



SCEMD

SCEMD: Trying to Reason with Hurricane Season using Esri Technology

Charlie Kaufman – GIS Manager

ckaufman@emd.sc.gov

Melissa Potter – Chief of Operations Support

mpotter@emd.sc.gov

Introduction



SCEMD

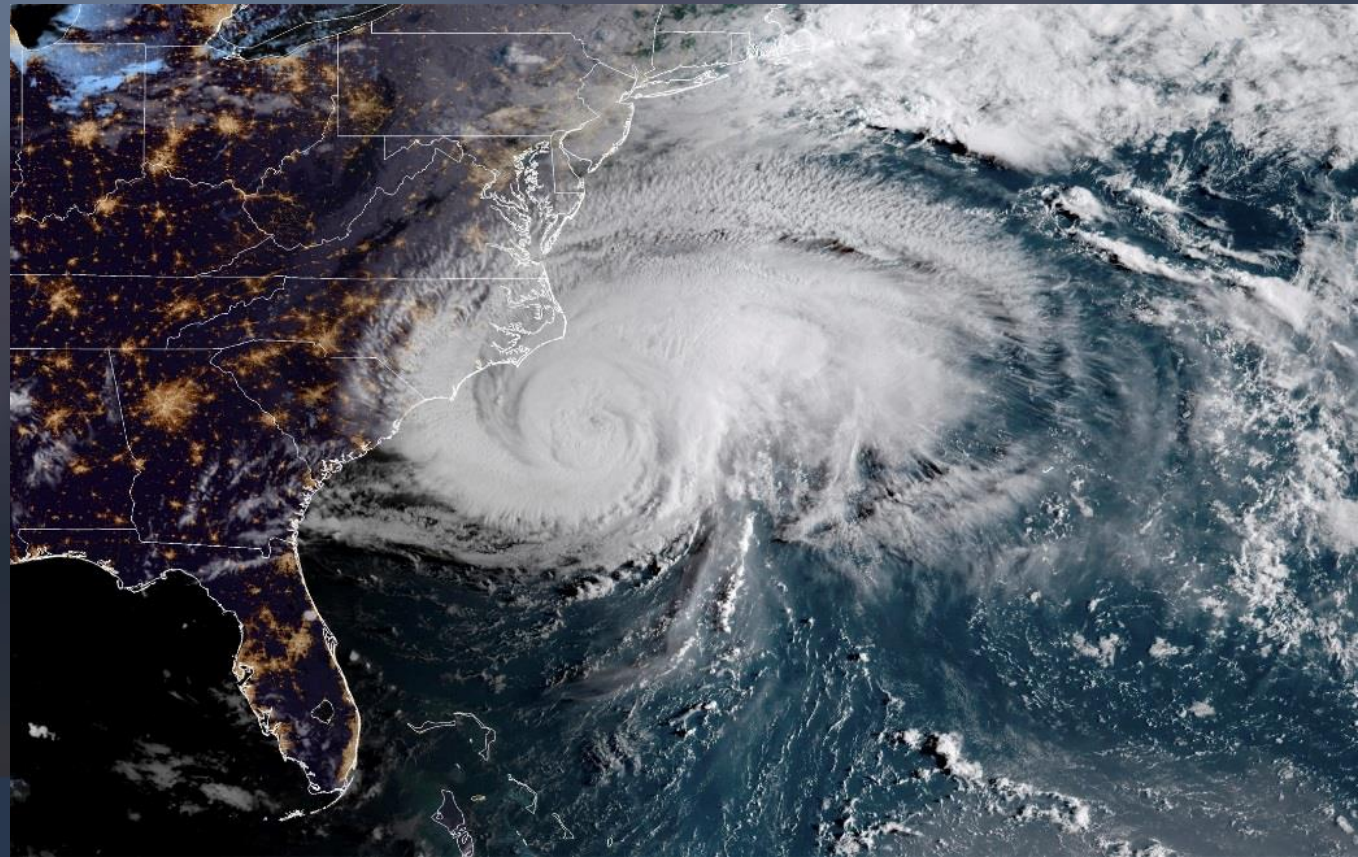
- South Carolina Emergency Management Division (SCEMD) is the coordinating agency responsible for the statewide emergency management program, and is responsible for coordinating the preparation for, response to, and recovery from any major disaster in SC.
- The GIS Department falls under the Operations Support Section as it supplies GIS data and maps to all aspects of SCEMD operations.

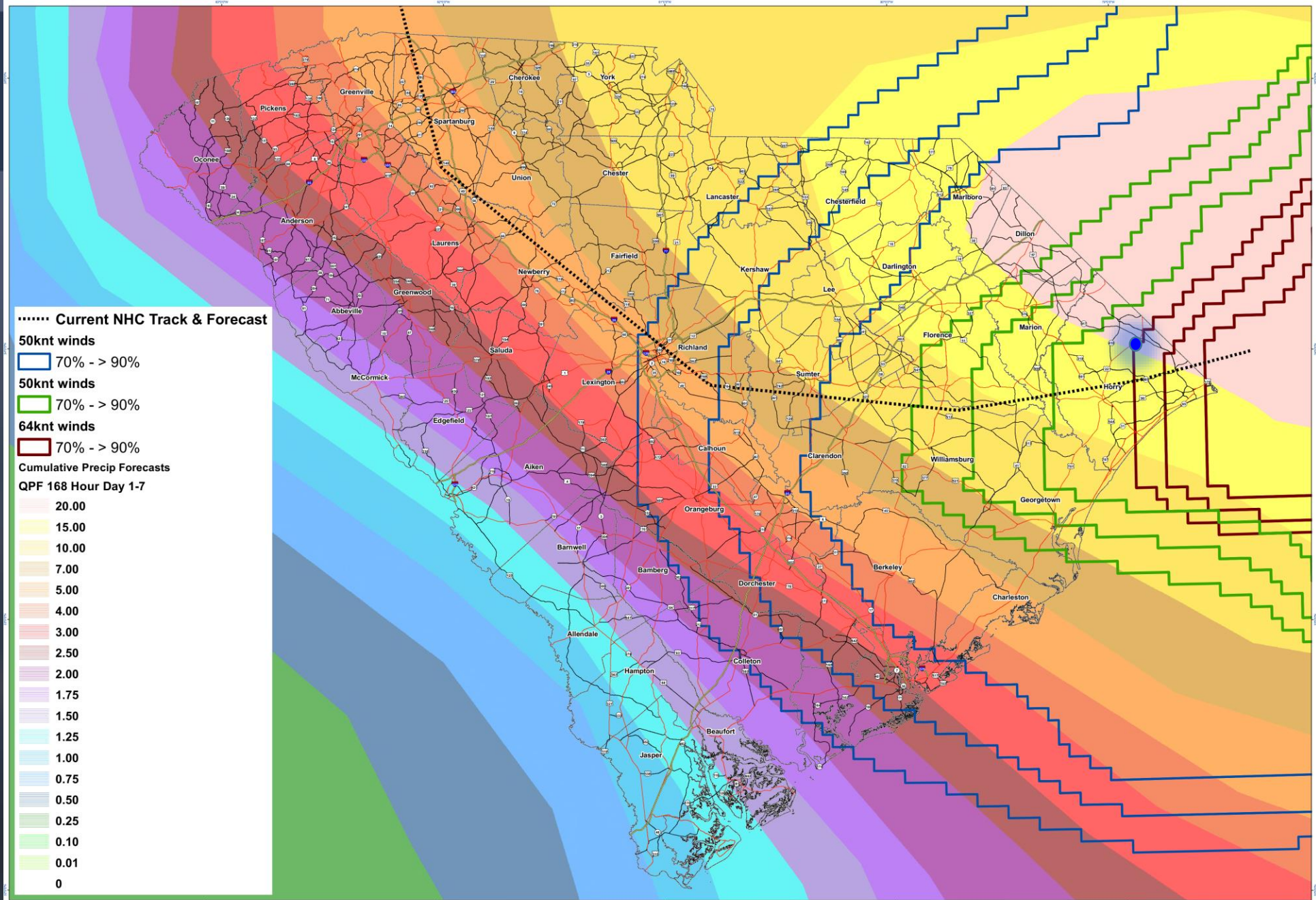
Hurricane Florence



SCEMD

- Hurricane Florence was a powerful hurricane that caused severe damage in the Carolinas in September 2018, primarily as a result of freshwater flooding.
- Florence rapidly intensified in September becoming a Cat 4 hurricane.
- Made landfall in NC as a Cat 1 storm on Sept 14th.





South Carolina: Hurricane Florence Wind and Rain Forecast Current Tract

9/14/2018

0 25 50 100 Miles

Disclaimer: This map is a graphic representation of data obtained from various sources. All efforts have been made to warrant the accuracy of this map. However, SC EMD disclaims all responsibility and liability for the use of this map.



SC Emergency Management Division
2779 Fish Hatchery Road
West Columbia, SC 29172
(803) 737-8588
E-mail: ckaufman@emd.sc.gov
Charlie Kaufman -- 9/14/2018

Introduction



SCEMD

- When Hurricane Florence threatened and then impacted the Carolinas, SCEMD utilized Esri software in multiple ways.
 - Common Operating Picture - Palmetto
 - ArcMap / Static Mapping
 - Arc Online / Web Apps

Common Operating Picture Palmetto

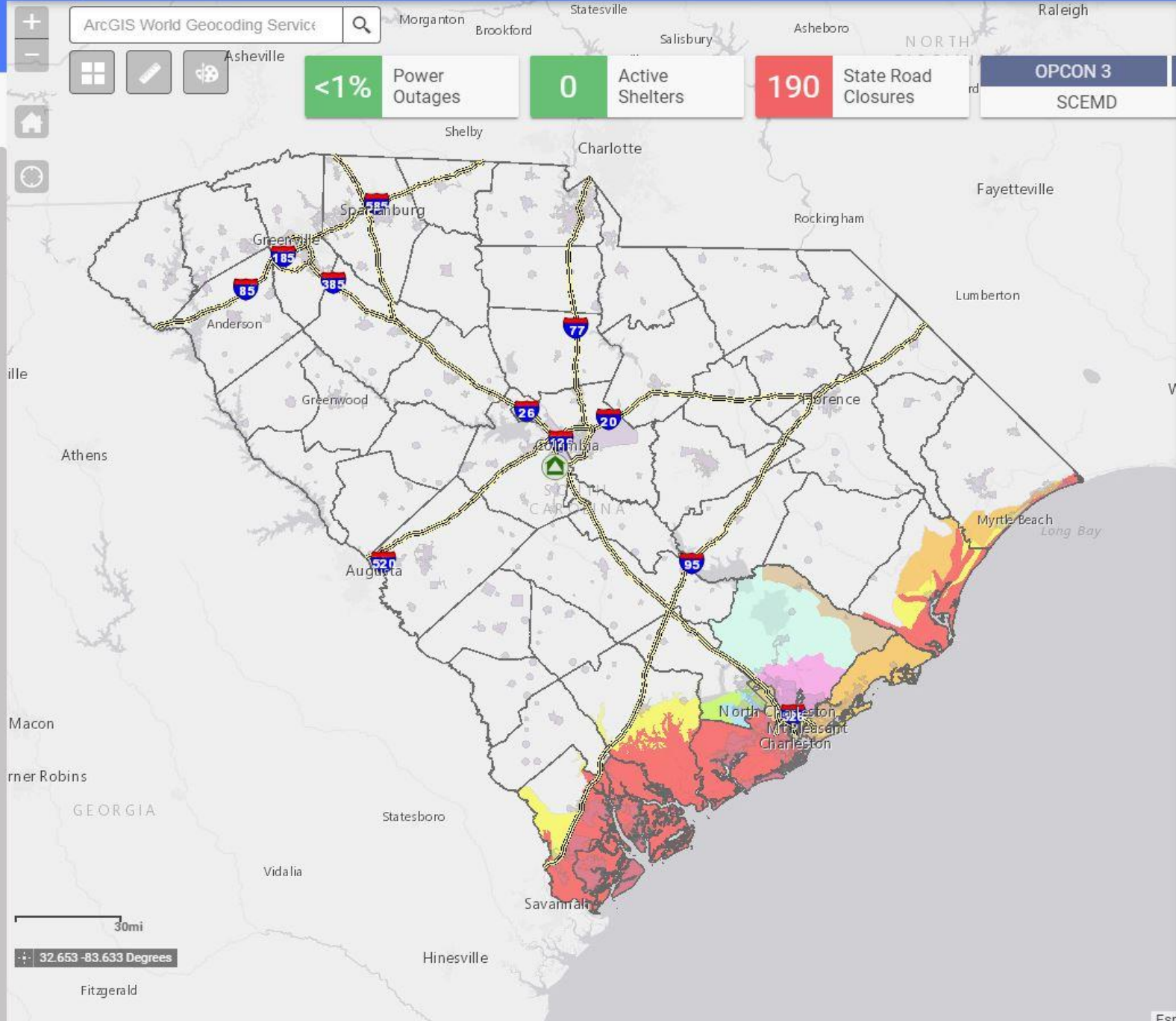


SCEMD

- Palmetto: SC's Statewide COP.
 - Launched in June of 2017, Florence's activation saw the largest amount of simultaneous users ~ 1,500.
- Fully customizable application that utilizes Esri's Web App Builder.
 - Integrates all types of data feeds, and allows users situational awareness of an incident.
- "Mobile First" design allows users to share information on their mobile devices in the field.
- Available to all State, County , and Local emergency managers.

- 
- Call Center
- Chat
- Communication Check
- Damage Assessment
- DOT Video Wall
- >

Executive Summary
- File Library
- Incidents
- Notifications
- Operational Rhythm
- Position Log
- Public Information
- Resource Request
- Shelters
- Significant Events
- Traffic Cameras



30mi

32.653 -83.633 Degrees

- Layer List
- State Bridge
- ☒

Base Data

...
- ☐

Earthquake - Base Layers

...
- ☐

Flood - Base Layers

...
- ☐

FNF - Base Layers

...
- ☒

Hurricane - Base Layers

...

☐

Conglomerate Outlines

...

☐

Conglomerates

...

☐

Hurricane TCP

...

☐

DHEC Hurricane Special Medical Needs

...

☐

Hurricane Shelters

...

☐

Evacuation Fuel Stops

...

☐

SCDOT Hurricane Evacuation Routes

...

☐

SLOSH Cat1

...

☐

SLOSH Cat2

...

☐

SLOSH Cat3

...

☐

SLOSH Cat4

...

☐

SLOSH Cat5

...

☒

Outside of Evacuation Zone

...

☐

Evacuation Zone Current Status

...

☒

Northern Conglomerate Evacuation Zones

...

☒

Central Conglomerate Evacuation Zones

...

☐

Southern Conglomerate Evacuation Zones

...

- Ckaufman
SCEMD
- ⚙️

💬

📶
- Call Center
- Chat
- Communication Check

🔌
- Damage Assessment
- DOT Video Wall
- > Executive Summary

🔵
- File Library
- Incidents
- Notifications

🔌
- Operational Rhythm
- Position Log

🔌
- Public Information
- Resource Request

🔌
- Shelters

🔌
- Significant Events

🔌
- Traffic Cameras

🔌

Resource Requests

Track...	Resource Name	Requ...	Assig...	Status
▼ 0234	GIS Support Contract	SCEMD	ESF 7	Complete
GIS emergency support. Request Purchase Order for additional GIS support. SCEMD Finance please contact Charlie Kaufman. See attached cost estimate.				
▼ 0834	plotter supplies	SCEMD	ESF 7	Complete
Need replacement Ink and Paper for GIS Plotter. Everything can be ordered from the same location Bluedogink.com Have attached sheet with part number. Need one of each ink cartridge and 2 rolls of paper.				
▼ 0972	Maps	SCEMD	ESF 1	Complete
Request county road maps from SCDOT GIS. Need 10 hard copies of each of the affected Northern Conglomerate Counties. SCDOT county road maps printed on ARCH E (36x48). Delivered to SCEMD's GIS office.				

3

0

0

3

TOTAL

SUBMITTED

CANCELLED

COMPL

Significant Events

Add Entry

Incident

•

2019 SWP Daily Sitrep

🗺️

Tsunami

✕

▼

Title

Tsunami Alert

Description

Test of system

LOCATION DETAILS

📍

SELECT POINT ON MAP

📍

USE CURRENT LOCATION

🔵

Autofill address

Address

415 Ben Sawyer Bikeway

Address 2

Address 2

City

Sullivan's Island

County

Charleston

State

SC

Zip code

29482

Latitude

32.76849184

Longitude

-79.8427834

CONTACT DETAILS

Primary name

•

Charlie Kaufman

Primary phone

•

+1 803-737-8588

- Bridge
- ...
- Base Layers
- ...
- Layers
- ...
- Layers
- ...
- Base Layers
- ...
- erate Outlines
- ...
- erates
- ...
- TCP
- ...
- urricane Special Medical Needs
- ...
- Shelters
- ...
- on Fuel Stops
- ...
- Hurricane Evacuation Routes
- ...
- at1
- ...
- at2
- ...
- at3
- ...
- at4
- ...
- at5
- ...
- of Evacuation Zone
- ...
- on Zone Current Status
- ...
- Conglomerate Evacuation
- ...
- onglomerate Evacuation
- ...
- Conglomerate Evacuation
- ...

Palmetto

- Examples

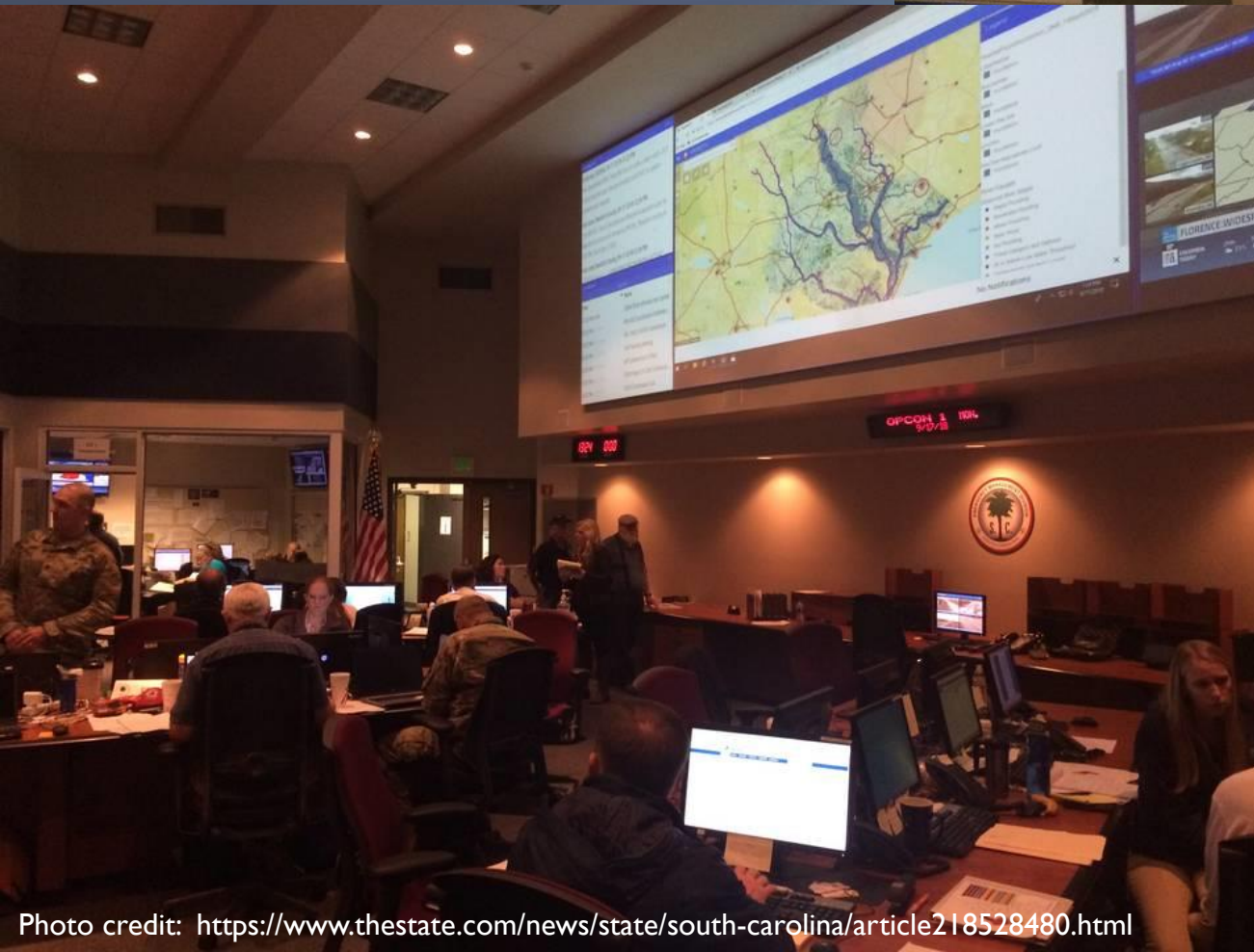


Photo credit: SCEMD

Photo credit: <https://www.thestate.com/news/state/south-carolina/article218528480.html>



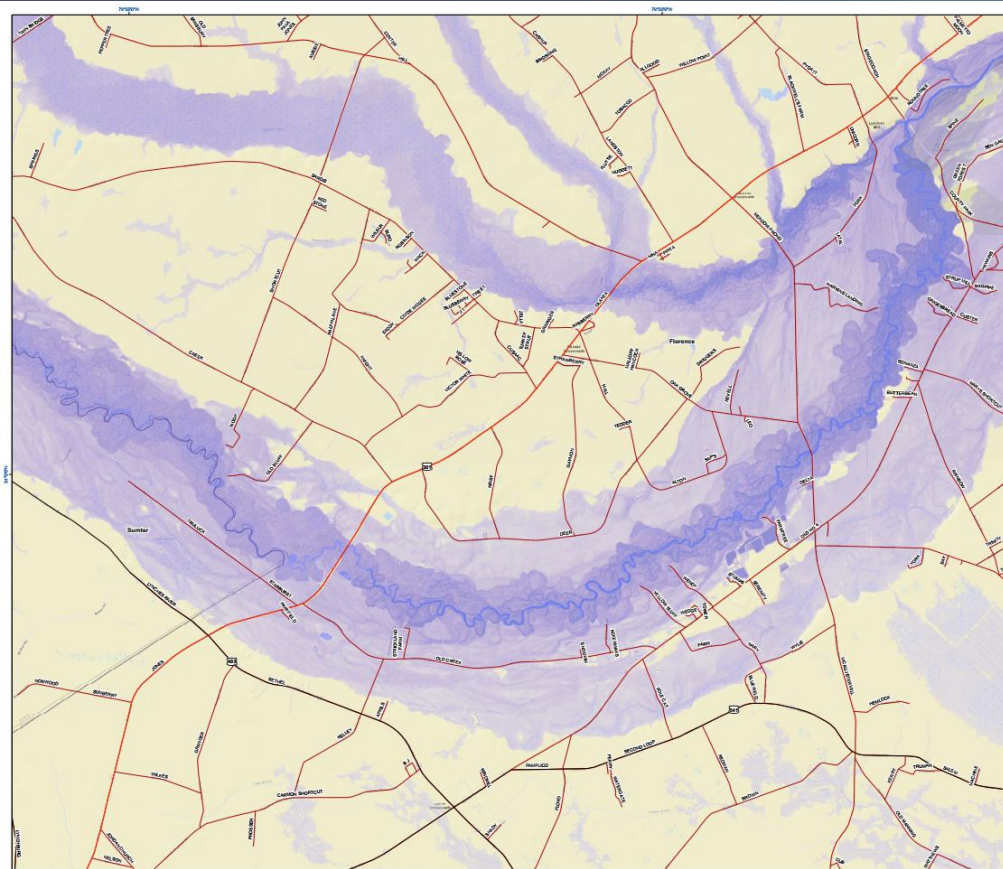
- SCEMD at the time had not moved to ArcPro – used Arc 10.5.1.
- 36 different ArcMap files were created and updated.
- These files served as the templates for the final 66 GIS maps that were published.
- 130 maps were printed from the plotter.

GIS (\GIS-DSK) (Y:) > Events > Hurricane_Florence2018 > maps				
Organize	Burn	New folder		
★ Favorites	Name	Date modified	Type	Size
Desktop	scenarios_florence962018.mxd	9/6/2018 12:39 PM	ArcGIS ArcMap D...	16,263 KB
Recent Places	scenarios_florence_9-7-2018.mxd	9/9/2018 1:49 PM	ArcGIS ArcMap D...	8,023 KB
Downloads	slosh_nw_cat4_25hightide.mxd	9/9/2018 6:17 PM	ArcGIS ArcMap D...	16,394 KB
	MEOW_hospitals.mxd	9/10/2018 11:12 AM	ArcGIS ArcMap D...	16,223 KB
Libraries	MEOW_evac_zones.mxd	9/10/2018 12:40 PM	ArcGIS ArcMap D...	16,423 KB
Documents	hurricane_conglomerates_tv.mxd	9/10/2018 1:13 PM	ArcGIS ArcMap D...	9,305 KB
Music	composite_MEOWs.mxd	9/10/2018 1:51 PM	ArcGIS ArcMap D...	760 KB
Pictures	southern_recind_order.mxd	9/11/2018 11:00 AM	ArcGIS ArcMap D...	18,562 KB
Videos	DHEC_facilities.mxd	9/11/2018 1:59 PM	ArcGIS ArcMap D...	16,052 KB
	nc_sc_map.mxd	9/12/2018 9:56 AM	ArcGIS ArcMap D...	16,088 KB
Computer	nichols_flood.mxd	9/12/2018 4:30 PM	ArcGIS ArcMap D...	655 KB
Windows (C:)	ESF9_SAR_grids.mxd	9/12/2018 6:36 PM	ArcGIS ArcMap D...	16,125 KB
HP_RECOVERY (D:)	scenarios_florence_2018.mxd	9/13/2018 8:33 AM	ArcGIS ArcMap D...	16,284 KB
Dept (J:)	rivers.mxd	9/13/2018 10:23 AM	ArcGIS ArcMap D...	16,161 KB
Common (K:)	ESF9_SAR_Staging.mxd	9/13/2018 1:21 PM	ArcGIS ArcMap D...	16,740 KB
SEOC (S:)	uscg_areal_comms.mxd	9/13/2018 2:11 PM	ArcGIS ArcMap D...	16,091 KB
ckaufman (\\filesolve\user) (U:)	scratch.mxd	9/13/2018 4:31 PM	ArcGIS ArcMap D...	16,050 KB
root (\\imagery) (V:)	correctional_facilities.mxd	9/13/2018 6:22 PM	ArcGIS ArcMap D...	16,260 KB
SecureData (X:)	crit_fac_targets.mxd	9/13/2018 6:54 PM	ArcGIS ArcMap D...	787 KB
GIS (\GIS-DSK) (Y:)	horry_flood.mxd	9/14/2018 4:39 PM	ArcGIS ArcMap D...	16,257 KB
	ESF9_SAR_divisions.mxd	9/15/2018 9:03 AM	ArcGIS ArcMap D...	16,071 KB
Network	CoastGuard_FAA.mxd	9/16/2018 2:24 PM	ArcGIS ArcMap D...	16,207 KB
	ESF9_flood_divisions.mxd	9/16/2018 3:27 PM	ArcGIS ArcMap D...	16,199 KB
	ESF9_SAR_Planing.mxd	9/16/2018 4:52 PM	ArcGIS ArcMap D...	18,044 KB
	dillion_rescue.mxd	9/16/2018 7:20 PM	ArcGIS ArcMap D...	16,235 KB
	ESF9_SAR_Staging_large.mxd	9/19/2018 4:31 PM	ArcGIS ArcMap D...	16,305 KB
	flood_depth.mxd	9/19/2018 6:20 PM	ArcGIS ArcMap D...	879 KB
	horry_roadclosed.mxd	9/20/2018 2:44 PM	ArcGIS ArcMap D...	16,290 KB
	Florence_county_evac.mxd	9/21/2018 1:30 PM	ArcGIS ArcMap D...	16,632 KB
	georgetown_divisions.mxd	9/25/2018 3:02 PM	ArcGIS ArcMap D...	16,742 KB
	registration_hotspots.mxd	9/28/2018 1:05 PM	ArcGIS ArcMap D...	1,032 KB
	northern_pop_density.mxd	9/28/2018 5:29 PM	ArcGIS ArcMap D...	16,437 KB
	florence_service.mxd	10/9/2018 5:06 PM	ArcGIS ArcMap D...	1,950 KB
	redcross_damage_assessment.mxd	10/11/2018 4:52 PM	ArcGIS ArcMap D...	16,002 KB
	viirs_imagery.mxd	10/22/2018 11:23 ...	ArcGIS ArcMap D...	16,296 KB
	florence_declarations.mxd	10/31/2018 3:50 PM	ArcGIS ArcMap D...	16,117 KB
	county_ltrg.mxd	1/24/2019 4:29 PM	ArcGIS ArcMap D...	3,282 KB

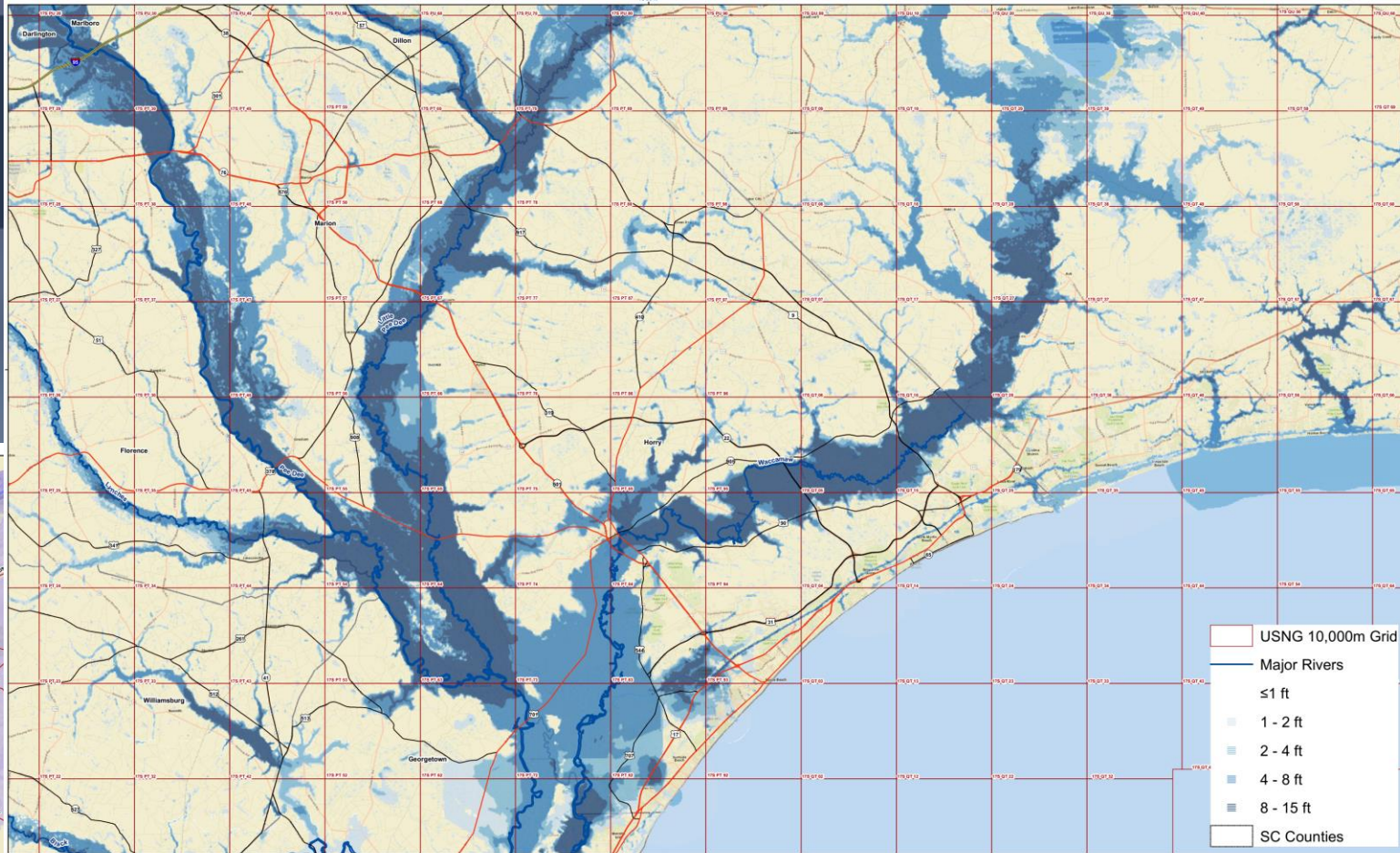
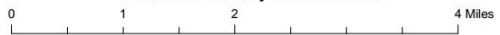
GIS (\GIS-DSK) (Y:) > Events > Hurricane_Florence2018 > outputs				
Organize	Burn	New folder		
★ Favorites	Name	Date modified	Type	Size
Desktop	SouthCarolinaDams.pdf	9/14/2018 7:51 AM	Foxit Reader PDF ...	4,155 KB
Recent Places	SouthCarolinaNuclearPlants.pdf	9/14/2018 7:52 AM	Foxit Reader PDF ...	1,727 KB
Downloads	StatewideTopo_HighFloodPotential.pdf	9/14/2018 7:52 AM	Foxit Reader PDF ...	1,854 KB
	StatewideTopo.pdf	9/14/2018 7:53 AM	Foxit Reader PDF ...	1,927 KB
Libraries	nc_sc_map1.pdf	9/14/2018 9:50 AM	Foxit Reader PDF ...	240,229 KB
Documents	ESF9_SAR_Planing_9142018.pdf	9/14/2018 3:24 PM	Foxit Reader PDF ...	2,424 KB
Music	ESF9_SAR_Planing_9142018a.pdf	9/14/2018 3:31 PM	Foxit Reader PDF ...	3,593 KB
Pictures	horry_flood_cemetery.pdf	9/14/2018 4:02 PM	Foxit Reader PDF ...	123,763 KB
Videos	horry_flood.pdf	9/14/2018 4:40 PM	Foxit Reader PDF ...	1,288 KB
	ESF9_SAR_Staging_large.pdf	9/14/2018 6:27 PM	Foxit Reader PDF ...	2,737 KB
Computer	ESF9_SAR_divisions1.pdf	9/15/2018 8:42 AM	Foxit Reader PDF ...	11,893 KB
Windows (C:)	ESF9_SAR_divisions3.pdf	9/15/2018 10:07 AM	Foxit Reader PDF ...	12,015 KB
HP_RECOVERY (D:)	ESF9_SAR_divisions2.pdf	9/15/2018 10:13 AM	Foxit Reader PDF ...	11,220 KB
Dept (J:)	ESF9_SAR_Planing_9152018.pdf	9/15/2018 4:39 PM	Foxit Reader PDF ...	4,316 KB
Common (K:)	ESF9_SAR_Planing_9152018a.pdf	9/15/2018 4:45 PM	Foxit Reader PDF ...	5,857 KB
SEOC (S:)	CoastGuard_FAA.pdf	9/16/2018 2:13 PM	Foxit Reader PDF ...	122,405 KB
ckaufman (\\filesolve\user) (U:)	ESF9_flood_divisions.pdf	9/16/2018 3:29 PM	Foxit Reader PDF ...	4,332 KB
root (\\imagery) (V:)	ESF9_flood_chesterfield.pdf	9/16/2018 3:30 PM	Foxit Reader PDF ...	2,921 KB
SecureData (X:)	ESF9_flood_marlboro.pdf	9/16/2018 3:31 PM	Foxit Reader PDF ...	2,981 KB
GIS (\GIS-DSK) (Y:)	ESF9_flood_marion.pdf	9/16/2018 3:32 PM	Foxit Reader PDF ...	3,121 KB
	ESF9_flood_horry.pdf	9/16/2018 3:32 PM	Foxit Reader PDF ...	3,125 KB
Network	ESF9_flood_dillon.pdf	9/16/2018 3:40 PM	Foxit Reader PDF ...	2,884 KB
	ESF9_SAR_Planing_9162018.pdf	9/16/2018 4:34 PM	Foxit Reader PDF ...	5,273 KB
	dillion_rescue.pdf	9/16/2018 7:15 PM	Foxit Reader PDF ...	123,037 KB
	ESF9_SAR_Planing_9172018.pdf	9/17/2018 3:56 PM	Foxit Reader PDF ...	4,547 KB
	sc_roads.pdf	9/18/2018 3:00 PM	Foxit Reader PDF ...	125,917 KB
	ESF9_SAR_Staging_flood.pdf	9/19/2018 4:20 PM	Foxit Reader PDF ...	124,839 KB
	sc_usng_10000m.pdf	9/19/2018 4:35 PM	Foxit Reader PDF ...	12,124 KB
	horry_roadclosed.pdf	9/20/2018 2:05 PM	Foxit Reader PDF ...	123,643 KB
	Florence_county_evac.pdf	9/21/2018 10:08 AM	Foxit Reader PDF ...	123,464 KB
	florence_declarations_M_shelters.pdf	9/22/2018 1:40 PM	Foxit Reader PDF ...	3,721 KB
	florence_declarations_M.pdf	9/23/2018 9:53 AM	Foxit Reader PDF ...	11,421 KB
	georgetown_divisions.pdf	9/25/2018 2:44 PM	Foxit Reader PDF ...	123,578 KB
	northern_pop_density.pdf	9/28/2018 5:31 PM	Foxit Reader PDF ...	122,353 KB
	florence_declarations_M_IA.pdf	10/2/2018 3:29 PM	Foxit Reader PDF ...	11,430 KB
	redcross_damage_assessment.pdf	10/11/2018 4:53 PM	Foxit Reader PDF ...	10,954 KB
	florence_declarations_M_PA_status.pdf	10/11/2018 5:11 PM	Foxit Reader PDF ...	12,231 KB
	viirs_imagery.pdf	10/22/2018 11:24 ...	Foxit Reader PDF ...	123,524 KB
	florence_declarations_M_PA.pdf	10/31/2018 3:50 PM	Foxit Reader PDF ...	11,457 KB

ArcMap

• Examples



Florence County Evacuations



ESF 9: Potential Flooding Horry



Disclaimer: This map is a graphic representation of data obtained from various sources. All efforts have been made to warrant the accuracy of this map. However, SC EMD disclaims all responsibility and liability for the use of this map.

ArcMap

- Examples

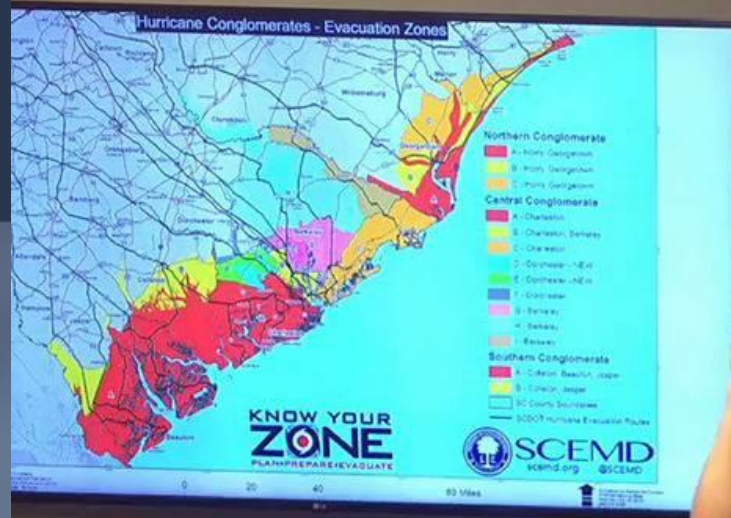


Photo credit: <https://www.thestate.com/news/state/south-carolina/article218123955.html>

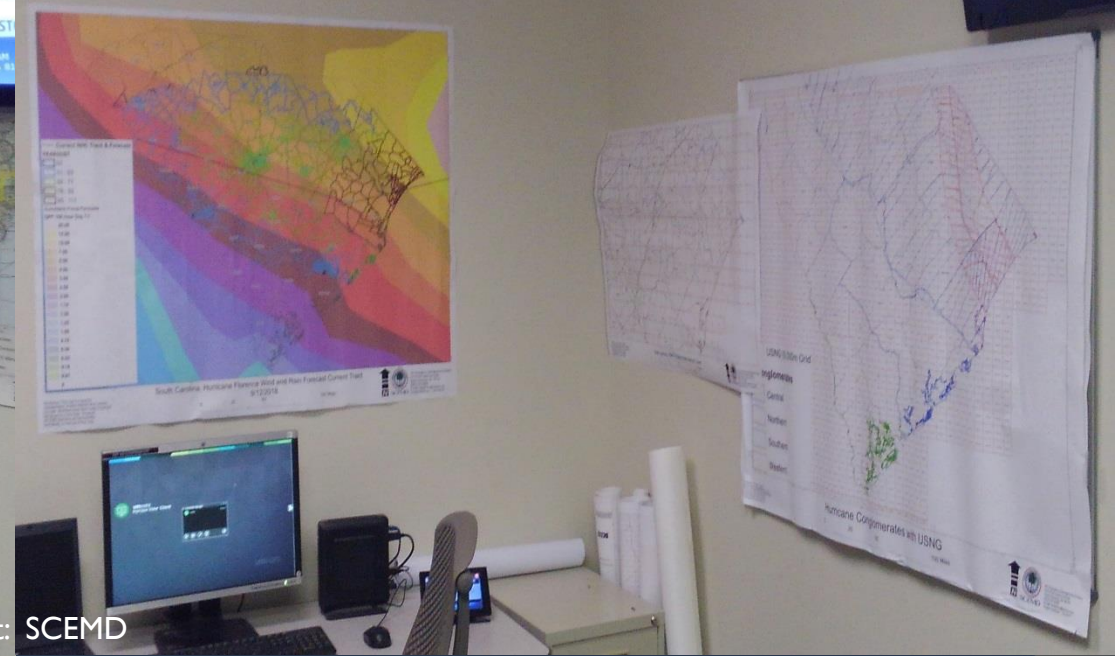
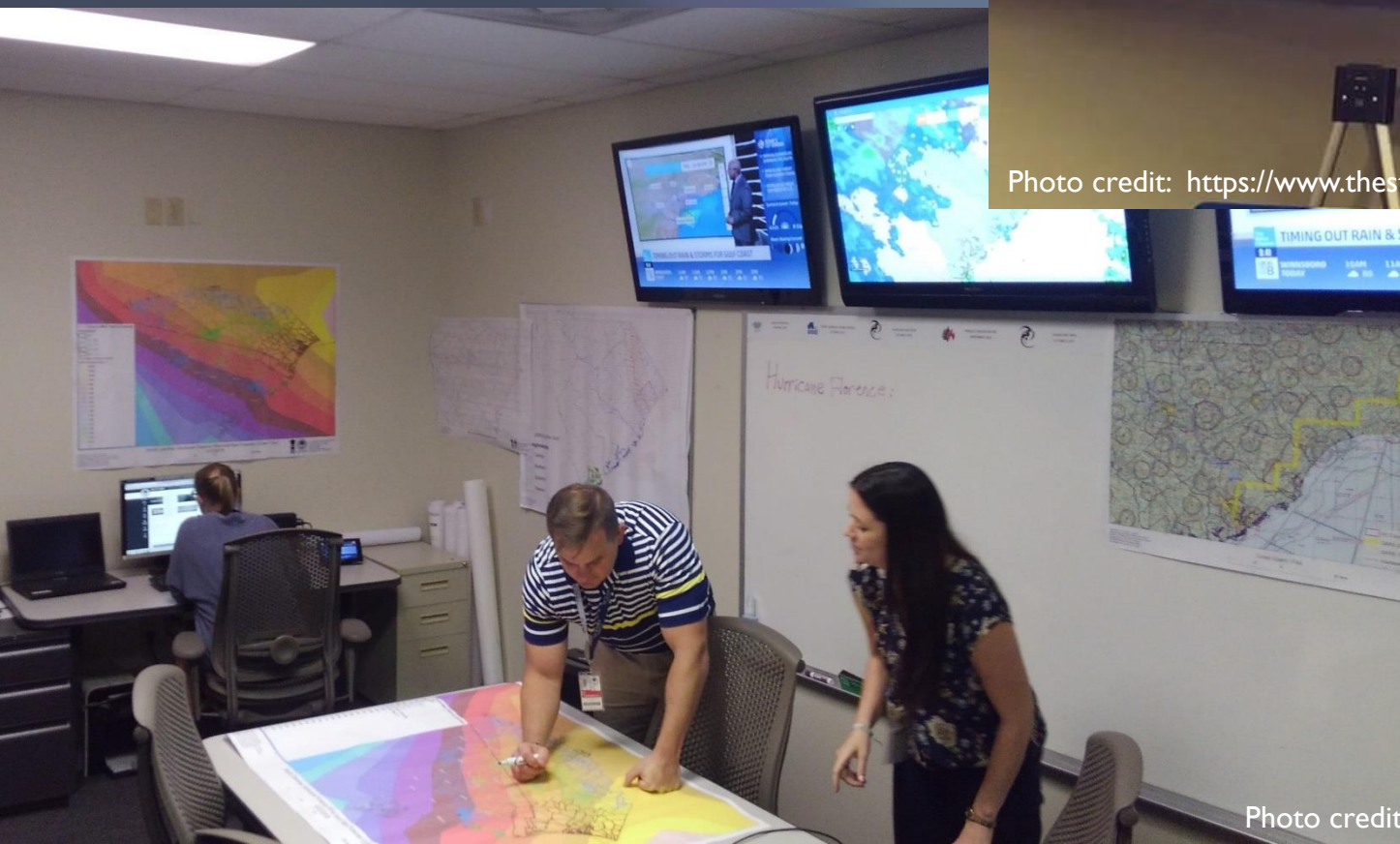


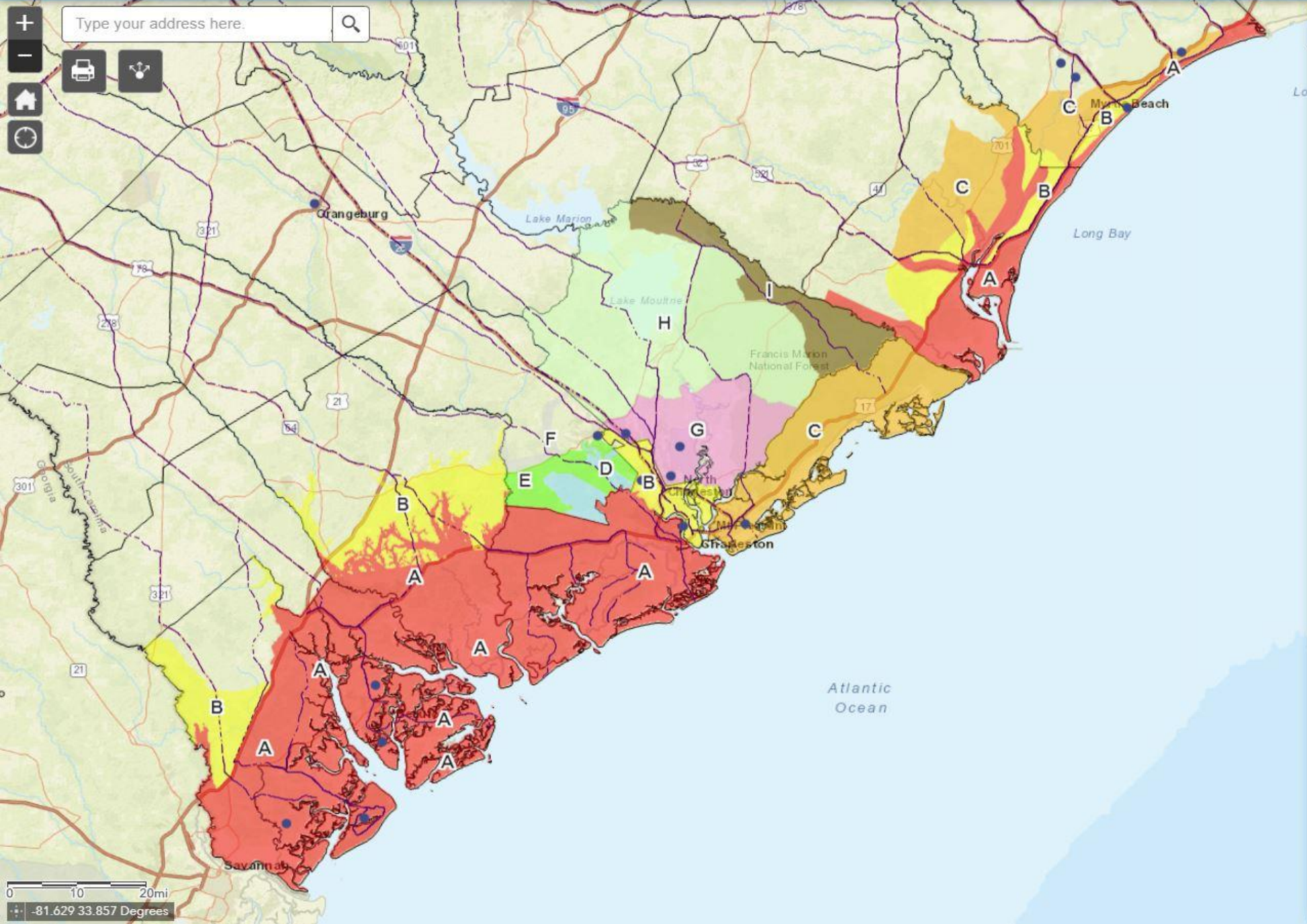
Photo credit: SCEMD

Arc Online



SCEMD

- SCEMD used Arc Online to create and host several web applications.
- Several of these apps were vital to SCEMD during the Hurricane Florence response and recovery.
 - Know Your Zone
 - Situation Report Dashboard
 - Search and Rescue Grid
 - Aerial Photo Viewer



Map Legend  

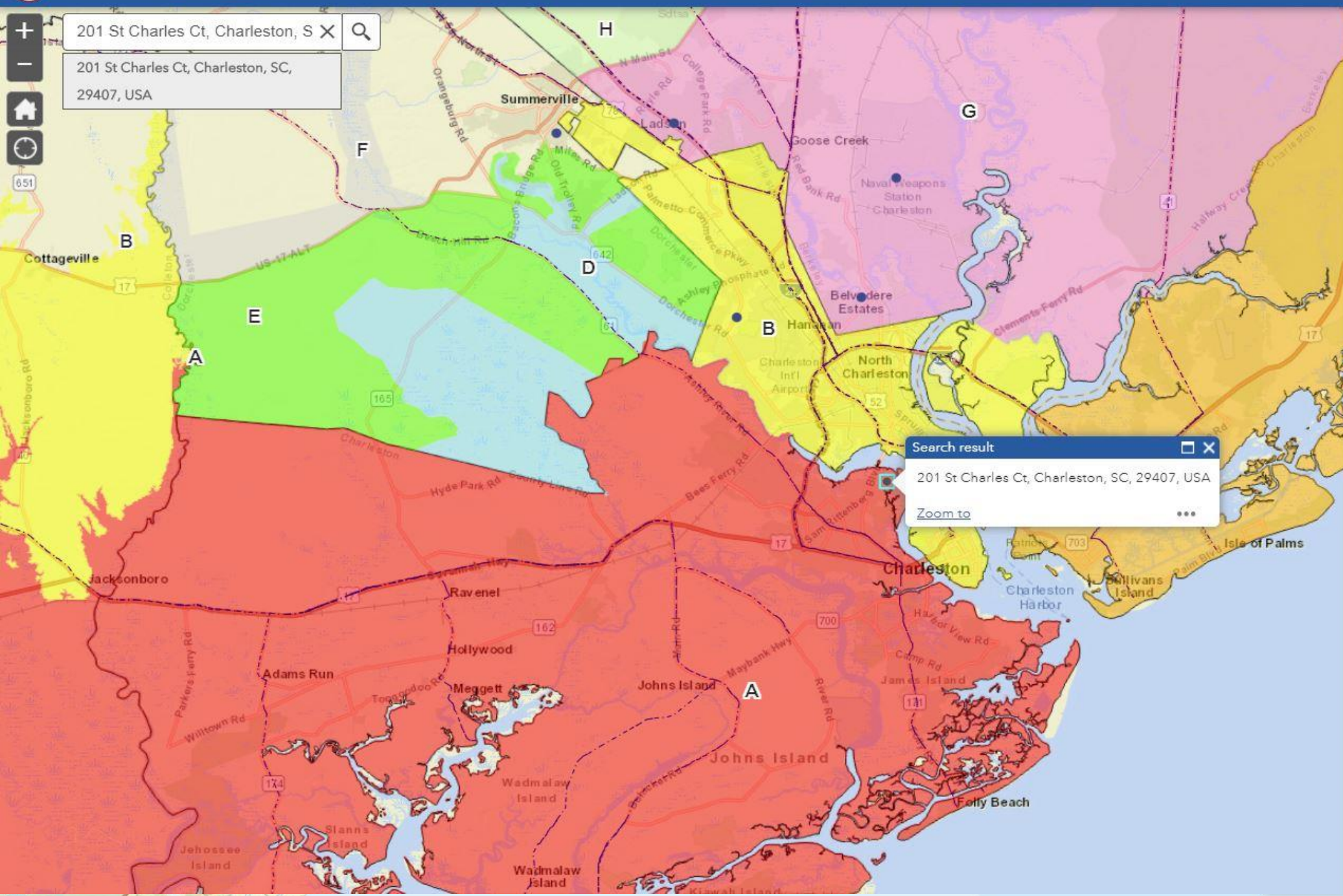
SC Cities


SCDOT Hurricane Evacuation Routes


Northern Evacuation Zones
 A (Horry, Georgetown)
 B (Horry, Georgetown)
 C (Horry, Georgetown)

Central Evacuation Zones
 A (Charleston)
 B (Berkeley, Charleston) *New
 C (Charleston)
 D (Dorchester)
 E (Dorchester)
 F (Dorchester)
 G (Berkeley)
 H (Berkeley)
 I (Berkeley)

Southern Evacuation Zones
 A (Colleton, Beaufort, Jasper)
 B (Beaufort, Jasper)



Map Legend

SC Cities



SCDOT Hurricane Evacuation Routes



Northern Evacuation Zones

- A (Horry, Georgetown)
- B (Horry, Georgetown)
- C (Horry, Georgetown)

Central Evacuation Zones

- A (Charleston)
- B (Berkeley, Charleston) *New
- C (Charleston)
- D (Dorchester)
- E (Dorchester)
- F (Dorchester)
- G (Berkeley)
- H (Berkeley)
- I (Berkeley)

Southern Evacuation Zones

- A (Colleton, Beaufort, Jasper)
- B (Beaufort, Jasper)

08:58:53 EDT

Current Weather Conditions



Esri, HERE, Garmin, NGA, USGS, NPS | NOAA/NOS...

Wildfires

569 

Outages by Provider

Current Incident Situation Report

803-737-8500

SCEMID



For more detailed information please login to: <http://palmettoeoc.com/>

Tue, September 18, 2018
10:41:31 EDT

County Closures
Dillon **Closed** 9/17/2018, 12:22:54 PM

(Refresh page for updated closures)

DOT 511 Data

Current # of Traffic Incidents

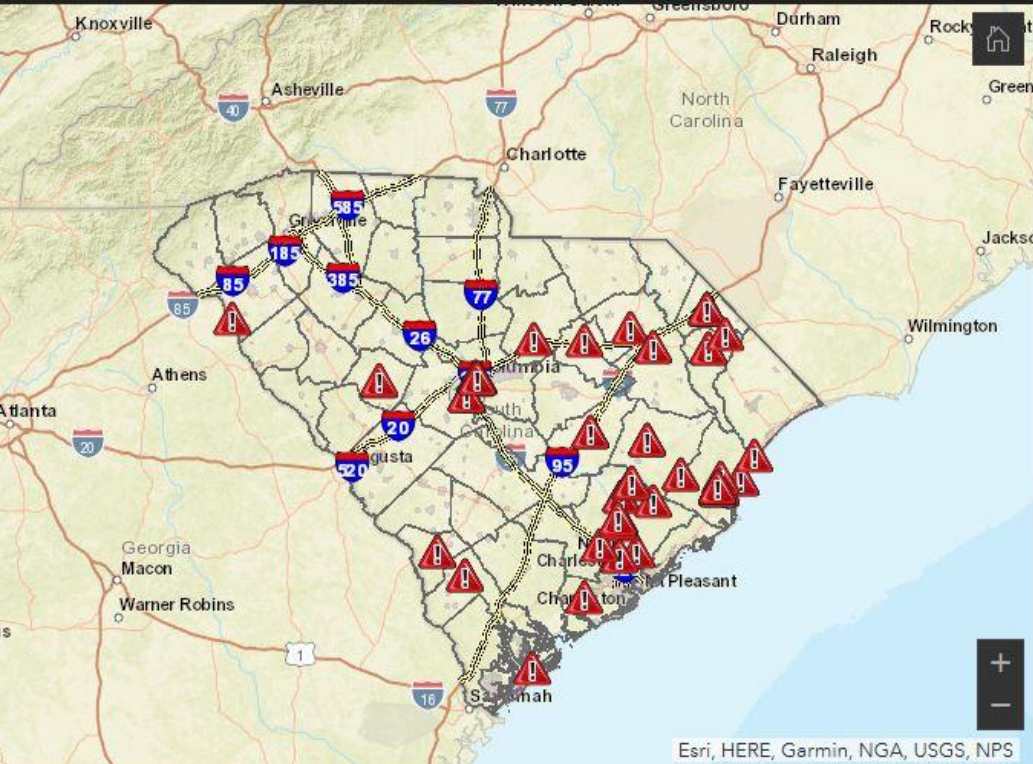
41

(Previous # 41)

<http://www.511sc.org/>

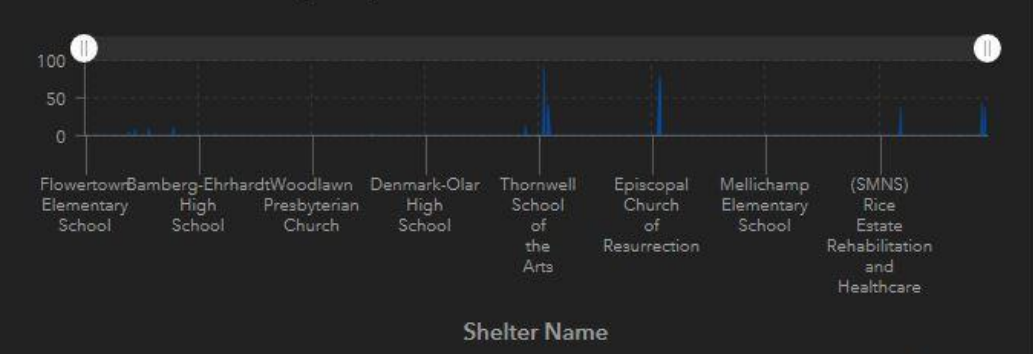
Last update: a few seconds ago

Current Significant Events



- Significant Events - Display
- Significant Event - Entries
- INTEL
- NWS - ILM Office

Current Shelter Occupancy



Current Weather Conditions



- National Weather Service National Hurricane Center
- Current Weather Conditions
 - NHC 2-Day Outlook
 - Riverine Conditions

Power Outages

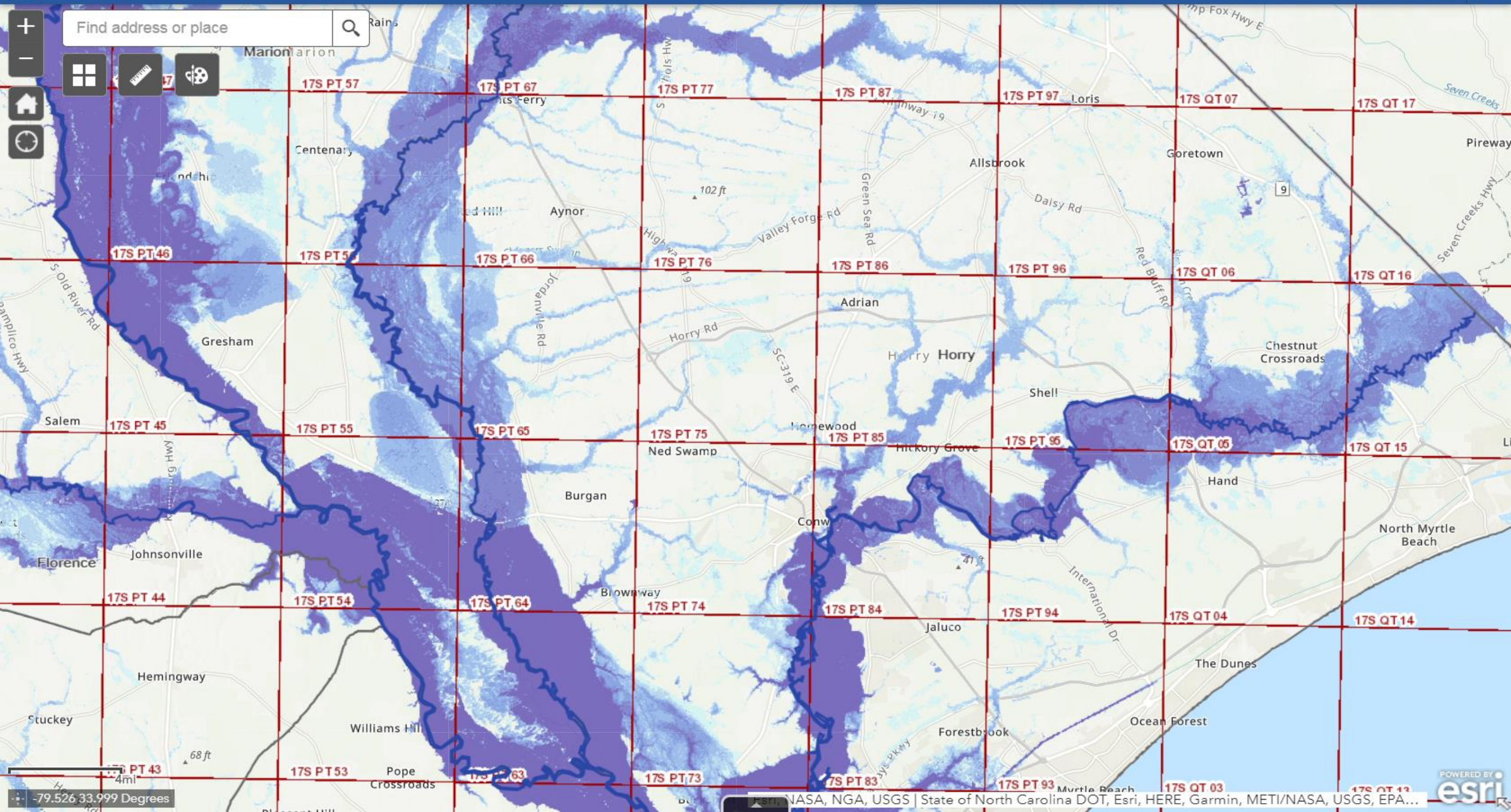
Customers Affected

3,768

(Previous # 3,768)

(Refresh page for updated numbers)

Total Outages Outages by Provider





Hurricane Florence Imagery

Imagery Obtained from multiple sources including NOAA, NASA, and Civil Air Patrol.



Find address or place



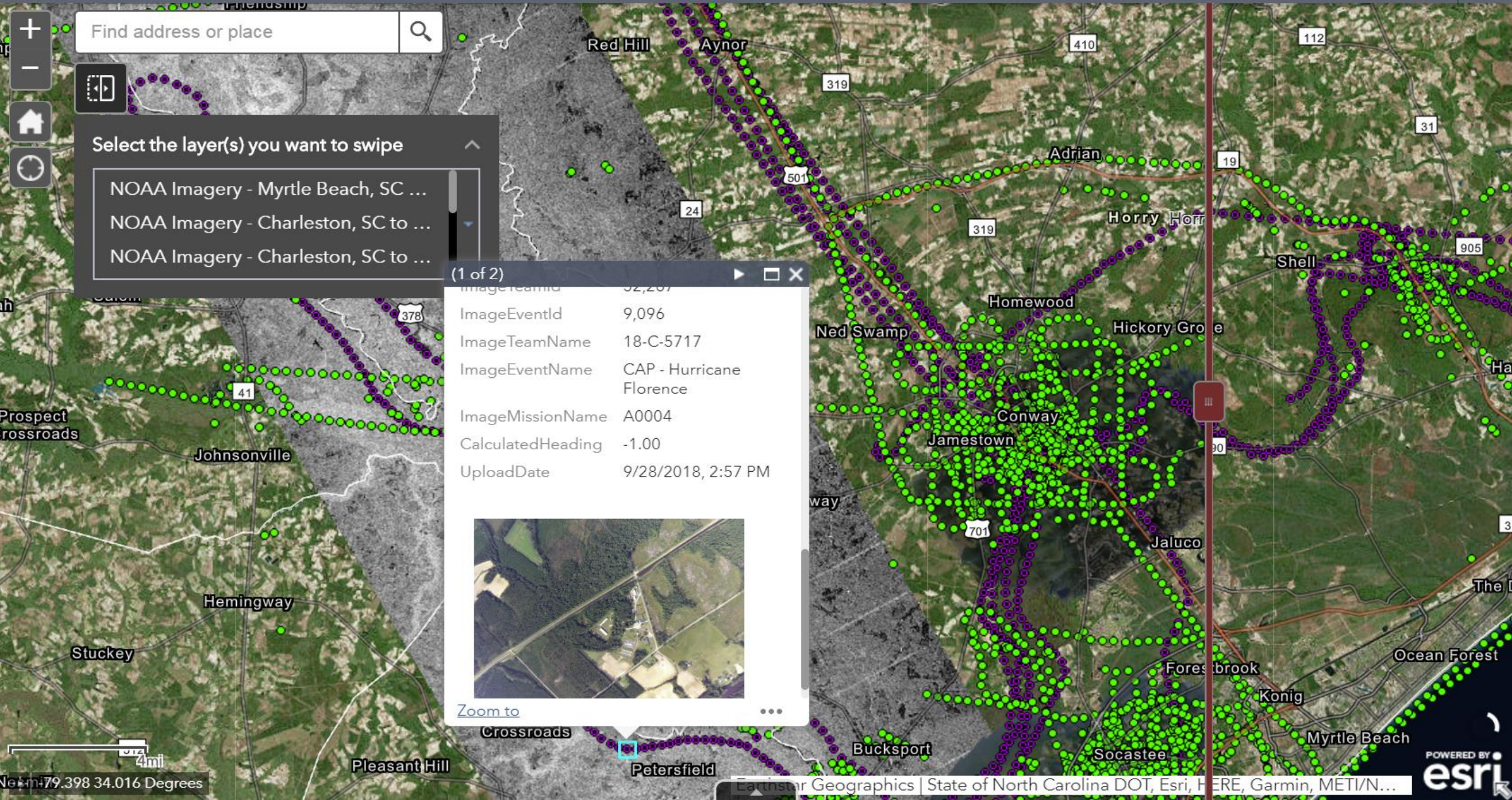
- Select the layer(s) you want to swipe
- NOAA Imagery - Myrtle Beach, SC ...
 - NOAA Imagery - Charleston, SC to ...
 - NOAA Imagery - Charleston, SC to ...

(1 of 2)

ImageTeamId	52,207
ImageEventId	9,096
ImageTeamName	18-C-5717
ImageEventName	CAP - Hurricane Florence
ImageMissionName	A0004
CalculatedHeading	-1.00
UploadDate	9/28/2018, 2:57 PM



[Zoom to](#)

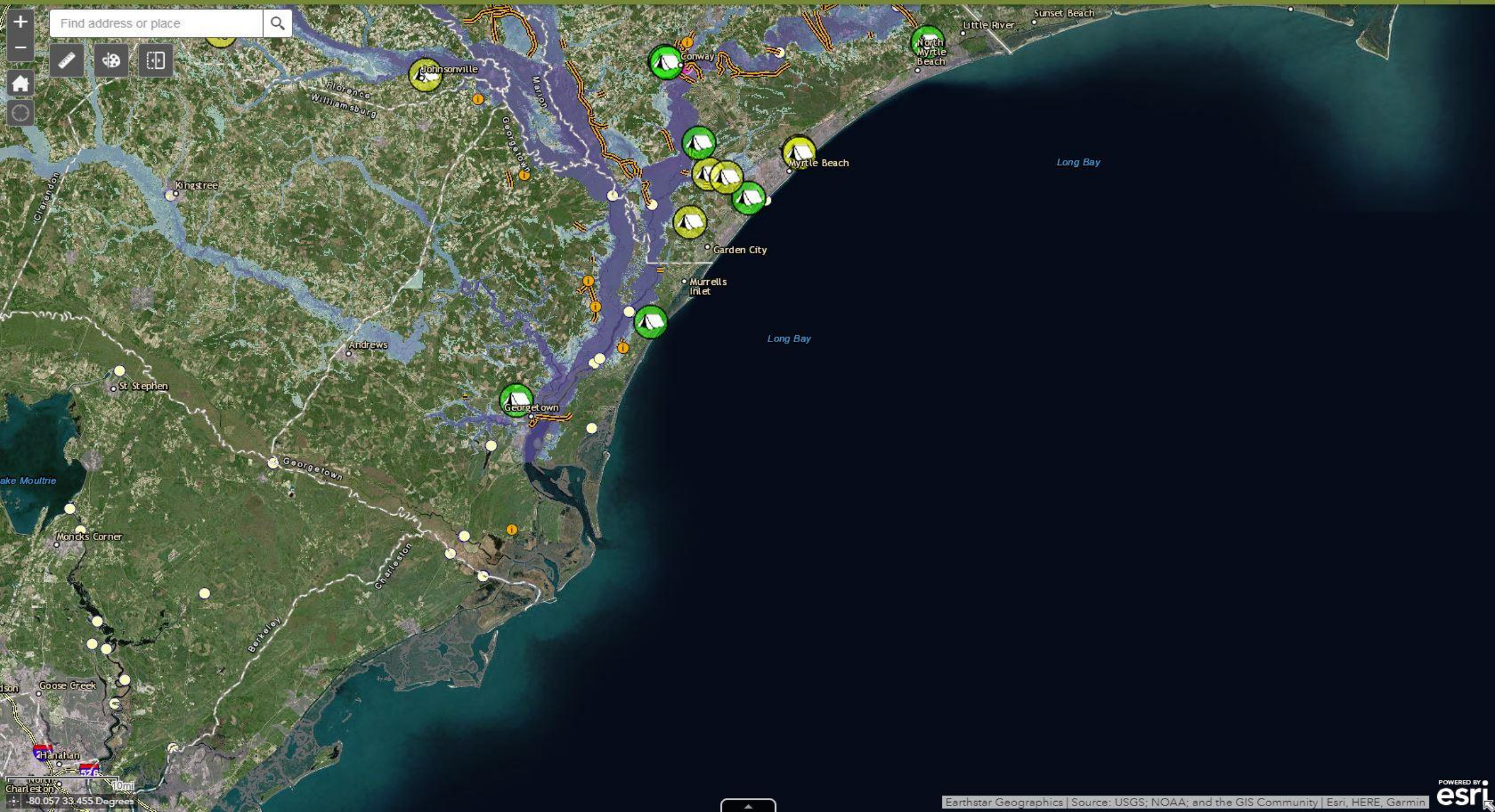


North 79.398 34.016 Degrees





- The SC National Guard (SCNG) provided GIS support throughout the Hurricane Florence activation.
 - SCNG created briefing apps that our Plans section used to brief out on each day.
 - SCNG also created an advanced Search and Rescue Grid application to assist the National Guard with impacts and damage assessment.



Find address or place



Zoom to

We Had Help



SCEMD

- As with the past 3 years of natural disasters, Esri's Disaster Response Program (DRP) provided support.
 - Technical – both in house and online.
 - Project based – ingested outside agency flood models.
 - Kept me relatively sane!
- Renee Bernstein & Cameron Amrine came to SCEMD during the activation and were lifesavers!
 - **THANK YOU!**

Summary



SCEMD

- SCEMD was activated for a record 33 days, and GIS played a role in supporting all aspects of the activation.
- SCEMD's GIS department saw requests for all types of GIS outputs from interactive web applications to the more traditional static maps.
- The goal of the GIS department is to provide better data to the emergency managers and responders to help them make better plans and decisions.

Questions??

