

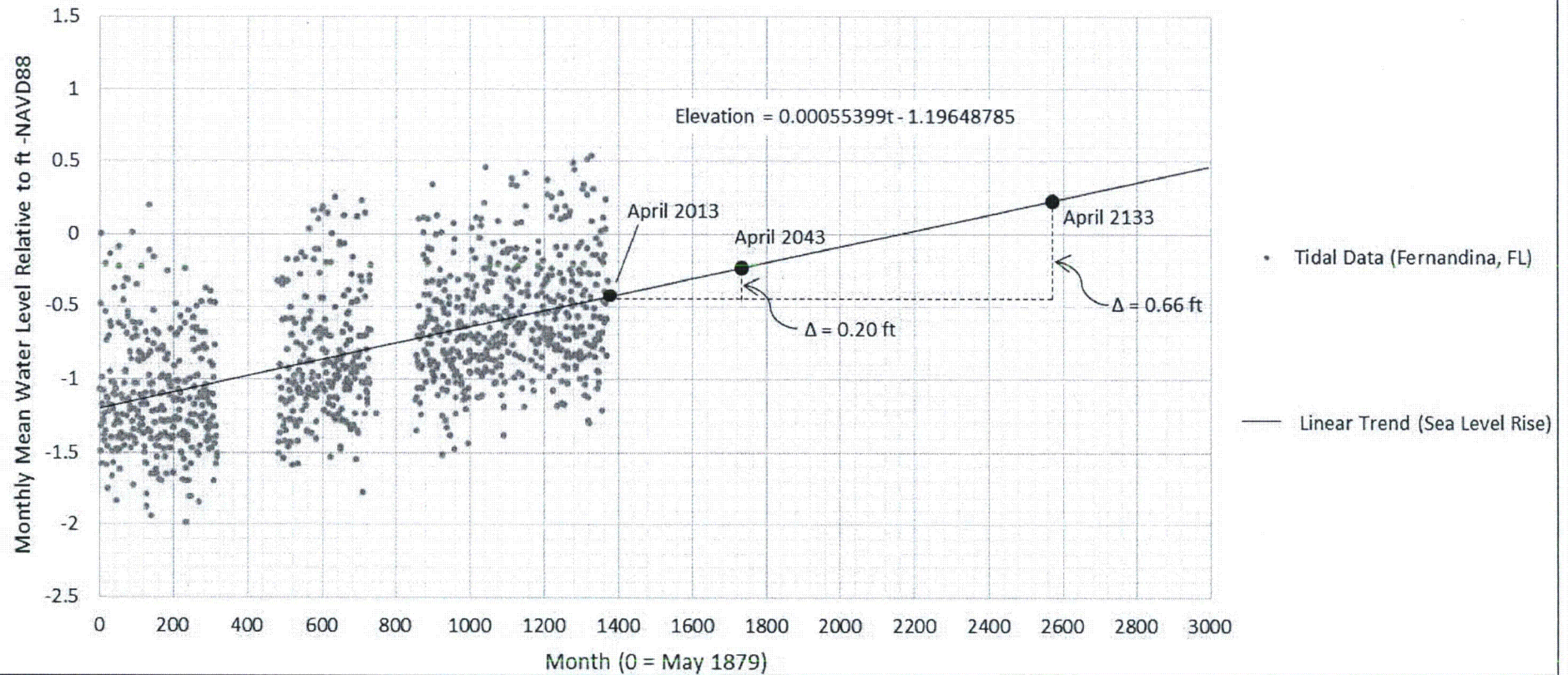
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Flooding Hazards Reevaluation Report



**Figure 4-10**  
Cumulative Density Function

# Fernandina, FL - Linear Trend

(Station 8720030)



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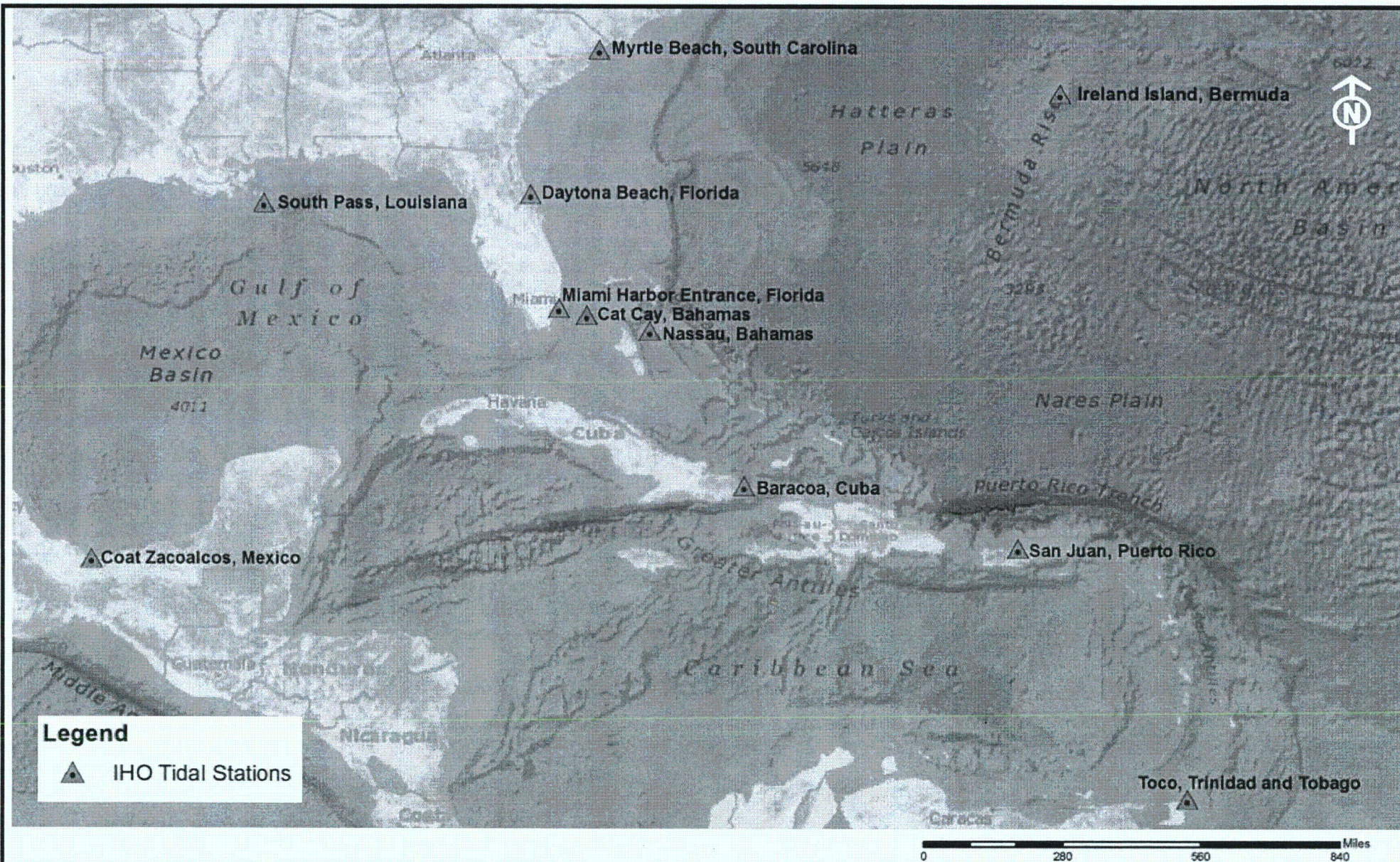
Figure 4-11  
Sea Level Rise

Reference: NOAA, 2013k

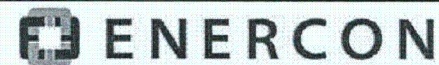
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**Figure 4-12**  
IHO Tidal Stations Used for Tidal Calibration

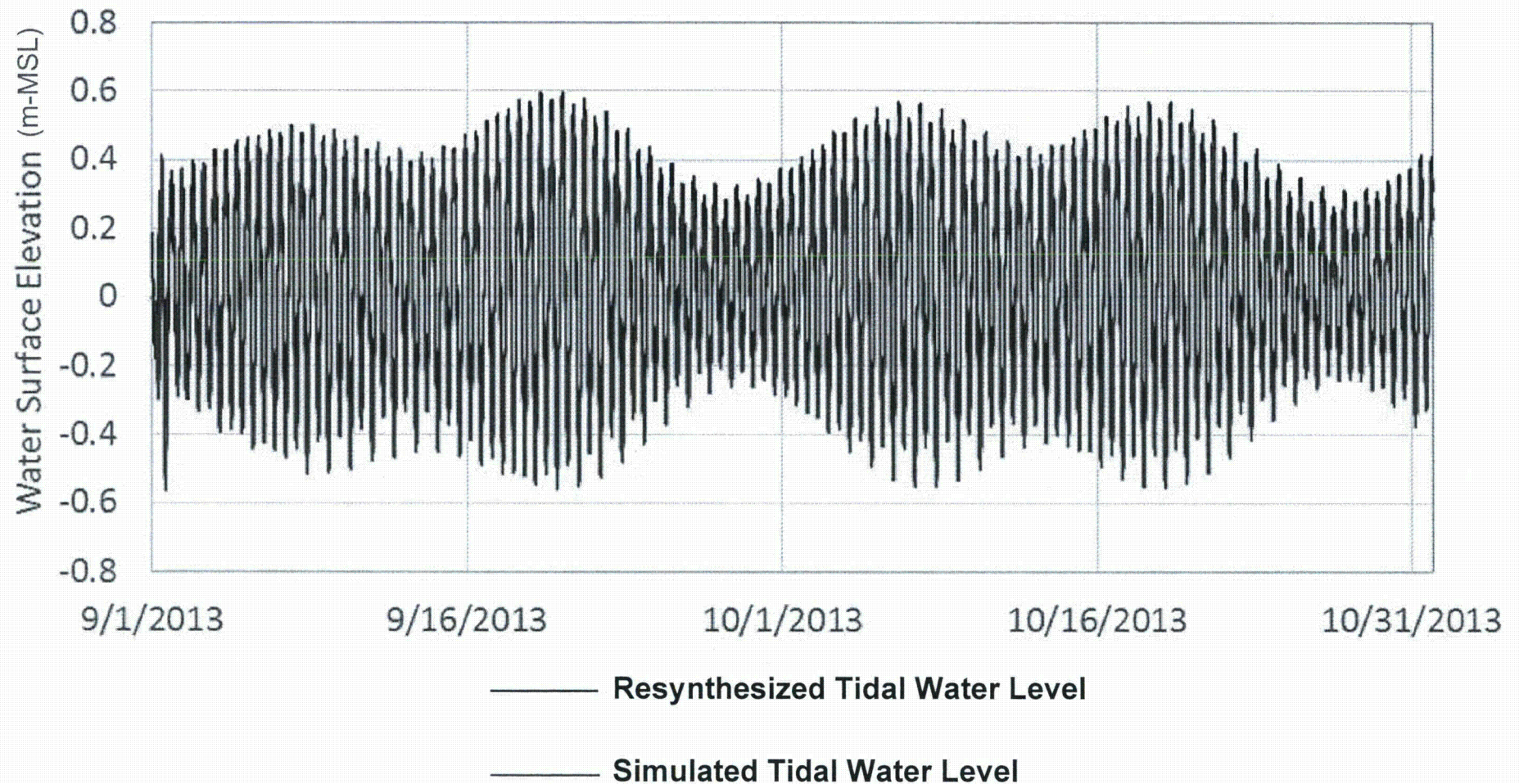
References: Deltares, 2012; ESRI, 2014d

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## Miami Harbor Tidal Station Calibration



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Figure 4-13

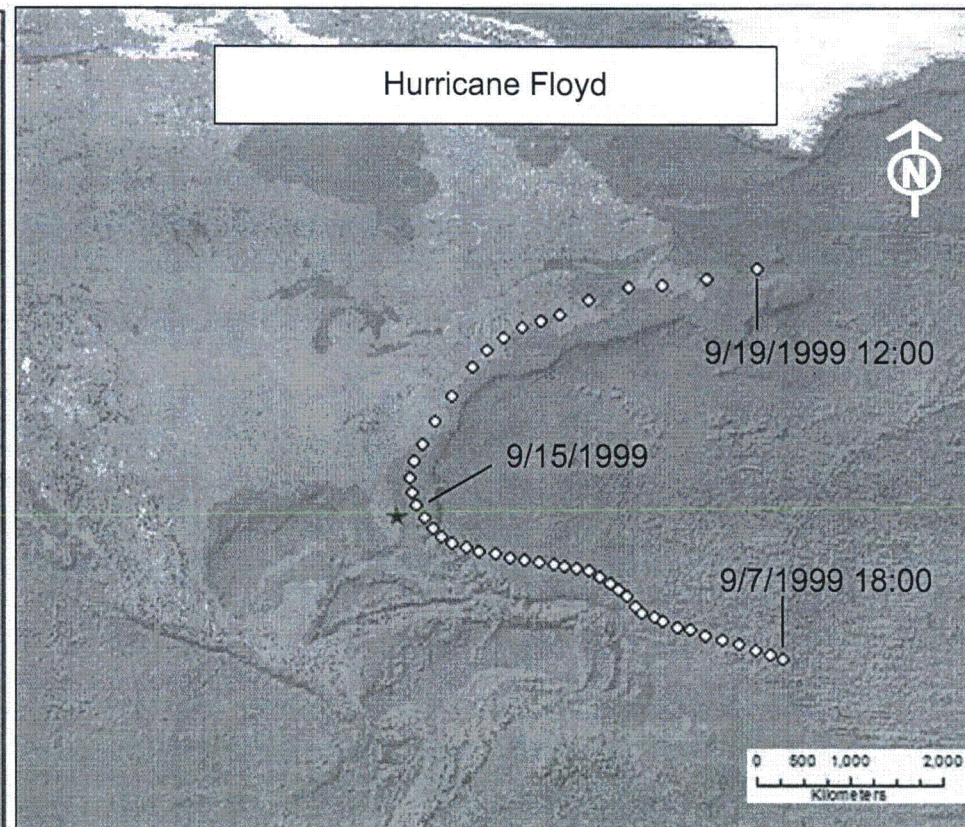
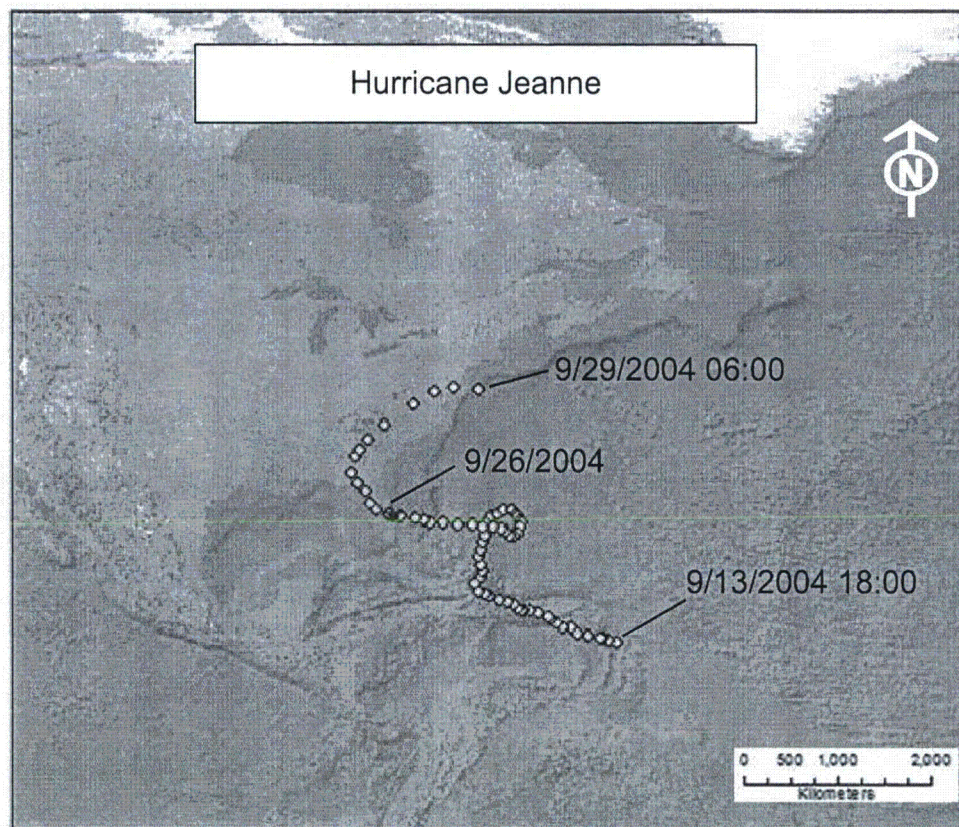
Tidal Times Series Comparison of Simulated versus  
Resynthesized Water Levels at Miami Harbor Entrance

Reference: Deltares, 2012

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- ★ PSL
- ◇ Hurricane Track

Note: Each point represents a six-hour time interval

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References: ESRI, 2014d; NOAA, 1999; NOAA, 2004b

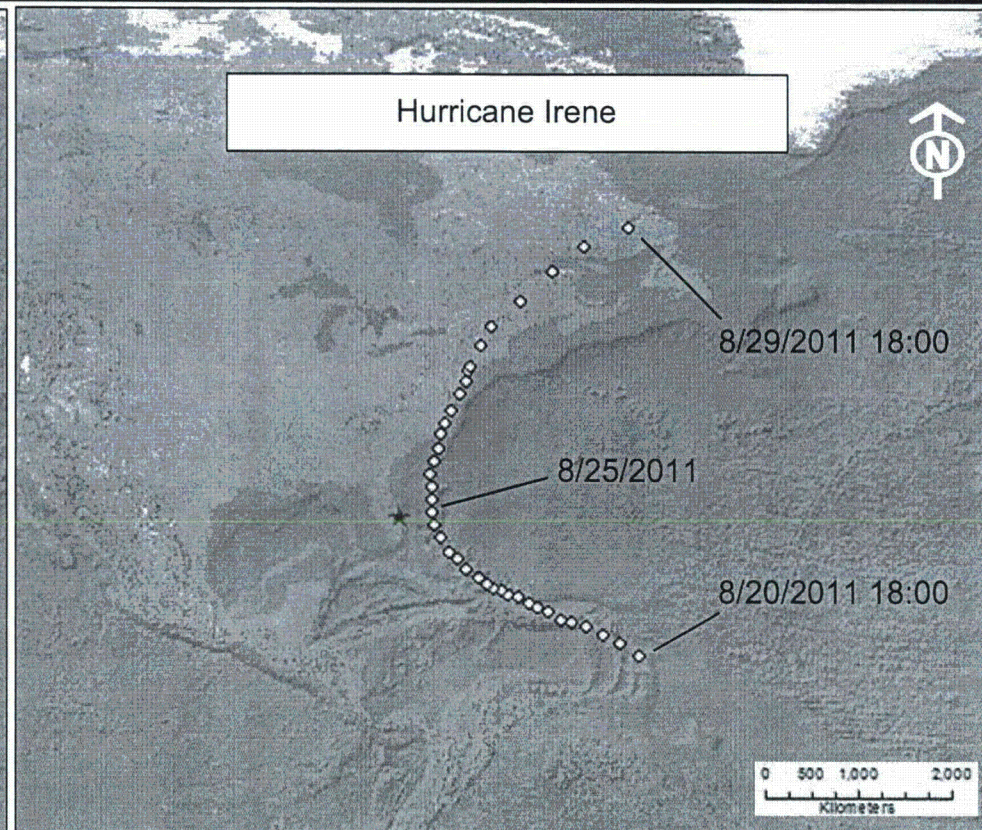
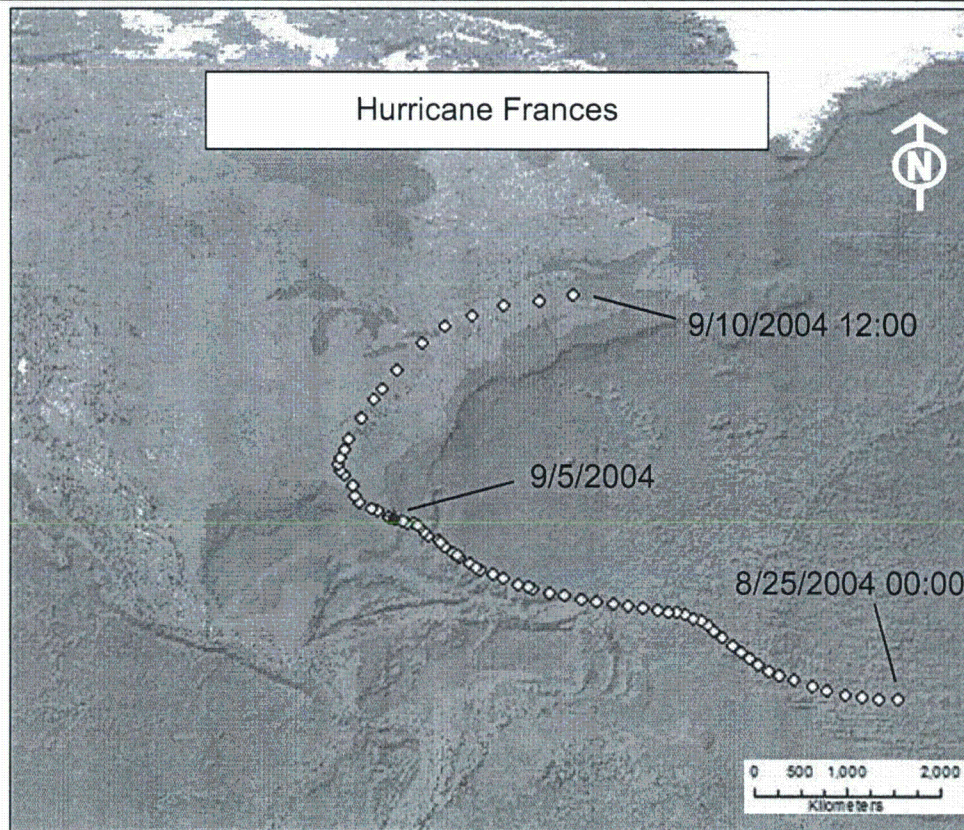


**Figure 4-14**  
Hurricane Jeanne and Hurricane Floyd Storm Tracks

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- ★ PSL
- ◇ Hurricane Track

Note: Each point represents a six-hour time interval

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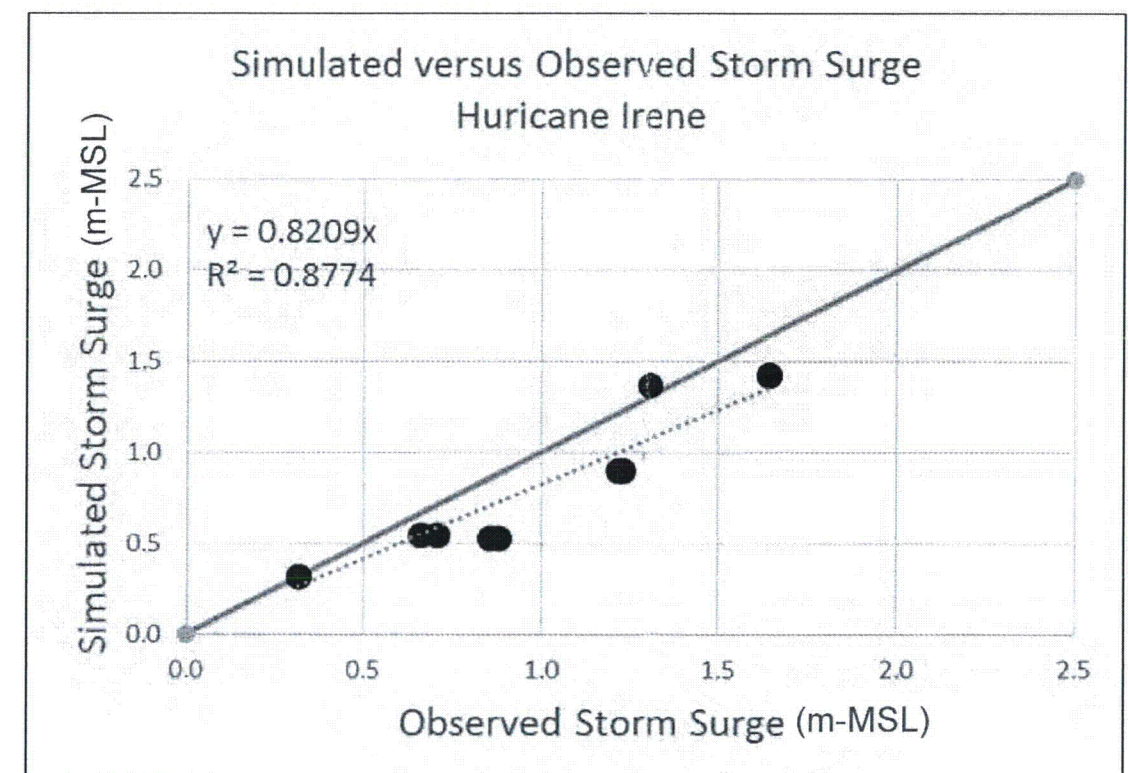
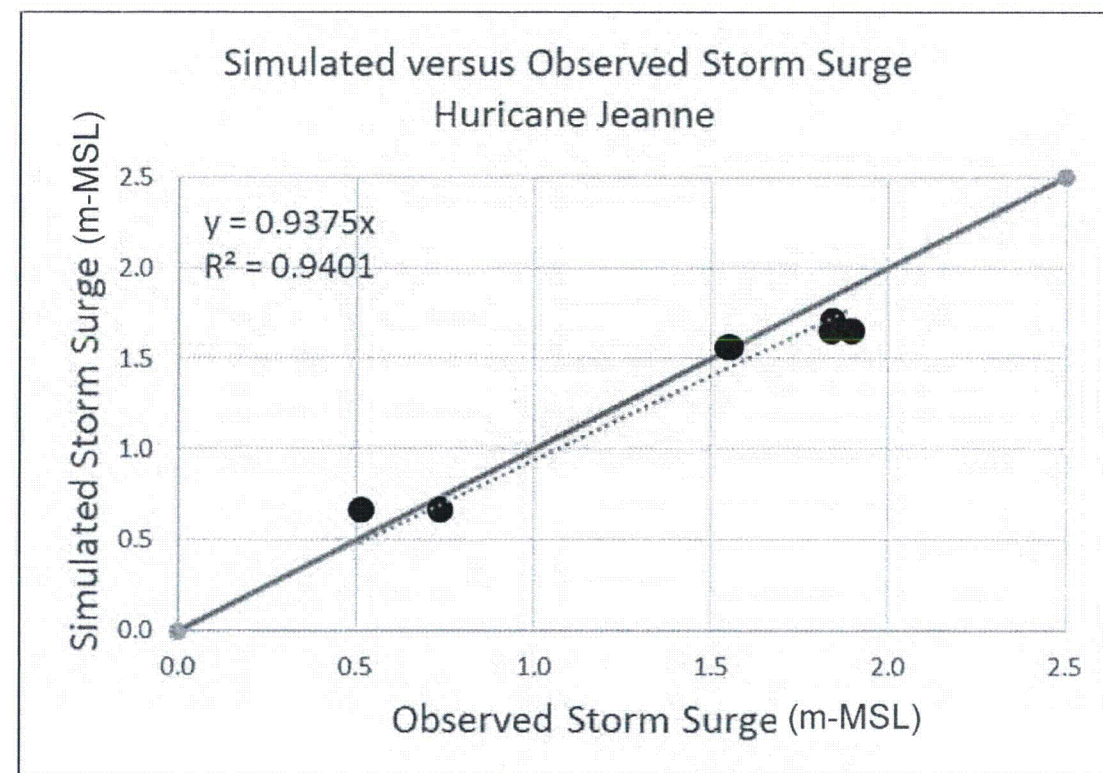
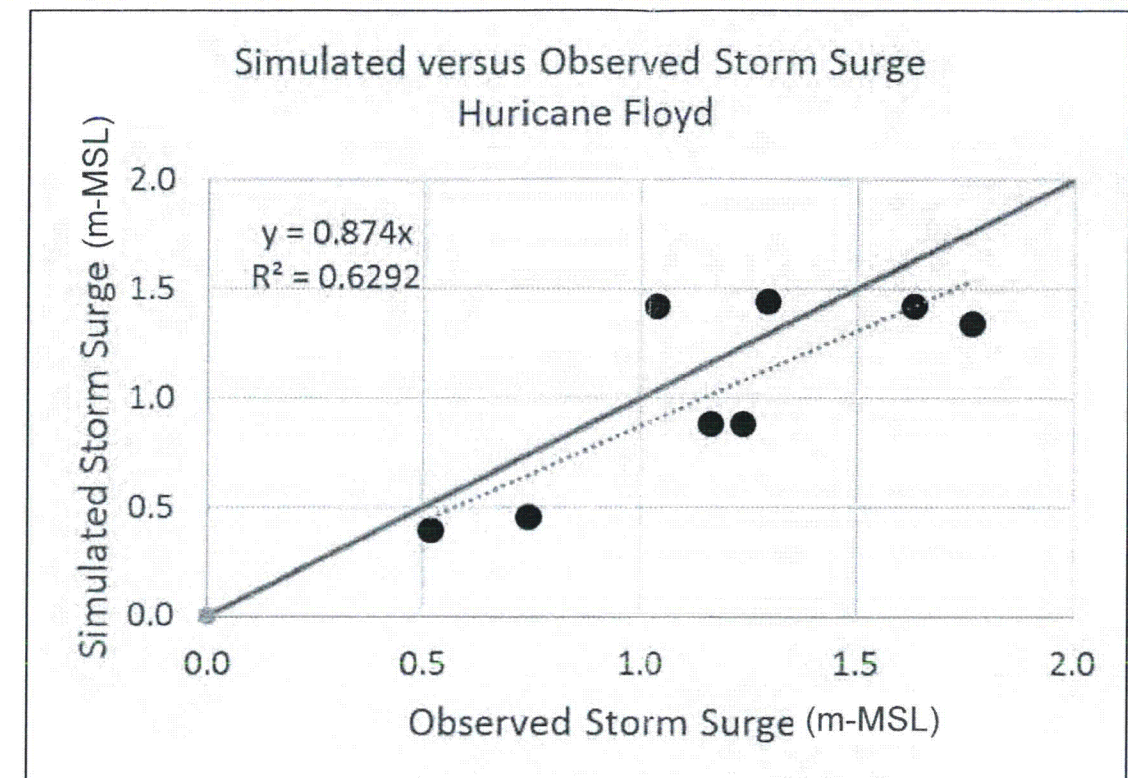
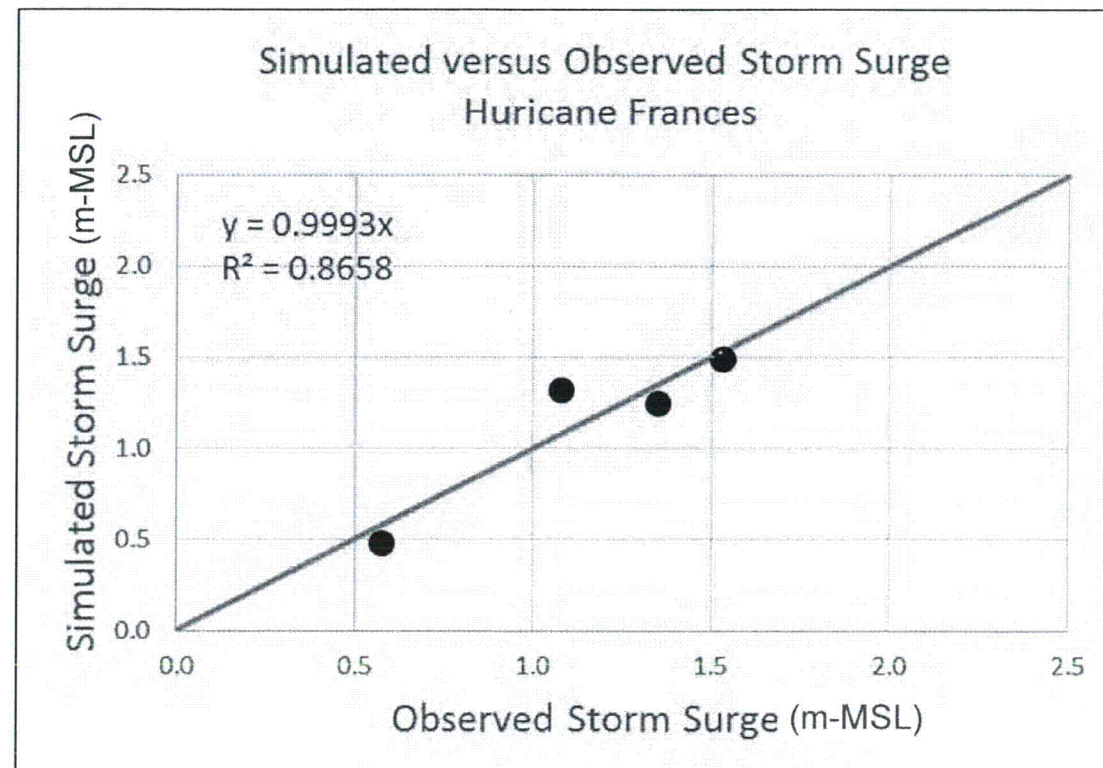
**Figure 4-15**  
Hurricane Frances and Hurricane Irene Storm Tracks

References: ESRI, 2014d; NOAA, 2004a; NOAA, 2011a

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References: NOAA, 2000; NOAA, 2004d; NOAA, 2011b; NOAA, 2013m; NOAA, 2013n; NOAA, 2013o; NOAA, 2013p; NOAA, 2013r; NOAA, 2013x; NOAA, 2013y; NOAA, 2013z; NOAA, 2013aa; NOAA, 2013ab; NOAA, 2013ac; NOAA, 2013ad

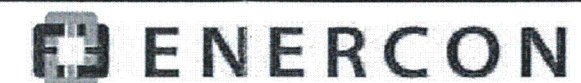
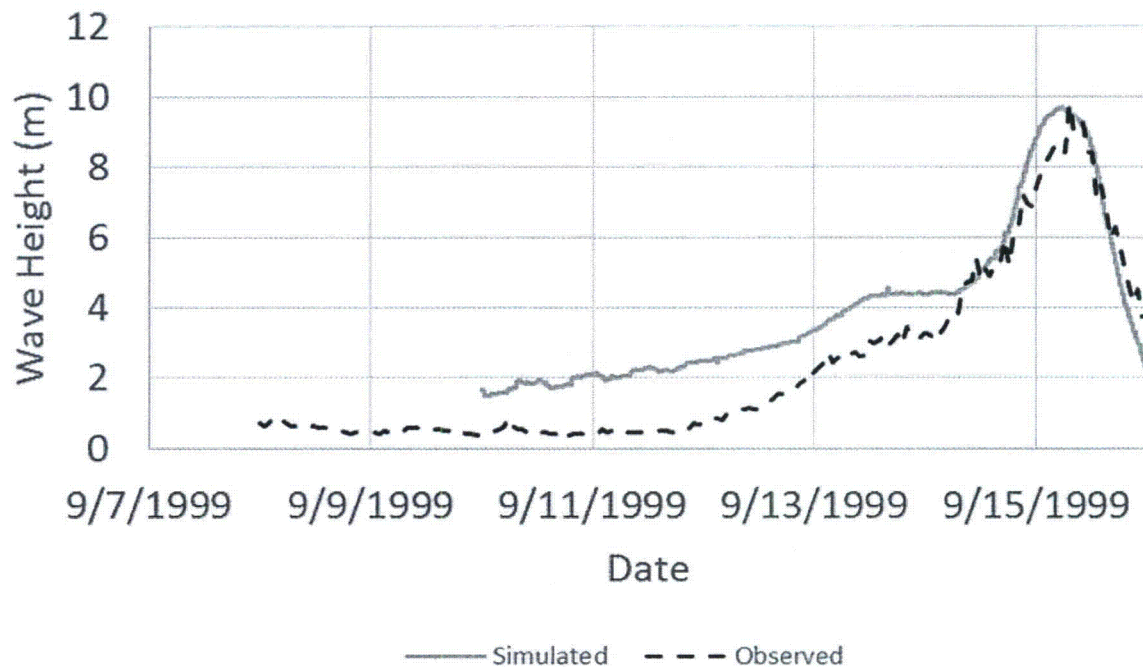


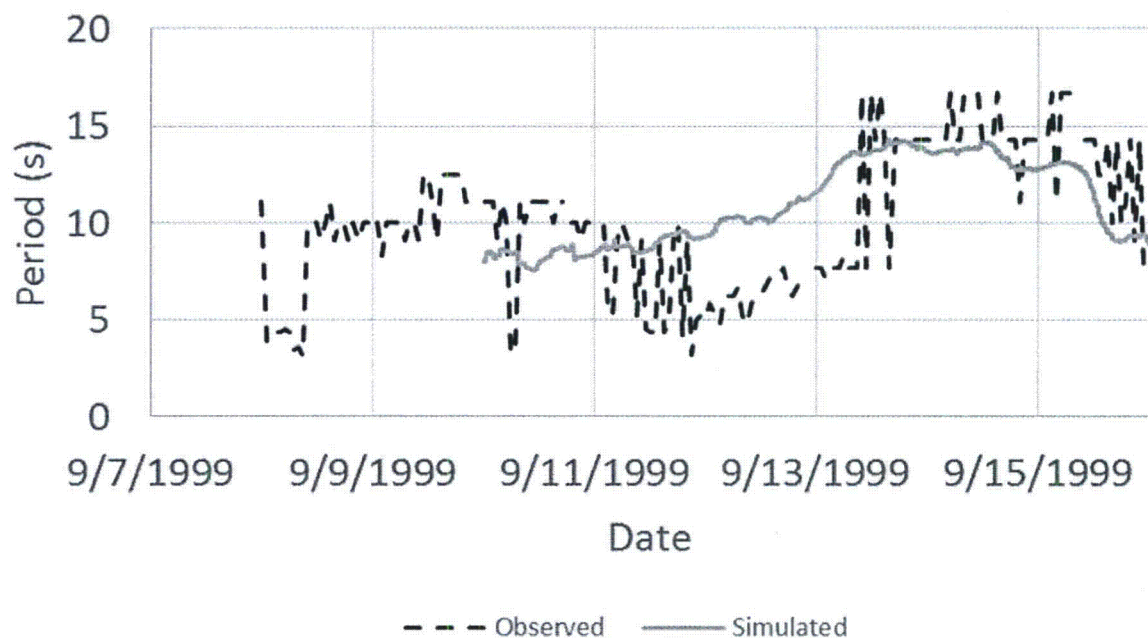
Figure 4-16  
Scatter Plot of Simulated Versus Observed Maximum WSEL for Hurricane Irene, Hurricane Jeanne, Hurricane Floyd and Hurricane Frances



### Station 41009 Significant Wave Height



### Station 41009 Period

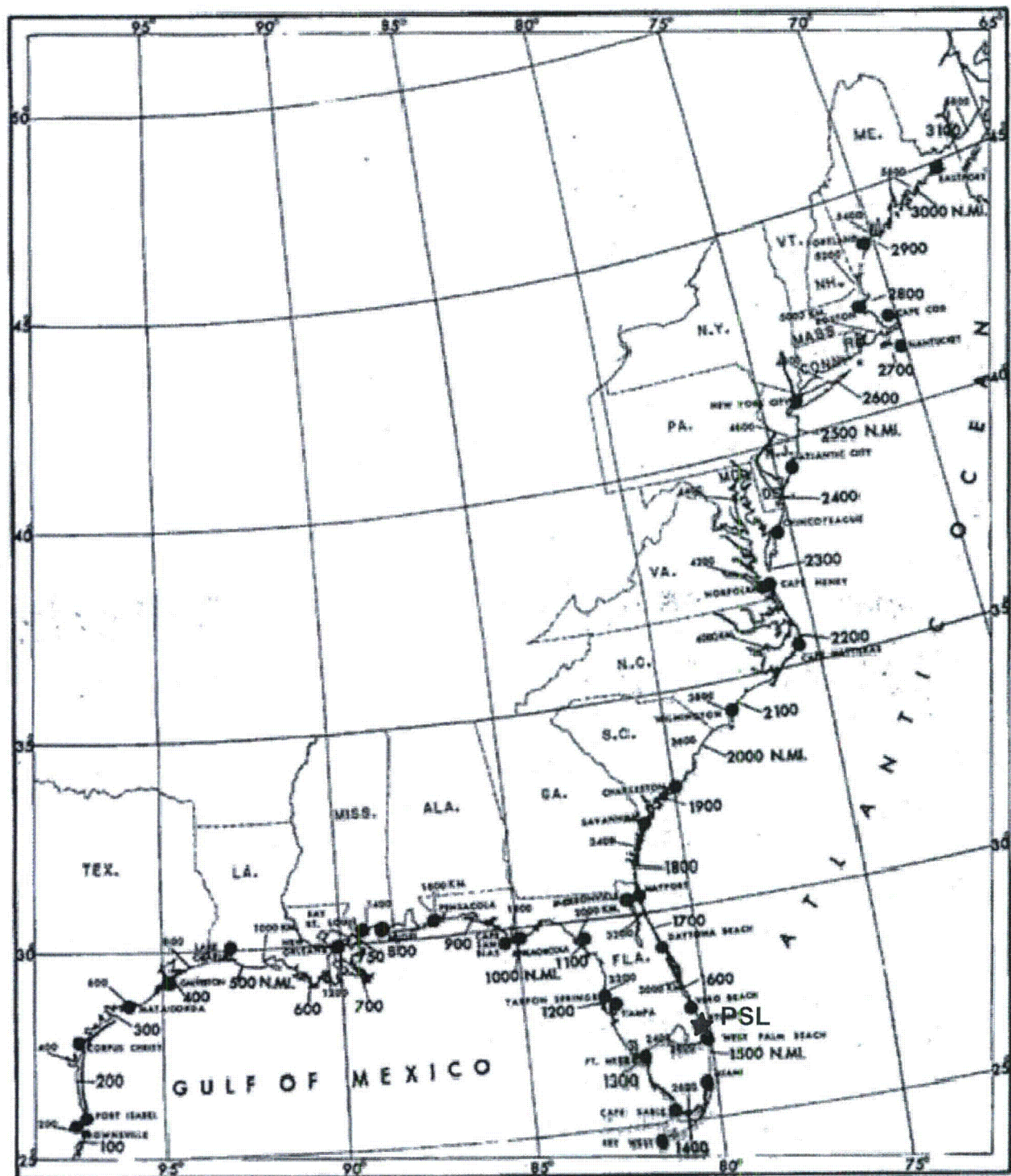


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**Figure 4-17**  
Time Series of Simulated versus Observed  
Significant Wave Height and Wave Period for  
Hurricane Floyd at Buoy 41009

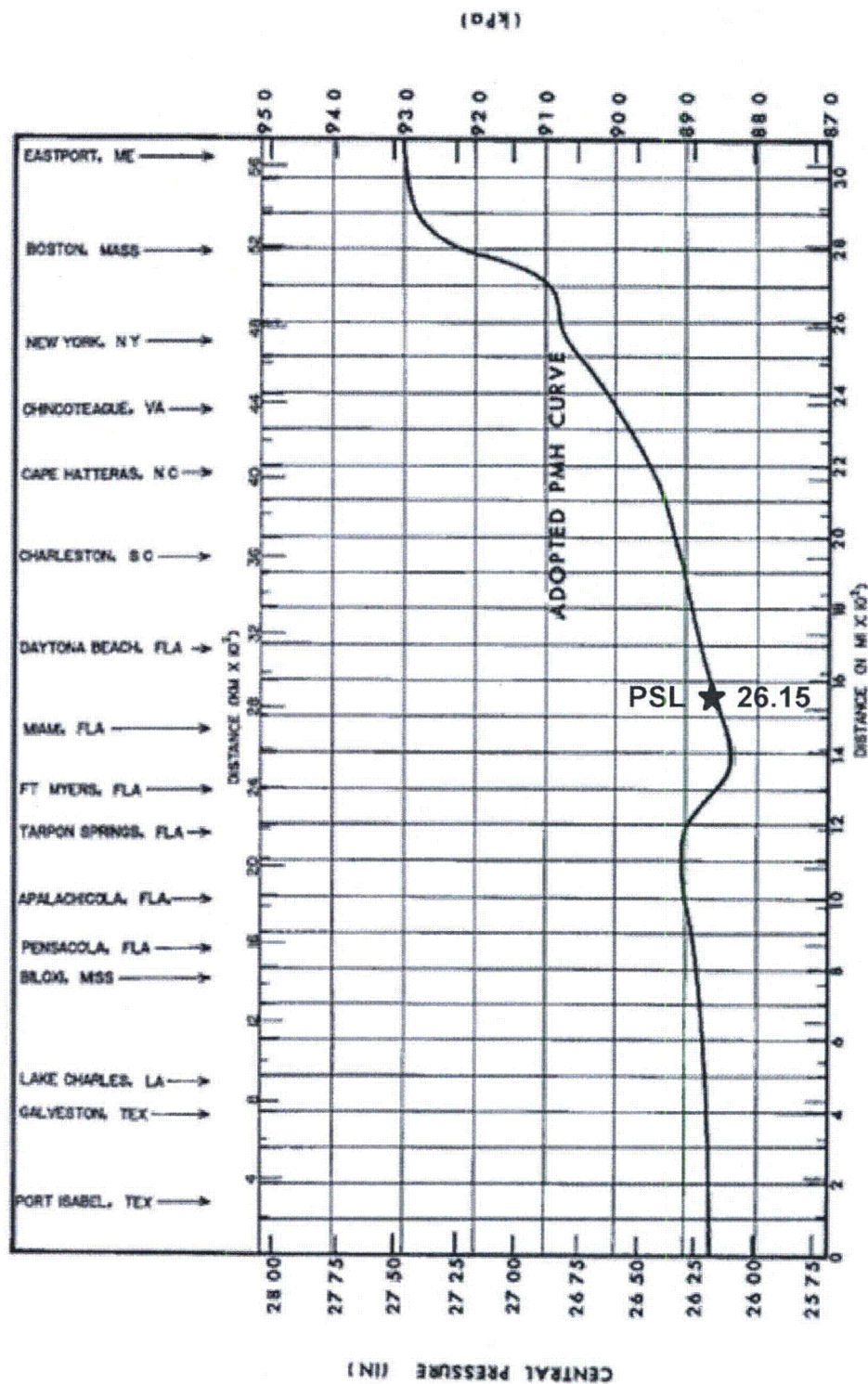




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Figure 4-18  
 Locator Map with Coastal Distance Intervals  
 Marked in Nautical Miles and Kilometers



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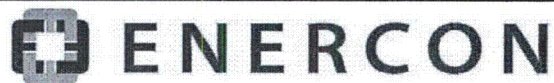
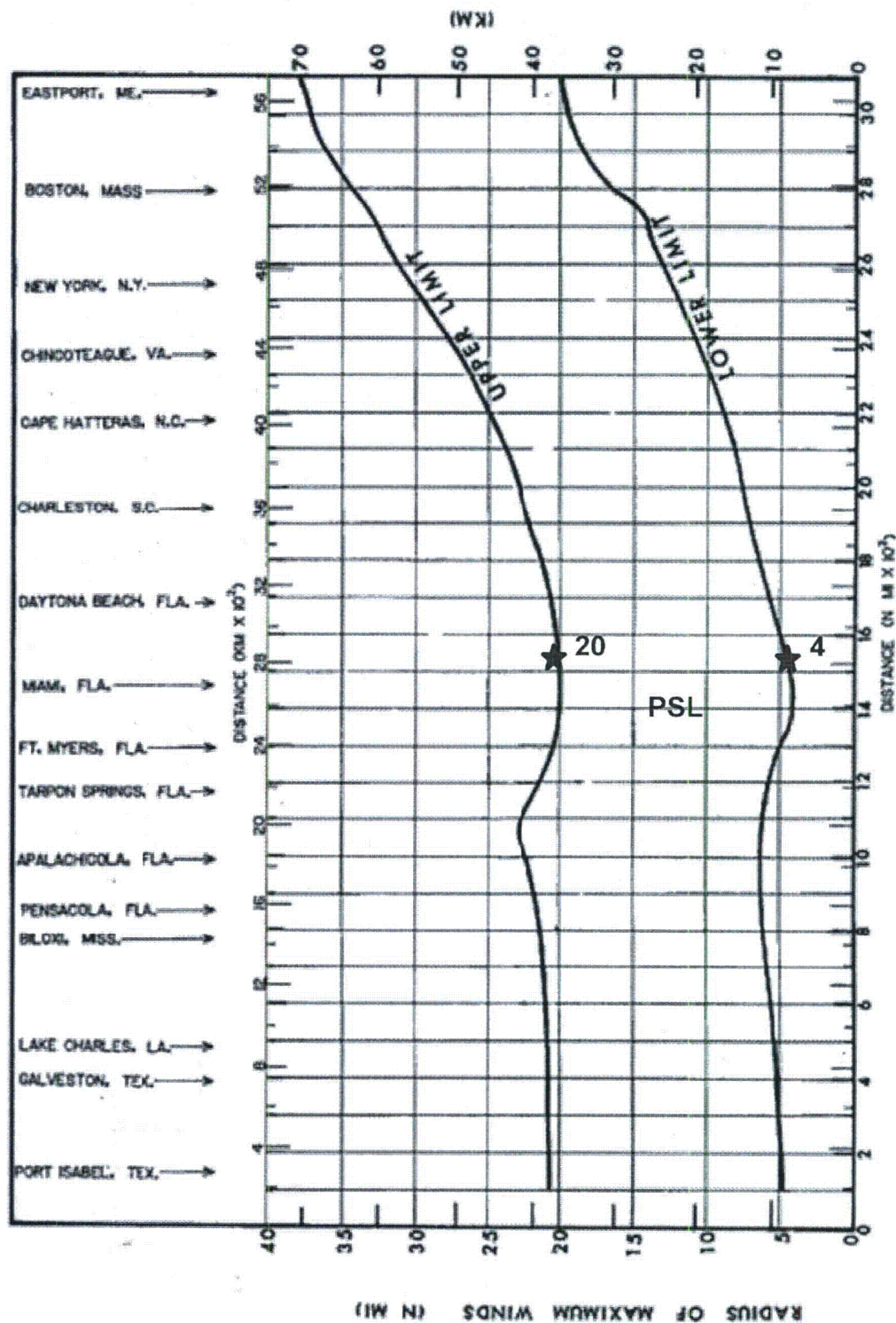


Figure 4-19  
Adopted Central Pressure of the Probable  
Maximum Hurricane





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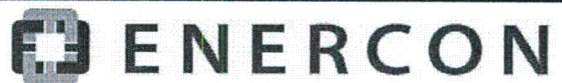
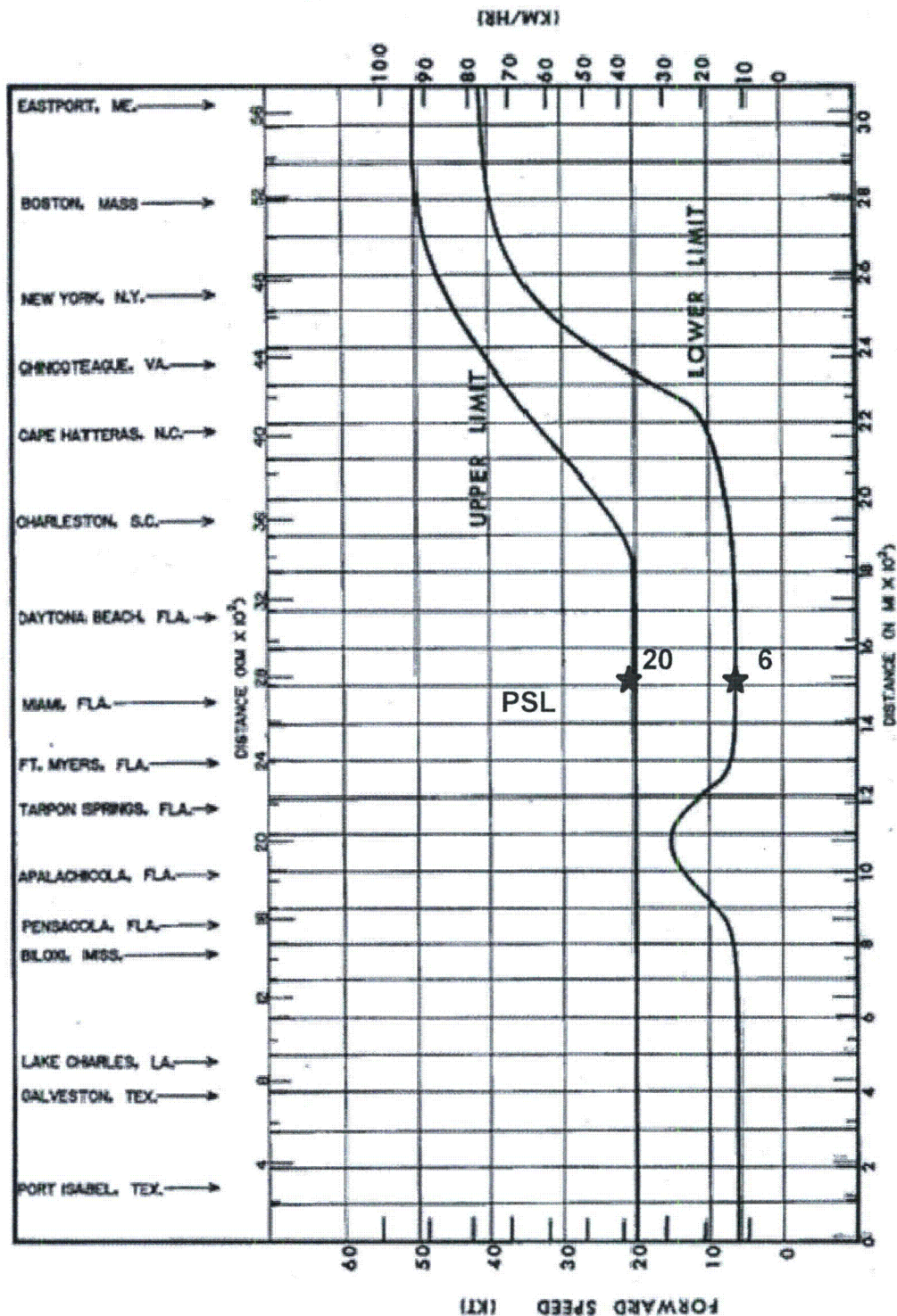


Figure 4-20  
Adopted Upper and Lower Limits of Radius of  
Maximum Winds for the PMH





NextEra Energy (NEE)  
St. Lucie Nuclear Power Plant Units 1 & 2  
Flooding Hazards Reevaluation Report

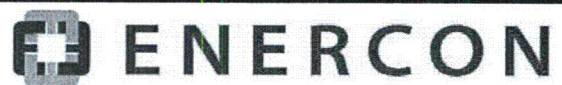
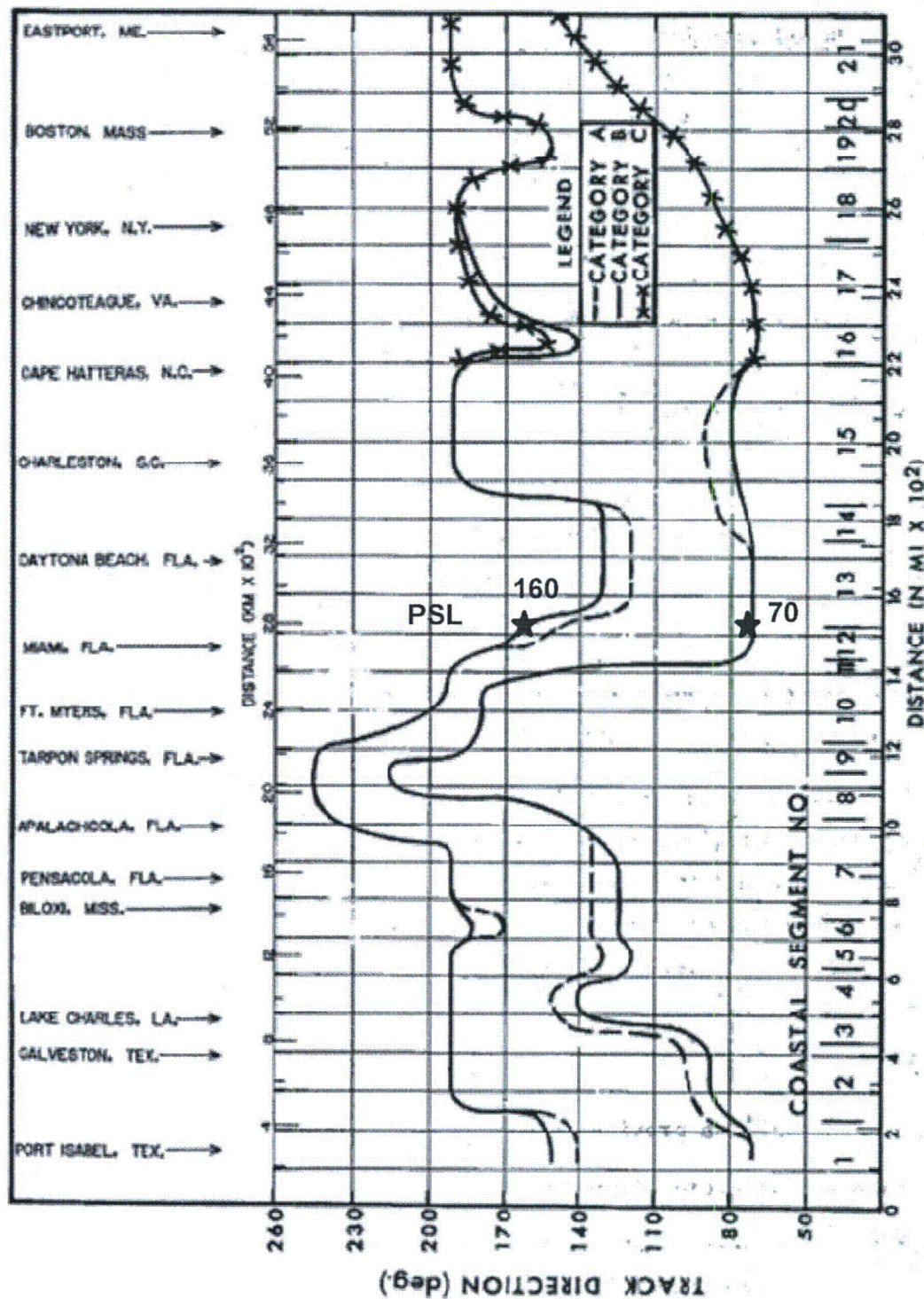


Figure 4-21  
Adopted PMH Upper and Lower Limits of Forward  
Speed





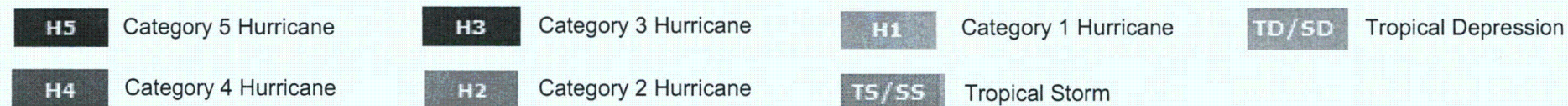
Note: The track direction is in accordance with the nautical convention

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Figure 4-22  
Maximum Allowable Range of the PMH Track  
Direction





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Flooding Hazards Reevaluation Report**



Figure 4-23

Recorded Major (H3 and Above) Hurricanes within  
120 Nautical Miles of PSL since 1842

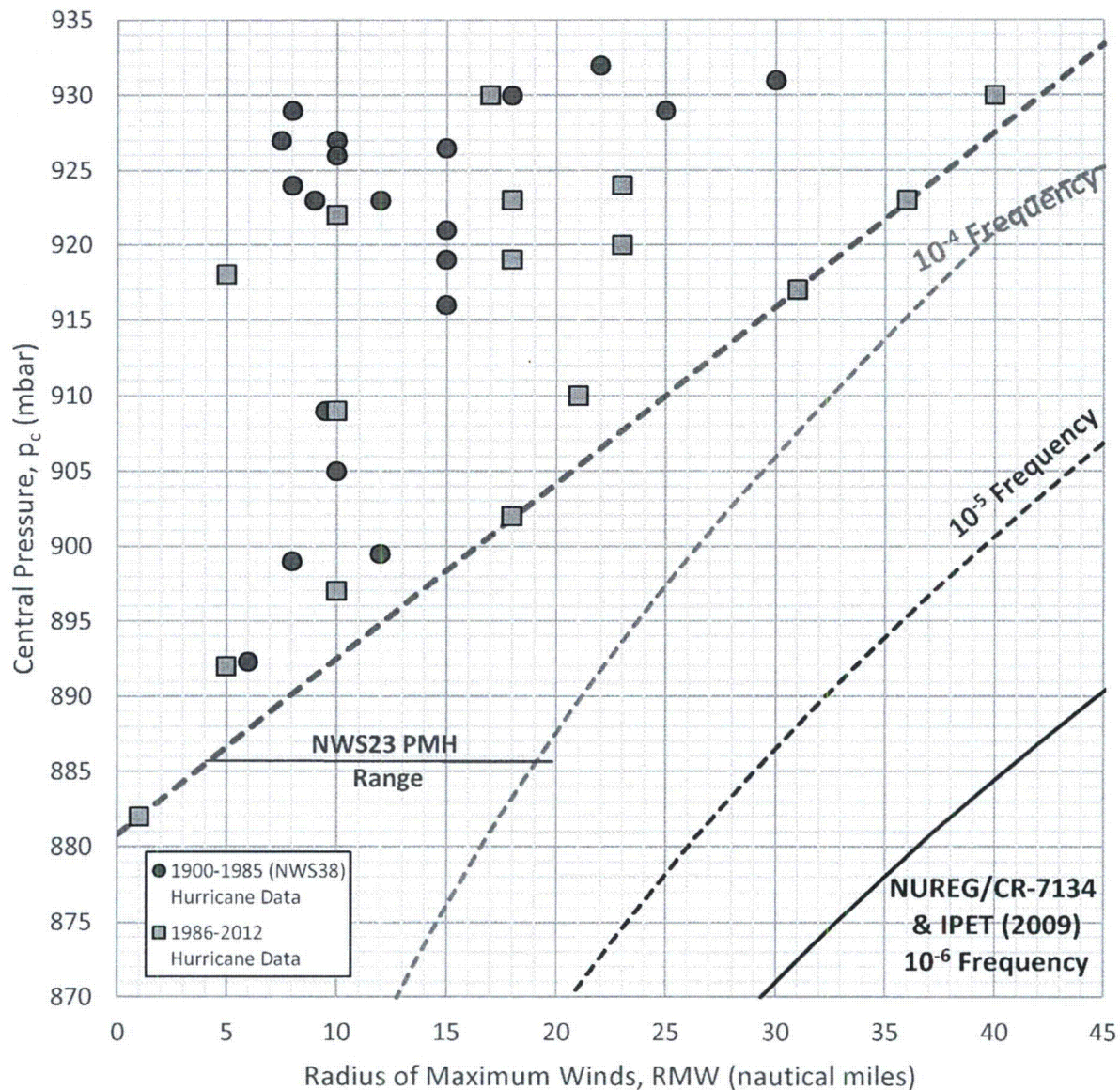
Reference: NOAA, 2013I

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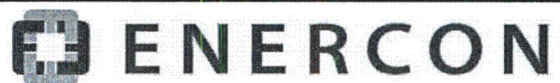
## Low Frequency Event Thresholds



Note: The PMH RMW range from NWS (1979) is shown for reference, along with historical hurricane data.

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**St. Lucie Nuclear Power Plant Units 1 & 2**  
**Flooding Hazards Reevaluation Report**

References: NWS, 1979; NWS, 1987; IPET, 2009; NOAA, 2012; Willoughby et al., 1989; Rappaport, 2005; Mayfield, 1995; Guiney and Lawrence, 2000; Pasch, 2006b; Beven and Cobb, 2004; Stewart, 2005; Knabb, 2006a; Knabb, 2006b; Pash, 2006a; Franklin, 2008

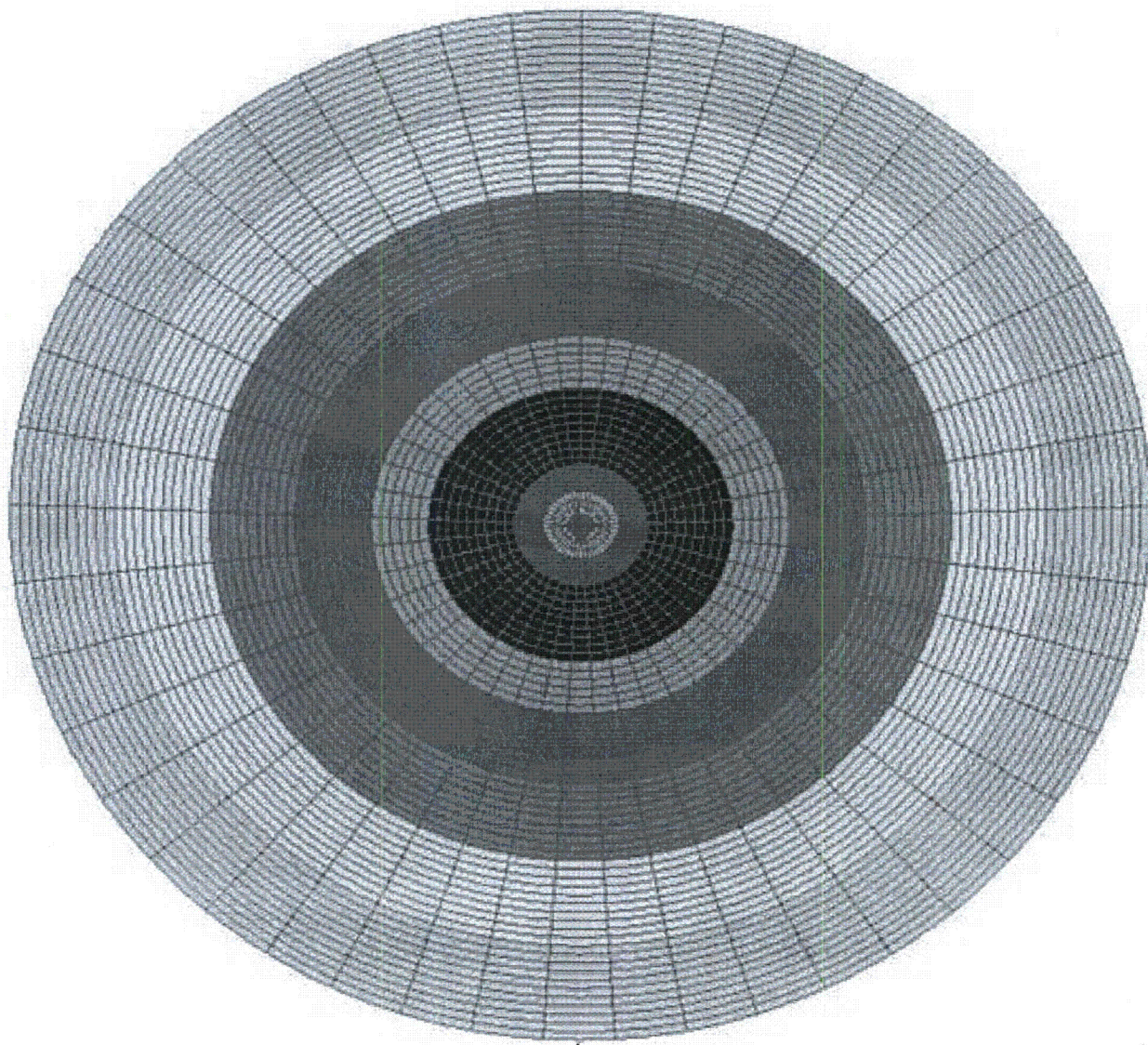


**Figure 4-24**  
 Low Probability Central Pressure-RMW  
 Thresholds for Hurricanes Near St. Lucie Nuclear  
 Power Plant (PSL)

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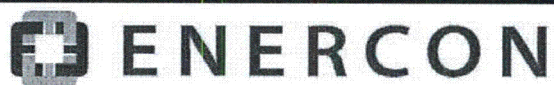
# **Legend**

Pressure Drop (in Hg)

	0.370802 - 0.491591		1.257098 - 1.813777
	0.196058 - 0.234107		0.491592 - 0.650342
	0.234108 - 0.290471		0.650343 - 0.889221
	0.290472 - 0.370801		0.889222 - 1.257097
			1.813778 - 2.541125
			2.541126 - 3.819856

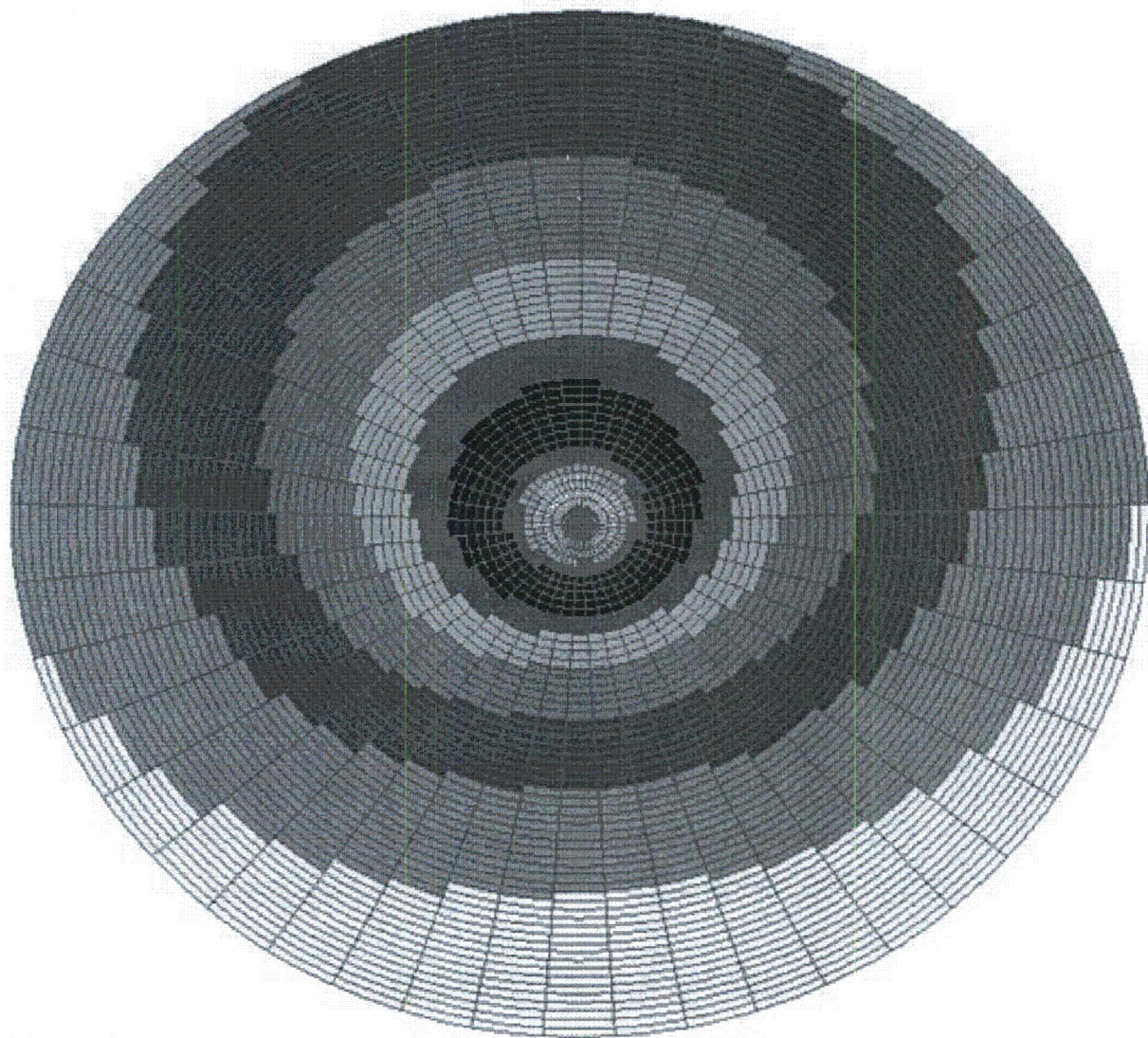
300 N mi

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**Figure 4-25**  
NWS23 PMH Pressure Drop Field (in Hg) Output  
Illustration



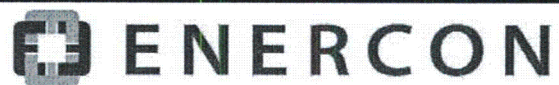


### Legend

Wind Knots	41 - 50	101 - 110
0	51 - 60	111 - 120
1 - 10	61 - 70	121 - 130
11 - 20	71 - 80	131 - 140
21 - 30	81 - 90	
31 - 40	91 - 100	

300 N mi

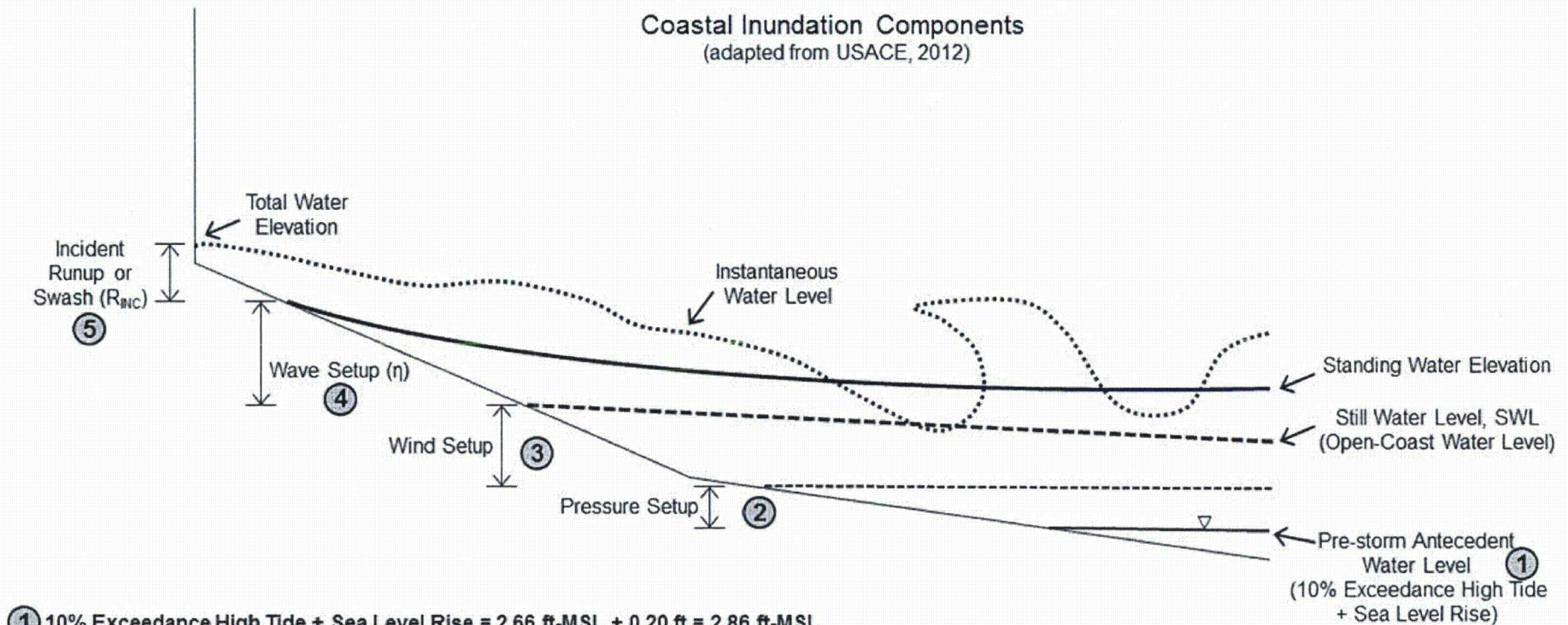
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**Figure 4-26**  
NWS23 PMH Wind Field (knots) Output Illustration



# Coastal Inundation Components (adapted from USACE, 2012)



① 10% Exceedance High Tide + Sea Level Rise = 2.66 ft-MSL + 0.20 ft = 2.86 ft-MSL

② Calculated by Numerical Modeling (DELFT3D)

③ Calculated by Numerical Modeling (DELFT3D) = 12.36 ft

④ Calculated by Numerical Modeling (DELFT3D) = 0.66 ft

⑤ Hand-Calculated by Empirical Relationships = 0 ft at Power Block (Overtopping =  $7.6 \times 10^{-6}$  ft<sup>3</sup>/s/foot)

Note: Drawing not to scale

$$\text{Probable Maximum Storm Surge at PSL Powerblock With Wave Runup} = \left\{ \begin{array}{l} +15.86 \text{ ft} - \text{MSL} \\ +18.3 \text{ ft} - \text{PSL Datum} \\ +14.9 \text{ ft} - \text{NAVD88} \end{array} \right\}$$

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Flooding Hazards Reevaluation Report



Figure 4-27  
Storm Surge Components





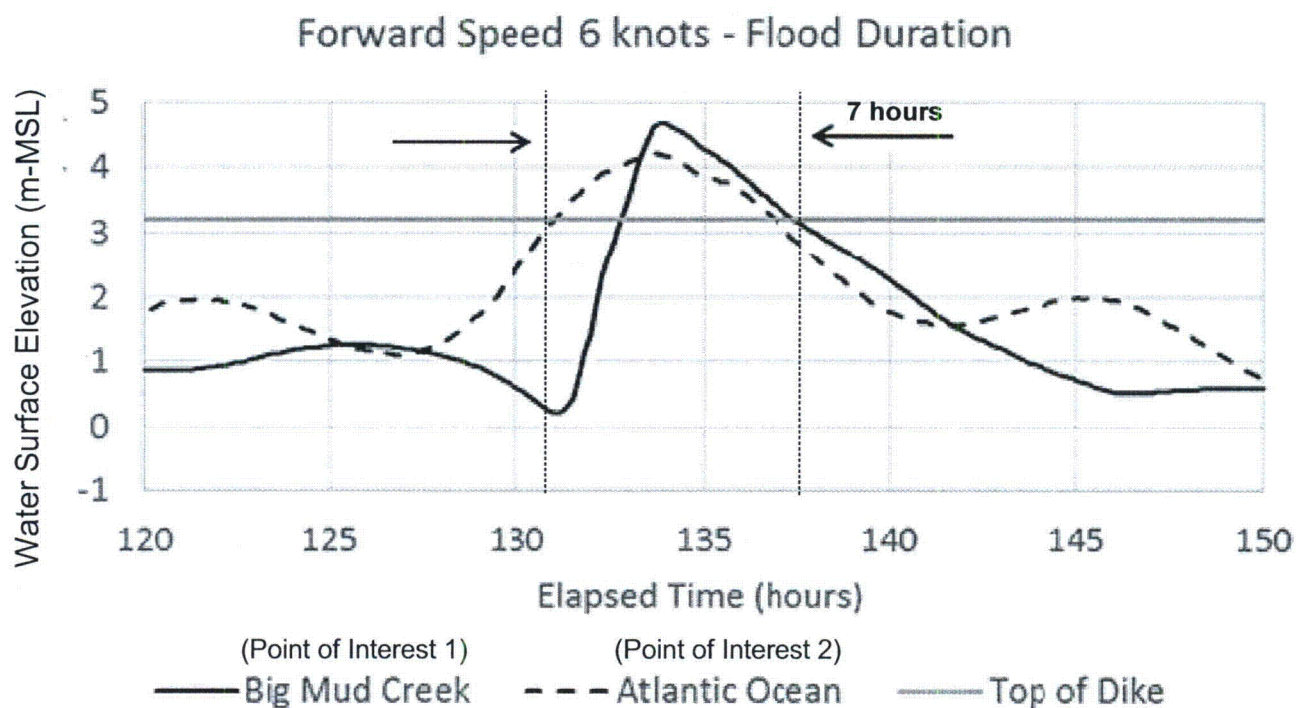
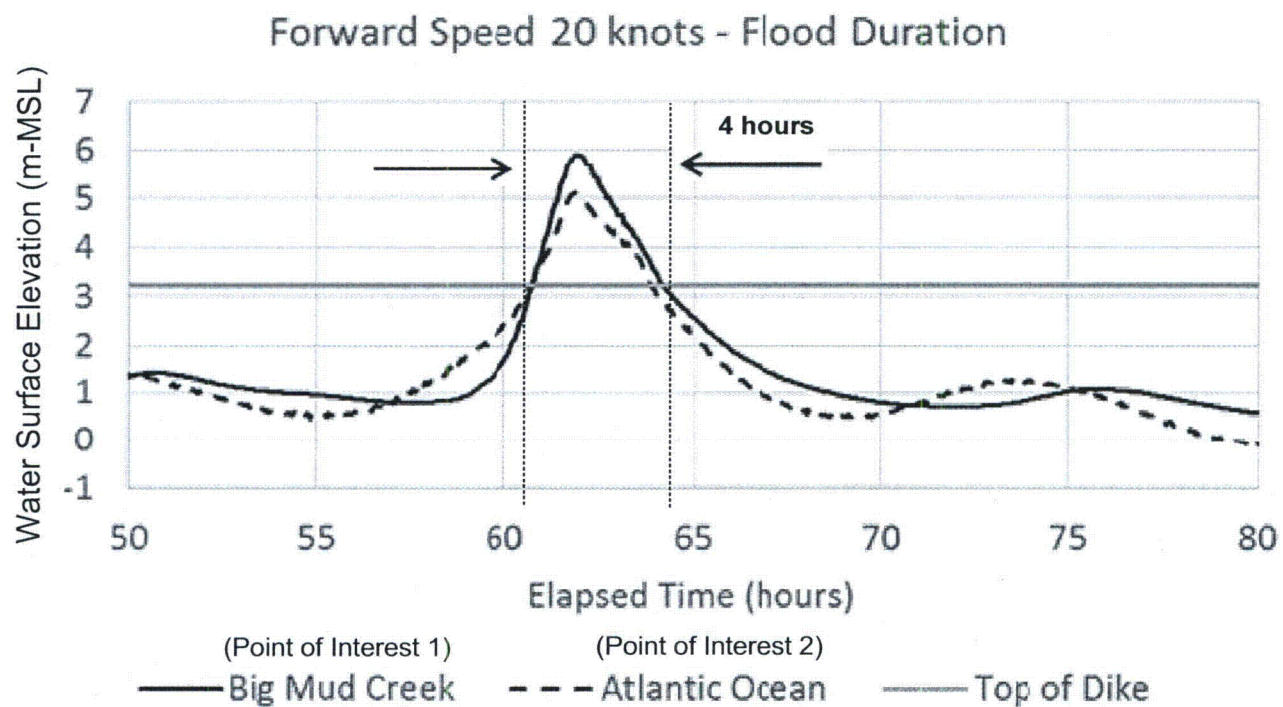
**NextEra Energy (NEE)  
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Flooding Hazards Reevaluation Report**



**Figure 4-28**

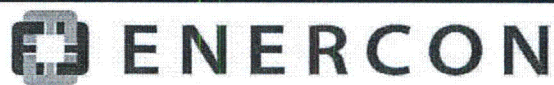
PMSS Inundation (Excluding Runup) at  
EL 14.9 ft-NAVD88





Note: The points used to obtain the The Big Mud Creek and the Atlantic Ocean results are shown in Figure 4-31

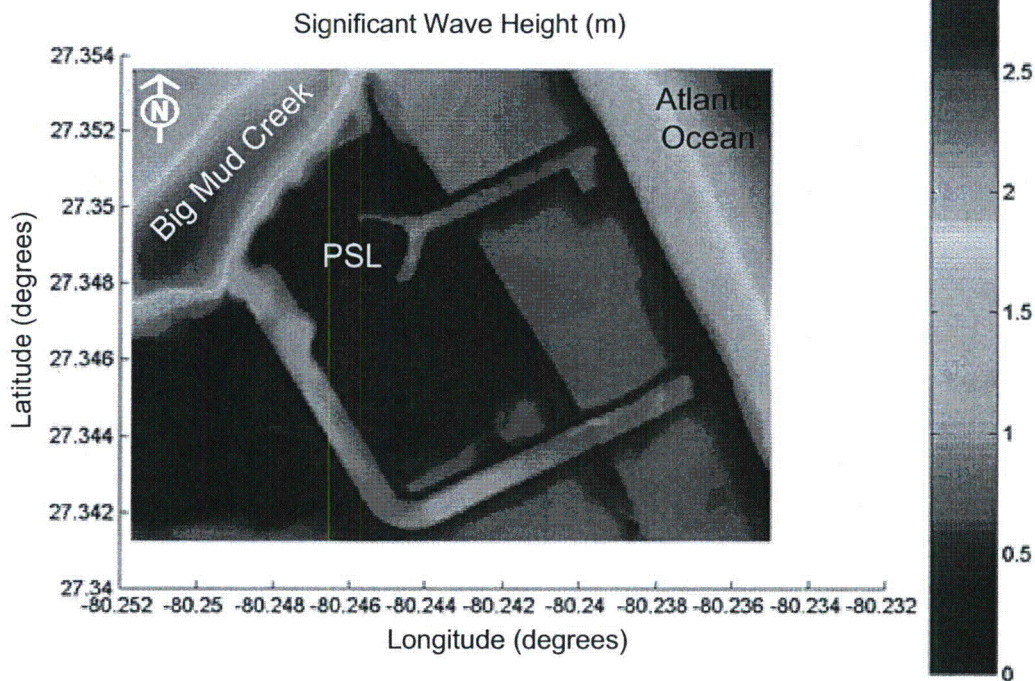
NextEra Energy (NEE)  
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Flooding Hazards Reevaluation Report



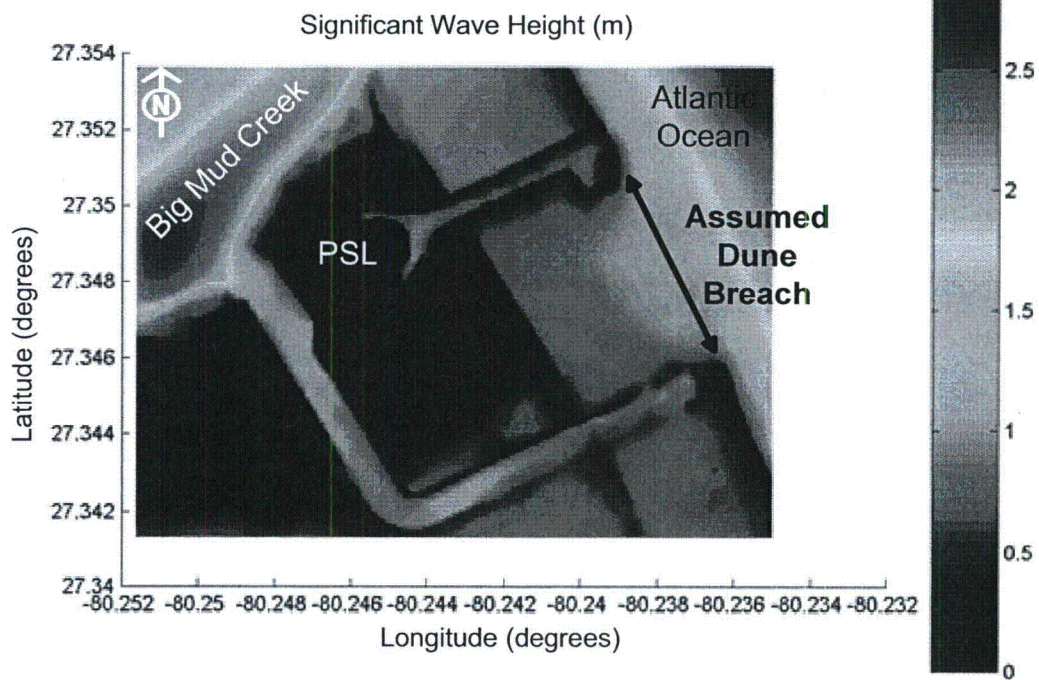
**Figure 4-29**  
Duration of Flooding for Forward Speeds



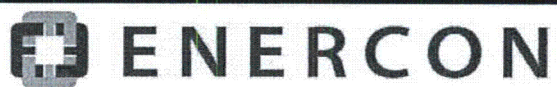
### Dunes Not Breached



### Dunes Breached



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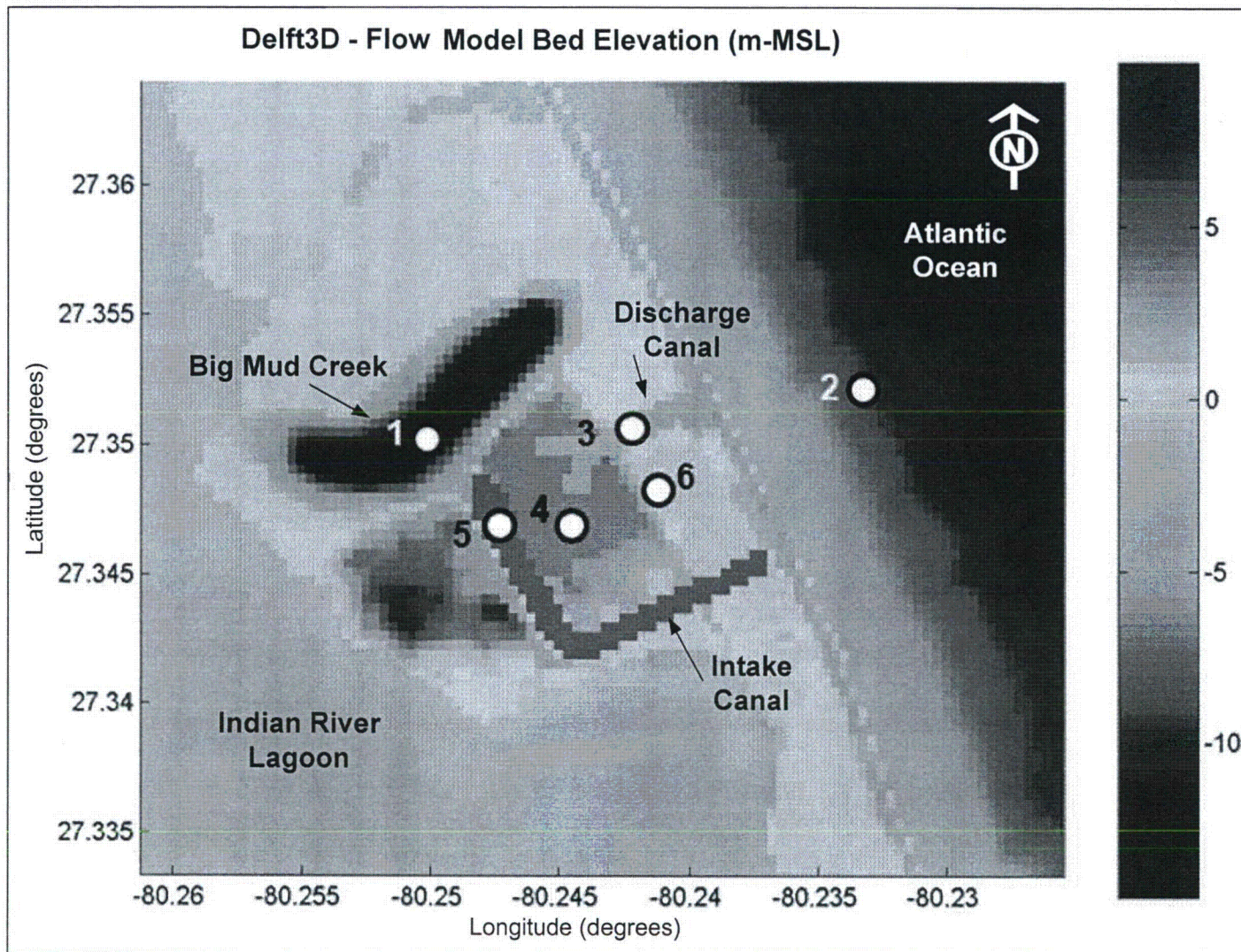


**Figure 4-30**  
Significant Wave Height (m) at Time of Maximum  
Surge – Breached & Non Breached Sand Dunes

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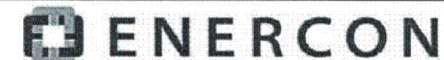
REV. 0





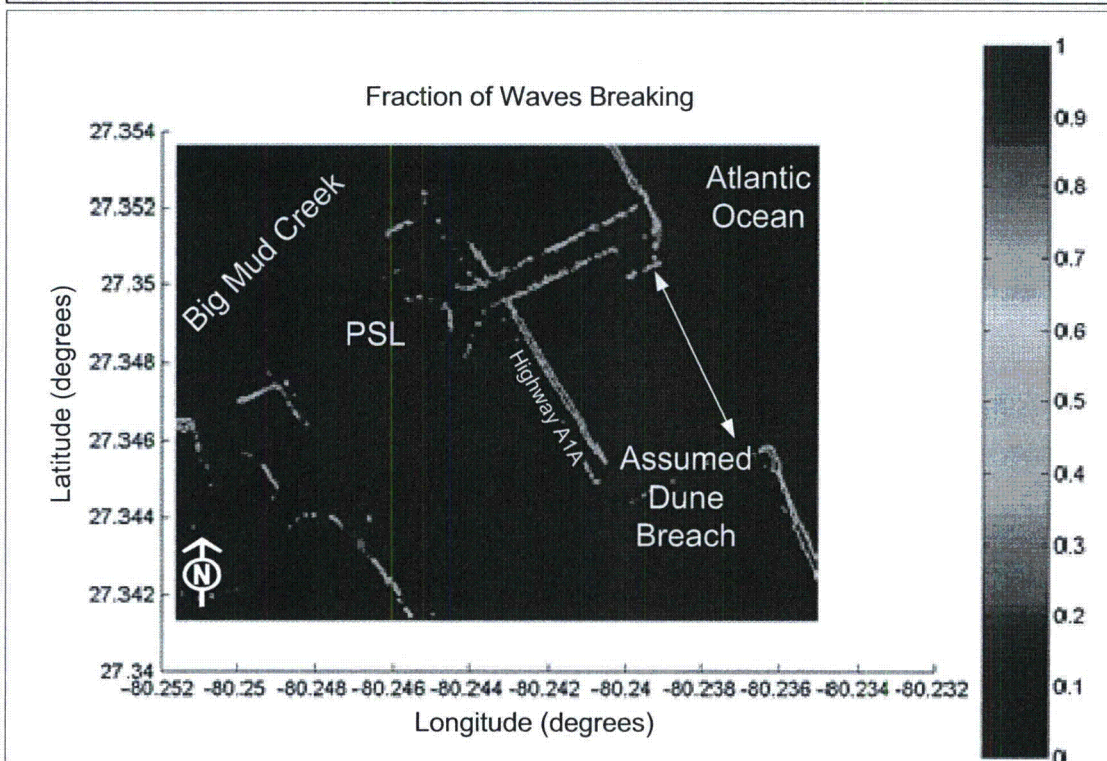
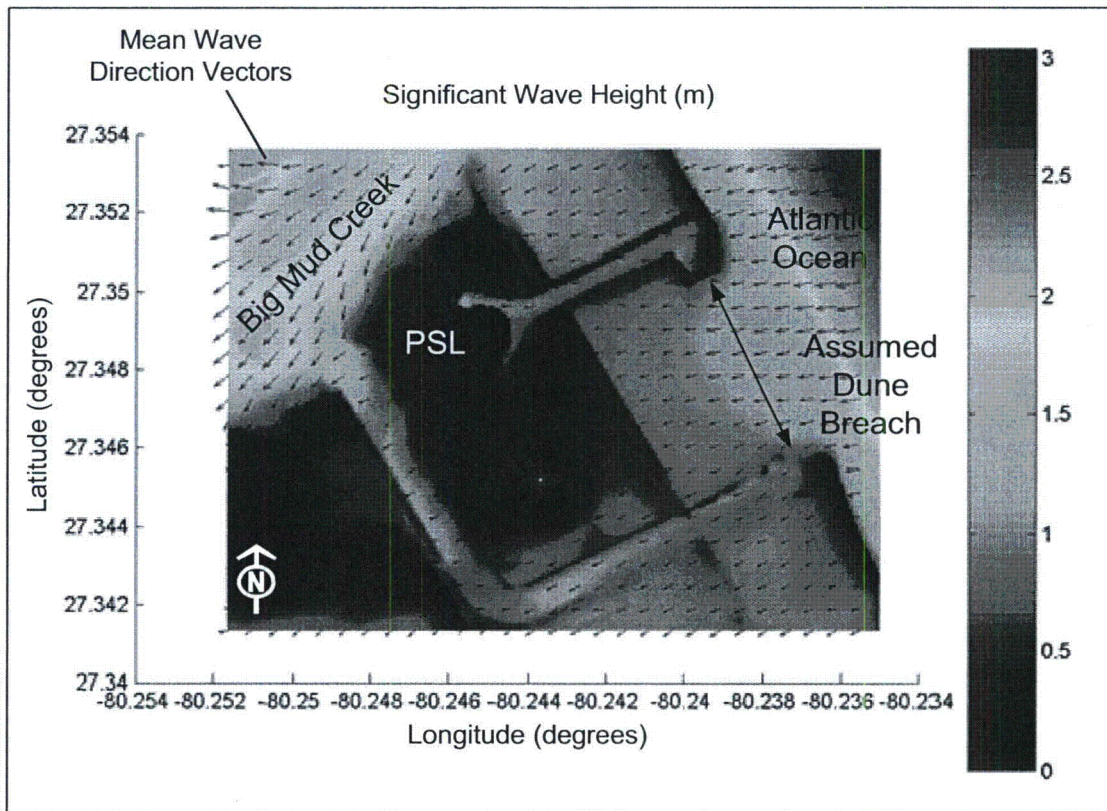
Point of Interest	Location
1	Big Mud Creek
2	Atlantic Ocean
3	Discharge Canal
4	Obs. Point 4
5	Intake Canal
6	Obs. Point 6

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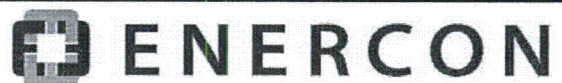


**Figure 4-31**  
PMSS Observation Points



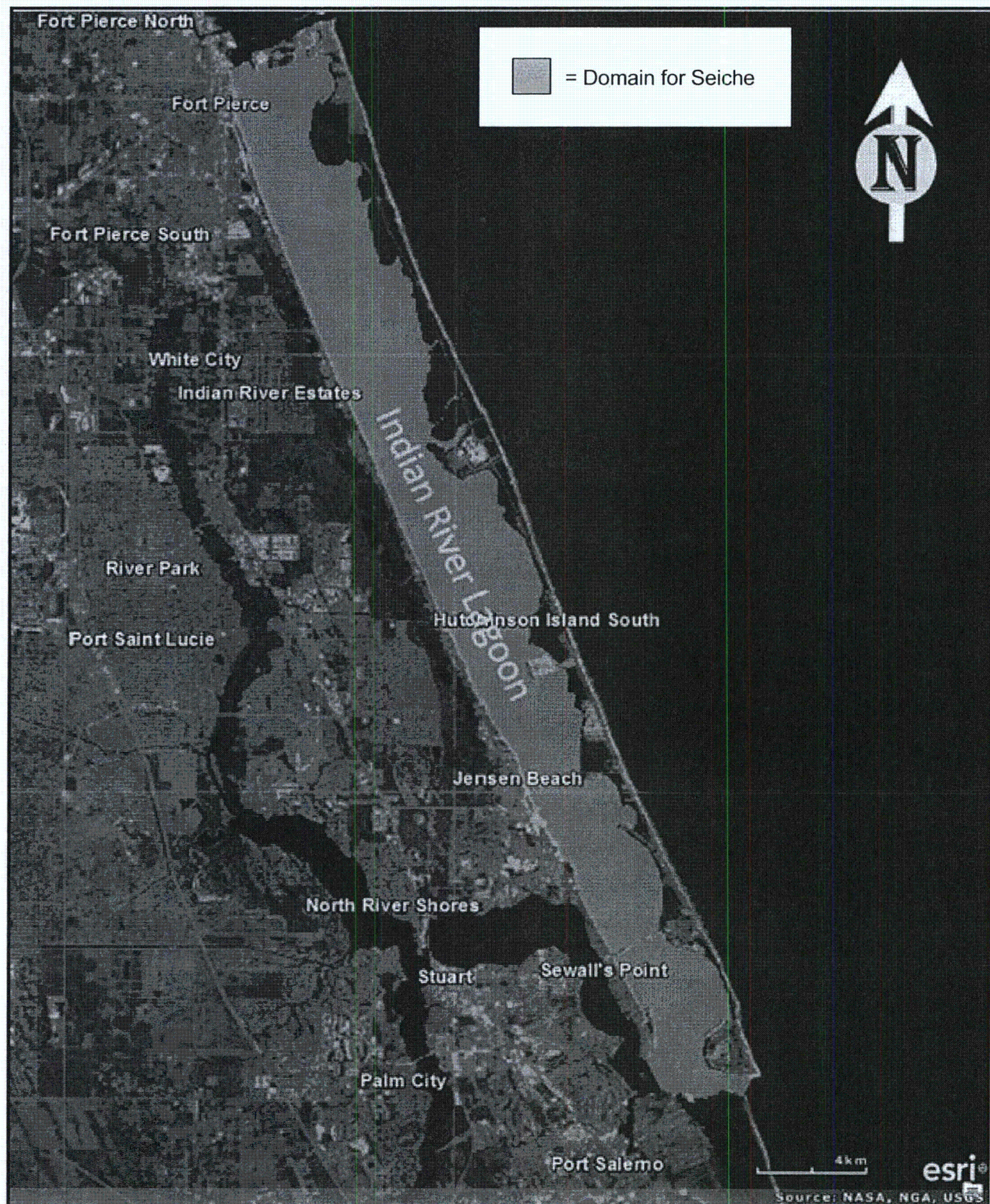


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**Figure 4-32**  
PMSS Wave Results at Time of Maximum Surge



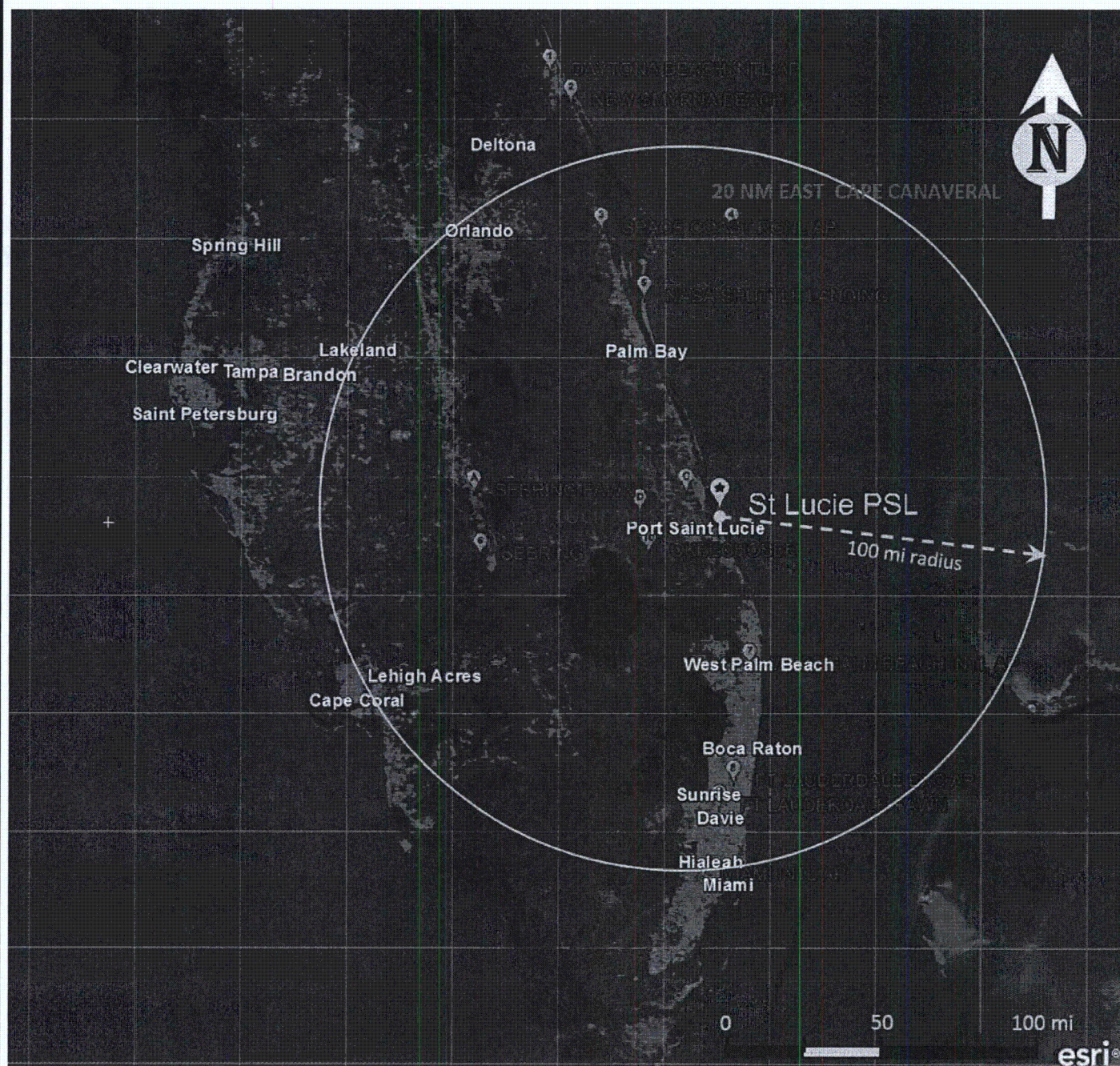


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Flooding Hazards Reevaluation Report

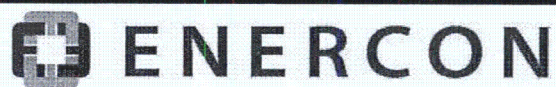


**Figure 4-33**  
Indian River Lagoon Domain for Seiche Analysis





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**Figure 4-34**  
Meteorological Stations with Wind Data

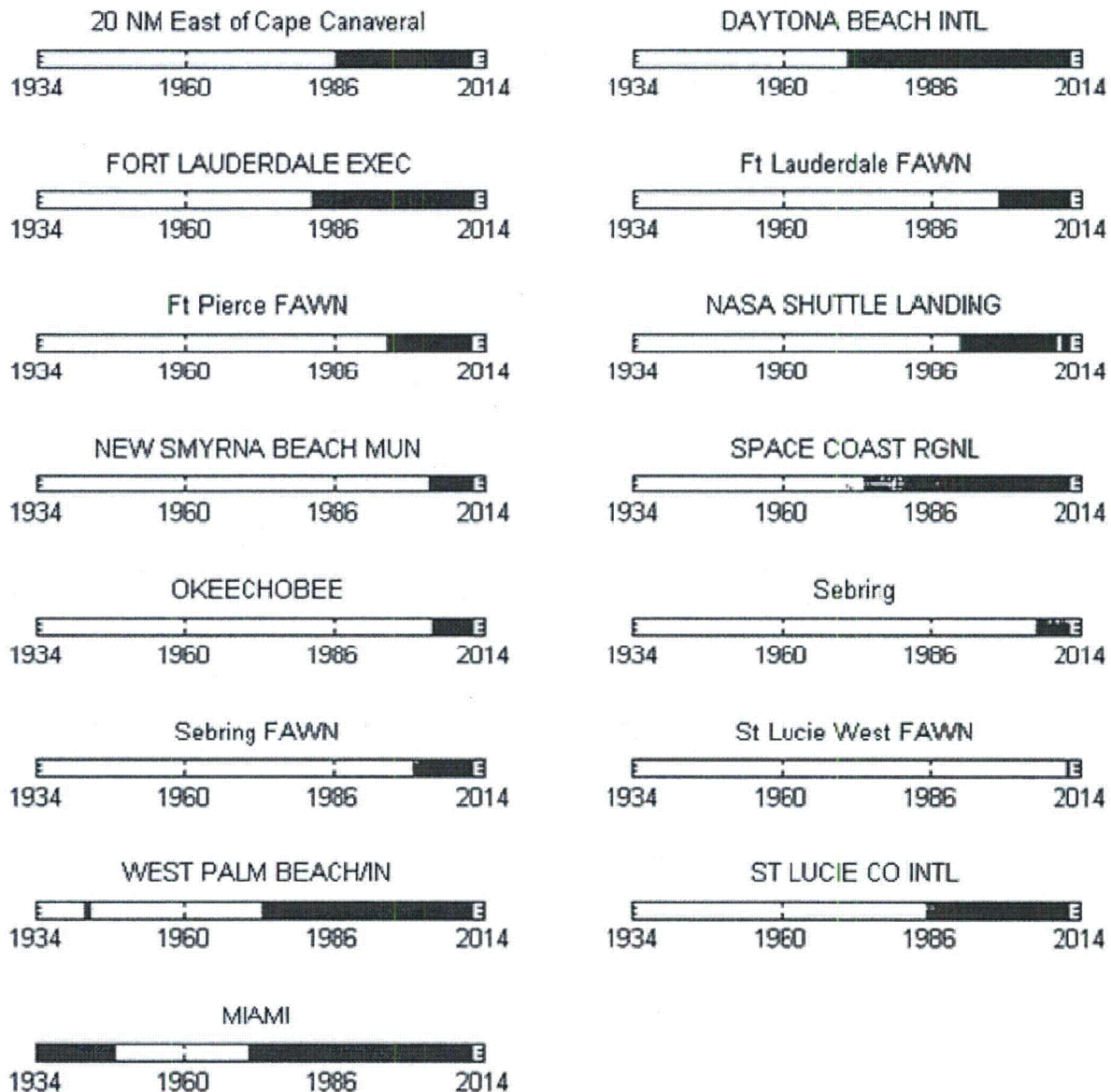
References: ESRI, 2014a; FAWN, 2014; NOAA, 2014a;  
NOAA, 2014b

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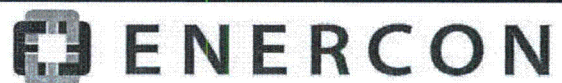


### Wind Speed Data Span



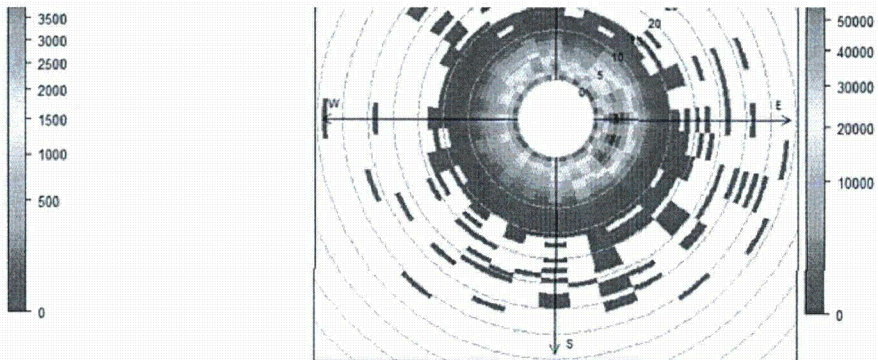
Note: All of the stations have at least hourly information, the FAWN stations and buoy data have sub-hourly data

NextEra Energy (NEE)  
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Flooding Hazards Reevaluation Report

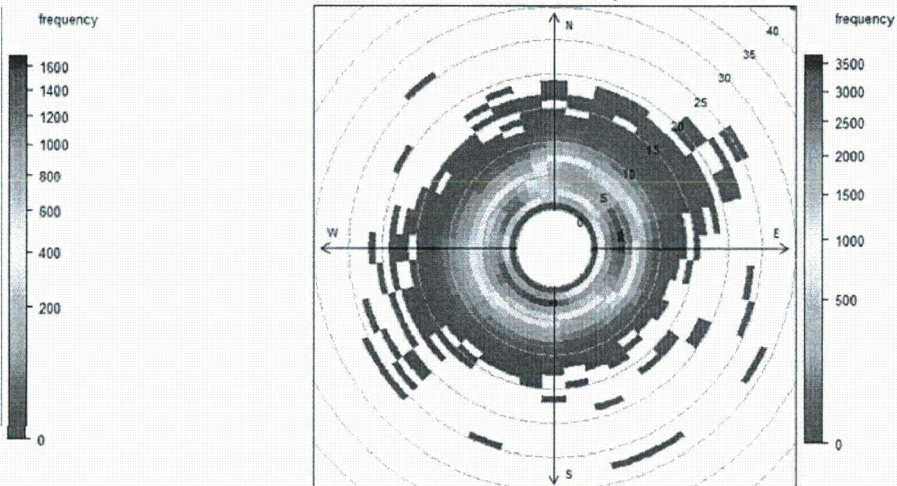


**Figure 4-35**  
Record Length at Selected Meteorological  
Stations with Wind Data

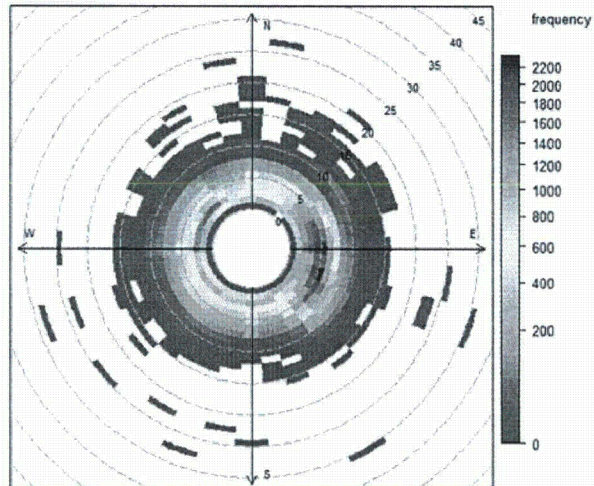




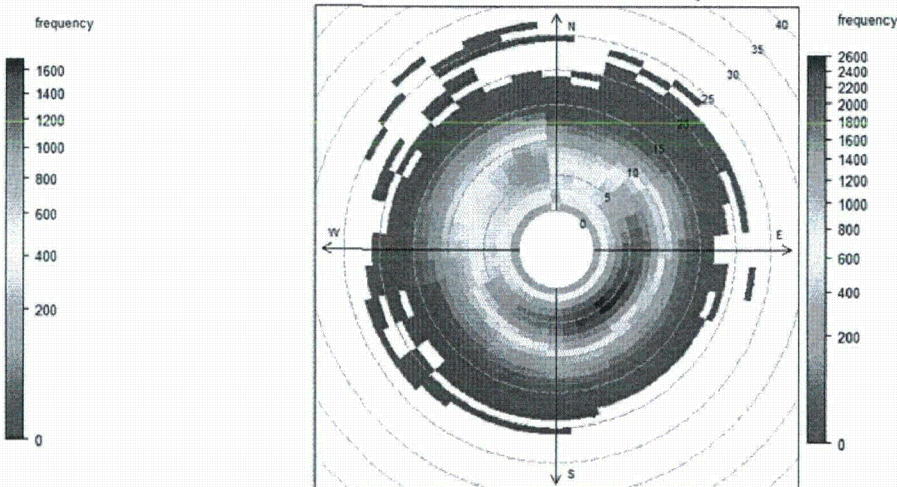
Station: Daytona Beach



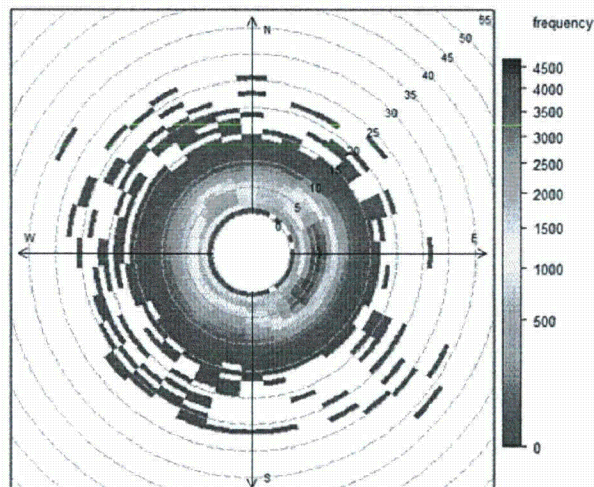
Station: St Lucie



Station: 20 NM East of Cape Canaveral

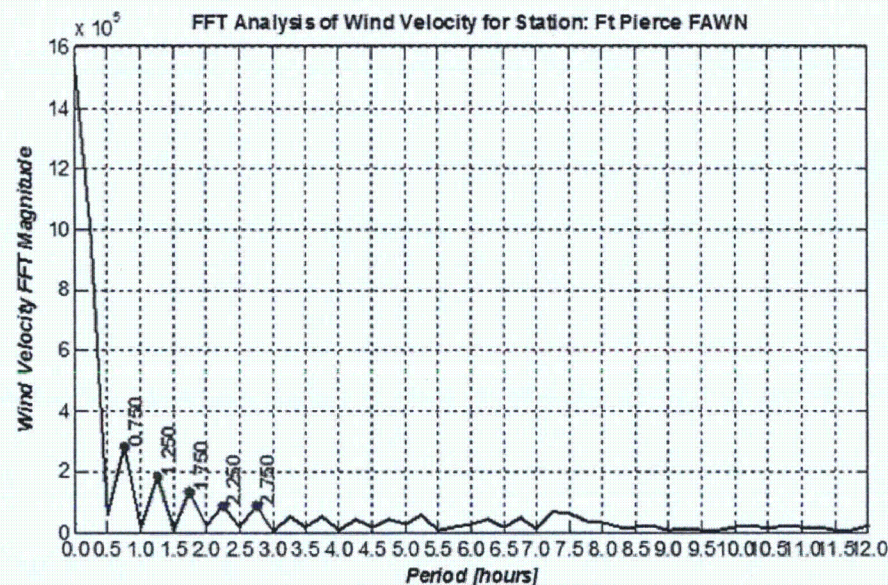
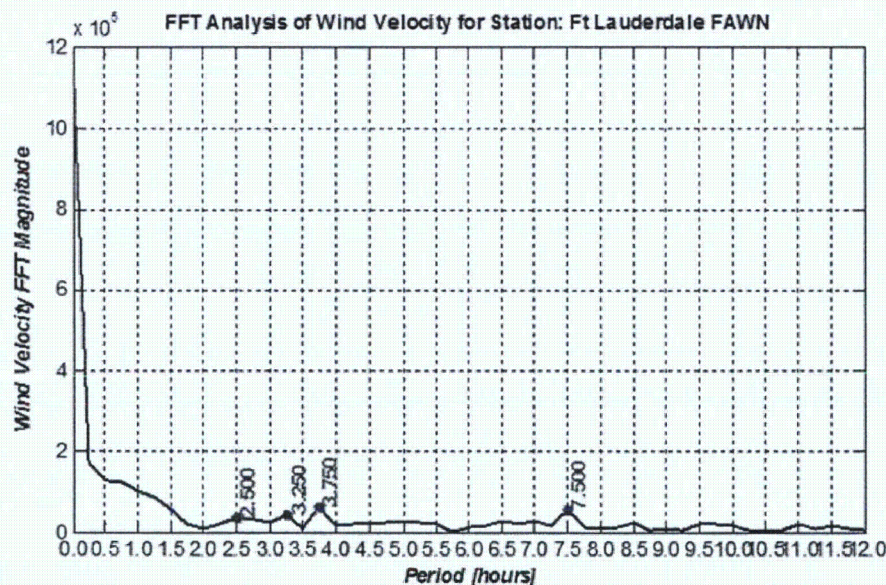
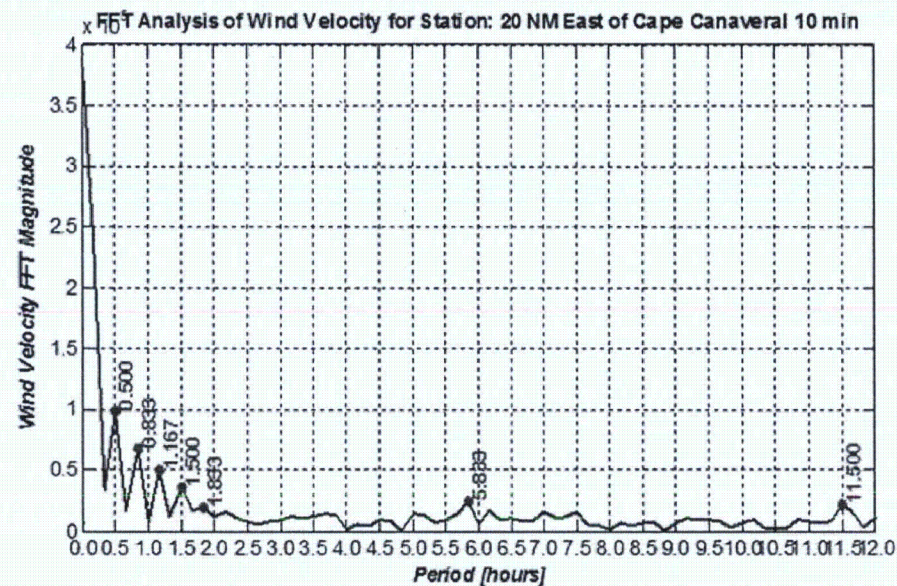
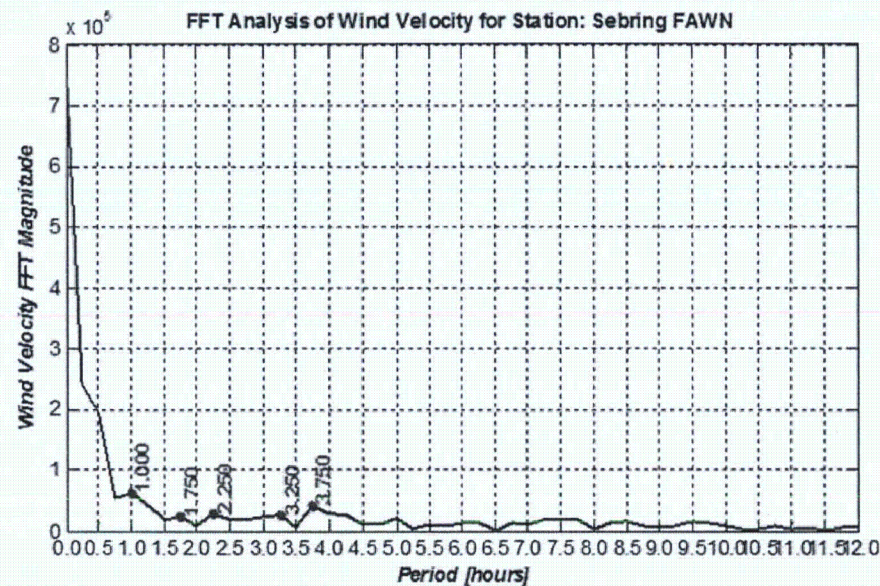


Station: West Palm Beach



s of m/s





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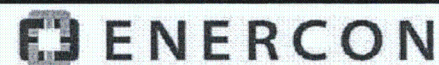
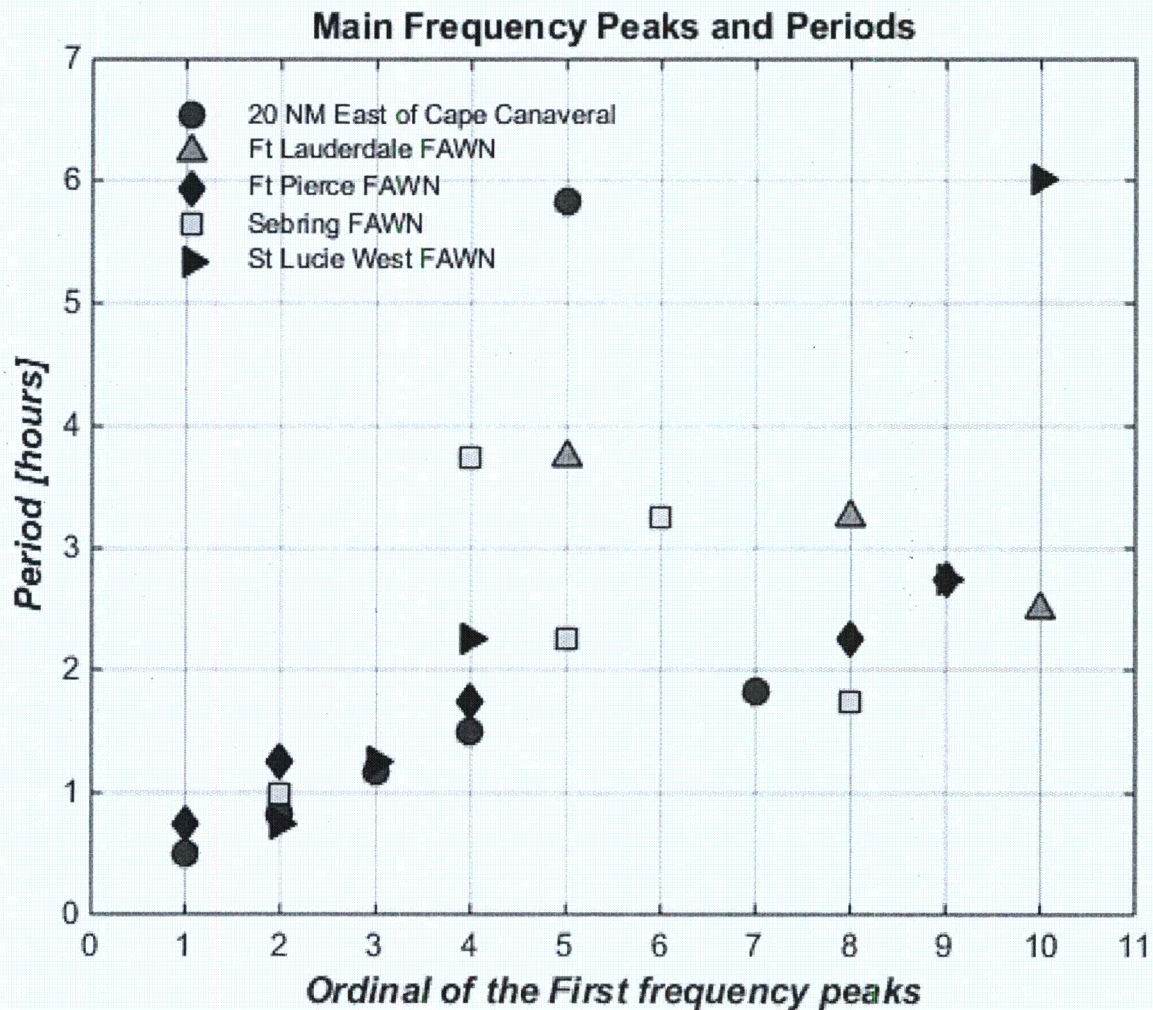


Figure 4-37  
FFT Analysis of Wind Speed for Selected Stations





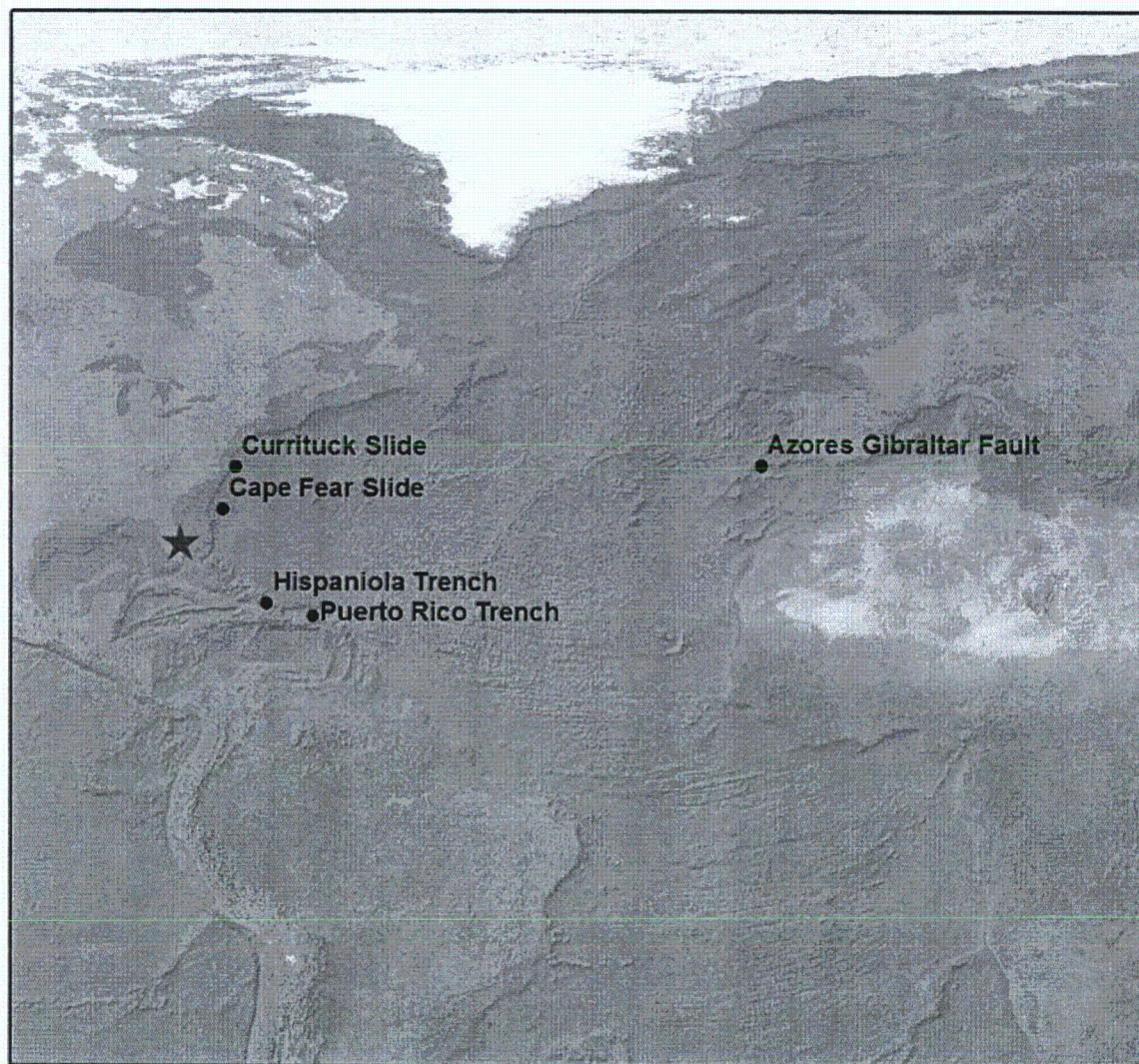
Note: All of the stations have at least hourly information, the FAWN stations and buoy data have sub-hourly data

NextEra Energy (NEE)  
St. Lucie Nuclear Power Plant Units 1 & 2  
Flooding Hazards Reevaluation Report



**Figure 4-38**  
Main Periods of the First Frequency Peaks for  
Selected Stations



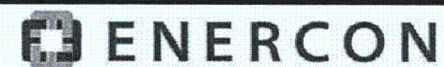


- Tsunami Sources
- ★ PSL



0 1,000 2,000 4,000  
Kilometers

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St. Lucie Nuclear Power Plant Units 1 & 2  
Flooding Hazards Reevaluation Report



**Figure 4-39**  
Tsunami Source Locations Evaluated

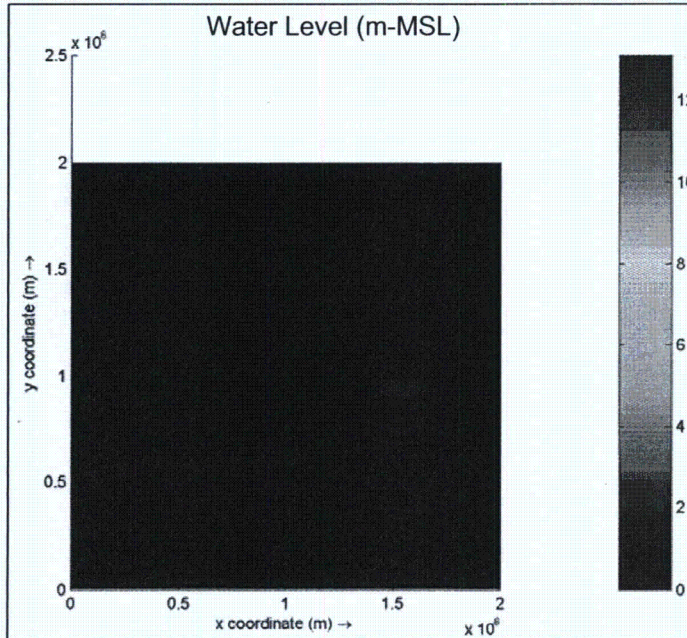
Reference: ESRI, 2014a

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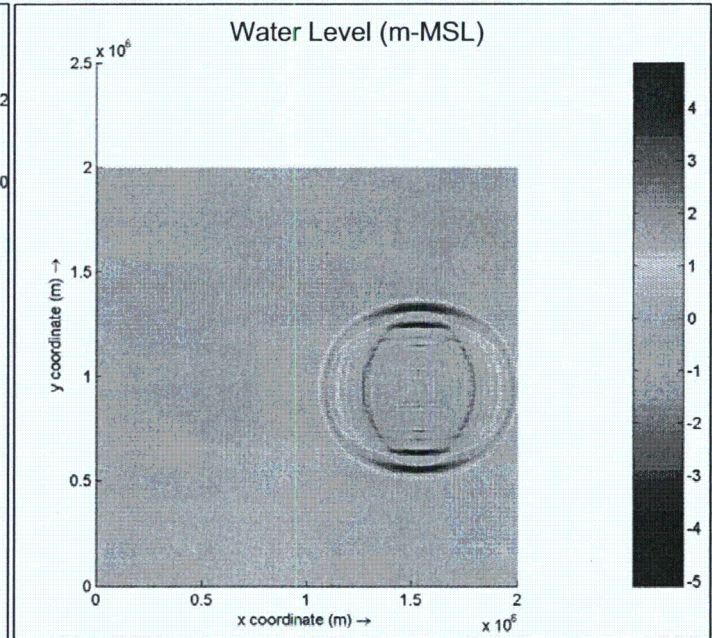
REV. 0



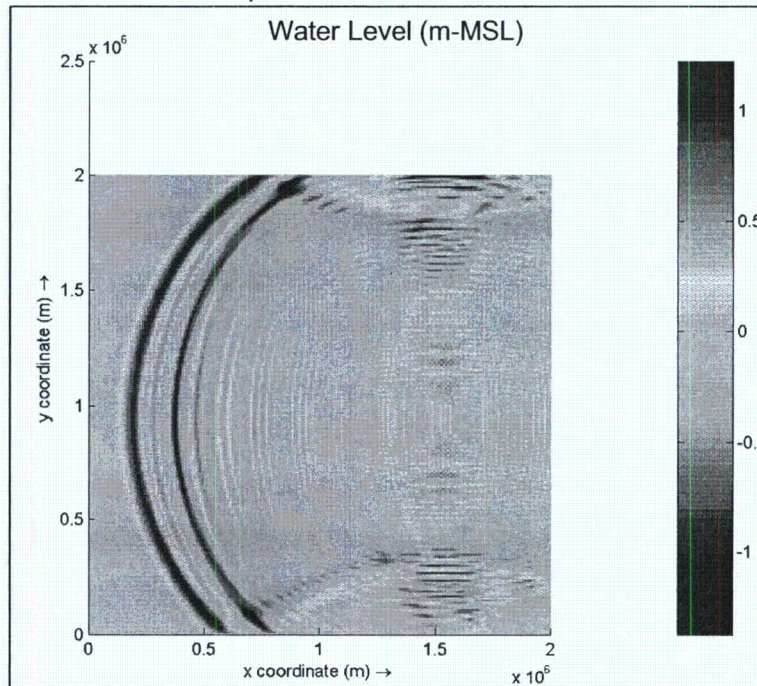
Elapsed time = 0 minutes



Elapsed time = 29 minutes



Elapsed time = 99 minutes



NextEra Energy (NEE)  
St. Lucie Nuclear Power Plant Units 1 & 2  
Flooding Hazards Reevaluation Report



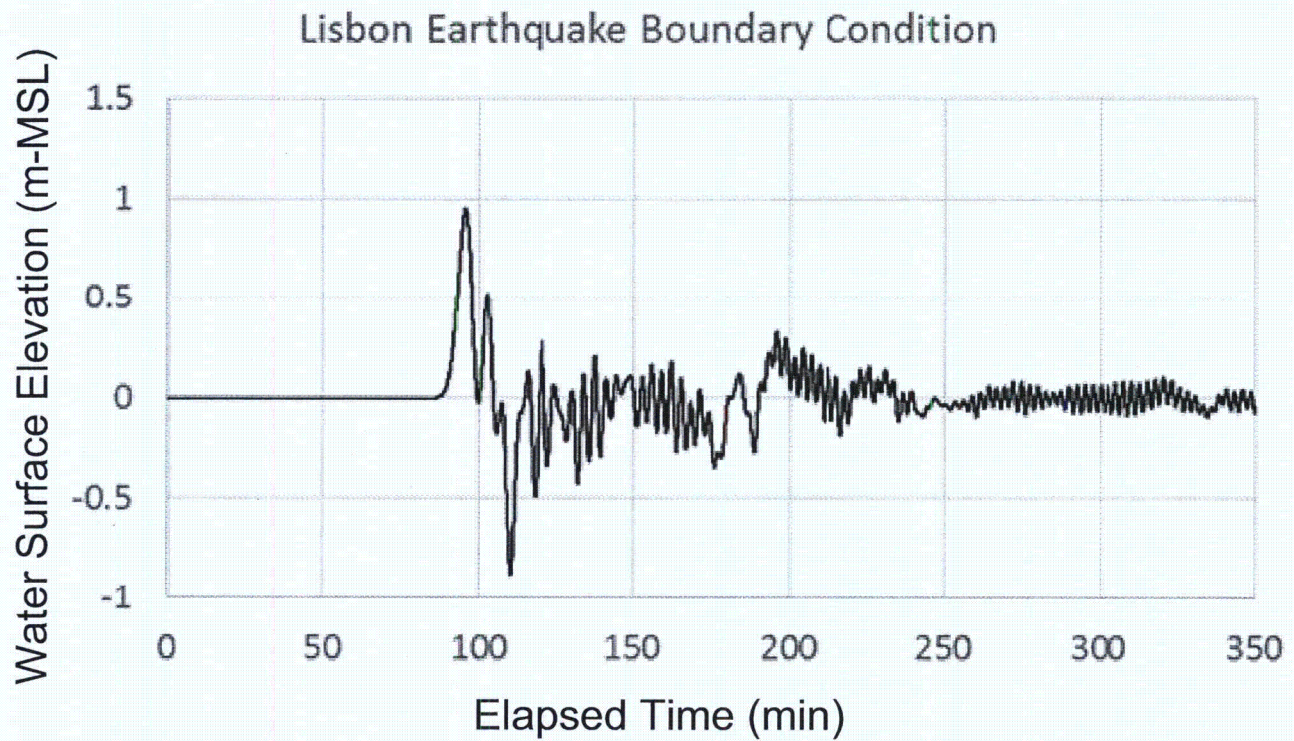
Figure 4-40

1755 Lisbon Earthquake Tsunami Elapsed Times;  
Mw = 8.53 - Tsunami Origination Zone

FPL-072-PR-002

REV. 0



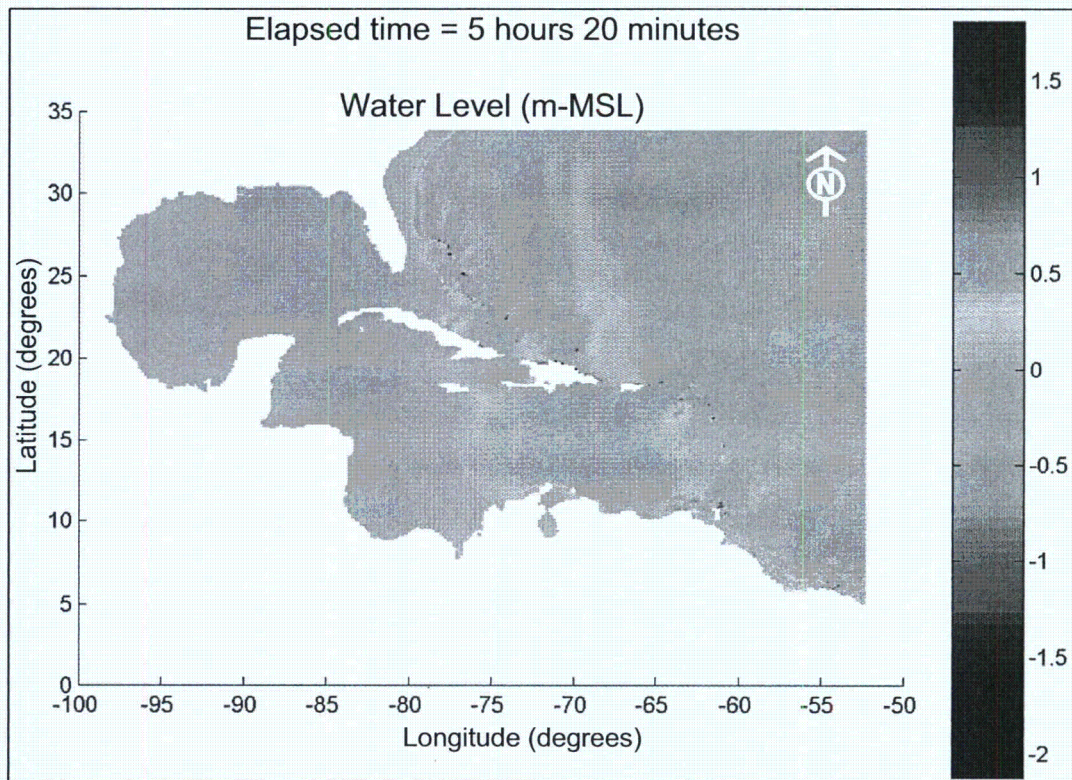
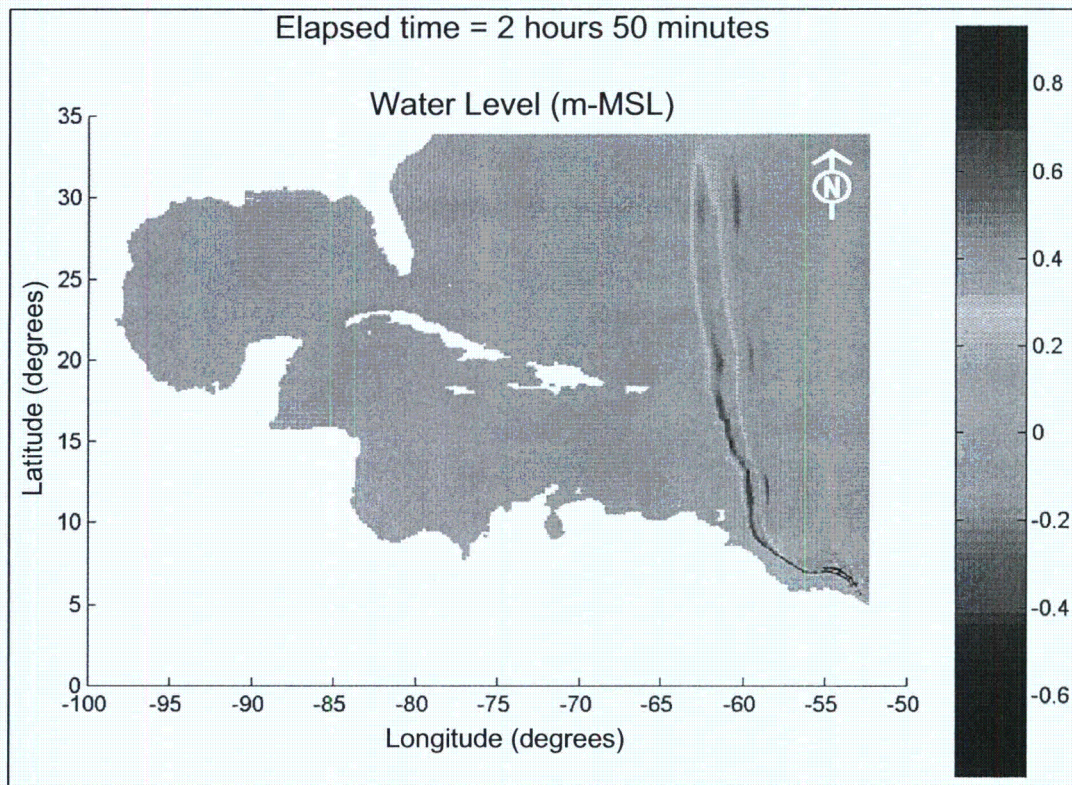


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**Figure 4-41**  
 1755 Lisbon Earthquake Boundary Condition;  
 Mw = 8.53



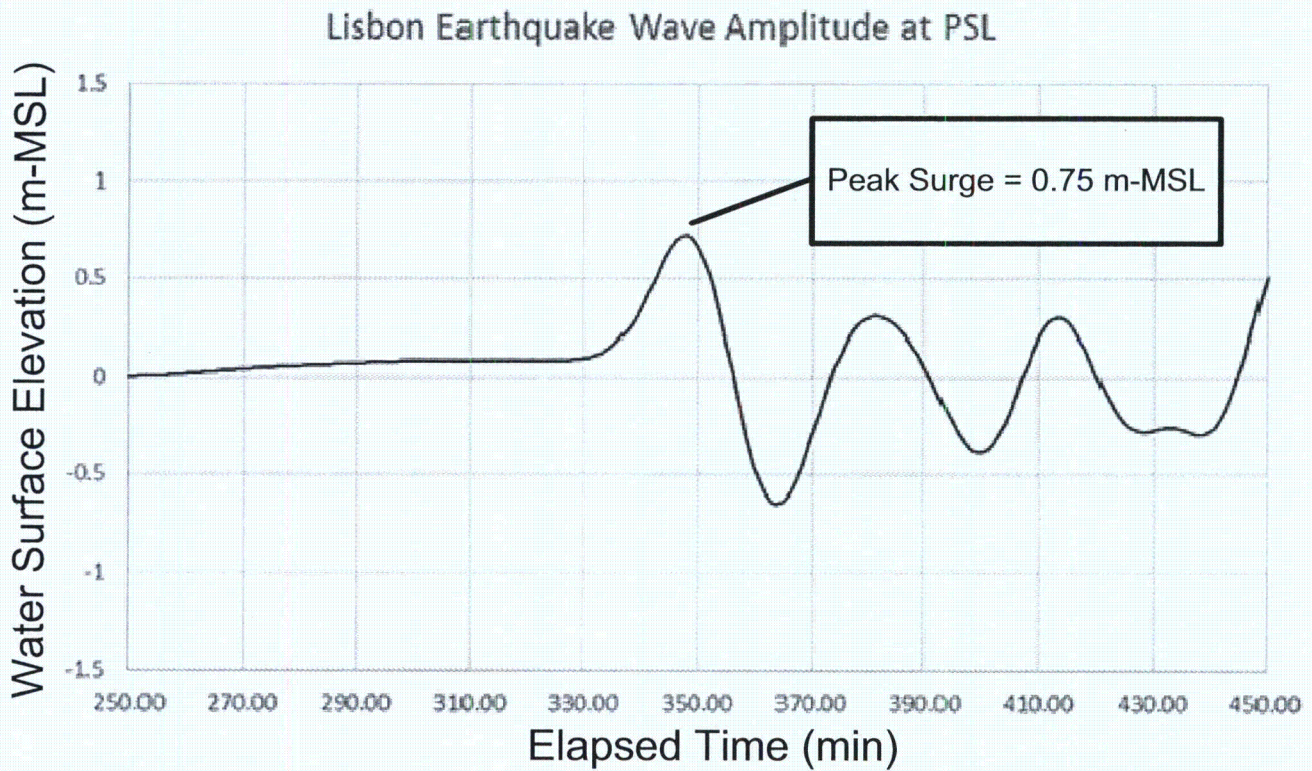


**NextEra Energy (NEE)**  
**St. Lucie Nuclear Power Plant Units 1 & 2**  
**Flooding Hazards Reevaluation Report**

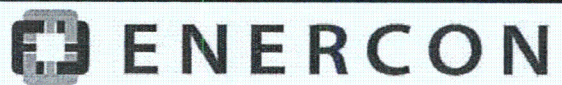


**Figure 4-42**  
 1755 Lisbon Earthquake Tsunami Elapsed Times;  
 Mw = 8.53 – Propagation to PSL





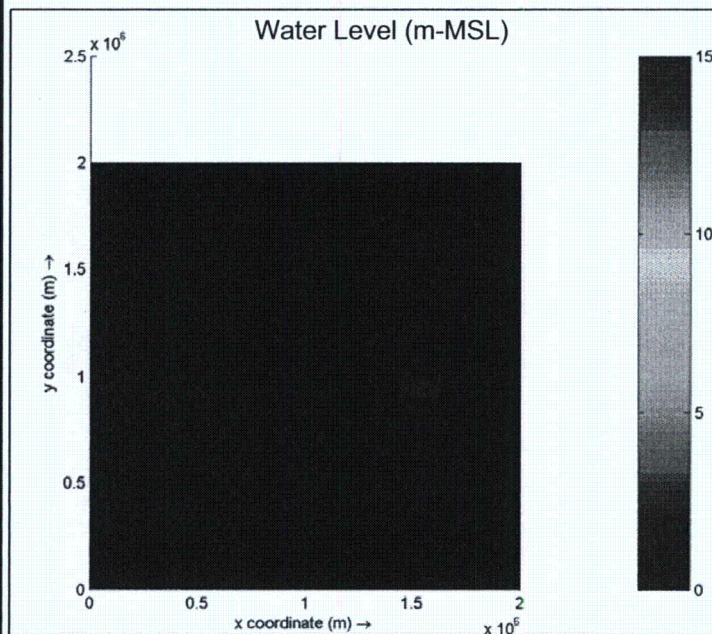
NextEra Energy (NEE)  
St. Lucie Nuclear Power Plant Units 1 & 2  
Flooding Hazards Reevaluation Report



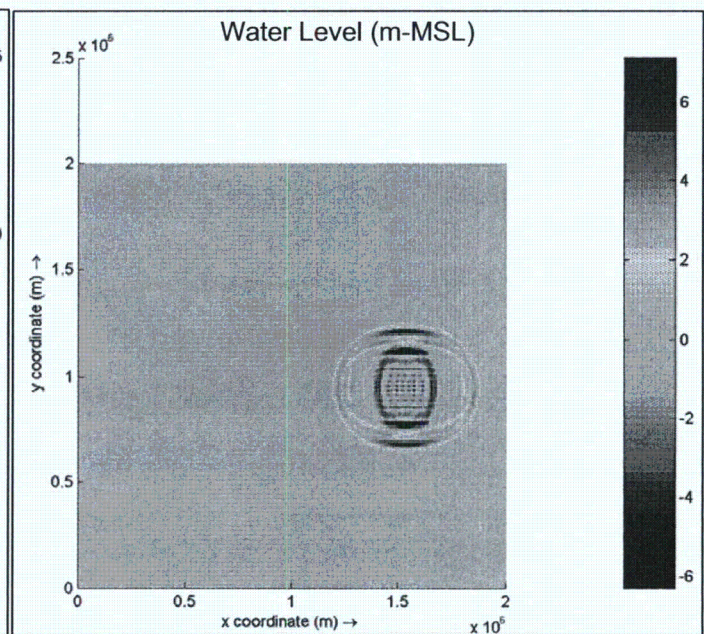
**Figure 4-43**  
1755 Lisbon Earthquake Tsunami Wave  
Amplitude at PSL; Mw = 8.53



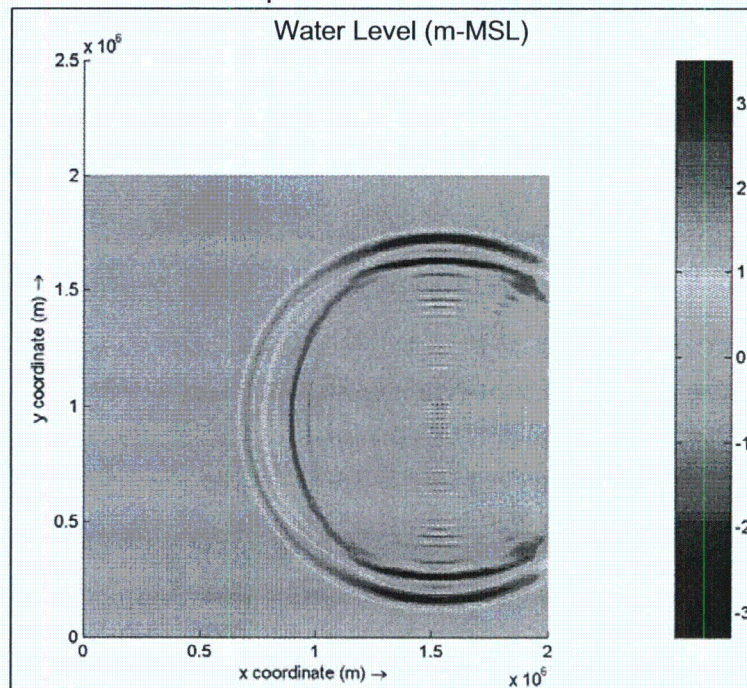
Elapsed time = 0 minutes



Elapsed time = 19 minutes



Elapsed time = 59 minutes



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St. Lucie Nuclear Power Plant Units 1 & 2  
Flooding Hazards Reevaluation Report

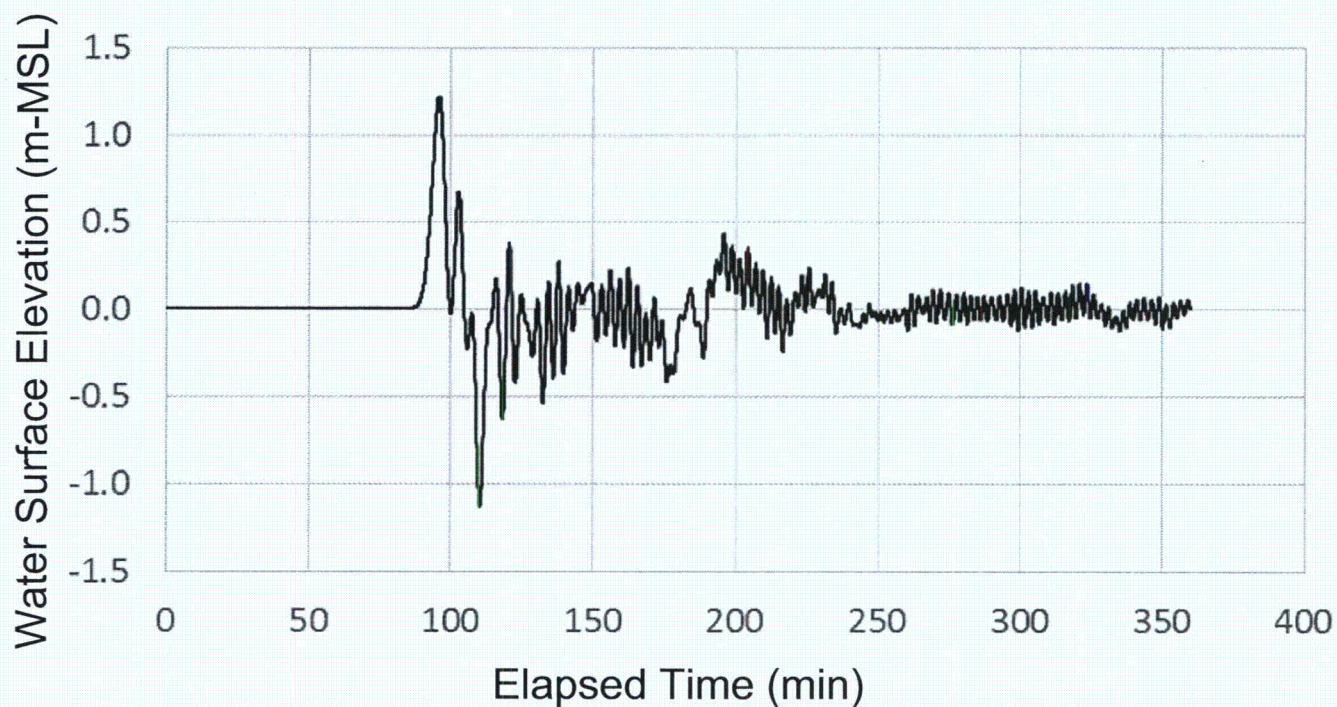


**Figure 4-44**

1755 Lisbon Earthquake Tsunami Elapsed Times;  
Mw = 8.61 – Origination Zone



### Lisbon Earthquake Boundary Condition

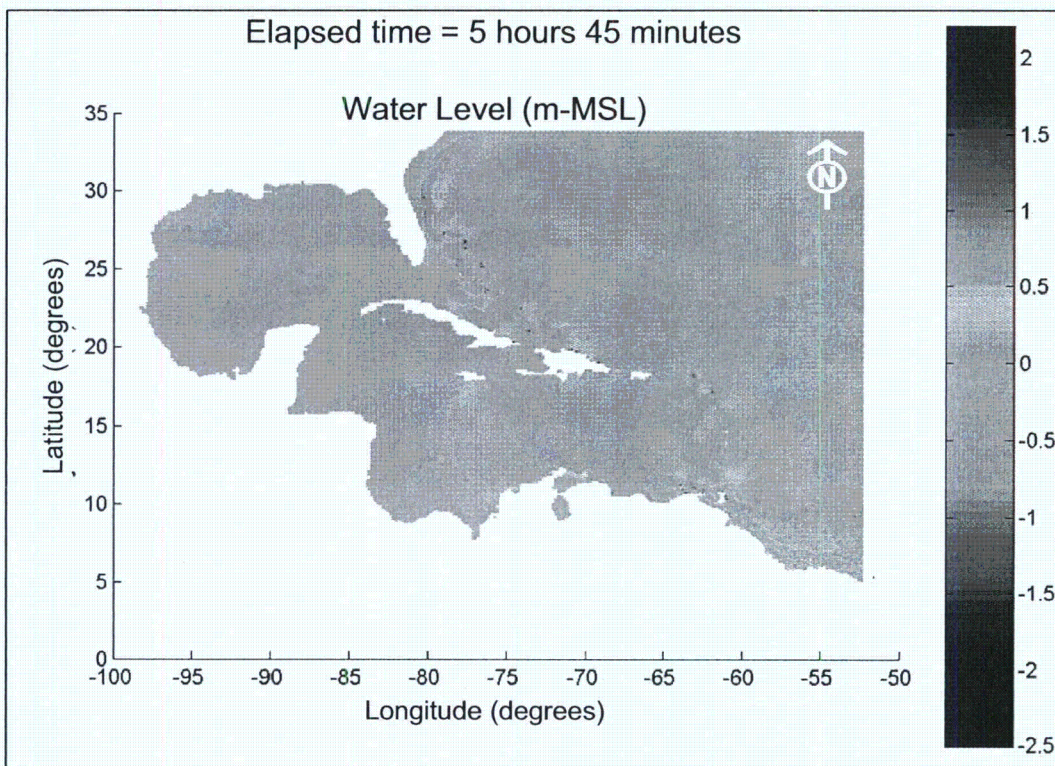
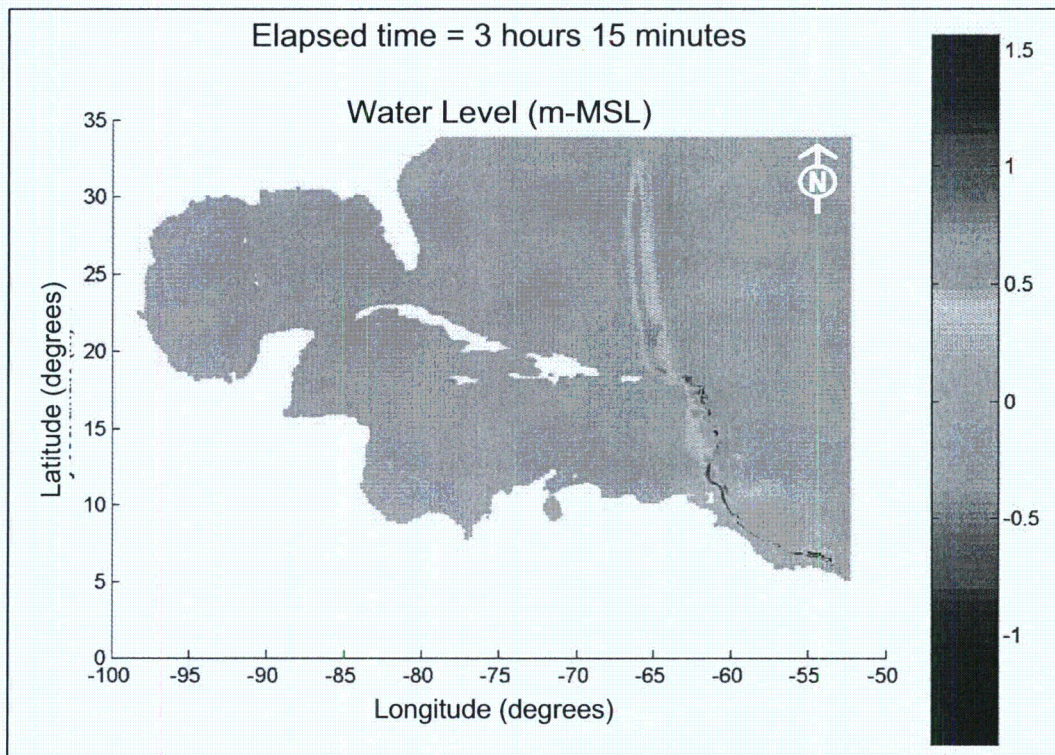


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**Figure 4-45**  
1755 Lisbon Earthquake Boundary Condition;  
Mw = 8.61



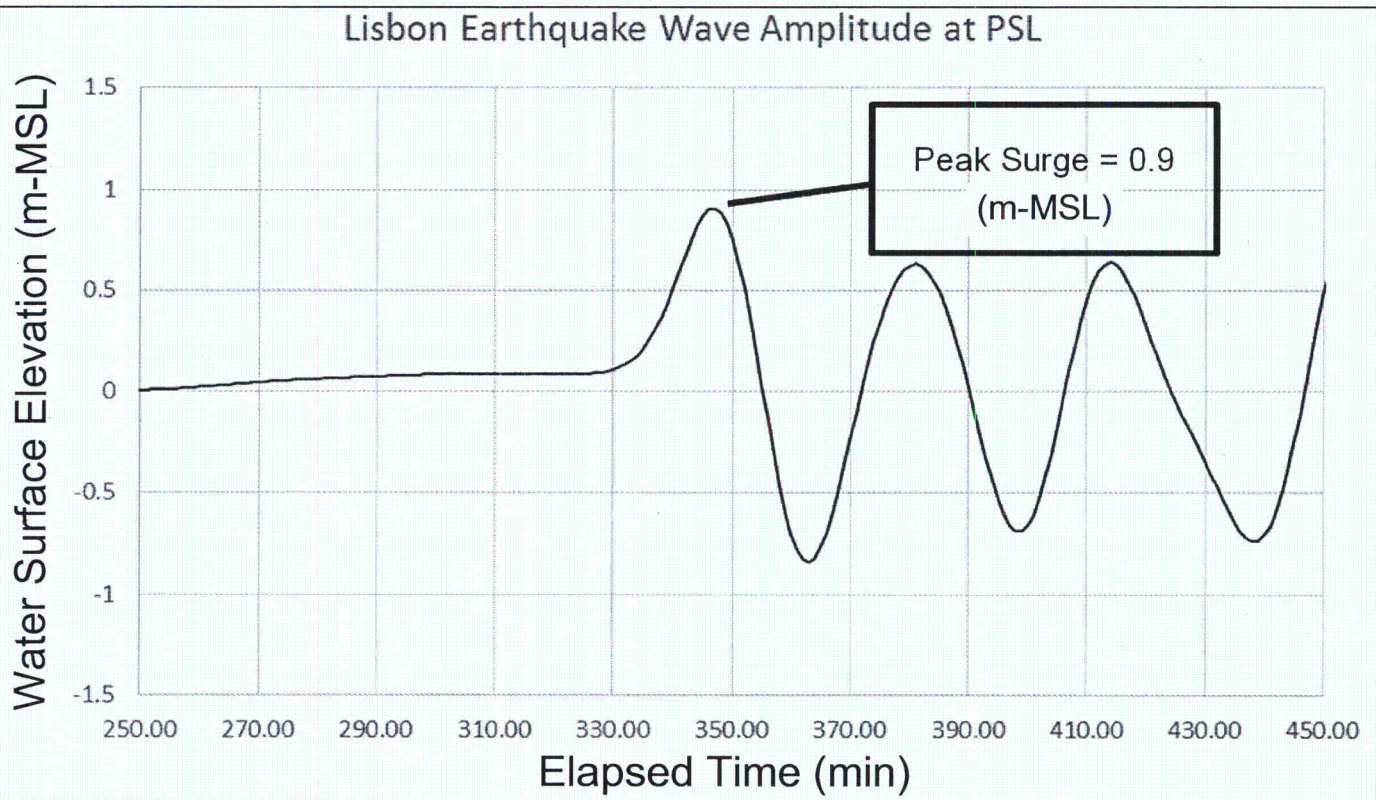


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**Figure 4-46**  
1755 Lisbon Earthquake Tsunami Elapsed Times;  
Mw = 8.61 – Propagation to PSL





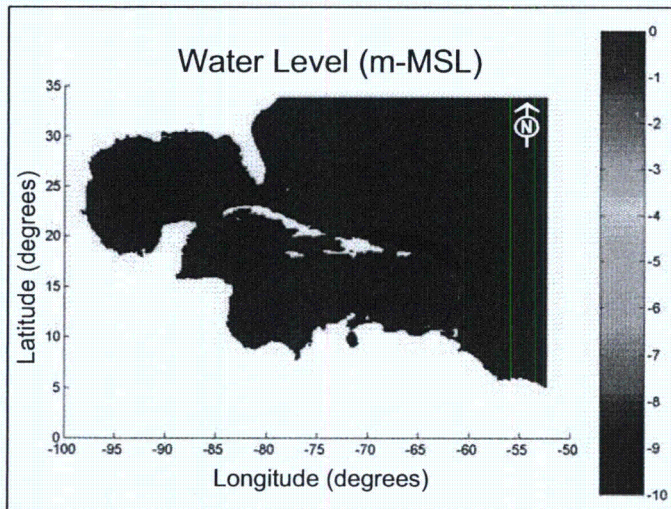
**NextEra Energy (NEE)**  
**St. Lucie Nuclear Power Plant Units 1 & 2**  
**Flooding Hazards Reevaluation Report**



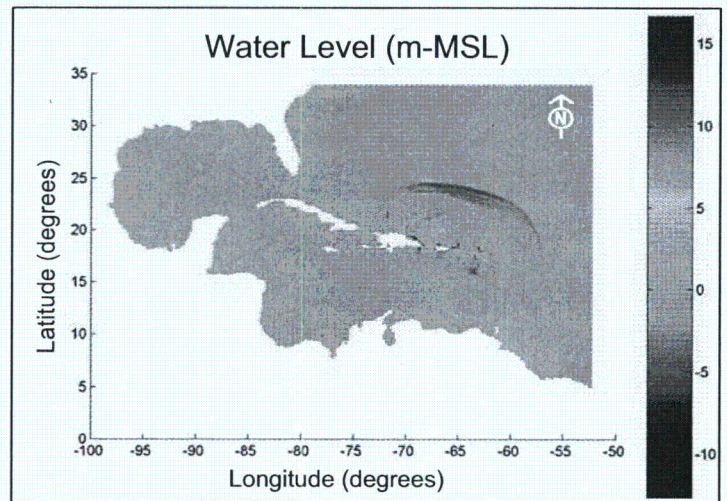
**Figure 4-47**  
 1755 Lisbon Earthquake Tsunami Wave  
 Amplitude at PSL; Mw = 8.61



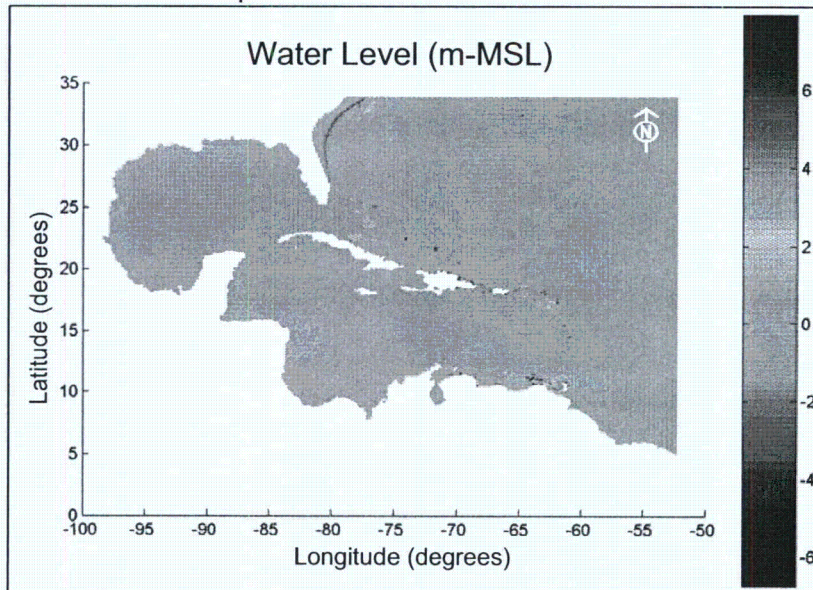
Elapsed time = 0 minutes



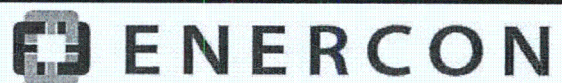
Elapsed time = 35 minutes



Elapsed time = 3 hours 15 minutes

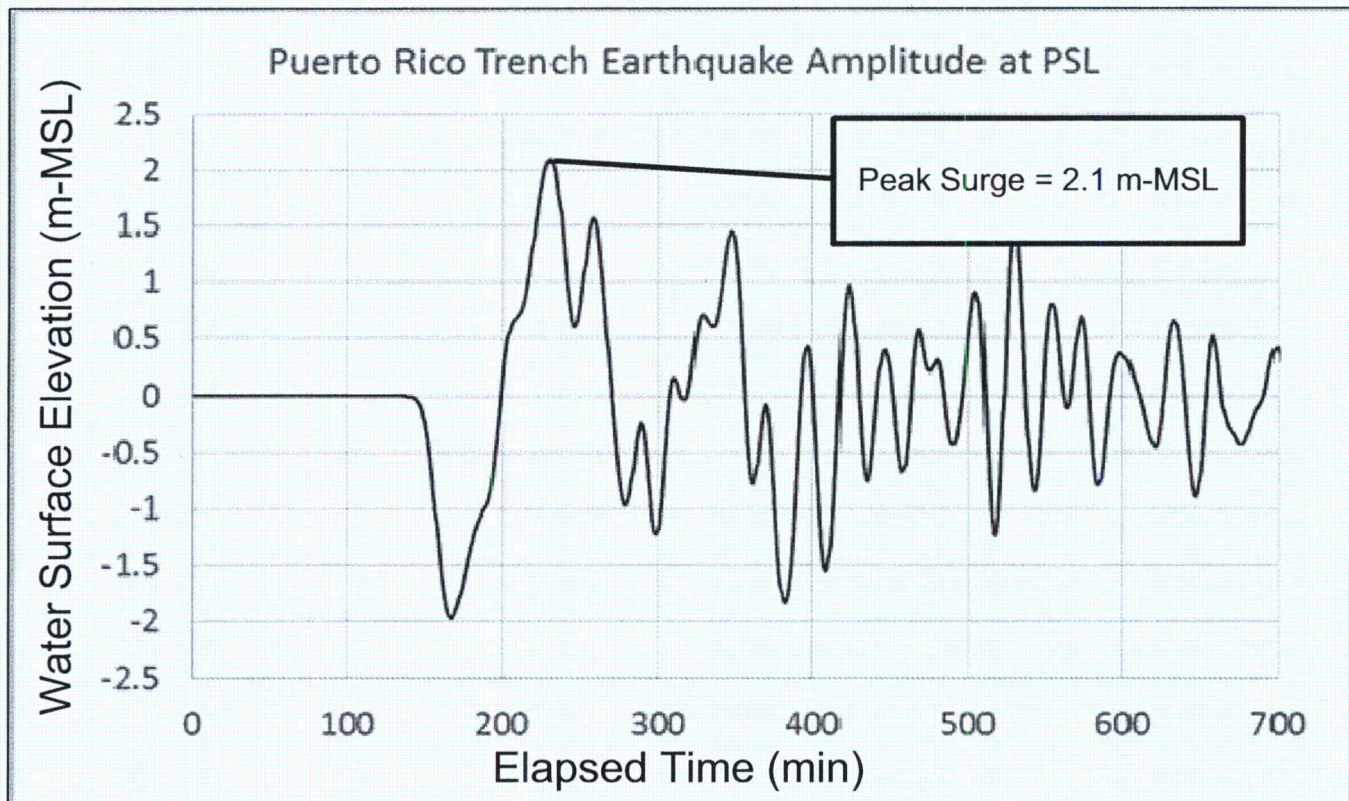


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St. Lucie Nuclear Power Plant Units 1 & 2  
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**Figure 4-48**  
Puerto Rico Trench Earthquake Tsunami





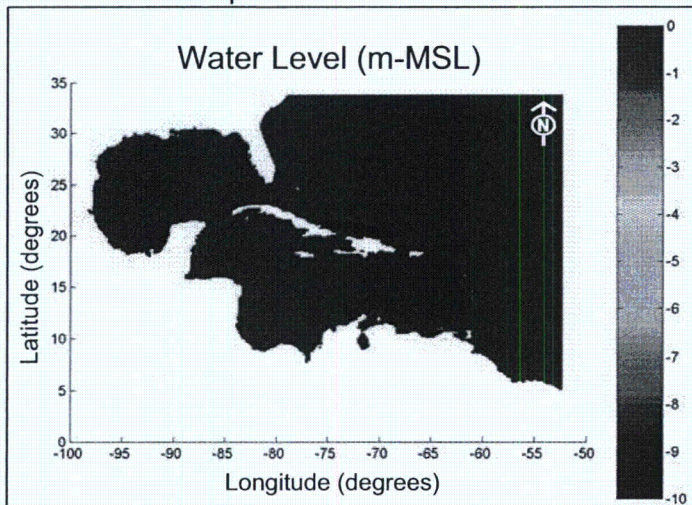
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Flooding Hazards Reevaluation Report



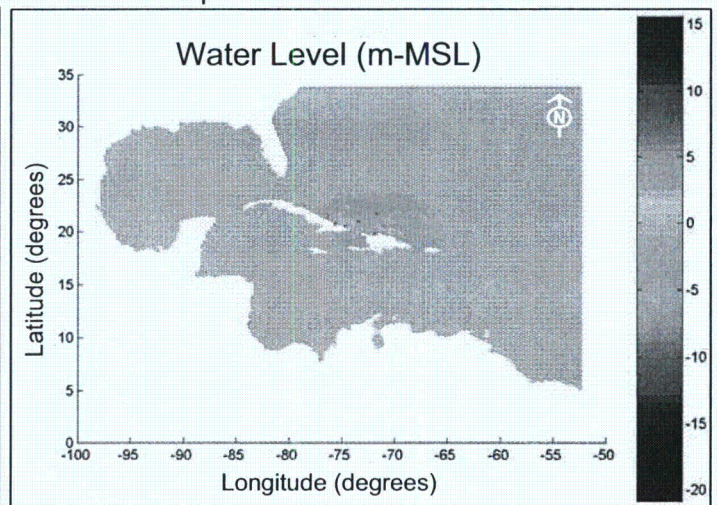
**Figure 4-49**  
Puerto Rico Trench Earthquake Tsunami Wave  
Amplitude at PSL



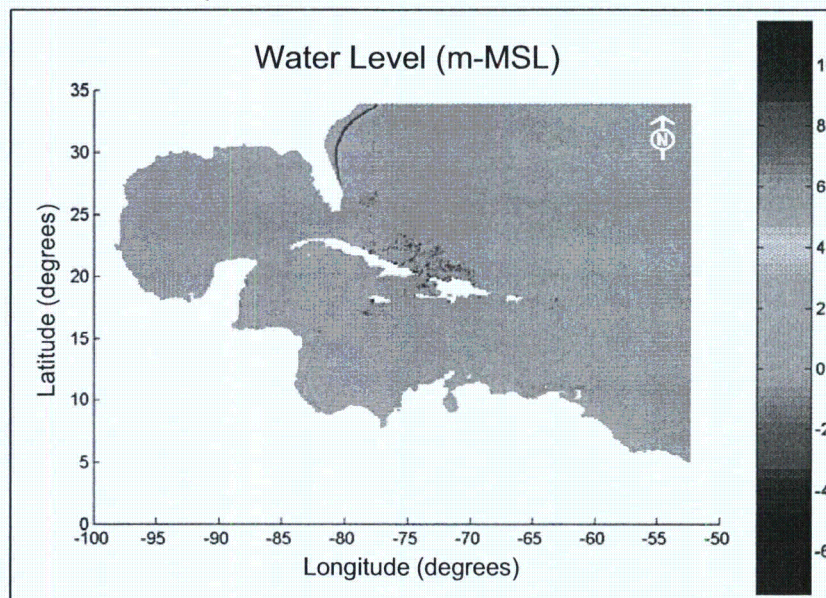
Elapsed time = 0 minutes



Elapsed time = 25 minutes



Elapsed time = 3 hours 15 minutes

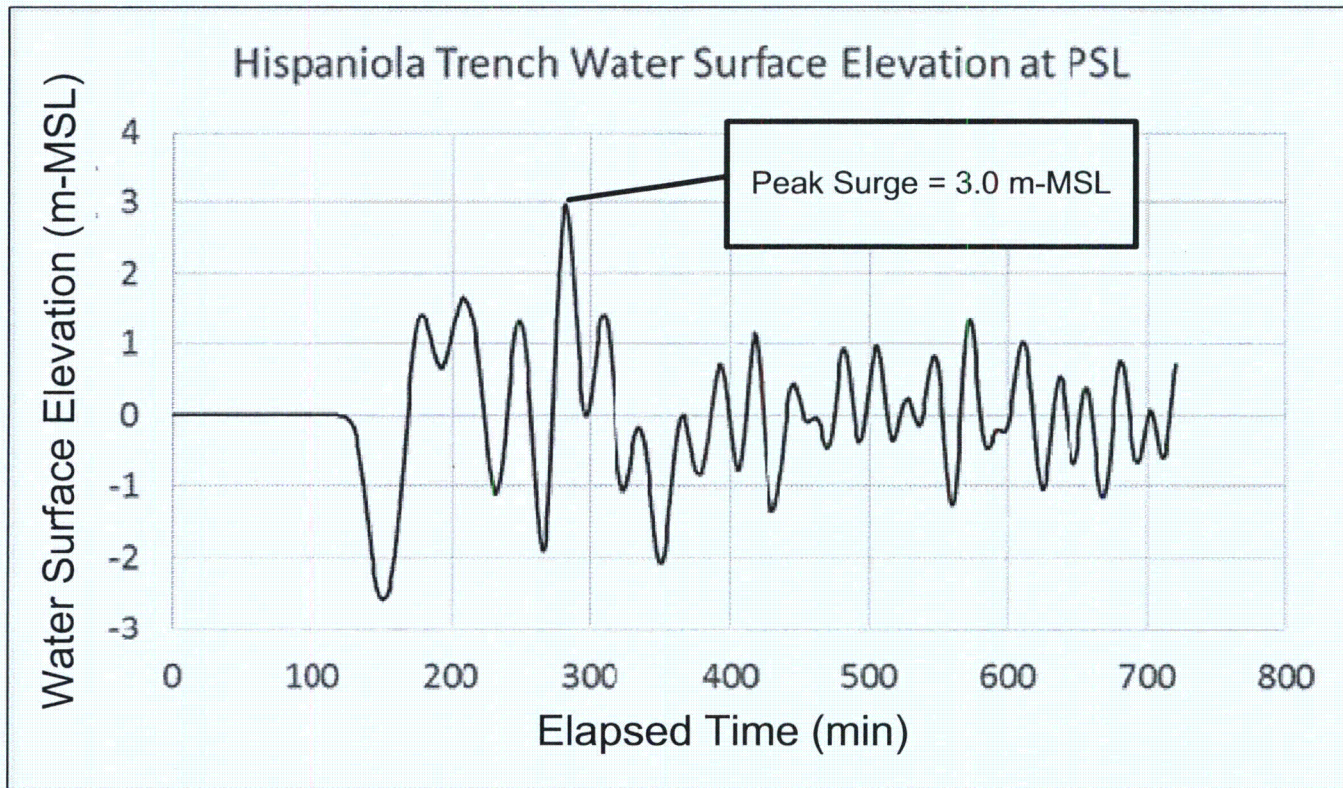


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St. Lucie Nuclear Power Plant Units 1 & 2  
Flooding Hazards Reevaluation Report



**Figure 4-50**  
Hispaniola Trench Earthquake Tsunami



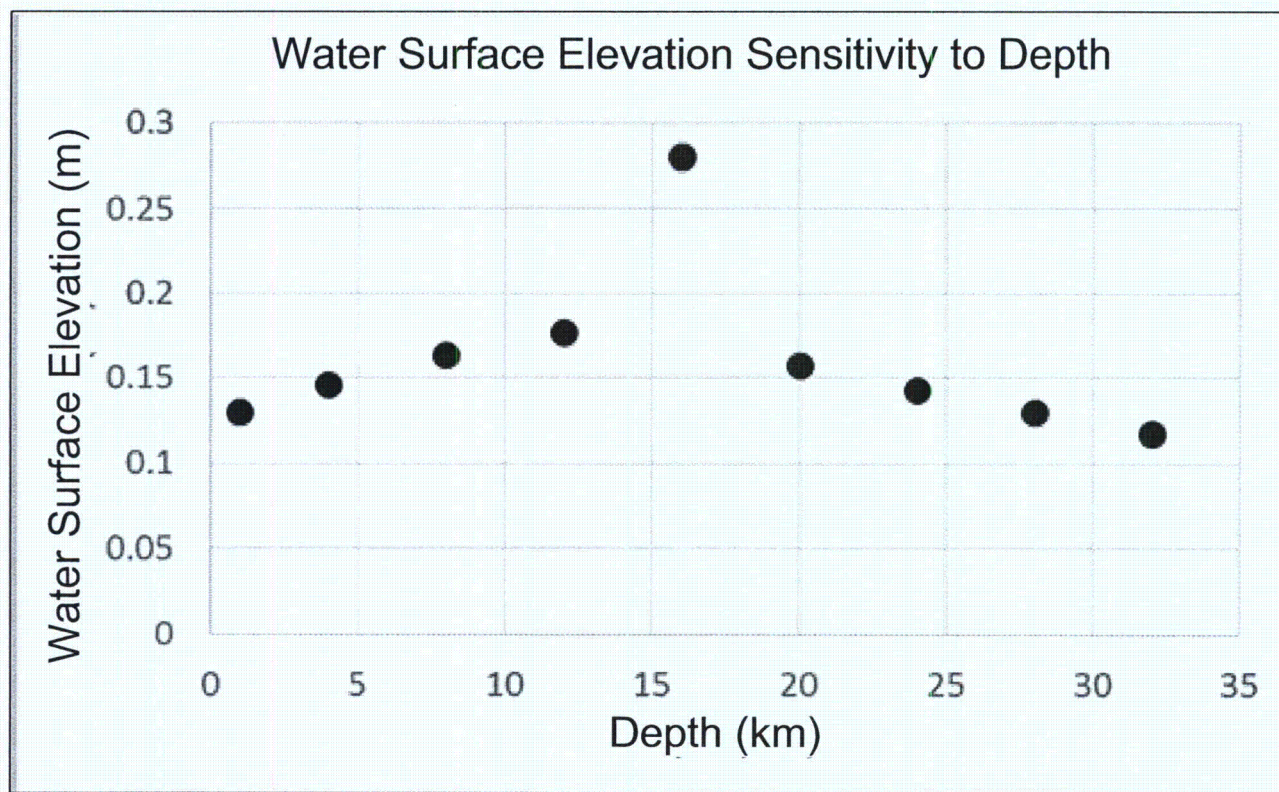
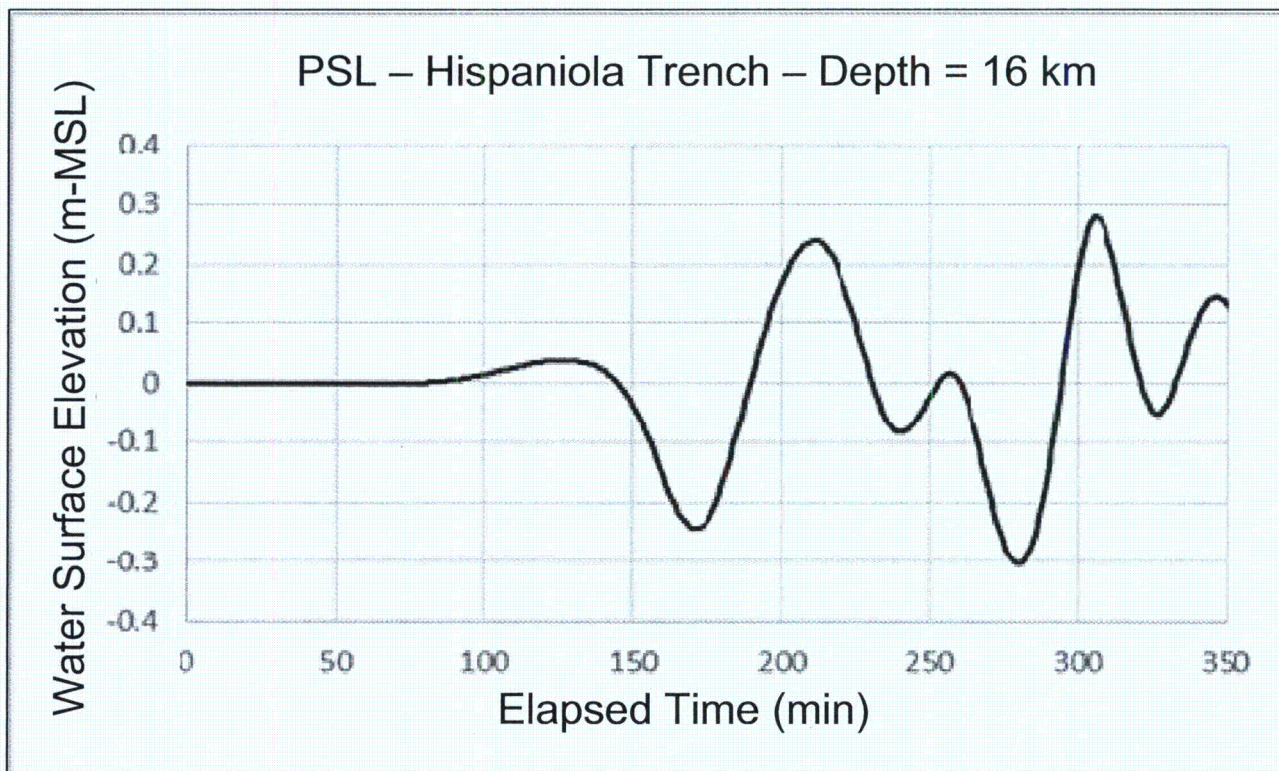


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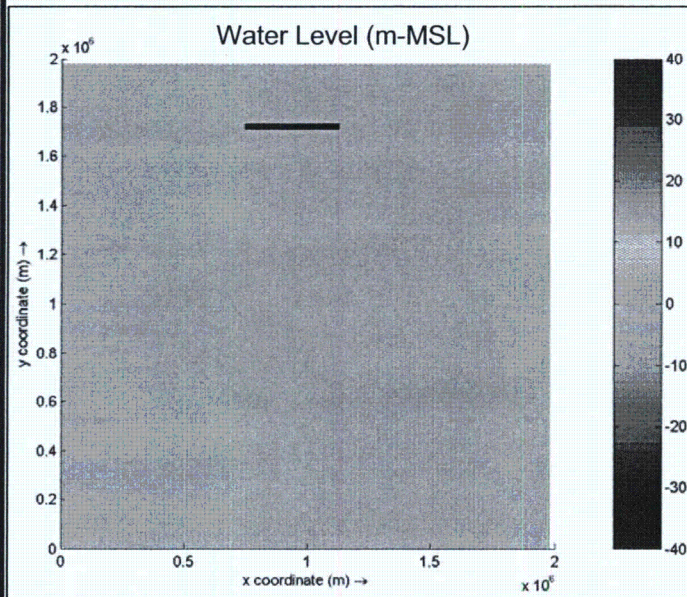
**Figure 4-51**  
Hispaniola Trench Tsunami Wave Amplitude at PSL



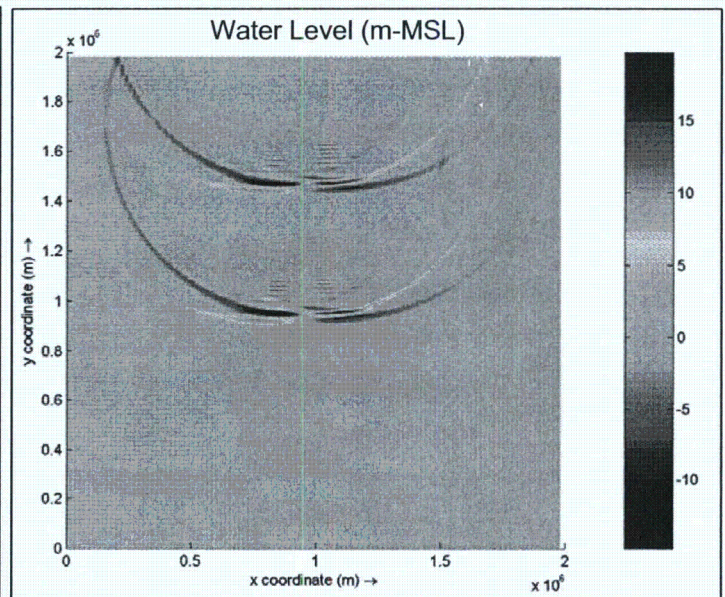




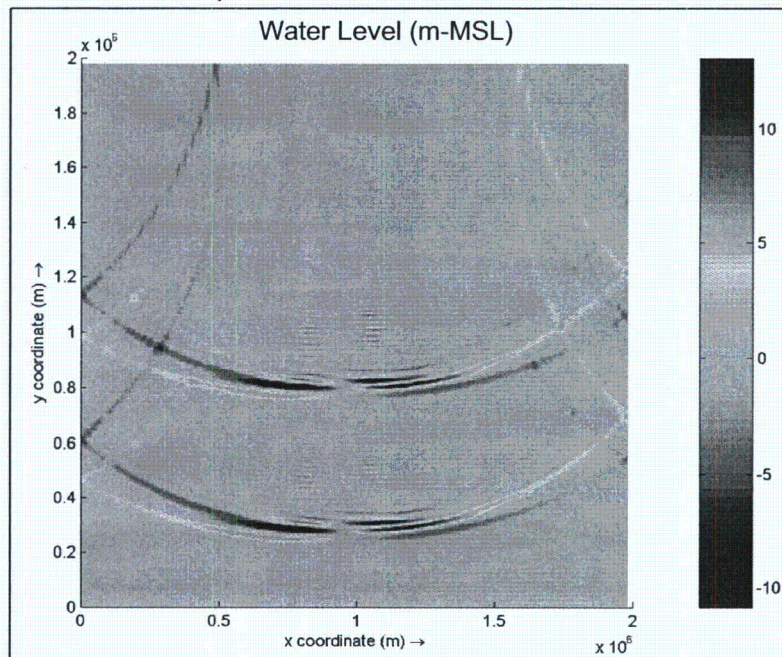
Elapsed time = 0 minutes



Elapsed time = 1 hour 35 minutes



Elapsed time = 2 hours 55 minutes

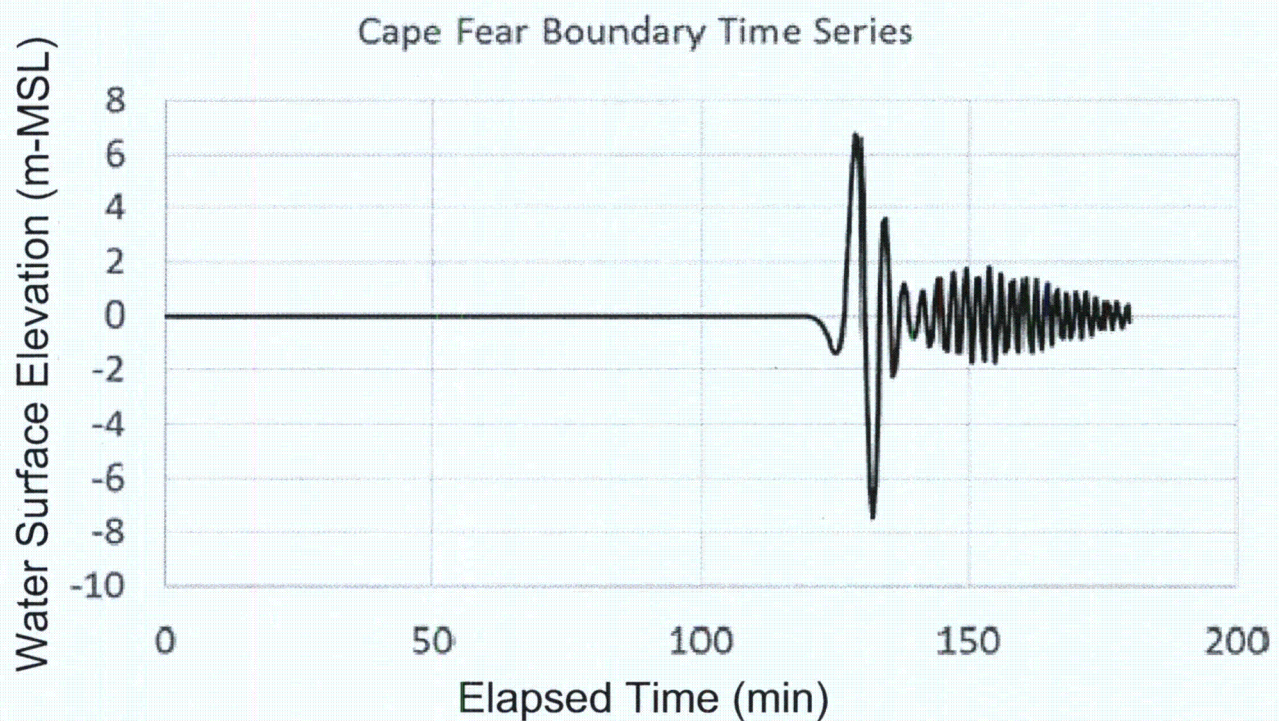


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St. Lucie Nuclear Power Plant Units 1 & 2  
Flooding Hazards Reevaluation Report

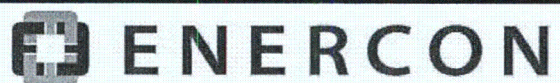


Figure 4-53  
Cape Fear Landslide Source





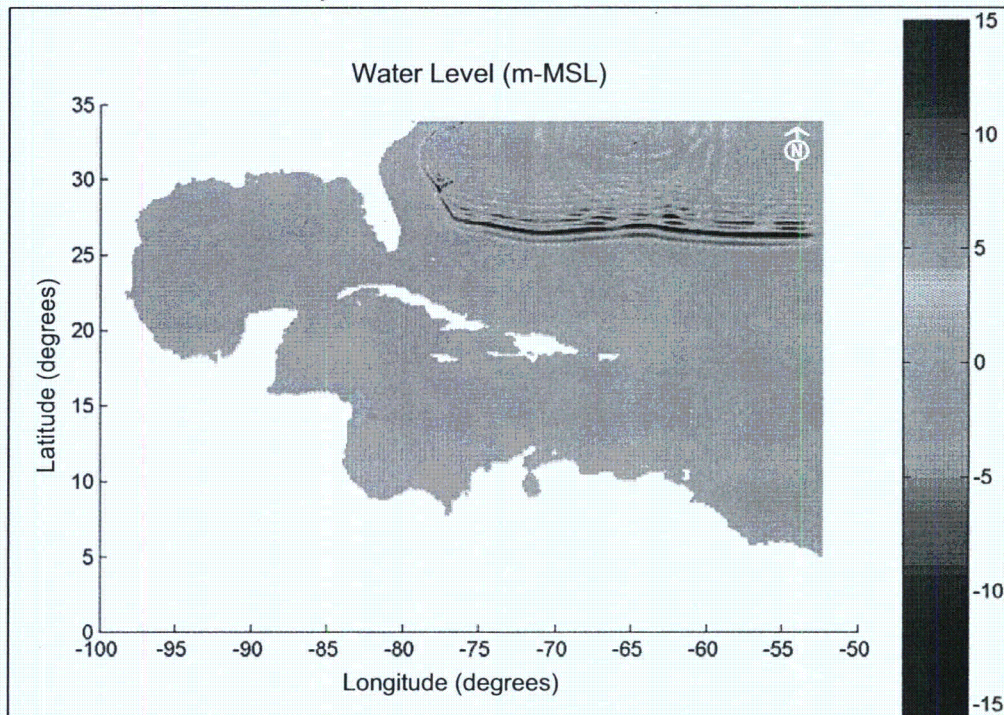
NextEra Energy (NEE)  
St. Lucie Nuclear Power Plant Units 1 & 2  
Flooding Hazards Reevaluation Report



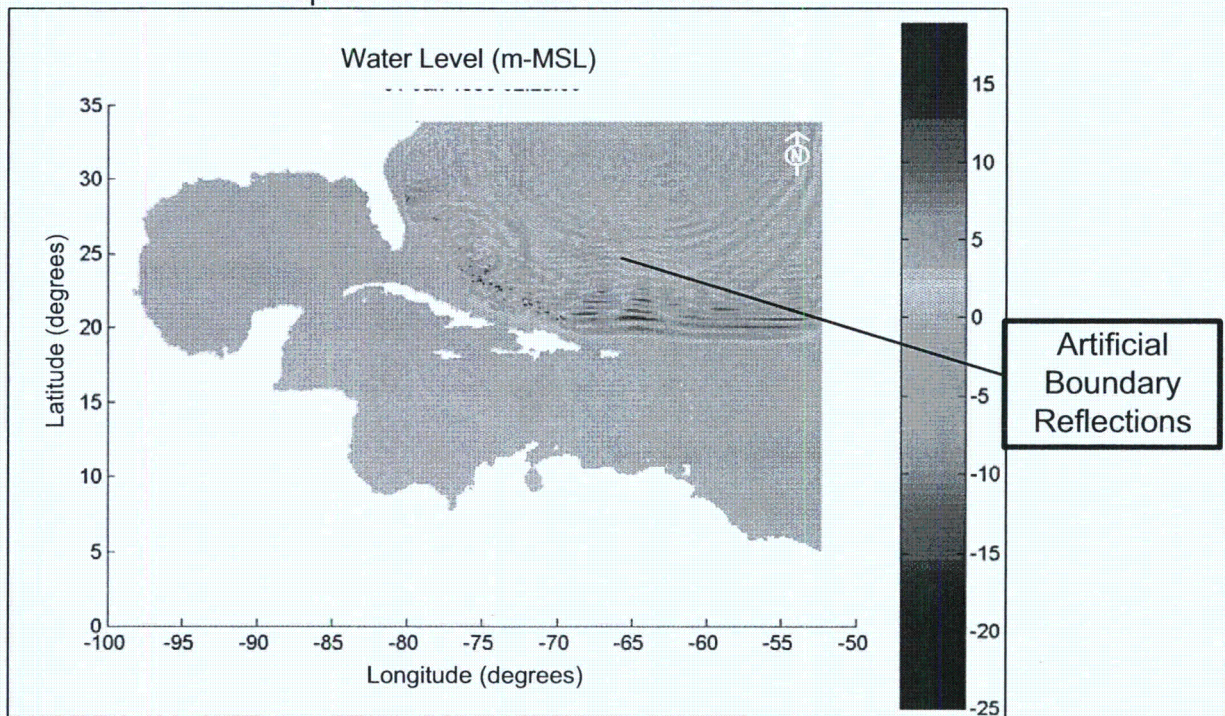
**Figure 4-54**  
Cape Fear Landslide Boundary Condition Time Series



Elapsed time = 1 hour 35 minutes



Elapsed time = 2 hours 25 minutes

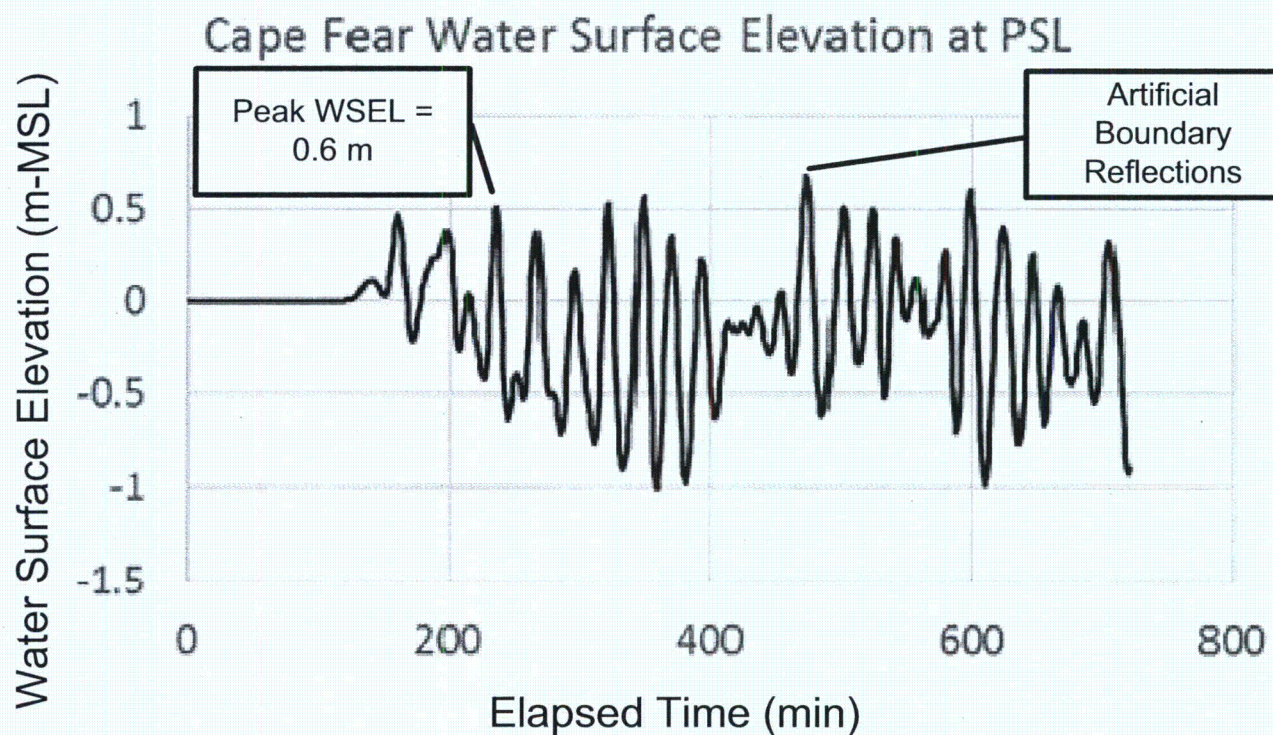


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Figure 4-55  
Cape Fear Landslide





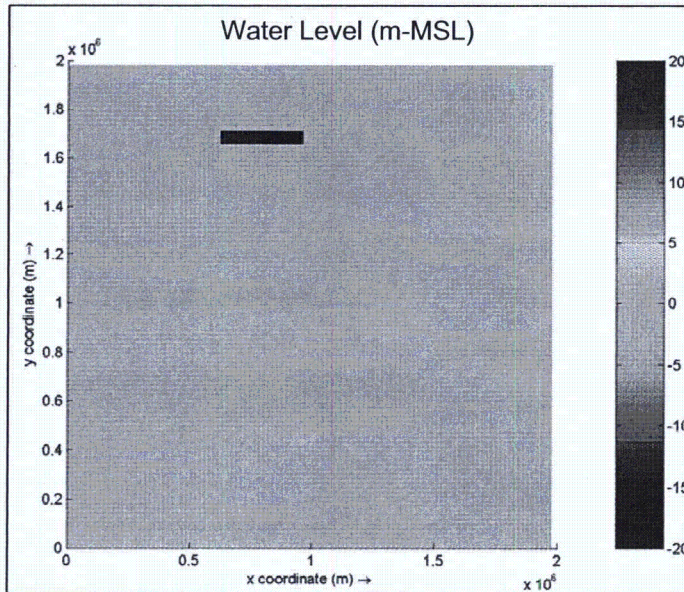
NextEra Energy (NEE)  
St. Lucie Nuclear Power Plant Units 1 & 2  
Flooding Hazards Reevaluation Report



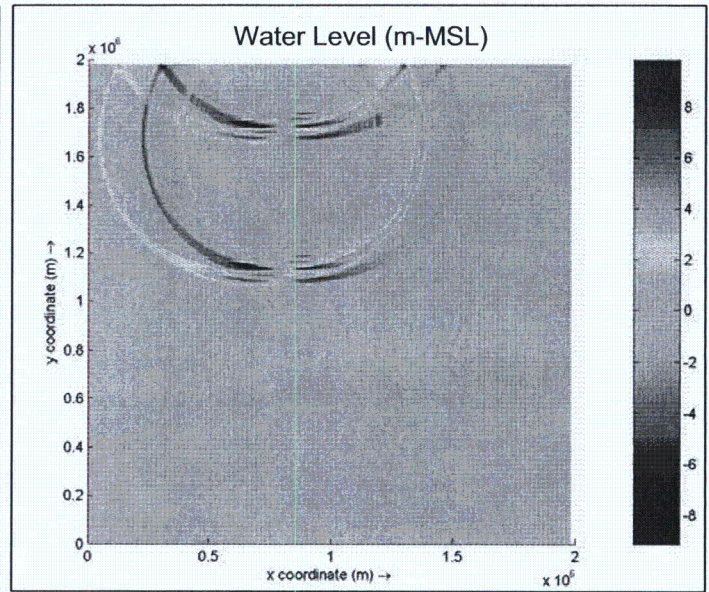
**Figure 4-56**  
Cape Fear Landslide; PSL Water Surface  
Elevation Time Series



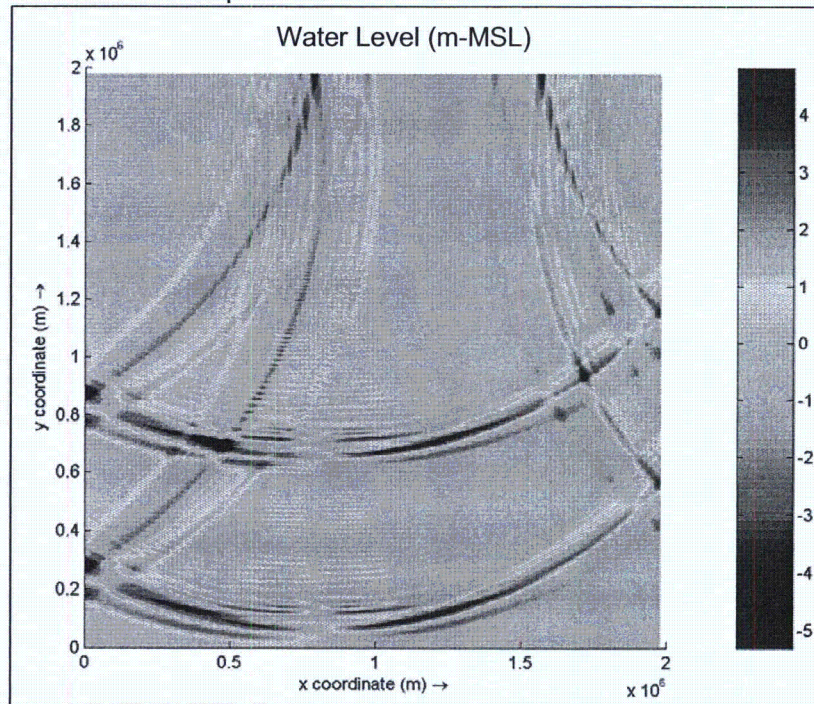
Elapsed time = 0 minutes



Elapsed time = 1 hour 10 minutes



Elapsed time = 3 hours 15 minutes

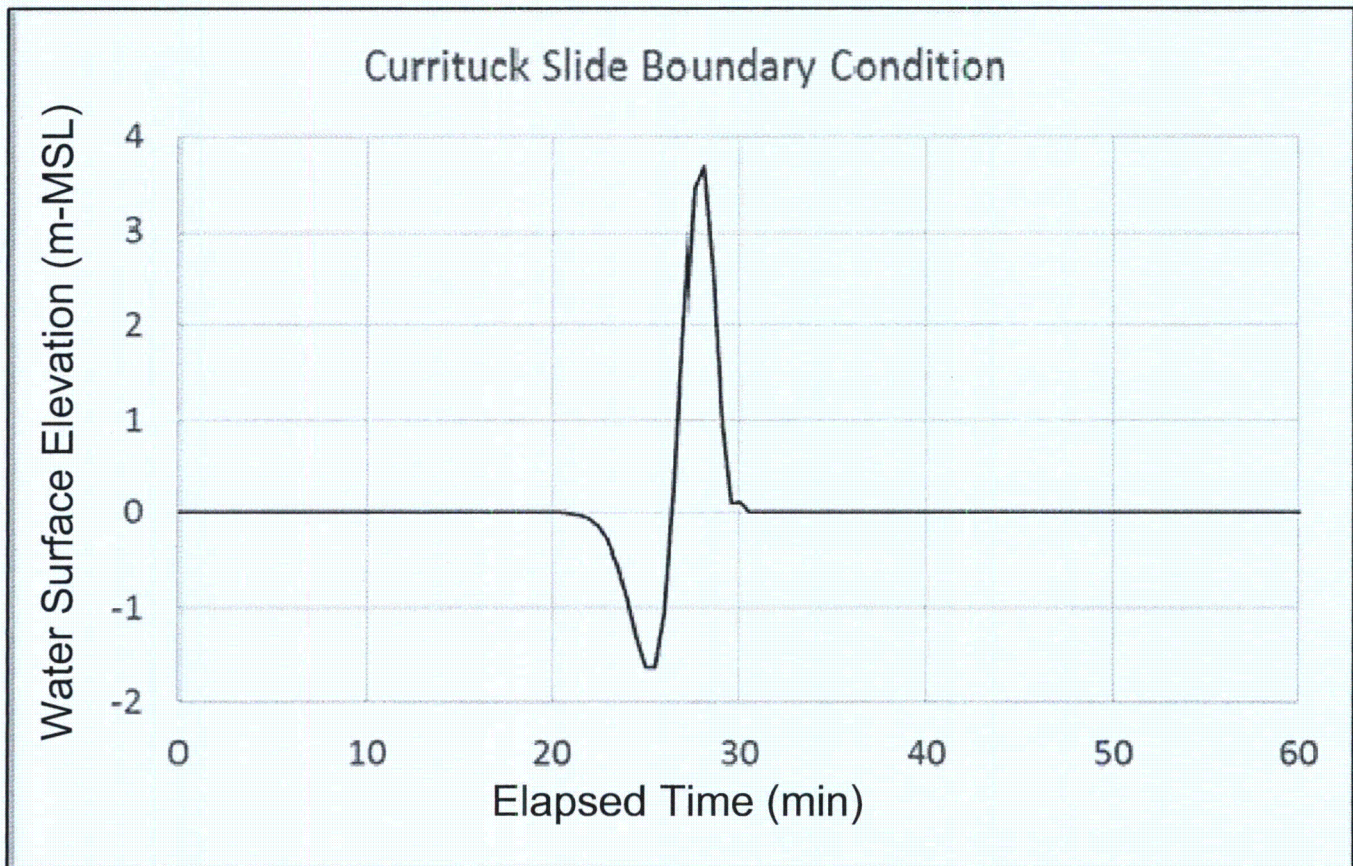


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St. Lucie Nuclear Power Plant Units 1 & 2  
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**Figure 4-57**  
Currituck Slide Source





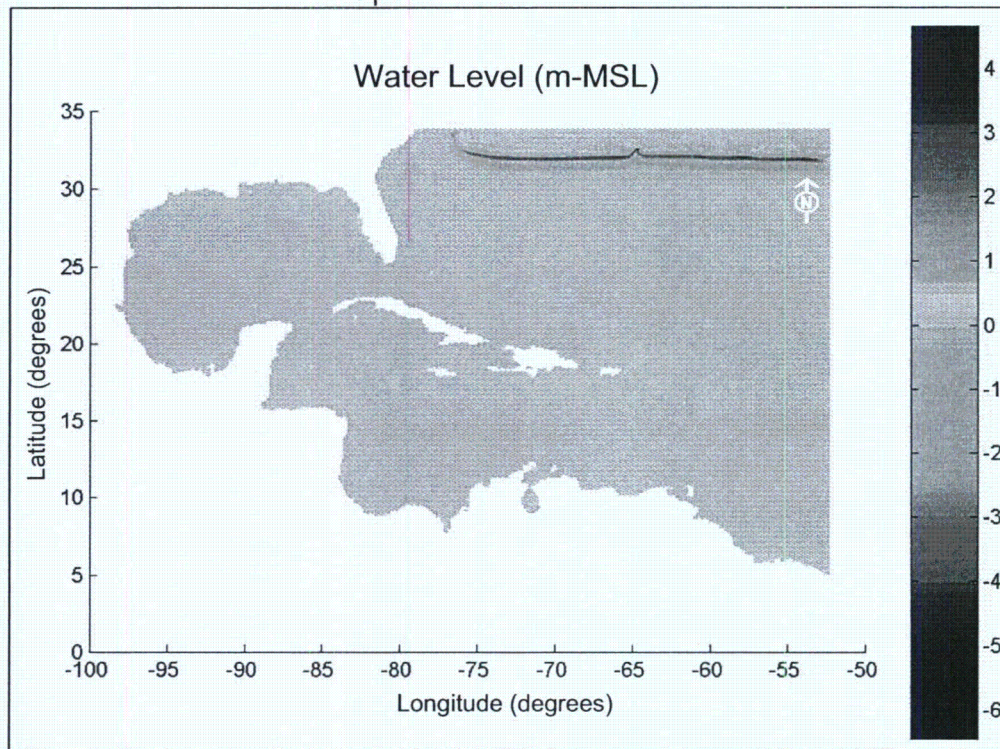
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Flooding Hazards Reevaluation Report



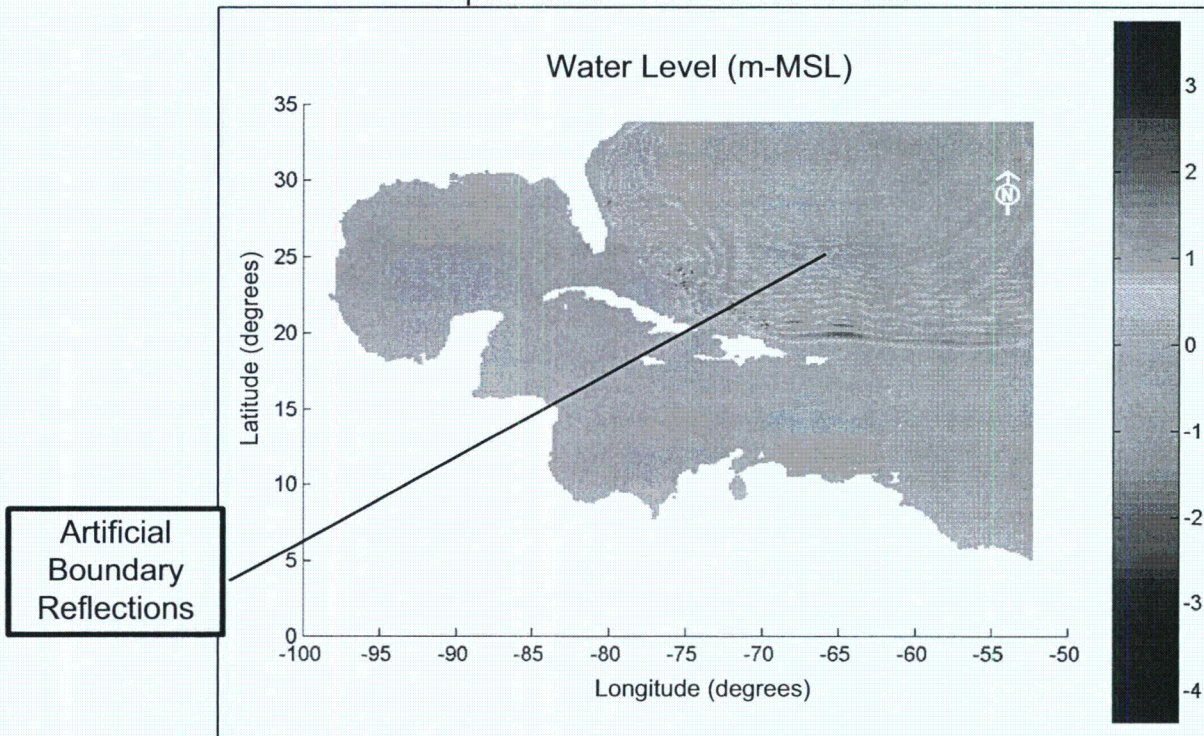
**Figure 4-58**  
Currituck Slide Boundary Time Series



Elapsed time = 45 minutes



Elapsed time = 2 hours 25 minutes

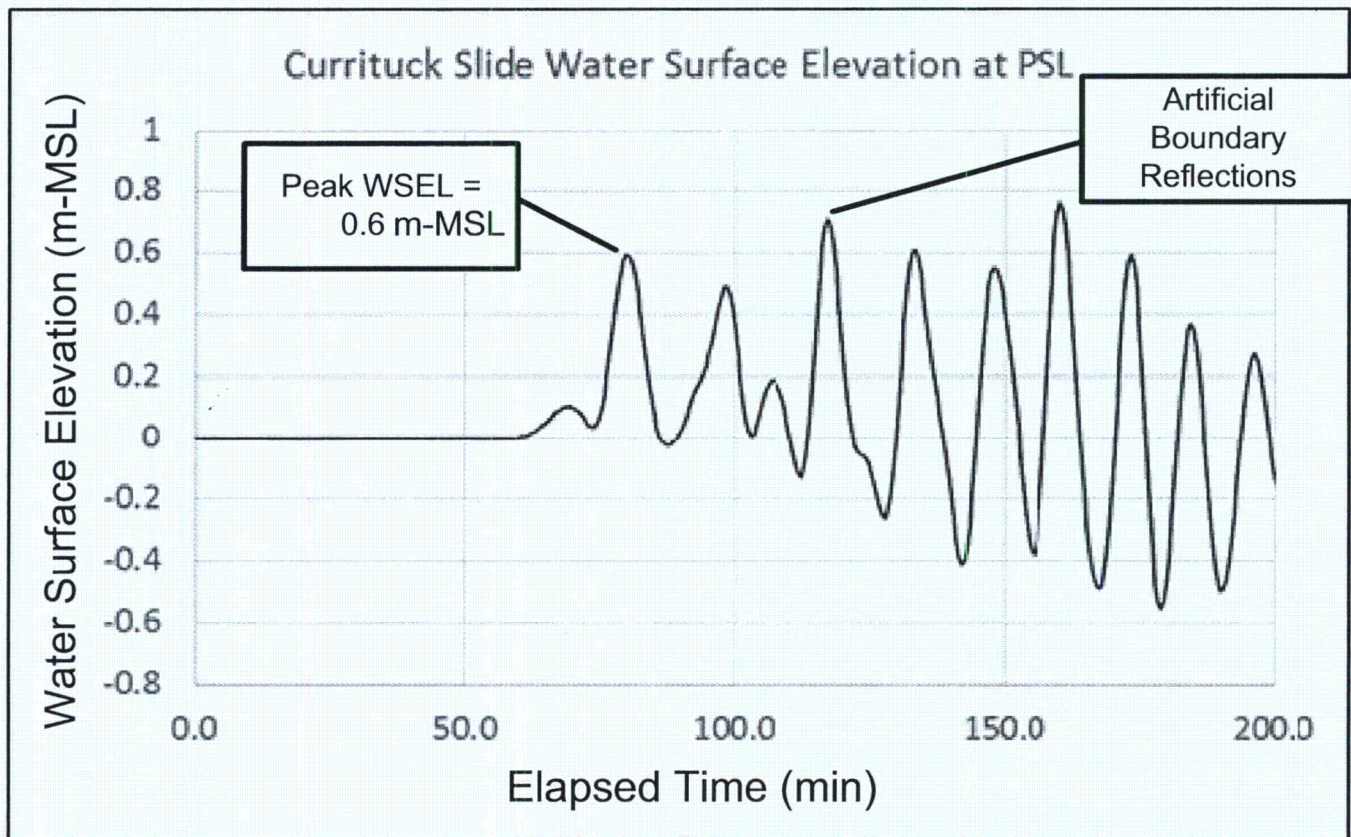


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Flooding Hazards Reevaluation Report



Figure 4-59  
Currituck Landslide



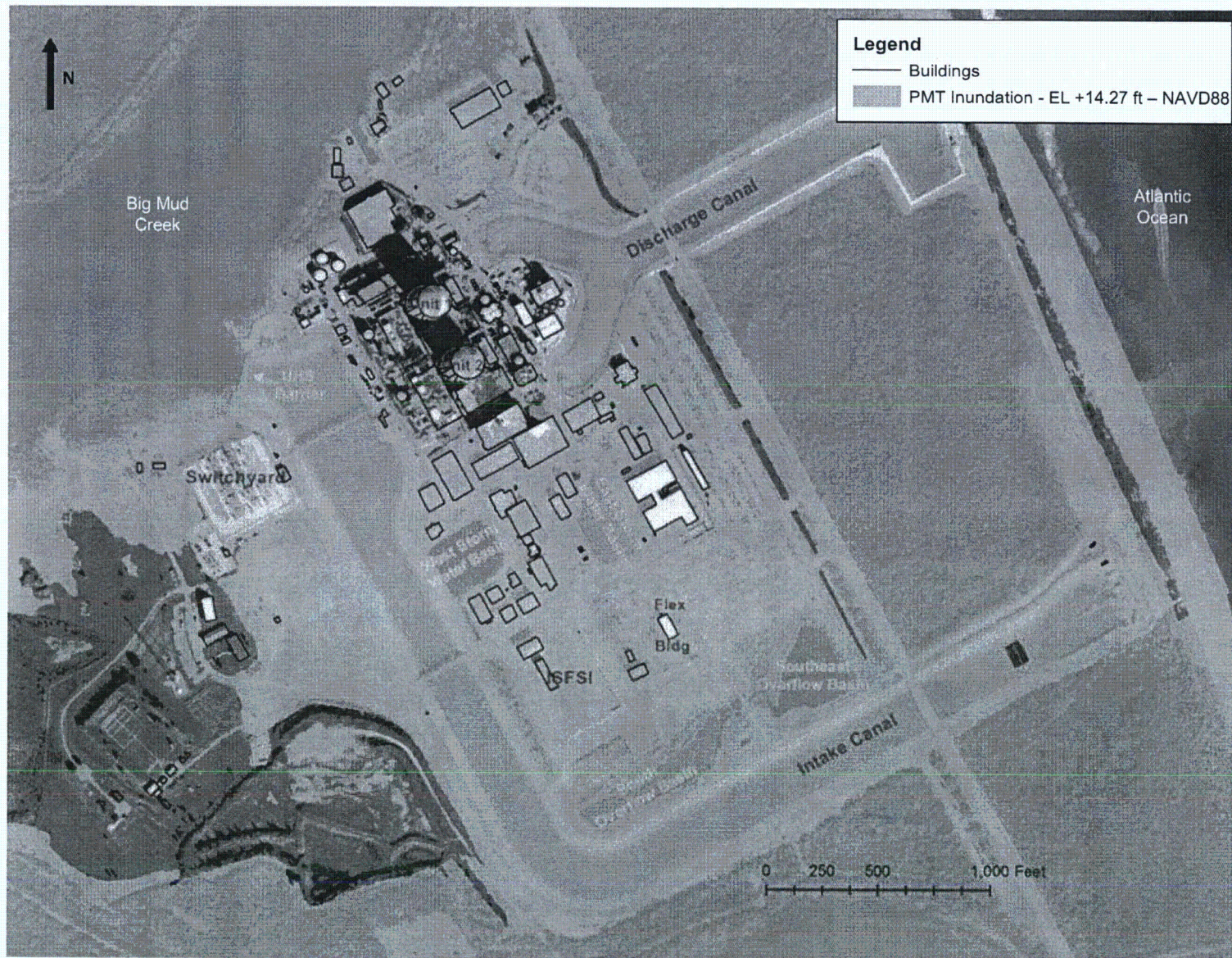


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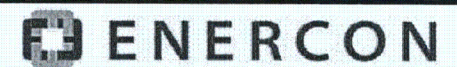


**Figure 4-60**  
Currituck Slide; PSL Water Surface Elevation





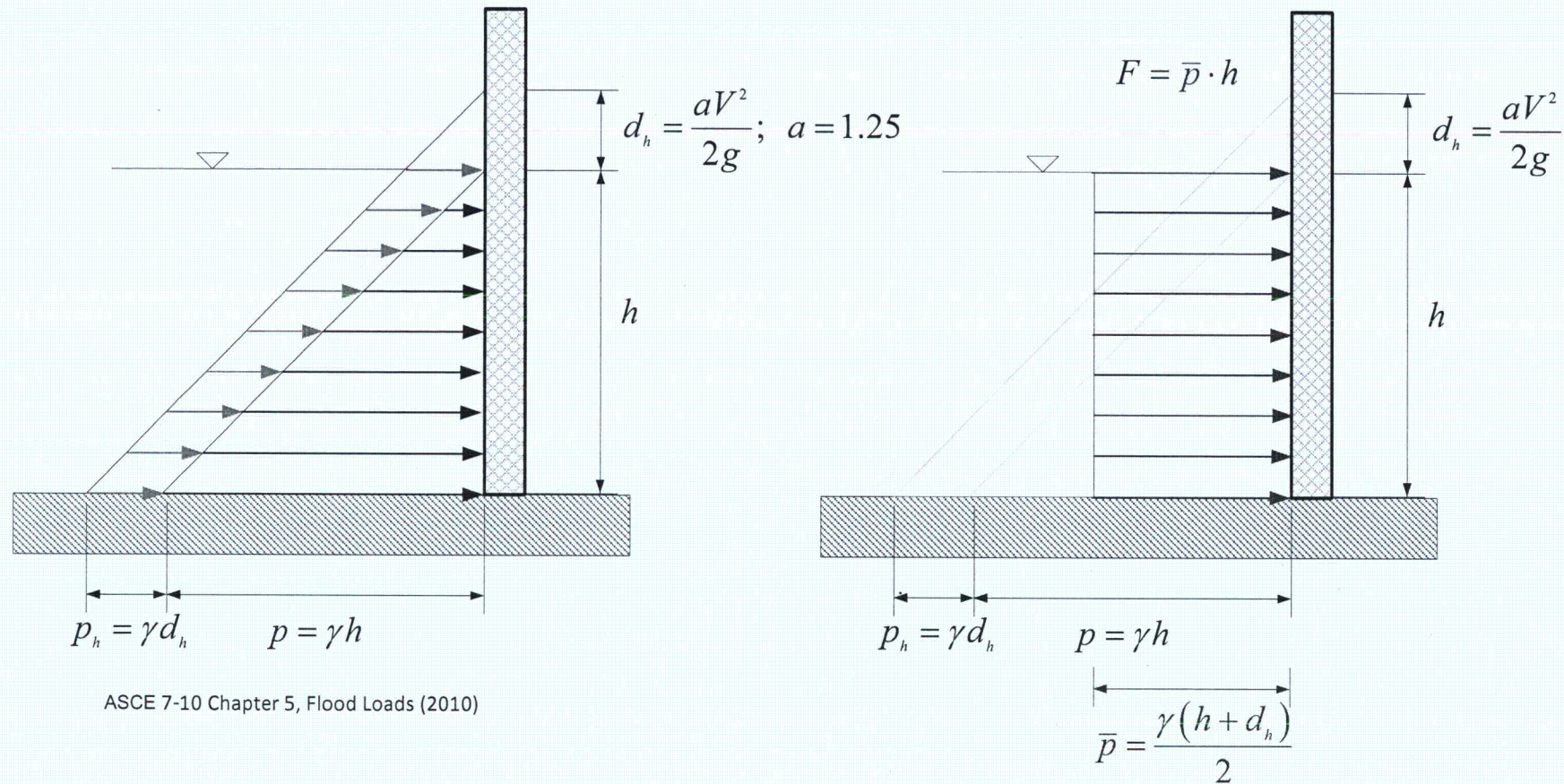
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Flooding Hazards Reevaluation Report



**Figure 4-61**  
PMT Inundation at EL 14.27 ft-NAVD88



# Flood loads on a vertical wall



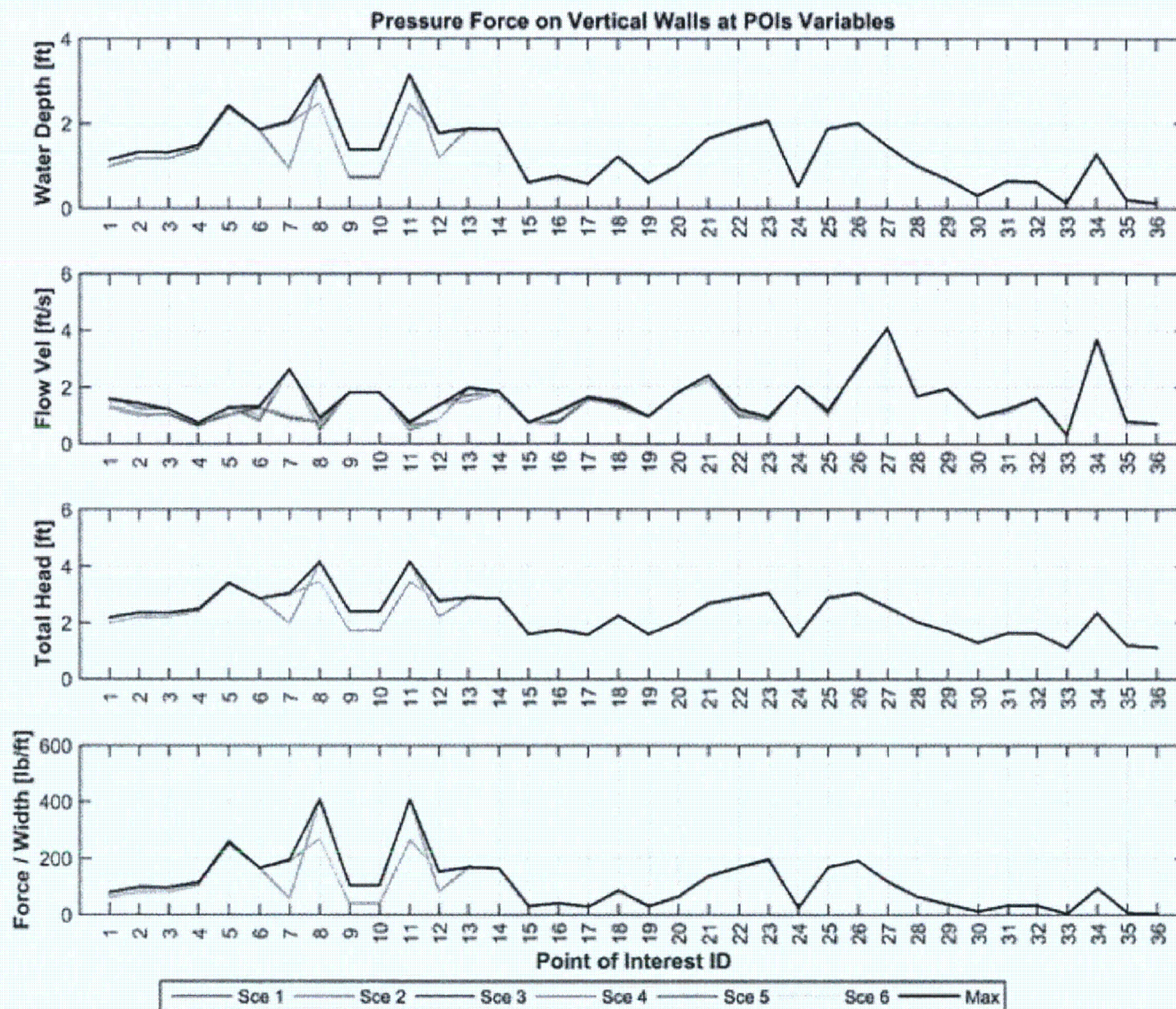
ASCE 7-10 Chapter 5, Flood Loads (2010)

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St. Lucie Nuclear Power Plant Units 1 & 2  
Flooding Hazards Reevaluation Report

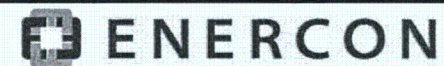
**ENERCON**

**Figure 4-62**  
LIP Loading Diagram



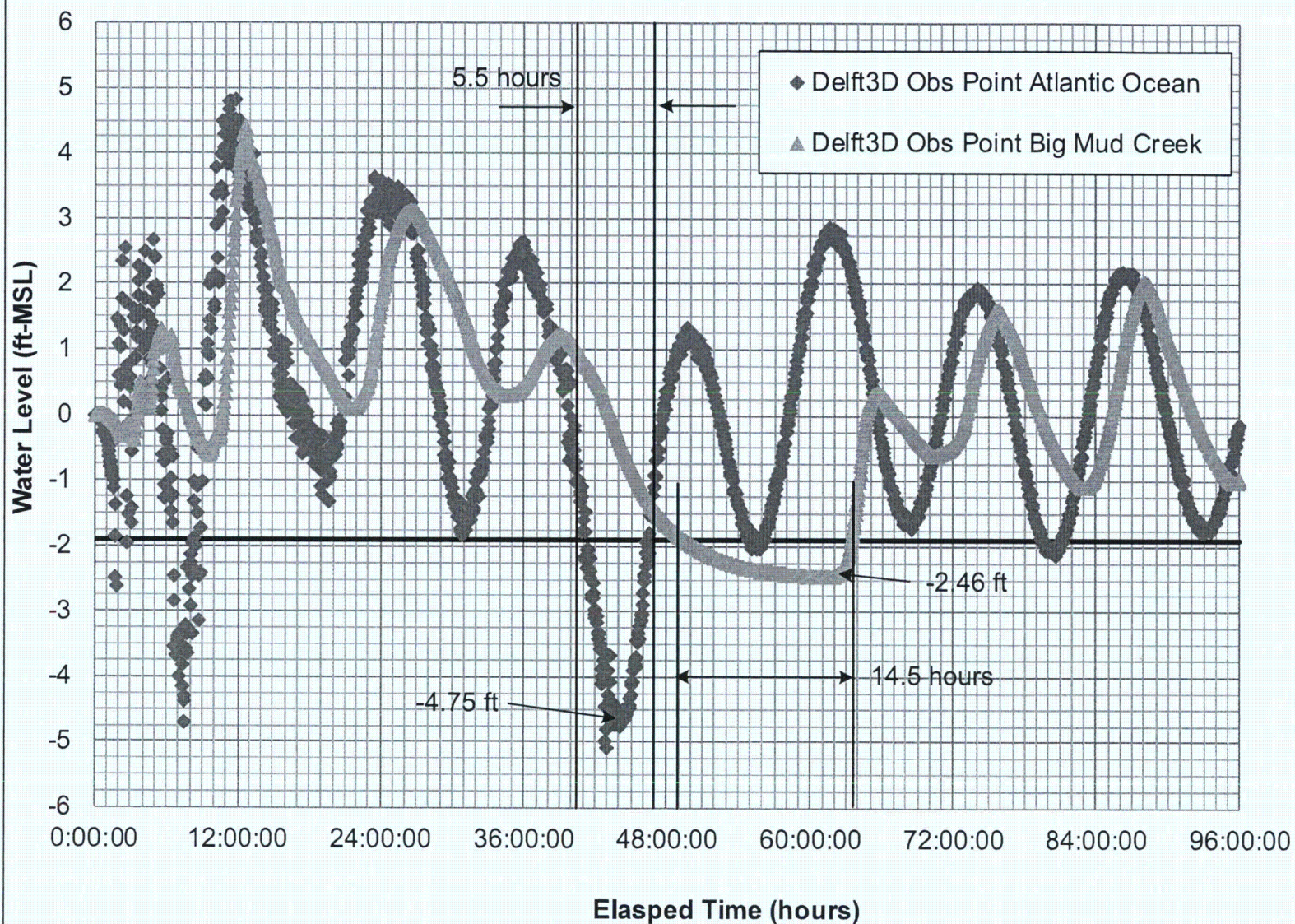


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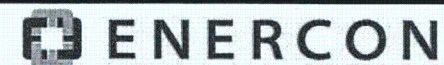


**Figure 4-63**  
Bounding LIP Loads at POIs





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**Figure 4-64**  
Time Series of PMS Low Water