



## Hurricane Dorian 09.06.19 Analysis

Risk Services Division

6 September 2019

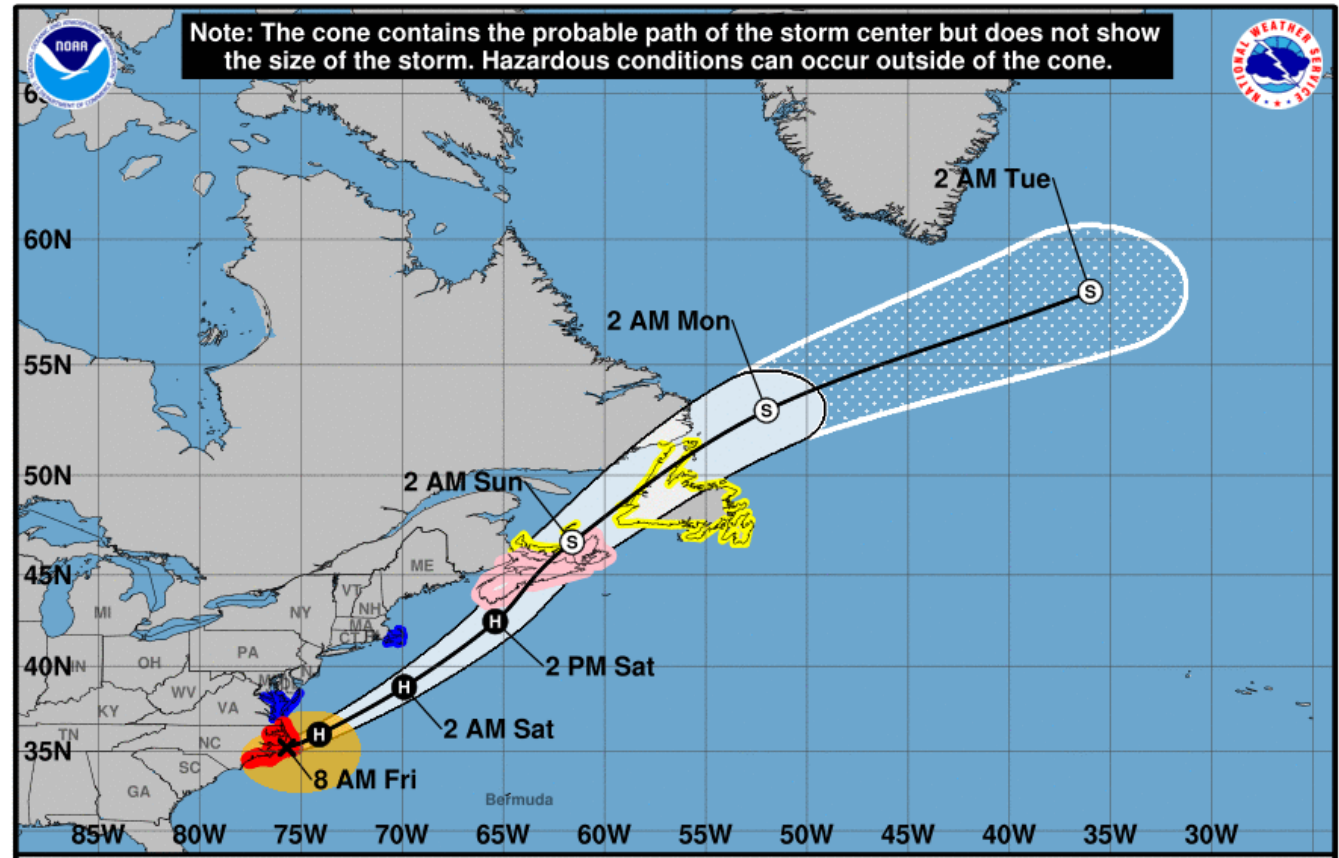
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## Hurricane Dorian

Status at 9:00AM EDT (13:00 UTC) 6 September, 2019

- Dorian made landfall today over Cape Hatteras, North Carolina as a Category 1 hurricane.
- The center of Hurricane Dorian is located near 35.3N 75.5 W about 5 miles (8km) NE of Cape Hatteras, North Carolina.
- Dorian is moving northeastward (50°) at 8mph (13km/h).
- Maximum sustained winds are 90mph (150km/h) with higher gusts.
- Hurricane-force winds extend outward up to 45miles (75km) from the center, and tropical-storm-force winds extend outward up to 220miles (350km).
- Life-threatening storm surge and dangerous winds are expected to continue along portions of the North Carolina coast, portions of southeast Virginia and the southern Chesapeake Bay: Water levels could rise well in advance of the arrival of strong winds.



- Flash flooding is occurring, and will continue to become more widespread across the eastern Carolinas and far southeast Virginia this morning. There is a high risk of flash flooding over these areas where significant, life-threatening, flash flooding is expected.

## Summary

At 9:00 AM EDT (1300UTC), the National Hurricane Center reports the center of Hurricane Dorian is located near 35.3N 75.5 W about 5 miles (8km) NE of Cape Hatteras, North Carolina. Dorian is moving northeastward (50°) at 14mph (22km/h) and this general motion, with an increase in forward speed, is expected through Saturday. On the forecast track, the center of Dorian will move near or over the coast of North Carolina during the next few hours. The center should move to the southeast of extreme southeastern New England tonight and Saturday morning, and then across Nova Scotia late Saturday or Saturday night.

Maximum sustained winds are near 90mph (150km/h) with higher gusts. Dorian is a category 1 hurricane on the Saffir-Simpson Hurricane Wind Scale. Dorian should remain a powerful hurricane as it moves near or along the coast of North Carolina during the next few hours. Dorian is forecast to become a post-tropical cyclone with hurricane-force winds by Saturday night as it approaches Nova Scotia.

Hurricane-force winds extend outward up to 45miles (75km) from the center and tropical-storm-force winds extend outward up to 220 miles (350km).

The estimated minimum central pressure is 956mb (28.23inches).

## Discussion

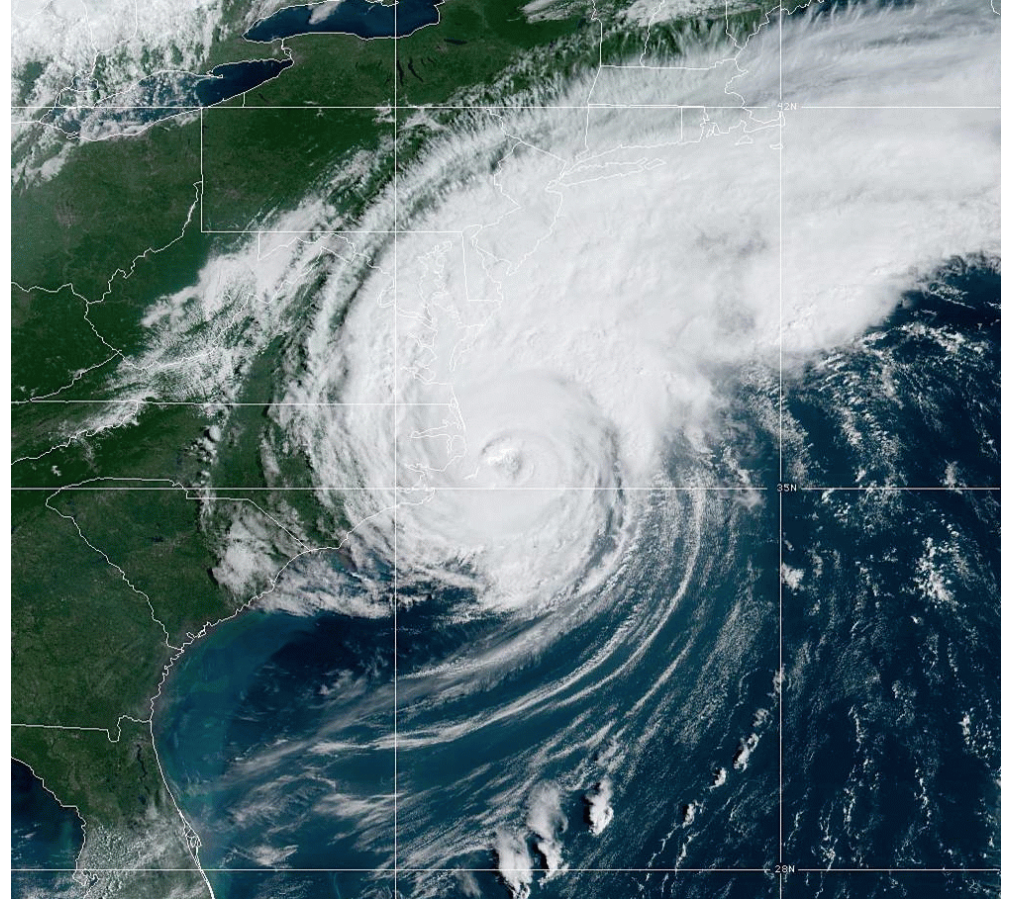
The center of the eye of Hurricane Dorian is located just off the coast of North Carolina not far from Cape Lookout. There have been several reports in eastern North Carolina of sustained tropical-storm-force winds and hurricane-force gusts, with the strongest winds being reported in the northern eyewall.

Dorian is moving northeastward at 14mph (22km/h). A faster northeastward motion is expected during the next few days as a mid- to upper-level trough, currently over the U.S. Great Lakes, approaches the system and accelerates the steering flow. This track forecast takes the hurricane along the coast of North Carolina during the next several hours and near or over Atlantic Canada this weekend.

The hurricane is expected to gradually weaken during the next couple of days and is expected to cross the north wall of the Gulf Stream current in about 36 hours, and head over much colder waters after that. These atmospheric and oceanic conditions should cause the cyclone to become a powerful hurricane-force extratropical cyclone in about 2 days. As the system gains latitude, the tropical-storm-force winds are expected to expand significantly.

**Key Messages**

1. Life-threatening storm surge and dangerous winds are expected to continue along portions of the North Carolina coast, portions of southeast Virginia and the southern Chesapeake Bay: Water levels could rise well in advance of the arrival of strong winds
2. Flash flooding is occurring, and will continue to become more widespread across the eastern Carolinas and far southeast Virginia this morning. There is a high risk of flash flooding over these areas where significant, life-threatening, flash flooding is expected



## Watches and Warnings

### **A hurricane warning is in effect for:**

- Surf City to the North Carolina/Virginia Border
- Pamlico and Albemarle Sounds

### **A hurricane watch is in effect for:**

- Nova Scotia

### **A Tropical Storm Warning is in effect for:**

- North Carolina/Virginia border to Fenwick Island DE
- Chesapeake Bay from Drum Point southward
- Tidal Potomac south of Cobb Island
- Woods Hole to Sagamore Beach MA
- Nantucket and Martha's Vineyard MA

### **A Tropical Storm Watch is in effect for:**

- Prince Edward Island
- Magdalen Islands
- Fundy National Park to Shediac
- Francois to Boat Harbour

### **A Storm Surge Warning is in effect for:**

- Salter Path NC to Poquoson, Virginia
- Pamlico and Albemarle Sounds
- Neuse and Pamlico Rivers
- Hampton Roads

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A Hurricane Warning means that hurricane conditions are expected somewhere within the warning area. A warning is typically issued 36 hours before the anticipated first occurrence of tropical-storm-force winds, conditions that make outside preparations difficult or dangerous. Preparations to protect life and property should be rushed to completion.

A Hurricane Watch means that hurricane conditions are possible within the watch area. A watch is typically issued 48 hours before the anticipated first occurrence of tropical-storm-force winds, conditions that make outside preparations difficult or dangerous.

A Tropical Storm Warning means that tropical storm conditions are expected somewhere within the warning area within 36 hours.

A Tropical Storm Watch means that tropical storm conditions are possible within the watch area, generally within 48 hours.

A Storm Surge Warning means there is a danger of life-threatening inundation, from rising water moving inland from the coastline, during the next 36 hours in the indicated locations. This is a life-threatening situation. Persons located within these areas should take all necessary actions to protect life and property from rising water and the potential for other dangerous conditions. Promptly follow evacuation and other instructions from local officials.

A Storm Surge Watch means there is a possibility of life-threatening inundation, from rising water moving inland from the coastline, in the indicated locations during the next 48 hours

### Hazards Affecting Land

**WIND:** Hurricane conditions should continue along portions of the North Carolina coast for the next few hours. Tropical storm conditions are spreading onto the Virginia coast in the warning area.

Tropical storm conditions are expected elsewhere in the Tropical Storm Warning area in the Mid-Atlantic states later today and over portions of extreme southeastern Massachusetts tonight or early Saturday.

Hurricane conditions are possible in Nova Scotia on Saturday.

**STORM SURGE:** The combination of a dangerous storm surge and the tide will cause normally dry areas near the coast to be flooded by rising waters moving inland from the shoreline.

The water could reach the following heights above ground somewhere in the indicated areas if the peak surge occurs at the time of high tide:

- Salter Path, NC to Duck NC, including Pamlico and Albemarle Sounds and the Neuse and Pamlico Rivers: 4 to 7 ft
- Duck NC to Poquoson VA, including Hampton Roads: 2 to 4 ft

Water levels could begin to rise well in advance of the arrival of strong winds. The surge will be accompanied by large and destructive waves. Surge-related flooding depends on the how close the center of Dorian comes to the coast, and can vary greatly over short distances.

**RAINFALL:** Dorian is expected to produce the following rainfall totals through Saturday:

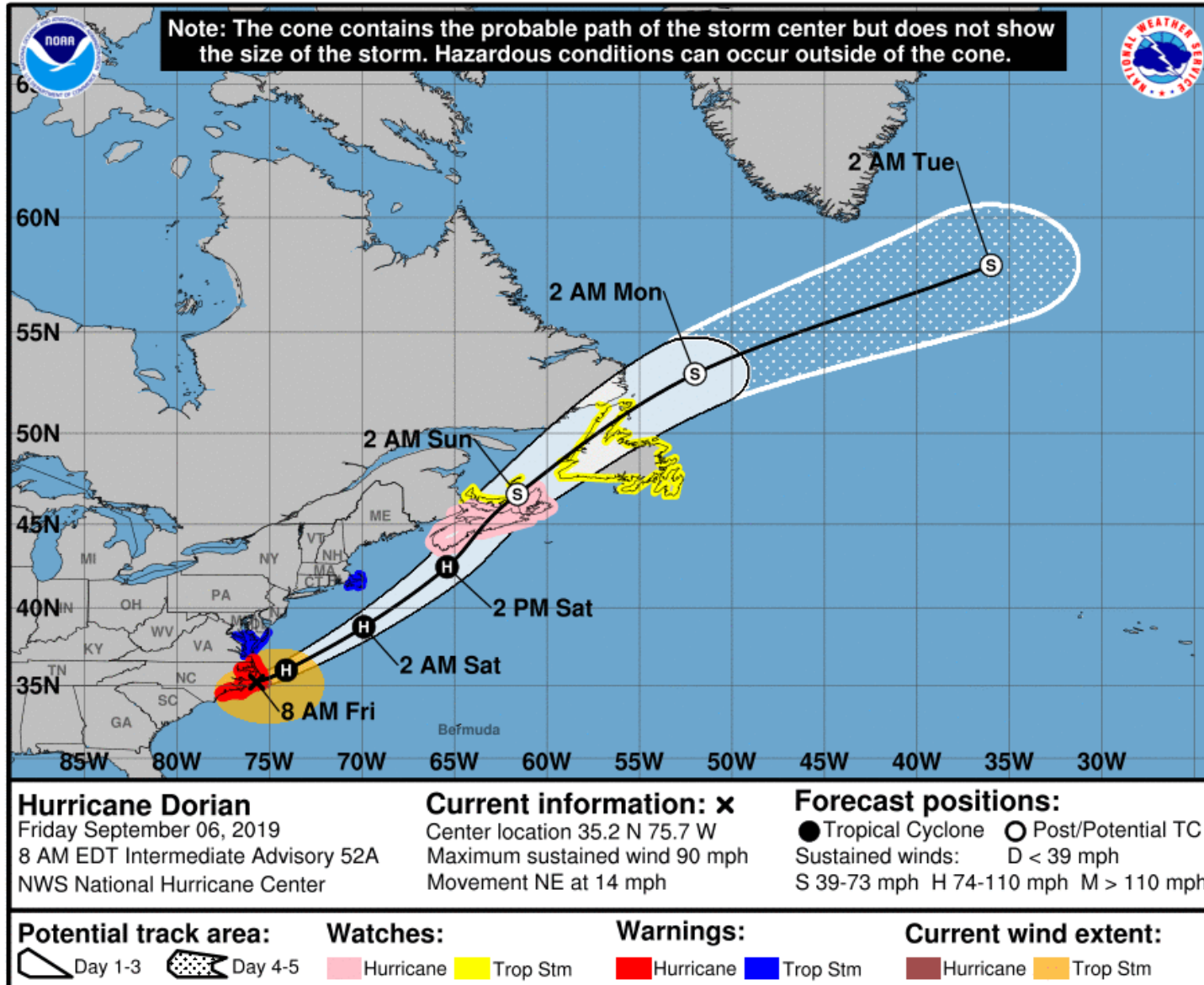
- Northeastern North Carolina: additional 3 to 8 inches, isolated 15 inches
- Far southeast Virginia: 3 to 8 inches
- Extreme southeastern New England: 2 to 4 inches
- Nova Scotia and Prince Edward Island: 3 to 5 inches
- Newfoundland: 1 to 2 inches

This rainfall may cause life-threatening flash floods.

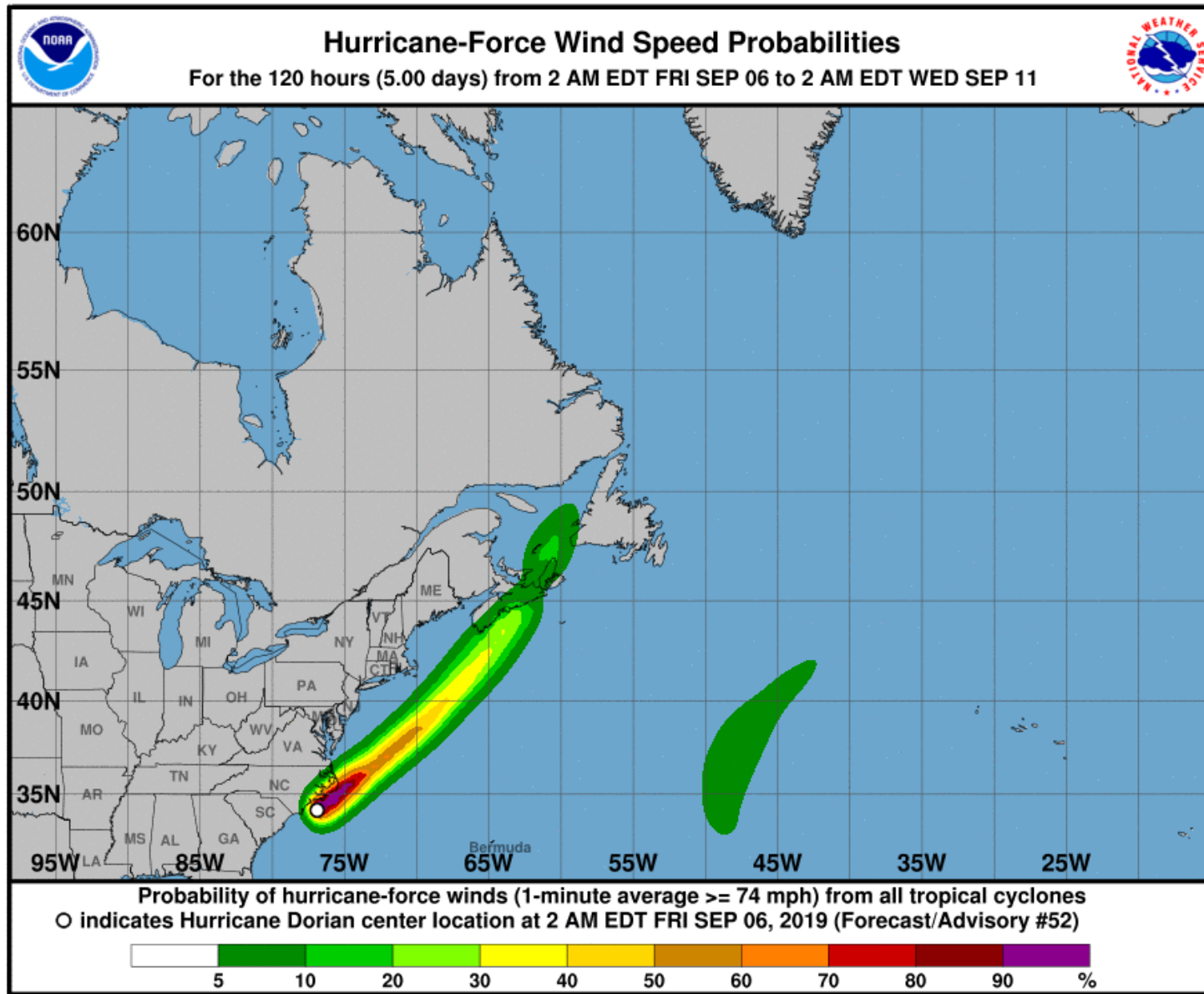
**SURF:** Large swells will affect much of the southeastern United States coast from northern Florida through North Carolina during the next several days. These swells are likely to cause life-threatening surf and rip current conditions.

**Tornadoes:** Isolated tornadoes are possible this morning across eastern North Carolina into southeastern Virginia.

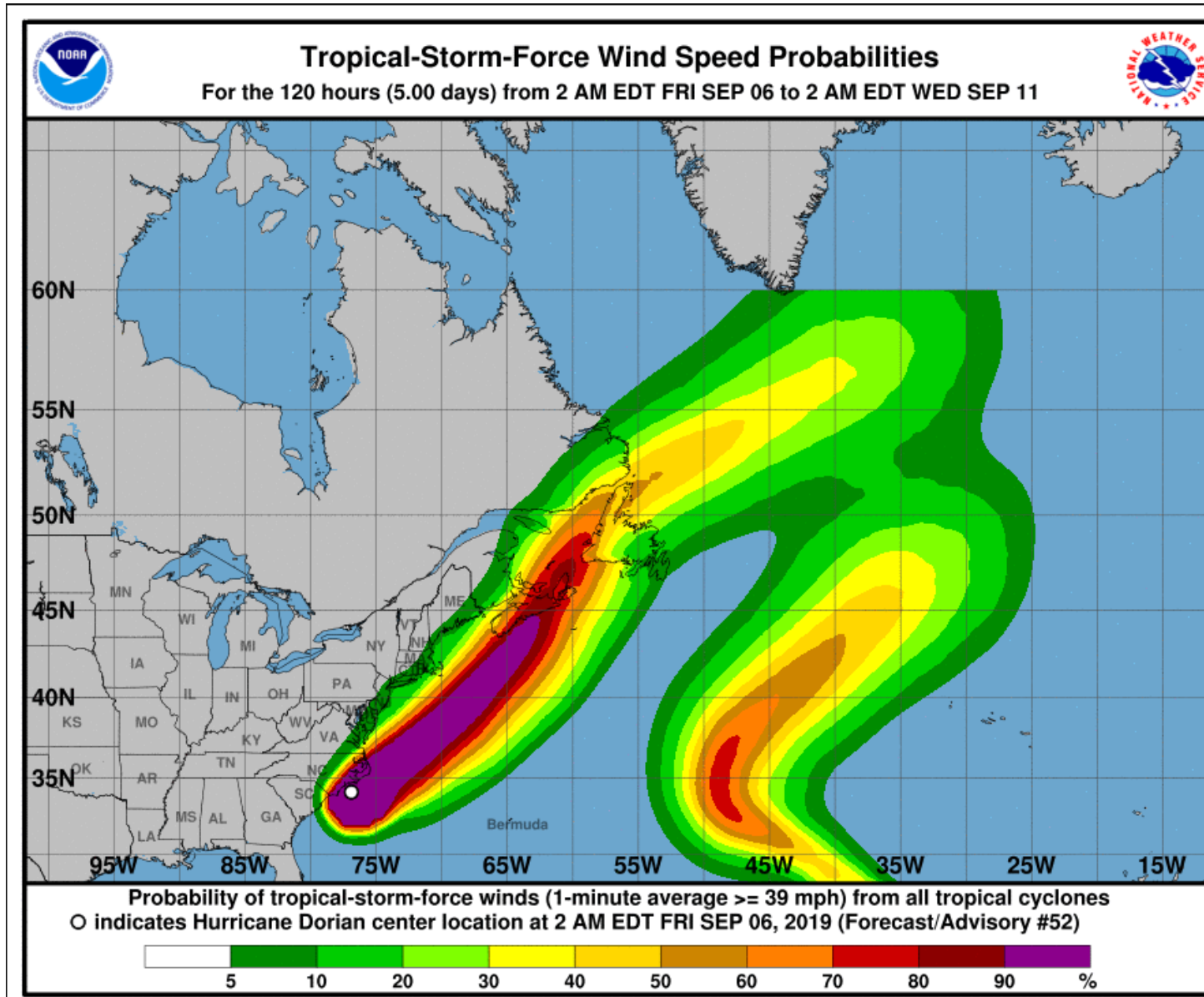
Current Predicted Path (5 Day)



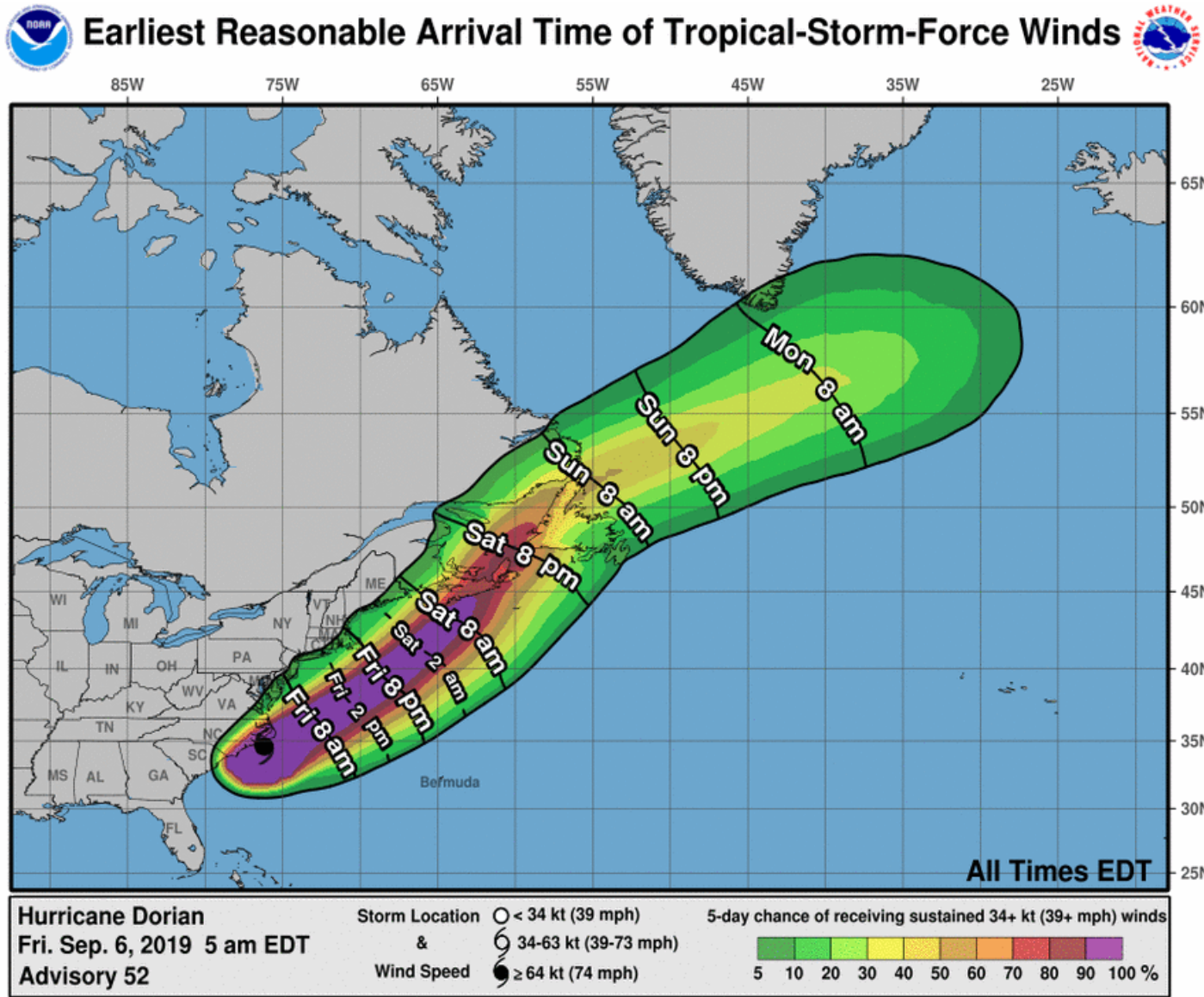
Hurricane-Force Wind Speed Probabilities



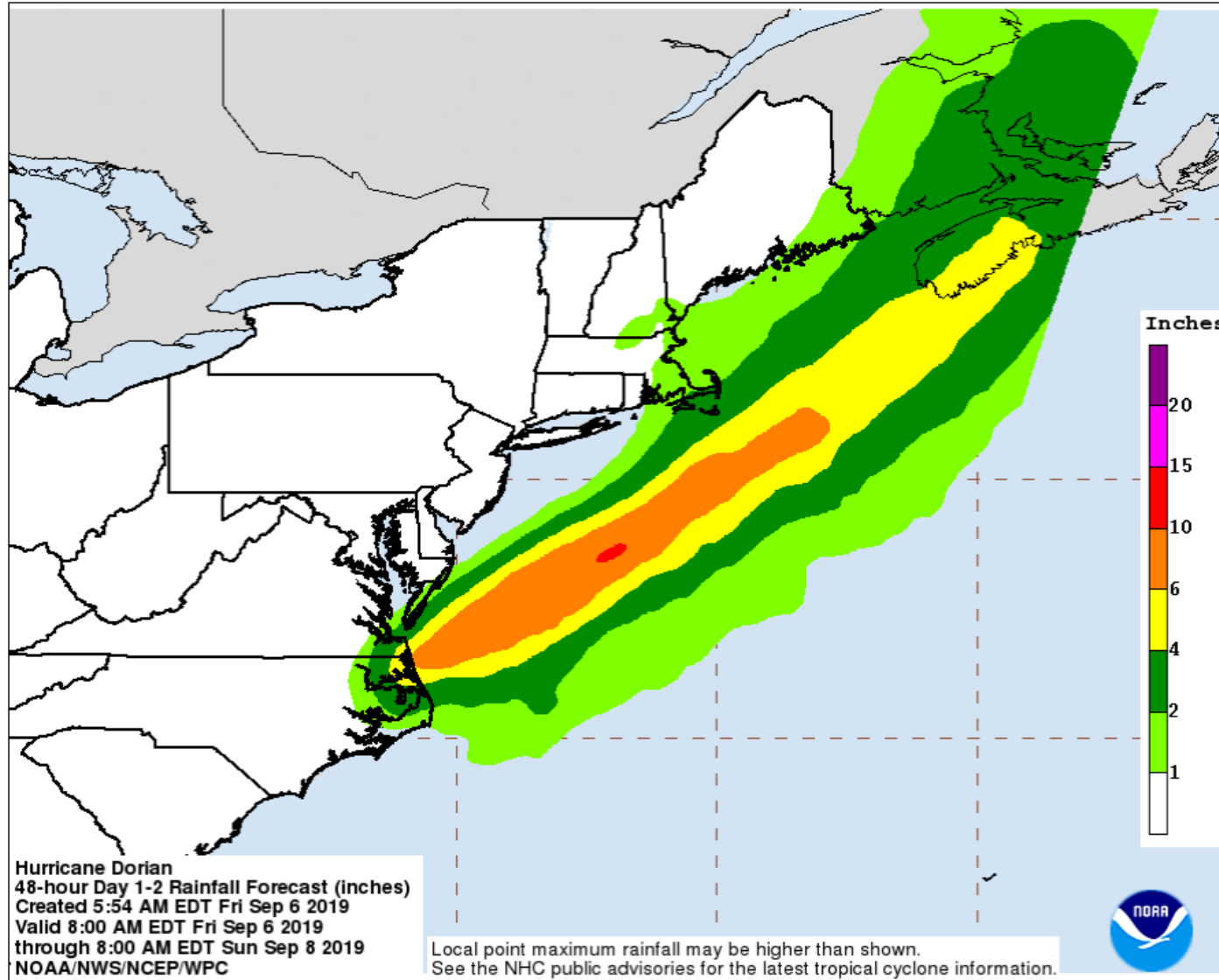
Tropical-Storm-Force Wind Speed Probabilities



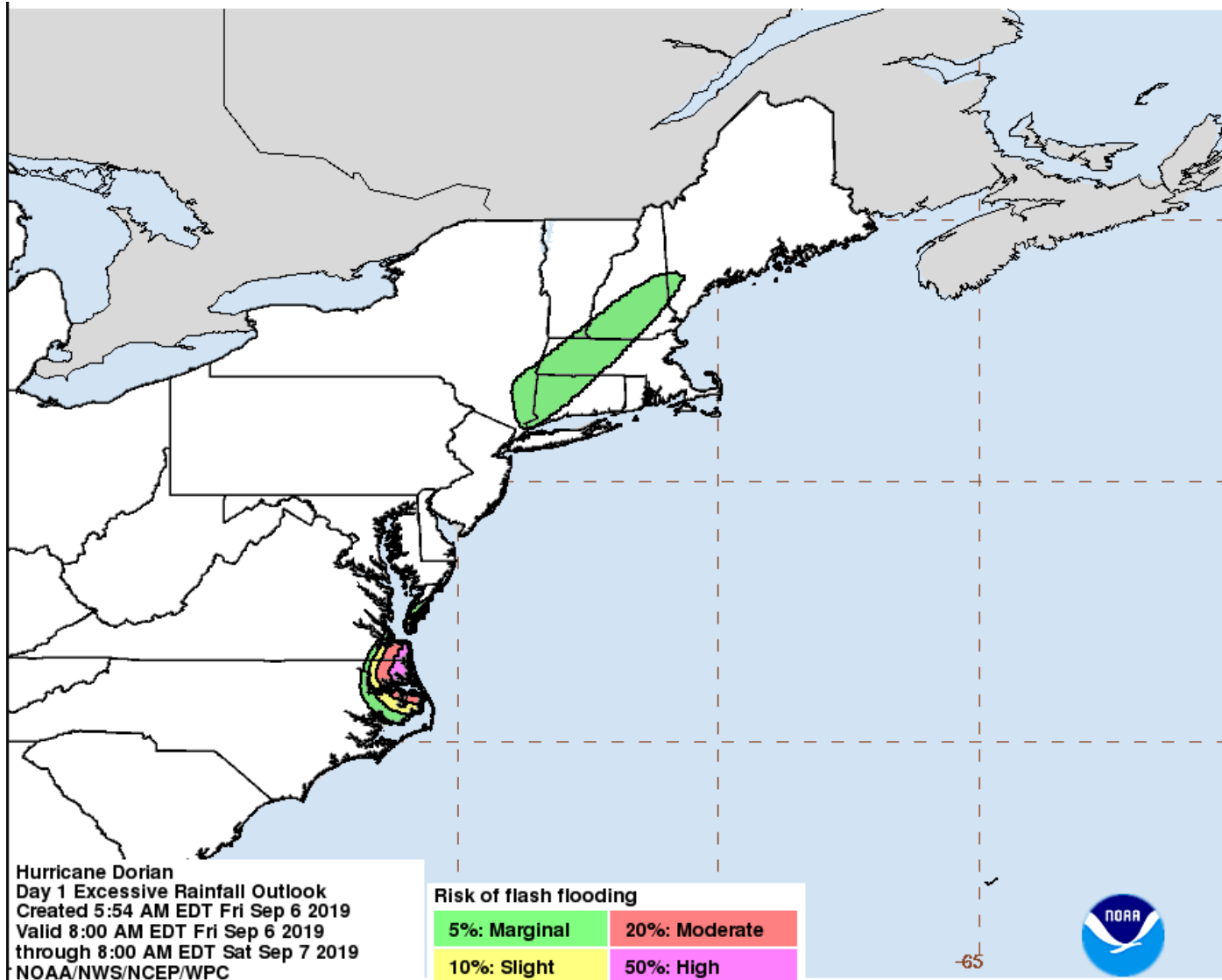
Most Likely Arrival Time of Tropical-Storm-Force Winds



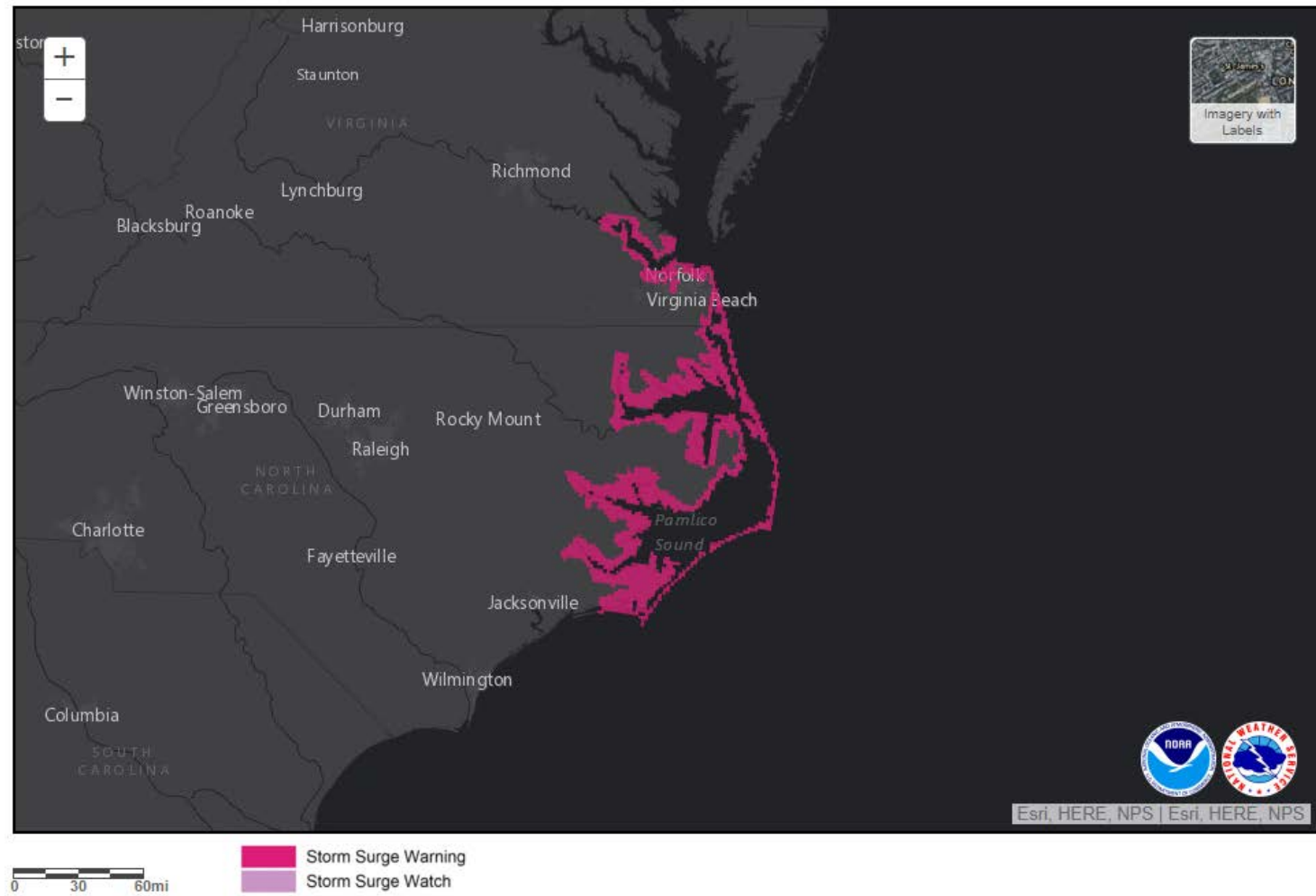
Rainfall Potential



Flash Flood Risk Over Next 3 Days



Storm Surge Watch/Warning Graphic



## Safety Procedures & Readiness

### Hurricane Hazards

While hurricanes pose the greatest threat to life and property, tropical storms and depressions also can be devastating. The primary hazards from tropical cyclones (which include tropical depressions, tropical storms, and hurricanes) are storm surge flooding, inland flooding from heavy rains, destructive winds, tornadoes, and high surf and rip currents.

- Storm surge is the abnormal rise of water generated by a storm's winds. This hazard is historically the leading cause of hurricane related deaths in the United States. Storm surge and large battering waves can result in large loss of life and cause massive destruction along the coast.
- Storm surge can travel several miles inland, especially along bays, rivers, and estuaries.
- Flooding from heavy rains is the second leading cause of fatalities from landfalling tropical cyclones. Widespread torrential rains associated with these storms often cause flooding hundreds of miles inland. This flooding can persist for several days after a storm has dissipated
- Winds from a hurricane can destroy buildings and manufactured homes. Signs, roofing material, and other items left outside can become flying missiles during hurricanes.
- Tornadoes can accompany landfalling tropical cyclones. These tornadoes typically occur in rain bands well away from the center of the storm
- Dangerous waves produced by a tropical cyclone's strong winds can pose a significant hazard to coastal residents and mariners. These waves can cause deadly rip currents, significant beach erosion, and damage to structures along the coastline, even when the storm is more than a 1,000 miles offshore

Now is the time to prepare. All residents and visitors in the path of Hurricane Lane should review these tips:

- Check to make sure your [emergency kit](#) is stocked and test your [family communications plan](#).
- Know your evacuation routes and how to find higher ground. Determine where you would go, and how you would get there if instructed to evacuate. *If directed to evacuate by local officials, evacuate.*

Stay vigilant and continue to monitor local radio or TV stations and local emergency management officials for updated weather and emergency information.

- The [FEMA App](#) (available in English and Spanish) provides National Weather Service alerts (for up to 5 areas), emergency kit checklists, directions to open shelters, safety preparation tips and more.
- Make plans to secure your property:
  - Cover all of your home's windows. Permanent storm shutters offer the best protection for windows. A second option is to board up windows with 5/8" marine plywood, cut to fit and ready to install. Tape does not prevent windows from breaking.
  - Reinforce your garage doors; if wind enters a garage it can cause dangerous and expensive structural damage.
  - Plan to bring in all outdoor furniture, decorations, garbage cans, and anything else that is not tied down.
  - Determine how and where to secure boats and other marine craft.
- You can safely install a generator for emergencies. Remember, never run a generator inside and keep it away from windows, doors, and vents.
- If using candles, please use caution. If possible, use flashlights instead. If you must use candles, do not burn them on or near anything that can catch fire.
- Your phone is an important tool to ensure your family's safety. Make sure to charge your phone and other electronic devices.
- Businesses of all sizes are encouraged to follow local public safety authority direction and to share safety messaging with employees in order to reduce risk.
- If you have a National Flood Insurance Program (NFIP) flood insurance policy, you may be eligible for reimbursement for actions taken to protect your property. Call your insurance agent to find out more.

**The Saffir-Simpson Hurricane Wind Scale**

The Saffir-Simpson Hurricane Wind Scale is a 1 to 5 rating based on a hurricane's sustained wind speed. This scale estimates potential property damage. Hurricanes reaching Category 3 and higher are considered major hurricanes because of their potential for significant loss of life and damage. Category 1 and 2 storms are still dangerous, however, and require preventative measures. In the western North Pacific, the term "super typhoon" is used for tropical cyclones with sustained winds exceeding 150 mph.

Category	Sustained Winds	Types of Damage Due to Hurricane Winds
1	74-95 mph 64-82 kt 119-153 km/h	<b>Very dangerous winds will produce some damage:</b> Well-constructed frame homes could have damage to roof, shingles, vinyl siding and gutters. Large branches of trees will snap and shallowly rooted trees may be toppled. Extensive damage to power lines and poles likely will result in power outages that could last a few to several days.
2	96-110 mph 83-95 kt 154-177 km/h	<b>Extremely dangerous winds will cause extensive damage:</b> Well-constructed frame homes could sustain major roof and siding damage. Many shallowly rooted trees will be snapped or uprooted and block numerous roads. Near-total power loss is expected with outages that could last from several days to weeks.
3 (major)	111-129 mph 96-112 kt 178-208 km/h	<b>Devastating damage will occur:</b> Well-built framed homes may incur major damage or removal of roof decking and gable ends. Many trees will be snapped or uprooted, blocking numerous roads. Electricity and water will be unavailable for several days to weeks after the storm passes.
4 (major)	130-156 mph 113-136 kt 209-251 km/h	<b>Catastrophic damage will occur:</b> Well-built framed homes can sustain severe damage with loss of most of the roof structure and/or some exterior walls. Most trees will be snapped or uprooted and power poles downed. Fallen trees and power poles will isolate residential areas. Power outages will last weeks to possibly months. Most of the area will be uninhabitable for weeks or months.
5 (major)	157 mph or higher 137 kt or higher 252 km/h or higher	<b>Catastrophic damage will occur:</b> A high percentage of framed homes will be destroyed, with total roof failure and wall collapse. Fallen trees and power poles will isolate residential areas. Power outages will last for weeks to possibly months. Most of the area will be uninhabitable for weeks or months.

**For Additional Information:**

American Red Cross	<a href="http://www.redcross.org/">http://www.redcross.org/</a>
US Coast Guard Storm Center	<a href="https://www.uscg.mil/news/stormcenter/">https://www.uscg.mil/news/stormcenter/</a>
US National Hurricane Center	<a href="http://www.nhc.noaa.gov">www.nhc.noaa.gov</a>
US Federal Emergency Management Agency	<a href="http://www.ready.gov/hurricanes">http://www.ready.gov/hurricanes</a>
FEMA – Mobile App	<a href="https://www.fema.gov/mobile-app">https://www.fema.gov/mobile-app</a>
FEMA – Flooding	<a href="https://www.fema.gov/media-library-data/1522342356506-54bd8d92d0d0d07bca4c1250ebde2b21/Flood_508.pdf">https://www.fema.gov/media-library-data/1522342356506-54bd8d92d0d0d07bca4c1250ebde2b21/Flood_508.pdf</a>
Ready Gov	<a href="http://www.ready.gov">www.ready.gov</a>
Listo Gov (Spanish)	<a href="http://www.listo.gov">www.listo.gov</a>
Emergency Management Agencies	<a href="https://www.fema.gov/emergency-management-agencies">https://www.fema.gov/emergency-management-agencies</a>
Caribbean Disaster Emergency Management Agency	<a href="http://www.cdema.org/index.php?option=com_wrapper&amp;view=wrapper&amp;Itemid=417">http://www.cdema.org/index.php?option=com_wrapper&amp;view=wrapper&amp;Itemid=417</a>
Smart Traveler Enrollment Program	<a href="https://step.state.gov/">https://step.state.gov/</a>