Florida Statewide Regional Evacuation Study Program

Directional Atlas

Broward County

Volume 10-11 Book 1A
N-NE Directional Storms
Florida Division of Emergency Management
South Florida Regional Council

South Florida Region

2015

Includes Hurricane Evacuation Study
This Atlas is part of Volume 10 of the Statewide Regional Evacuation Study Program (SRESP), and one of three sets of county books in the South Florida Storm Tide Directional Atlas series. Book 1 covers Broward County; Book 2 covers Miami-Dade County; and Book 3 covers Monroe County. In each county, the primary volume presents an overview of the study and the methodology, while the Appendices, numbered from A to E, include the surge inundation maps for each of five directional storm clusters. The Atlas maps identify those areas subject to potential storm tide flooding from the five categories of hurricane on the Saffir-Simpson Hurricane Wind Scale, as determined by the National Oceanic and Atmospheric Administration (NOAA) numerical storm surge model, Sea, Lake and Overland Surges from Hurricanes (SLOSH). Volume 10 is unique in that it is based on the direction the storm is heading and depicts the resulting surge of storms approaching from that specific directional angle.

The Storm Tide Directional Atlas series supplements the original hazards analysis for storm tides (Volume 7-11) and depth (Volume 9-11), and enhances a key component of the SRESP. The Technical Data Report (Volume 1-11) was built upon the original storm tide analysis and includes the evacuation zones and population estimates, results of the evacuation behavioral data, shelter analysis and evacuation transportation analysis. The study, which provides vital information to state and local emergency management, forms the basis for county evacuation plans. The final study documents are available on the Internet at http://www.sfregionalcouncil.org/sresp.htm.

This Atlas series was produced by the South Florida Regional Council with funding from the Federal Emergency Management Agency, through the Florida Division of Emergency Management.
CREDITS AND ACKNOWLEDGEMENTS

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The Council acknowledges and extends its appreciation to the following agencies and people for their cooperation and assistance in the development of this Atlas:

**National Oceanic and Atmospheric Administration** (NOAA/TPC-NHC) for the SLOSH numerical storm surge model developed by the late Chester L. Jelesnianski, the development of the 2009 Biscayne Bay and Florida Bay Basins under the management of Jamie Rhome, and for the storm tide computation and interpretation provided by the NOAA Storm Surge Modeling team.

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Richard Butgereit, GIS Manager

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Elizabeth Payne, Project Manager

**Florida Emergency Preparedness Association**
For their support in this statewide effort

**County Emergency Management Agencies**
Miguel Ascarrunz, Director, Broward County Emergency Management Division
Curtis Sommerhoff, Director, Miami-Dade County Department of Emergency Management and Homeland Security
Irene Toner, Director, Monroe County Emergency Management Department
A. Storm Tide Directional Atlas

The surge inundation limits (directional maximum surge heights minus the ground elevations) are provided as GIS shape files and graphically displayed on maps in the Directional Storm Tide Atlas for the South Florida Region. The Atlas was prepared by the South Florida Regional Council under contract to the State of Florida, Division of Emergency Management, as part of this study effort. The maps prepared for the Atlas consist of base maps (1:24000) including topographic, hydrographic and highway files (updated using 2008 county and state highway data). Detailed shoreline and storm tide limits for each category of storm were determined using the region's geographic information system (GIS).

The purpose of the maps contained in this Atlas is to reflect a worst probable scenario of the hurricane storm tide inundation for a given cluster of compass directions that a storm would be heading and to provide a basis for the hurricane evacuation zones and study analyses. While the storm tide delineations include the addition of an astronomical mean high tide and tidal anomaly, it should be noted that the data reflects only stillwater saltwater flooding. Local processes such as waves, rainfall and flooding from overflowing rivers, are usually included in observations of storm tide height, but are not surge and are not calculated by the SLOSH model. It is incumbent upon local emergency management officials and planners to estimate the degree and extent of freshwater flooding as well as to determine the magnitude of the waves that will accompany the surge.

Although the methodology used for surge determination in this Atlas does the most to reduce inconsistencies and human subjectivity, factors remain in the data itself that could show variations from previous efforts and results. Whenever a SLOSH basin is changed in any way, results can vary. Using MEOW (Maximum Envelope of Water) data as we do in this directional atlas, instead of the MOM (Maximum of Maximums) data, and choosing directional subsets of the maximums (MOMs) will indeed produce different results than other atlases – and this was expected. Other factors can include different elevation model data, as well as number and scope of selected SLOSH basin grid cells. Also, any data that is beyond the original extent or boundary of the basin is interpolation influenced by the modeling trend up to that location, and hand adaptation of basin extensions.

Figure 1 shows the projected surge inundation for each category of storm for storms moving in a N-NE direction. Figure 2 provides an index of the N-NE directional map series for Broward County.

B. Points of Reference

County emergency management agencies selected reference points, which include key facilities or locations critical for emergency operations. The Table 1 includes the map identification number, descriptions of the selected points, and the elevation of the site. The elevation is based on the digital elevation data provided by LiDAR. It should be noted that if the site is large, elevations may vary significantly. Table 1 also provides the storm tide value from the SLOSH value and the depth of inundation (storm tide value minus the ground elevation) at the site.
Figure 1 Directional N-NE Storm Surge for Broward County
### Table 1  Selected Points of Reference, N-NE Direction - Broward County

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<sup>1</sup> Depth refers to the depth of inundation at the site (storm surge value minus the ground elevation)

<sup>2</sup> Surge refers to the storm surge value from the SLOSH Model
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<td>NE 6 Ave &amp; 56 St, Oakland Park Broward Blvd &amp; SW 4 Av, Fort Lauderdale</td>
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Figure 2  N-NE Atlas Map Index
Please consult with local authorities.

This map is for emergency planning purposes only. Storm tide category maximums are based on an 8.2 ft MSLD and not water levels during a flood event and are not to be used for flood mapping.

1. Storm tide levels are based on an 8.2 ft MSLD at high tide with no wave setup.
2. Total Storm Tide levels were derived from Maximum Storm Surge heights over LiDAR based digital elevation model.
3. The Points of Reference are based on the best available data and are relevant to emergency management officials.

This map is intended for use by those involved in emergency management and should not be used for flood mapping.

Printed Pages in Yellow

Datum = NAD 1983, 1,000-m USGS

US National Grid
100,000-m Square ID

Grid Zone Designation
17R

Broward, 2015
Scale 1:24,000

Map Plate 33

Produced by the South Florida Regional Planning Council for the Florida Division of Emergency Management, 2011-2012
This map is for emergency planning purposes only. Hurricane evacuation decision-making and growth management implementation are local responsibilities. Please consult with local authorities.

Notes:
1. Surge limits are based on all water surge (tide height + storm surge + LIDAR) at high tide with no wave setup.
2. Total Storm Tide limits were derived from Maximum of Maximum surge height over LIDAR based digital elevation model.
3. The Points of Reference are baselines determined to be relevant to emergency management officials.

Produced by the South Florida Regional Planning Council for the Florida Division of Emergency Management, 2011-2012
This map is for emergency planning purposes only. Hurricane evacuation decision-making and growth management implementation are local responsibilities. Please consult with local authorities.

Notes:
1. Surge limits are based on still water above sea level height above NAVD88 at high tide with no wave setup.
2. Total Storm Tide limits were derived from Maximum Sea Level Surge Heights over LIDAR based digital elevation.
3. The Points of Reference are benchmarks determined to be relevant to emergency management officials.

Datum = NAD 1983, 1,000-m USNG

US National Grid
100,000-m Square ID
NJ
Grid Zone Designation
17R

N-NE Storm Tide
Broward, 2015
Scale 1:24,000

Map Plate 53

Produced by the South Florida Regional Planning Council for the Florida Division of Emergency Management, 2011-2012
The Points of Reference are maximum surge heights derived from elevation above NAVD88 still water storm tide height.

Notes:
1. Surge limits are based on still water storm tide height at high water with no wave setup.
2. Total Storm Tide limits were derived from Maximum of Maximum surge heights over 15 year based digital data.
3. The Points of Reference are subject to change based on information provided by emergency management officials.

Produced by the South Florida Regional Planning Council for the Florida Division of Emergency Management, 2011-2012
This map is for emergency planning purposes only. Hurricane evacuation decision-making and growth management implementation are local responsibilities. Please consult with local authorities.

Notes:
1. Storm tide are based on all water storm tide height above MSL and based on NOS Bathymetry at high tide with no wave setup.
2. Total Storm Tide limits were derived from Maximum Storm Surge Height over LIDAR based digital datum.
3. The Points of Reference are locations determined to be relevant to emergency management officials.
This map is for emergency planning purposes only. The hurricane evacuation decision-making and growth management implementation are local responsibilities. Please consult with local authorities.

Notes:
1. Surge limits are based on wave-driven storm surge height at high tide with no wave setup.
2. Total Storm Tide limits were derived from Maximum Surge Heights over LEA-based digital elevation data.
3. The Points of Reference are located determined to be relevant to emergency management officials.

Produced by the South Florida Regional Planning Council for the Florida Division of Emergency Management, 2011-2012
Notes:
1. Storm tide limits are based on still water storm tide height above CLWD at high tide with no wave setup.
2. Total Storm Tide limits were derived from Maximum of Maximum storm surge height over 1% ARI based digital.
3. The Points of Reference are essential determined to the relevant to emergency management officials.

ATLAS LEGEND
HOSPITAL
Points of Reference
City Limits
Evacuation Route
NHD Lakes

Storm Tide Category
Level 1
Orange
Level 2
Yellow
Level 3
Green
Level 4
Purple
Level 5
Red

Broward, 2015
Scale 1:24,000

Map Plate
57
Produced by the South Florida Regional Planning Council for the Florida Division of Emergency Management, 2011-2012

This map is for emergency planning purposes only. Hurricane evacuation decision-making and growth management implementation are local responsibilities. Please consult with local authorities.

ATLAS LEGEND

HOSPITAL
Points of Reference
City Limits
Evacuation Route
NHD Lakes

Storm Tide Category
Level 1
Level 2
Level 3
Level 4
Level 5

Datum = NAD 1983, 1,000-m USNG

US National Grid
160,000-m Square ID
NJ

Grid Zone Designation
17R

Notes:
1. Surge limits are based on all water storm surge height above NAVD88 at high tide with no wave setup.
2. Total Storm Tide limits were derived from Maximum of Maximum surge heights over LIDAR based digital elevation.
3. The Points of Reference are locations determined to be relevant to emergency management officials.

N-NE Storm Tide
Broward, 2015

Scale 1:24,000

Map Plate 59

Printed Pages in Yellow
This map is for emergency planning purposes only. Hurricane evacuation decision-making and growth management implementation are local responsibilities. Please consult with local authorities.

Notes:
1. Surge limits are based on still water storm tide height above NAVD88 at high tide with no wave setup.
2. Total Storm Tide limits were derived from Maximum of Maximums surge heights over LIDAR based digital elevation model.
3. The Points of Reference are locations determined to be relevant to emergency management officials.

Datum = NAD 1983, 1,000-m USNG

Produced by the South Florida Regional Planning Council for the Florida Division of Emergency Management, 2011-2012
This map is for emergency planning purposes only. 

Surge limits are based on 

1. Still water above 

2. Total Storm Tide limits were derived from Maximum storm surge height 

3. The Points of Reference are relative to 

Please consult with local authorities.
This map is for emergency planning purposes only. Hurricane evacuation decision-making and growth management implementation are local responsibilities. Please consult with local authorities.
This map is for emergency planning purposes only. Hurricane evacuation decision-making and growth management implementation are local responsibilities. Please consult with local authorities.

Notes:
1. Surge limits are based on still water above NAVD88 at high tide with no wave setup.
2. Total Storm Tide limits were derived from Maximum of Maximum surge heights over LIDAR based digital elevation above NAVD88 still water storm tide height.
3. The Points of Reference are locations determined to be relevant to emergency management officials.

Datum = NAD 1983, 1,000-m USNG

Produced by the South Florida Regional Planning Council for the Florida Division of Emergency Management, 2011-2012
Produced by the South Florida Regional Planning Council for the Florida Division of Emergency Management, 2011-2012

This map is for emergency planning purposes only. Hurricane evacuation decision-making and growth management implementation are local responsibilities. Please consult with local authorities.

Notes:
1. Surge limits are based on still water storm tide height above NAVD88 at high tide with no wave setup.
2. Total Storm Tide limits were derived from Maximum of Maximums surge heights over LIDAR based digital elevation.
3. The Points of Reference are locations determined to be relevant to emergency management officials.

Datum = NAD 1983, 1,000-m USNG

Scale: 1:24,000
Please consult with local authorities.

The Points of Reference are locations determined to be under LIDAR based digital setup.

Maximum surge heights were delivered from Maximum of Maximum surge heights over LiDAR based digital setup. Points of Reference are locations determined to be relevant to emergency management officials.

This map is for emergency planning purposes only. Hurricane evacuation decision-making and growth management implementation are local responsibilities.

Datum = NAD 1983, 1,000-m USNG

US National Grid
160,000-m Square ID
NJ
Grid Zone Designation
17R

Notes:
1. Surge heights are based on still water storm surge height at high tide with no wave setup.
2. Total Storm Tide limits were delivered from Maximum of Maximum surge heights over LiDAR based digital setup.
3. The Points of Reference are locations determined to be relevant to emergency management officials.

Produced by the South Florida Regional Planning Council for the Florida Division of Emergency Management, 2011-2012

Printed Pages in Yellow

Map Plate 97

Broward, 2015

Scale 1:24,000

Feet
This map is for emergency planning purposes only. Hurricane evacuation decision-making and growth management implementation are local responsibilities. Please consult with local authorities.
This map is for emergency planning purposes only. Hurricane evacuation decision-making and growth management implementation are local responsibilities. Please consult with local authorities.
Produced by the South Florida Regional Planning Council for the Florida Division of Emergency Management, 2011-2012

Please consult with local authorities.

26°13'0"N

US National Grid
100,000m Square ID
NJ
Grid Zone Designation
17R
Datum = NAD 1983, 1,000-m USGS

This map is for emergency planning purposes only. Hurricane evacuation decision-making and growth management implementation are local responsibilities. Please consult with local authorities.

ATLAS LEGEND

HOSPITAL

Points of Reference

City Limits

Evacuation Route

NHD Lakes

Storm Tide Category

Level 1

Level 2

Level 3

Level 4

Level 5

N-NE Storm Tide

Broward, 2015

Scale 1:24,000

Map Plate

Printed Pages in Yellow

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Produced by the South Florida Regional Planning Council for the Florida Division of Emergency Management, 2011-2012
The Points of Reference are still water storm tide height Category
3. The Points of Reference are those determined to be relevant to emergency
management implementation are local responsibilities.

This map is for emergency planning purposes only.
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Hurricane evacuation decision-making and growth management implementation are local responsibilities.

Datum = NAD 1983, 1,000-m USNG

N-NE Storm Tide
Broward, 2015

Scale 1:24,000

Map Plate 120

Notes:
1. Surge limits are based on still water storm surge height at high tide with no wave setup.
2. Total storm tide limits were derived from a combination of Maximum Surge Heights over USGS–based digital elevation models, elevation data, and field observations.
3. The Points of Reference are subject to revision and are relevant to emergency management officials.
This map is for emergency planning purposes only. Hurricane evacuation decision-making and growth management implementation are local responsibilities. Please consult with local authorities.

Notes:
1. Surge limits are based on still water above NAVD88, with a 2% chance of being exceeded at high tide with no wave energy.
2. Total Storm Tide limits were derived from Maximum Surge Height data (USGS Digital Coast) and Mean Storm Tide elevation above NAVD88.
3. The Points of Reference are boundary determined to be relevant to emergency management officials.
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Notes:
1. Surge limits are based on still water storm tide height above NAVD88 at high tide with no wave setup.
2. Total Storm Tide limits were derived from maximum surge heights over LIDAR based digital elevation.
3. The Points of Reference are locations determined to be relevant to emergency management officials.
Hurricane evacuation decision-making and growth management implementation are local responsibilities. Please consult with local authorities.
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