTLOOK. NOTE...ERRORS FOR TRACK HAVE AVERAGED NEAR 225 NM
ON DAY 4 AND 300 NM ON DAY 5...AND FOR INTENSITY NEAR 20 KT EACH DAY

OUTLOOK VALID 14/1200Z 22.0N  86.0W
MAX WIND  85 KT...GUSTS 105 KT.

OUTLOOK VALID 15/1200Z 26.0N  86.4W
MAX WIND  100 KT...GUSTS  120 KT.

REQUEST FOR 3 HOURLY SHIP REPORTS WITHIN 300 MILES OF 16.8N  77.8W

NEXT ADVISORY AT 10/2100Z

$$
FORECASTER NOAH
```

Simulated NWS Ruskin Hurricane Local Statement on NHC Advisory 30

Created 10/27/2009 by NWS Ruskin
ALL INFORMATION AND DATA CREATED FOR SIMULATION PURPOSES

URGENT - IMMEDIATE BROADCAST REQUESTED
HURRICANE PHOENIX LOCAL STATEMENT
NATIONAL WEATHER SERVICE TAMPA BAY FL
630 AM EDT WED OCT 15 2014

...HURRICANE WARNING IN EFFECT FOR WEST CENTRAL FLORIDA...

...HURRICANE WARNING IN EFFECT FOR THE GULF WATERS...

...HURRICANE PHOENIX IS STILL A CATEGORY 4 HURRICANE PACKING SUSTAINED WINDS OF 150 MPH...

...DIRECT STRIKE OF CATASTROPHIC AND LIFE THREATENING HURRICANE EXPECTED...

...AT THIS TIME PROTECTIVE MEASURES SHOULD HAVE BEEN COMPLETED...

...FLASH FLOOD WARNING IN EFFECT FOR WEST CENTRAL FLORIDA...

.AT 630 AM EDT…THE CENTER OF HURRICANE PHOENIX WAS LOCATED NEAR LATITUDE 26.4 NORTH, LONGITUDE 83.6 WEST OR 130 MILES SOUTHWEST OF TAMPA WHICH IS ABOUT 110 MILES SOUTHWEST OF SAINT PETE BEACH.

PHOENIX IS MOVING TOWARD THE NORTHEAST AT 15 MPH AND THIS MOTION IS EXPECTED TO CONTINUE FOR THE NEXT 24 HOURS.

MAXIMUM SUSTAINED WINDS ARE NEAR 150 MPH WITH HIGHER GUSTS. PHOENIX IS AN EXTREMELY DANGEROUS CATEGORY FOUR HURRICANE ON THE SAFFIR SIMPSON SCALE. SOME FLUCTUATIONS IN STRENGTH ARE LIKELY PRIOR TO LANDFALL... BUT PHOENIX IS EXPECTED TO MAKE LANDFALL AS A CATEGORY FOUR OR EVEN A CATEGORY FIVE HURRICANE.

GMZ830-850-870-853-873-FLZ050>051-055-060-100300-
/O.CON.KTBW.HU.W.0001.000000T0000Z-000000T0000Z/
COASTAL WATERS FROM ENGLEWOOD TO TARPON SPRINGS, FL OUT 20 NM-
COASTAL WATERS FROM ENGLEWOOD TO TARPON SPRINGS, FL EXTENDING FROM 20 TO 60 NM-
COASTAL WATERS FROM TARPON SPRINGS TO SUWANNEE RIVER, FL OUT 20 NM-
COASTAL WATERS FROM TARPON SPRINGS TO SUWANNEE RIVER, FL EXTENDING FROM 20 TO 60 NM-

TAMPA BAY WATERS-
PASCO-PINELLAS-HILLSBOROUGH-MANATEE-
630 AM EDT THU JUN 15 2006

...HURRICANE WARNING REMAINS IN EFFECT...
...FLASH FLOOD WARNING IN EFFECT...

...NEW INFORMATION...

PHOENIX WILL MOVE ONSHORE THE WESTERN COAST OF PINELLAS AND PASCO COUNTIES BETWEEN SAINT PETE BEACH AND HOLIDAY LATE THIS MORNING OR EARLY THIS AFTERNOON. CONDITIONS WILL RAPIDLY DETERIORATE OVER WEST CENTRAL FLORIDA BEFORE NOON.

...AREAS AFFECTED...

THIS STATEMENT RECOMMENDS ACTIONS TO BE TAKEN BY PERSONS IN THE FOLLOWING COUNTIES OR MARINE AREAS: WATERS FROM ENGLEWOOD TO SUWANNEE RIVER OUT TO 60 NM...TAMPA BAY WATERS...PASCO...PINELLAS... HILLSBOROUGH AND MANATEE COUNTIES.

...WATCHES/WARNINGS...

THE FOLLOWING WATCHES AND WARNINGS ARE CURRENTLY IN EFFECT FOR THIS AREA:

HURRICANE WARNING.
FLASH FLOOD WARNING.

...PRECAUTIONARY/PREPAREDNESS ACTIONS...

PROTECT YOURSELF AND YOUR FAMILY. RESIDENTS SHOULD RUSH PREPARATIONS FOR THE LANDFALL OF A CATASTROPHIC HURRICANE...WITH DEVESTATING HURRICANE FORCE WINDS AND HIGH STORM SURGE.

ALL MARINE CRAFT MUST STAY IN SAFE PORT.

...STORM SURGE IMPACTS...

TIDES OF 1 TO 2 FEET ABOVE NORMAL WILL RISE TO 5 TO 10 FEET ABOVE NORMAL BY LATE MORNING. SIGNIFICANT AND LIFE THREATENING STORM SURGE OF 15 TO 20 FEET ABOVE NORMAL WITH LARGE BATTERING WAVES IS EXPECTED THIS AFTERNOON. THE UPPER REACHES OF TAMPA BAY MAY REACH 25 FEET ABOVE NORMAL. INNUDATION OF LOW LYING AREAS WILL CONTINUE FOR MORE THAN 24 HOURS INTO LATE THURSDAY MORNING.

BARRIER ISLANDS WILL BE OVERTOPPED. CAUSEWAYS WILL BE WASHED AWAY AND BRIDGES DESTROYED. MANY HOMES AND BUSINESSES IN THE SURGE AREA WILL BE WASHED OFF THEIR FOUNDATAIONS.

ESTIMATED STORM SURGE POTENTIAL AT LOCATIONS ACROSS TAMPA BAY:

LONG BOAT KEY	13 FEET
ANNA MARIA ISLAND	12 FEET
SAINT PETERSBURG	18 FEET
CLEARWATER BEACH	10 FEET
OLDSMAR	21 FEET
HUDSON	12 FEET
LONG BOAT KEY	14 FEET
BRADENTON	12 FEET
APOLLO BEACH	21 FEET
TAMPA	21 FEET

...WIND IMPACTS...

EAST TO SOUTHEAST WINDS OF 60 MPH WITH HIGHER GUSTS WILL INCREASE RAPIDLY. SUSTAINED HURRICANE FORCE WINDS WILL BEGIN BY MID MORNING ALONG COASTAL AREA AND WILL MOVE INLAND AROUND NOON.

PHOENIX IS FORECAST TO MOVE ASHORE AS A CATASTROPHIC CATEGORY FOUR OR FIVE HURRICANE...SIMILAR IN STRENGTH TO HURRICANE KATRINA IN 2005.

AT LEAST ONE HALF OF WELL CONSTRUCTED HOMES WILL HAVE ROOF AND WALL FAILURE. GABLED ROOFS WILL FAIL...LEAVING THOSE HOMES SEVERELY DAMAGED OR DESTROYED.

THE MAJORITY OF INDUSTRIAL BUILDINGS WILL BECOME NON FUNCTIONAL. PARTIAL TO COMPLETE WALL AND ROOF FAILURE IS EXPECTED. WOOD FRAMED LOW RISING APARTMENT BUILDINGS WILL BE DESTROYED. CONCRETE BLOCK LOW RISE APARTMENTS WILL SUSTAIN MAJOR DAMAGE...INCLUDING SOME WALL AND ROOF FAILURE.

HIGH RISE OFFICE AND APARTMENT BUILDINGS WILL SWAY DANGEROUSLY...A FEW TO THE POINT OF TOTAL COLLAPSE. ALL WINDOWS WILL BLOW OUT.

AIRBORNE DEBRIS WILL BE WIDESPREAD...AND MAY INCLUDE HEAVY ITEMS SUCH AS HOUSEHOLD APPLIANCES AND EVEN LIGHT VEHICLES. SPORT UTILITY VEHICLES AND LIGHT TRUCKS WILL BE MOVED. THE BLOWN DEBRIS WILL CREATE ADDITIONAL DESTRUCTION. PERSONS...PETS...AND LIVESTOCK EXPOSED TO THE WINDS WILL FACE CERTAIN DEATH IF STRUCK.

POWER OUTAGES WILL LAST FOR WEEKS...AS MOST POWER POLES WILL BE DOWN AND TRANSFORMERS DESTROYED. WATER SHORTAGES WILL MAKE HUMAN SUFFERING INCREDIBLE BY MODERN STANDARDS.

THE VAST MAJORITY OF NATIVE TREES WILL BE SNAPPED OR UPROOTED. ONLY THE HEARTIEST WILL REMAIN STANDING...BUT BE TOTALLY DEFOLIATED. FEW CROPS WILL REMAIN. LIVESTOCK LEFT EXPOSED TO THE WINDS WILL BE KILLED.

...RAINFALL...

RAINFALL TOTALS OF 10 TO 12 INCHES...WITH ISOLATED MAXIMUM AMOUNTS OF 20 INCHES...ARE POSSIBLE.

...INLAND FLOODING...

EXPECT FLOODING OF LOW LYING AREAS...STREET INTERSECTIONS AND AREAS KNOWN FOR FLOODING THIS AFTERNOON AND EVENING. EROSION OF STREETS AND PARTIAL OR TOTAL COLLAPSE OF BRIDGES MAY CAUSE SERIUS INJURY OR DEATH TO UNSUSPECTING MOTORISTS.

...TORNADOES...

ISOLATED WATERSPOUTS AND TORNADOES ARE POSSIBLE IN THE OUTER RAINBANDS OF PHOENIX MAINLY NORTH AND NORTHWEST OF THE HURRICANE.

...LOCAL MARINE IMPACTS...

SOUTHEAST WINDS OF 70 TO 80 KNOTS WITH GUSTS TO 100 KNOTS ARE EXPECTED TO DEVELOP ACROSS THE COASTAL WATERS FROM ENGLEWOOD TO TARPON SPRINGS THIS MORNING...AND UP TO 120 KNOTS OR HIGHER NEAR THE CENTER OF PHOENIX. DANGEROUS LARGE SWELLS OF 15 TO 25 FEET WILL AFFECT THE WATERS UNTIL THE HURRICANE MOVES INLAND.

...NEXT UPDATE...

THIS STATEMENT WILL BE UPDATED BY 900 AM EDT.

Simulated NWS Ruskin Hurricane Local Statement on NHC Advisory 31

Created 10/27/2009 by NWS Ruskin
ALL INFORMATION AND DATA CREATED FOR SIMULATION PURPOSES

URGENT - IMMEDIATE BROADCAST REQUESTED
HURRICANE PHOENIX LOCAL STATEMENT
NATIONAL WEATHER SERVICE TAMPA BAY FL
1100 AM EDT WED OCT 15 2014

...HURRICANE WARNING IN EFFECT FOR MAINLAND CENTRAL WESTERN FLORIDA...

...HURRICANE WARNING IN EFFECT FOR THE GULF WATERS...

...THE EYE WALL OF CATEGORY FIVE HURRICANE PHOENIX HAS ENTERED TAMPA BAY WITH SUSTAINED WINDS OF 160 MPH ESTIMATED BY RADAR AT EGMONT KEY AND ANNA MARIA ISLAND...

...FLASH FLOOD WARNING IN EFFECT FOR CENTRAL WESTERN FLORIDA...

.AT 1100 AM EDT, THE CENTER OF HURRICANE PHOENIX WAS LOCATED NEAR LATITUDE 27.5 NORTH, LONGITUDE 83.1 WEST OR 50 MILES SOUTHWEST OF TAMPA WHICH IS ABOUT 30 MILES SOUTHWEST OF SAINT PETE BEACH. THE EYE WALL OF PHOENIX IS 45 MILES ACROSS AND HAS PASSED EGMONT KEY AND ANNA MARIA ISLAND. PHOENIX IS MOVING TOWARD THE NORTHEAST AT 16 MPH.

MAXIMUM SUSTAINED WINDS ARE NEAR 160 MPH WITH HIGHER GUSTS. PHOENIX IS AN EXTREMELY DANGEROUS CATEGORY FIVE HURRICANE ON THE SAFFIR SIMPSON SCALE.

GMZ830-850-870-853-873-FLZ050>051-055-060-100300-
/O.CON.KTBW.HU.W.0001.000000T0000Z-000000T0000Z/
COASTAL WATERS FROM ENGLEWOOD TO TARPON SPRINGS, FL OUT 20 NM-
COASTAL WATERS FROM ENGLEWOOD TO TARPON SPRINGS, FL EXTENDING FROM 20 TO 60 NM-
COASTAL WATERS FROM TARPON SPRINGS TO SUWANNEE RIVER, FL OUT 20 NM-
COASTAL WATERS FROM TARPON SPRINGS TO SUWANNEE RIVER, FL EXTENDING FROM 20 TO 60 NM-
TAMPA BAY WATERS-
PASCO-PINELLAS-HILLSBOROUGH-MANATEE-
630 AM EDT THU JUN 15 2006

...HURRICANE WARNING REMAINS IN EFFECT...
...FLASH FLOOD WARNING IN EFFECT...

...NEW INFORMATION...

THE EYE WALL OF HURRICANE PHOENIX WILL CONTINUE DEVESTATE THE TAMPA BAY REGION INTO LATE AFTERNOON. THE CENTER OF THE EYE WILL MOVE ONSHORE NEAR INDIAN ROCKS BEACH BEFORE NOON. THE FORWARD EDGE OF THE EYE WALL WILL REACH DOWNTOWN TAMPA AND NEW PORT RICHEY BY 1130 AM... BROOKSVILLE AND ZERPHYHILLS AROUND 1 PM...BUSNELL AROUND 230 PM...AND THE VILLAGES AROUND 330 PM.

...AREAS AFFECTED...

THIS STATEMENT RECOMMENDS ACTIONS TO BE TAKEN BY PERSONS IN THE FOLLOWING COUNTIES OR MARINE AREAS: WATERS FROM ENGLEWOOD TO SUWANNEE RIVER OUT TO 60 NM...TAMPA BAY WATERS...PASCO...PINELLAS... HILLSBOROUGH AND MANATEE COUNTIES.

...WATCHES/WARNINGS...

THE FOLLOWING WATCHES AND WARNINGS ARE CURRENTLY IN EFFECT FOR THIS AREA:

HURRICANE WARNING.
FLASH FLOOD WARNING.

...PRECAUTIONARY/PREPAREDNESS ACTIONS...

THE TIME TO PREPARE AND PROTECT PROPERTY IS NOW OVER. RESIDENTS MUST REMAIN SHELTERED AS BEST THEY CAN.

MARINE CRAFT MUST STAY IN SAFE PORT AS LETHAL MARINE CONDITIONS WILL PREVAIL.

...STORM SURGE IMPACTS...

A STORM TIDE OF 13 FEET WAS MEASURED AT ANNA MARIA ISLAND BEFORE THE TIDE GAUGE FAILED. THE SURGE HAS OVERTOPPED BARRIER ISLANDS FROM NORTH OF SARASOTA TO TREASURE ISLAND AND HAS CAUSED EXTENSIVE INNUNDATION IN WEST BRADENTON.

STORM SURGE CONDITIONS WILL BECOME EVEN WORSE. THE TAMPA BAY AREA CAN EXPECT A LIFE THREATENING STORM SURGE OF 15 TO 20 FEET ABOVE NORMAL TO PERSIST INTO THE EVENING. LARGE BATTERING WAVES ON TOP OF THE SURGE WILL ADD TO THE EXPECTED DAMAGE. THE UPPER REACHES OF TAMPA BAY MAY REACH 26 FEET ABOVE NORMAL. INNUDATION OF LOW LYING AREAS WILL CONTINUE FOR MORE THAN 24 HOURS INTO FRIDAY AFTERNOON.

BARRIER ISLANDS WILL BE OVERTOPPED. CAUSEWAYS WILL BE WASHED AWAY AND BRIDGES DESTROYED. MANY HOMES AND BUSINESSES IN THE SURGE AREA WILL BE WASHED OFF THEIR FOUNDATAIONS.

ESTIMATED STORM SURGE POTENTIAL AT LOCATIONS ACROSS TAMPA BAY:

LONG BOAT KEY	15 FEET
ANNA MARIA ISLAND	14 FEET
SAINT PETERSBURG	20 FEET
CLEARWATER BEACH	11 FEET
OLDSMAR	23 FEET
HUDSON	14 FEET
LONG BOAT KEY	16 FEET
BRADENTON	14 FEET
APOLLO BEACH	24 FEET
TAMPA	26 FEET

...WIND IMPACTS...

EAST TO SOUTHEAST WINDS OF 80 TO 90 MPH WITH HIGHER GUSTS OVER THE AREA WILL CONTINUE TO INCREASE WITH THE CORE OF THE STRONGEST WINDS...160 MPH WITH HIGHER GUSTS WITH THE EYE WALL.

AT LEAST ONE HALF OF WELL CONSTRUCTED HOMES WILL HAVE ROOF AND WALL FAILURE. GABLED ROOFS WILL FAIL...LEAVING THOSE HOMES SEVERELY DAMAGED OR DESTROYED.

THE MAJORITY OF INDUSTRIAL BUILDINGS WILL BECOME NON FUNCTIONAL. PARTIAL TO COMPLETE WALL AND ROOF FAILURE IS EXPECTED. WOOD FRAMED LOW RISING APARTMENT BUILDINGS WILL BE DESTROYED. CONCRETE BLOCK LOW RISE APARTMENTS WILL SUSTAIN MAJOR DAMAGE...INCLUDING SOME WALL AND ROOF FAILURE.

HIGH RISE OFFICE AND APARTMENT BUILDINGS WILL SWAY DANGEROUSLY...A FEW TO THE POINT OF TOTAL COLLAPSE. ALL WINDOWS WILL BLOW OUT.

AIRBORNE DEBRIS WILL BE WIDESPREAD...AND MAY INCLUDE HEAVY ITEMS SUCH AS HOUSEHOLD APPLIANCES AND EVEN LIGHT VEHICLES. SPORT UTILITY VEHICLES AND LIGHT TRUCKS WILL BE MOVED. THE BLOWN DEBRIS WILL CREATE ADDITIONAL DESTRUCTION. PERSONS...PETS...AND LIVESTOCK EXPOSED TO THE WINDS WILL FACE CERTAIN DEATH IF STRUCK.

POWER OUTAGES WILL LAST FOR WEEKS...AS MOST POWER POLES WILL BE DOWN AND TRANSFORMERS DESTROYED. WATER SHORTAGES WILL MAKE HUMAN SUFFERING INCREDIBLE BY MODERN STANDARDS.

THE VAST MAJORITY OF NATIVE TREES WILL BE SNAPPED OR UPROOTED. ONLY THE HEARTIEST WILL REMAIN STANDING...BUT BE TOTALLY DEFOLIATED. FEW CROPS WILL REMAIN. LIVESTOCK LEFT EXPOSED TO THE WINDS WILL BE KILLED.

...RAINFALL...

RAINFALL TOTALS OF 12 TO 15 INCHES...WITH ISOLATED MAXIMUM AMOUNTS OF 20 INCHES...ARE POSSIBLE NORTH AND WEST OF SUN CITY CENTER. ACROSS THE REST OF THE AREA...RAINFALL OF 6 INCHES OR LESS ARE EXPECTED.

...INLAND FLOODING...

EXPECT FLOODING OF LOW LYING AREAS...STREET INTERSECTIONS AND AREAS KNOWN FOR FLOODING THIS AFTERNOON AND EVENING. EROSION OF STREETS AND PARTIAL OR TOTAL COLLAPSE OF BRIDGES MAY CAUSE SERIUS INJURY OR DEATH TO UNSUSPECTING MOTORISTS.

...TORNADOES...

ISOLATED TORNADOES ARE STILL POSSIBLE THROUGH THE EARLY AFTERNOON HOURS FROM CEDARY KEY TO THE VILLAGES.

...LOCAL MARINE IMPACTS...

SOUTHEAST WINDS OF NEAR 100 KNOTS WITH HIGHER GUSTS ARE AFFECTING THE CENTRAL COASTAL WATERS FROM ENGLEWOOD TO TARPON SPRINGS...AND UP TO 140 KNOTS OR HIGHER NEAR THE CENTER OF HURRICANE PHOENIX. WINDS ARE GRADUALLY SHIFTING FROM THE SOUTH AND SOUTHWEST AT AS THE CENTER OF PHOENIX APPROACHES THE COASTLINE. DANGEROUS LARGE SWELLS OF 15 TO 20 FEET WILL AFFECT THE WATERS UNTIL THE HURRICANE MOVES INLAND.

...NEXT UPDATE...

THIS STATEMENT WILL BE UPDATED BY 230 PM EDT.

$$

Hurricane Phoenix Location and Intensity Information for Simulated NHC Advisories 11-34

Advisory	Date/Time	Lat	Lon	Pressure	Max Wind	Movement
11	10oct15z 11am	16.8	77.8	985 mb	70 kts	W at 6 kts
12	10oct21z 5pm	16.8	78.4	984 mb	70 kts	W at 5 kts
13	11oct03z 11pm	16.8	78.9	984 mb	70 kts	W at 6 kts
14	11oct09z 5am	16.8	79.5	982 mb	75 kts	W at 7 kts
15	11oct15z 11am	16.8	80.2	979 mb	75 kts	W at 5 kts
16	11oct21z 5pm	16.8	80.7	979 mb	75 kts	W at 6 kts
17	12oct03z 11pm	17.0	81.3	977 mb	75 kts	WNW at 7 kts
18	12oct09z 5am	17.3	82.0	975 mb	80 kts	WNW at 6 kts
19	12oct15z 11am	17.7	82.6	974 mb	80 kts	NW at 7 kts
20	12oct21z 5pm	18.0	83.2	974 mb	80 kts	NW at 8 kts
21	13oct03z 11pm	18.4	83.8	972 mb	85 kts	NW at 6 kts
22	13oct09z 5am	18.9	84.3	970 mb	85 kts	NW at 7 kts
23	13oct15z 11am	19.4	84.8	968 mb	90 kts	NW at 8 kts
24	13oct21z 5pm	20.1	85.2	960 mb	95 kts	NW at 10 kts
25	14oct03z 11pm	21.0	85.3	960 mb	95 kts	N at 10 kts
26	14oct09z 5am	22.0	85.2	955 mb	100 kts	N at 9 kts
27	14oct15z 11am	22.9	85.0	952 mb	105 kts	NNE at 12 kts
28	14oct21z 5pm	24.1	84.8	949 mb	110 kts	NNE at 12 kts
29	15oct03z 11pm	25.2	84.4	938 mb	120 kts	NE at 14 kts
30	15oct09z 5am	26.4	83.7	930 mb	130 kts	NE at 13 kts
31	15oct15z 11am	27.5	83.1	918 mb	140 kts	NE at 12 kts
32	15oct21z 5pm	28.5	82.3	933 mb	115 kts	NE at 15 kts
33	16oct03z 11pm	29.8	81.4	959 mb	90 kts	NE at 16 kts
34	16oct09z 5am	31.3	80.7	975 mb	85 kts	NE at 16 kts

APPENDIX B – HAZUS CONSEQUENCES TABLES

THIS PAGE INTENTIONALLY LEFT BLANK

APPENDIX B – HAZUS CONSEQUENCES TABLES

PRE-STORM STRUCTURE VALUE BY BUILDING TYPE

Occupancy Type	Number of Structures	Structures Values (Millions)	Percent of Total
Residential	1,438,227	$182,816	91.8%
Commercial	85,481	$43,372	5.5%
Industrial	24,579	$9,640	1.6%
Agricultural	6,532	$1,097	0.4%
Religion	7,112	$4,496	0.5%
Government	1,853	$1,559	0.1%
Education	2,143	$2,835	0.1%
Total	**1,565,927**	**$245,815**	**100.0%**

HOUSEHOLDS AND POPULATION WITH HOMES DESTROYED

County	Total Population	Total Residential Buildings (RBs)	Count of Residences Destroyed	Percent of Residences Destroyed	Estimated Population with Residence Destroyed	Percent Population with Residence Destroyed
Citrus	118,055	66,449	149	0.22%	265	0.22%
Hardee	26,938	10,108	2	0.02%	5	0.02%
Hernando	130,802	63,239	511	0.81%	1,057	0.81%
Hillsborough	998,948	367,696	146,495	39.84%	397,994	39.84%
Manatee	264,002	122,257	53,301	43.60%	115,098	43.60%
Pasco	344,765	170,815	49,729	29.11%	100,371	29.11%
Pinellas	921,482	388,775	218,183	56.12%	517,142	56.12%
Polk	483,924	223,007	202	0.09%	438	0.09%
Sumter	53,345	25,881	1,956	7.56%	4,032	7.56%
Regional Total	**3,342,261**	**1,438,227**	**470,528**	**32.72%**	**1,136,402**	**34.00%**

PERCENT OF BUILDING STOCK BY WIND DAMAGE CATEGORY (ALL OCCUPANCY TYPES)						
County	**Percent with No Damage**	**Percent with Minor Damage**	**Percent with Moderate Damage**	**Percent with Severe Damage**	**Percent Destroyed**	**Percent with Any Damage**
Citrus	74.06%	20.53%	5.37%	0.57%	0.22%	26.69%
Hardee	92.51%	6.50%	0.92%	0.05%	0.03%	7.49%
Hernando	63.51%	24.37%	9.29%	2.07%	0.76%	36.49%
Hillsborough	4.11%	8.07%	16.83%	33.71%	37.29%	95.89%
Manatee	2.05%	5.82%	16.66%	34.32%	41.15%	97.95%
Pasco	17.89%	13.35%	17.89%	23.21%	27.67%	82.12%
Pinellas	0.19%	1.31%	8.60%	36.97%	52.93%	99.81%
Polk	89.56%	8.47%	1.74%	0.14%	0.09%	10.44%
Sumter	45.54%	22.24%	17.00%	8.01%	7.20%	54.46%
Regional Total	**24.75%%**	**8.24%**	**11.42%**	**24.66%**	**30.92%**	**75.25%**

NUMBER OF BUILDINGS BY WIND DAMAGE CATEGORY (ALL OCCUPANCY TYPES)

County	Number of Structures in County	Total Structures Affected	Number of Structures with No Damage	Number of Structures with Minor Damage	Number of Structures with Moderate Damage	Number of Structures with Severe Damage	Number of Structures Destroyed
Citrus	71,714	18,996	52,714	14,614	3,822	406	154
Hardee	10,968	822	10,146	713	101	5	3
Hernando	69,266	25,278	43,988	16,881	6,437	1,434	526
Hillsborough	405,461	388,798	16,664	32,702	68,236	136,674	151,185
Manatee	132,349	129,637	2,713	7,706	22,043	45,428	54,459
Pasco	183,387	150,589	32,802	24,479	32,804	42,567	50,738
Pinellas	425,113	424,291	822	5,566	36,560	157,171	224,994
Polk	240,300	25,079	215,220	20,359	4,172	340	208
Sumter	27,373	14,906	12,467	6,089	4,653	2,193	1,971
Regional Total	**1,565,931**	**1,178,393**	**387,536**	**129,109**	**178,828**	**386,218**	**484,238**

WIND DAMAGE TO RESIDENTIAL STRUCTURES

County	Number of Residential Structures in County	Pre-Storm Residential Exposure (Millions)	Percent of Structures with No Damage	Percent of Structures with Minor Damage	Percent of Structures with Moderate Damage	Percent of Structures with Severe Damage	Percent of Structures Destroyed
Citrus	66,449	$6,008	73.87%	20.56%	4.93%	0.41%	0.22%
Hardee	10,108	$931	85.40%	5.94%	0.77%	0.03%	0.02%
Hernando	63,239	$6,649	63.89%	24.80%	8.77%	1.72%	0.81%
Hillsborough	367,696	$55,882	4.19%	8.44%	17.15%	30.38%	39.84%
Manatee	122,257	$16,075	1.99%	6.00%	16.90%	31.51%	43.76%
Pasco	170,815	$17,932	18.12%	13.59%	17.89%	21.28%	29.11%
Pinellas	388,705	$53,168	0.16%	1.34%	8.77%	33.63%	56.13%
Polk	223,007	$23,798	89.79%	8.43%	1.59%	0.09%	0.09%
Sumter	25,881	$2,374	45.81%	22.33%	16.72%	7.58%	7.56%
Regional Total	**1,438,157**	**$181,855**	**25.05%**	**8.44%**	**11.48**	**22.31**	**32.72%**

WIND DAMAGE TO COMMERCIAL STRUCTURES

County	Number of Commercial Structures in County	Pre-Storm Commercial Exposure (Millions)	Percent of Structures with No Damage	Percent of Structures with Minor Damage	Percent of Structures with Moderate Damage	Percent of Structures with Severe Damage	Percent of Structures Destroyed
Citrus	3,484	1,276	68.77%	17.94%	10.99%	2.27%	0.03%
Hardee	488	166	90.57%	7.17%	2.05%	0.20%	0%
Hernando	3,902	1,386	58.53%	19.73%	15.86%	5.72%	0.13%
Hillsborough	25,862	16,624	3.22%	4.03%	13.72%	65.39%	13.64%
Manatee	6,510	3,022	2.67%	3.52%	13.99%	67.57%	12.26%
Pasco	8,249	3,547	14.47%	9.73%	18.22%	49.32%	8.27%
Pinellas	25,031	11,848	0.58%	1.01%	7.03%	71.19%	20.19%
Polk	11,043	5,188	86.39%	9.03%	3.87%	0.71%	0.01%
Sumter	912	315	40.57%	19.96%	22.81%	15.79%	0.77%
Regional Total	**85,481**	**$43,372**	**20.33%**	**5.77%**	**10.96%**	**51.15%**	**11.79%**

WIND DAMAGE TO INDUSTRIAL STRUCTURES

County	Number of Industrial Structures in County	Pre-Storm Industrial Exposure (Millions)	Percent of Structures with No Damage	Percent of Structures with Minor Damage	Percent of Structures with Moderate Damage	Percent of Structures with Severe Damage	Percent of Structures Destroyed
Citrus	1,041	249	69.74%	17.48%	9.70%	2.98%	0.19%
Hardee	138	33	91.30%	6.52%	2.17%	0.72%	0%
Hernando	1,245	264	60.56%	19.04%	13.82%	6.35%	0.24%
Hillsborough	6,819	2,789	3.70%	4.19%	12.13%	72.56%	7.41%
Manatee	2,137	837	3.23%	3.42%	11.65%	74.59%	7.16%
Pasco	2,532	677	13.86%	9.08%	16.31%	55.49%	5.29%
Pinellas	6,959	3,254	0.68%	1.06%	5.58%	80.60%	12.07%
Polk	3,423	1,423	86.44%	8.94%	3.56%	0.96%	0.09%
Sarasota	3,495	997	33.56%	14.33%	20.20%	30.27%	1.60%
Sumter	285	115	41.75%	19.65%	21.05%	16.84%	1.05%
Regional Total	**24,579**	**$9,640**	**21.98%**	**5.92%**	**11.48%**	**55.93%**	**6.68%**

NUMBER OF BUILDINGS BY STORM SURGE DAMAGE CATEGORY

Counties	Total Structures	Number With Minor Damage	Number With Moderate Damage	Number with Severe Damage or Destroyed	Number With More Than Minor Damage
Citrus	71,711	1	3,012	1,301	4,313
Hernando	69,266	0	1,480	398	1,878
Hillsborough	405,461	67	42,678	38,252	80,930
Manatee	132,349	19	19,470	9,271	28,741
Pasco	183,387	7	11,653	6,626	18,279
Pinellas	425,113	70	85,265	36,979	122,244
Total	**1,287,287**	**164**	**163,558**	**92,827**	**256,385**

PERCENT OF BUILDING STOCK BY STORM SURGE DAMAGE CATEGORY

Counties	Total Structures	Percent With Minor Damage	Percent With Moderate Damage	Percent with Severe Damage or Destroyed	Percent With More Than Minor Damage
Citrus	71,711	0.0%	4.2%	1.8%	6.0%
Hernando	69,266	0.0%	2.1%	0.5%	2.6%
Hillsborough	405,461	0.0%	10.5%	9.4%	19.9%
Manatee	132,349	0.0%	14.7%	7.0%	21.7%
Pasco	183,387	0.0%	6.4%	3.6%	10.0%
Pinellas	425,113	0.0%	20.1%	8.6%	28.7%
Total	**1,287,287**	**0.0%**	**12.7%**	**7.2%**	**19.9%**

STORM SURGE DAMAGE TO RESIDENTIAL STRUCTURES

Counties	Total Residential Structures	Pre-Storm Residential Structures Value (millions of $)	Percent With Minor Damage	Percent With Moderate Damage	Percent with Severe Damage or Destroyed	Percent With More Than Minor Damage
Citrus	66,447	6,008	0.0%	4.5%	2.0%	6.5%
Hernando	63,240	6,649	0.0%	2.3%	0.6%	2.9%
Hillsborough	367,713	55,881	0.0%	11.3%	10.3%	21.6%
Manatee	122,250	16,075	0.0%	15.2%	7.6%	22.8%
Pasco	170,807	17,932	0.0%	11.1%	3.9%	15.0%
Pinellas	388,766	53,168	0.0%	21.1%	9.5%	30.6%
Total	**1,179,223**	**155,713**	**0.0%**	**14.0%**	**7.8%**	**21.9%**

STORM SURGE DAMAGE TO COMMERCIAL STRUCTURES

Counties	Total Commercial Structures	Pre-Storm Commercial Structures Value (millions of $)	Percent With Minor Damage	Percent With Moderate Damage	Percent with Severe Damage or Destroyed	Percent With More Than Minor Damage
Citrus	3,484	1,276	0.0%	1.3%	0.0%	1.3%
Hernando	3,902	1,386	0.0%	0.0%	0.0%	0.0%
Hillsborough	25,862	16,624	0.1%	3.3%	1.3%	4.6%
Manatee	6,510	3,022	0.0%	1.8%	0.0%	1.8%
Pasco	8,249	3,547	0.0%	1.6%	0.0%	1.6%
Pinellas	25,031	11,848	0.2%	3.1%	1.0%	4.1%
Total	**73,038**	**37,703**	**0.1%**	**2.6%**	**0.8%**	**3.4%**

STORM SURGE DAMAGE TO INDUSTRIAL STRUCTURES

Counties	Total Industrial Structures	Pre-Storm Industrial Structures Value (millions of $)	Percent With Minor Damage	Percent With Moderate Damage	Percent with Severe Damage or Destroyed	Percent With More Than Minor Damage
Citrus	1,041	249	0.0%	0.0%	0.0%	0.0%
Hernando	1,245	264	0.0%	0.0%	0.0%	0.0%
Hillsborough	6,819	2,789	0.0%	2.6%	0.5%	3.1%
Manatee	2,137	837	0.0%	0.5%	0.0%	0.5%
Pasco	2,532	677	0.0%	0.1%	0.1%	0.2%
Pinellas	6,959	3,254	0.1%	8.0%	0.6%	8.6%
Total	**20,733**	**8,070**	**0.0%**	**3.6%**	**0.4%**	**4.0%**

STORM SURGE DAMAGE TO AGRICULTURAL, EDUCATIONAL, AND GOVERNMENTAL STRUCTURES

Counties	Total Agriculture, Govt. and Educational Structures	Pre-Storm Agriculture, Govt. and Educational Structures Value (Millions of $)	Percent With Minor Damage	Percent With Moderate Damage	Percent with Severe Damage or Destroyed	Percent With More Than Minor Damage
Citrus	464	125	0.2%	0.4%	0.0%	0.0%
Hernando	601	174	0.0%	0.0%	0.0%	0.0%
Hillsborough	2,956	2,265	1.1%	6.0%	1.0%	7.0%
Manatee	813	361	0.6%	0.2%	0.0%	0.2%
Pasco	1,138	483	0.3%	0.6%	0.0%	0.6%
Pinellas	2,541	1,085	0.0%	1.7%	0.3%	2.0%
Total	**8,513**	**4,493**	**0.5%**	**2.7%**	**0.4%**	**3.1%**

PROPERTY DAMAGE DUE TO STORM SURGE

Counties	Structural Damage (Millions of $)	Contents and Inventory Damage (Millions of $)	Total Property Damage (Millions of $)
Citrus	278	348	627
Hernando	132	116	248
Hillsborough	10,893	11,026	21,920
Manatee	2,620	2,456	5,076
Pasco	1,789	1,880	3,669
Pinellas	12,824	12,725	25,548
Total	**28,536**	**28,551**	**57,088**

COMBINED DAMAGE

The following table summarizes the combined damage from wind and storm surge flooding.

Counties	Pre-Storm Building Stock Value (Millions of $)	Total Structural Damage from Wind (Millions of $)	Percent of Pre-Storm Building Stock Value Loss from Wind	Total Structural Damage from Storm Surge (Millions of $)	Percent of Pre-Storm Building Stock Value Loss from Storm Surge	Total Combined Structural Damage (Millions of $)	Total Combined Percent of Pre-Storm Building Stock Value Loss
Citrus	7,808	168	2.2%	278	3.6%	440	5.6%
Hardee	1,231	7	0.1%	0	0.0%	7	0.1%
Hernando	8,637	367	4.2%	132	1.5%	494	5.7%
Hillsborough	78,949	48,276	61.1%	10,893	13.8%	52,508	66.5%
Manatee	20,681	12,900	62.4%	2,620	12.7%	13,886	67.1%
Pasco	23,006	10,715	46.6%	1,789	7.8%	11,671	50.7%
Pinellas	70,489	54,287	77.0%	12,824	18.2%	57,235	81.2%
Polk	32,084	313	1.0%	0	0.0%	313	1.0%
Sumter	2,931	527	18.0%	0	0.0%	527	18.0%
Total	**244,585**	**127,553**	**52.2%**	**28,536**	**11.7%**	**141,207**	**57.7%**

THIS PAGE INTENTIONALLY LEFT BLANK

Tampa Bay Catastrophic Plan: *PROJECT PHOENIX*

FEMA

Tampa Bay Regional Planning Council