Integrated Approaches to Creating Community Resilience Designs

We propose to develop pre- and post-disaster planning and adaptation tools for coastal communities to increase resilience. These efforts will enable vulnerable communities to plan, react, and recover more quickly and effectively in areas facing repetitive disturbance. The goals of the program are to improve emergency response with regard to protecting vulnerable infrastructure and populations, and to reduce repetitive loss by providing accurate impact data to community planners in the immediate aftermath of an event.

- Provide assistance in pre- and post storm decision making

PI: **Robert Twilley**, Executive Director, Louisiana *Sea Grant* College Program
Brant Mitchell, Director, Stephenson Disaster Management Institute LSU
Jeff Carney, Director, Coastal Sustainability Studio LSU
Traci Birch, Assistant Research Professor, Coastal Sustainability Studio LSU
Carola Kaiser, IT Consultant, Center for Computation and Technology LSU

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Sea Grant
Louisiana

Project Overview

- Incorporate enhanced consequence modeling to a storm surge model to show how flood risks will impact people, industry, and coastal infrastructure
- Utilize these tools to inform community planners on impact analyses that will reduce repetitive loss by guiding crucial land use and redevelopment decisions following a flood disturbance.
- Trusted outreach community to help communities incorporate guidance that mitigates risks and rebuild for maximum future risk reduction.

The work is innovative by our multi-discipline approach that combines

- disaster research & response (SDMI),
- coastal hazard modeling (CCT, CERA),
- planning & design (CSS),
- and outreach (Sea Grant)

Our partners

Pre- and post-disaster planning and design tools directed to federal, state, and local community planners

- National Weather Service, Slidell LA
- Lower Mississippi River Forecast Center, Slidell LA
- USCG, New Orleans LA
- FEMA - Federal Preparedness Coordinato
- DHS Federal Protective Services
- LA National Guard
- LA GOHSEP, Deputy Director for Operations
- LA Office of Community Development, Director
- LA Coastal Restoration & Protection Authority, Director
- LA Dept Wildlife and Fisheries, Deputy Director

Governor's Office

Our partners

Pre- and post-disaster planning and design tools directed to federal, state, and local community planners

Emergency Managers –

- John Rahaim, Director – St. Bernard Parish
- Earl Eues, Director, Terrebonne Parish
- Kevin Savoie, Sea Grant Agent - Camaron Parish

Our partners

Pre- and post-disaster planning and design tools directed to federal, state, and local community planners

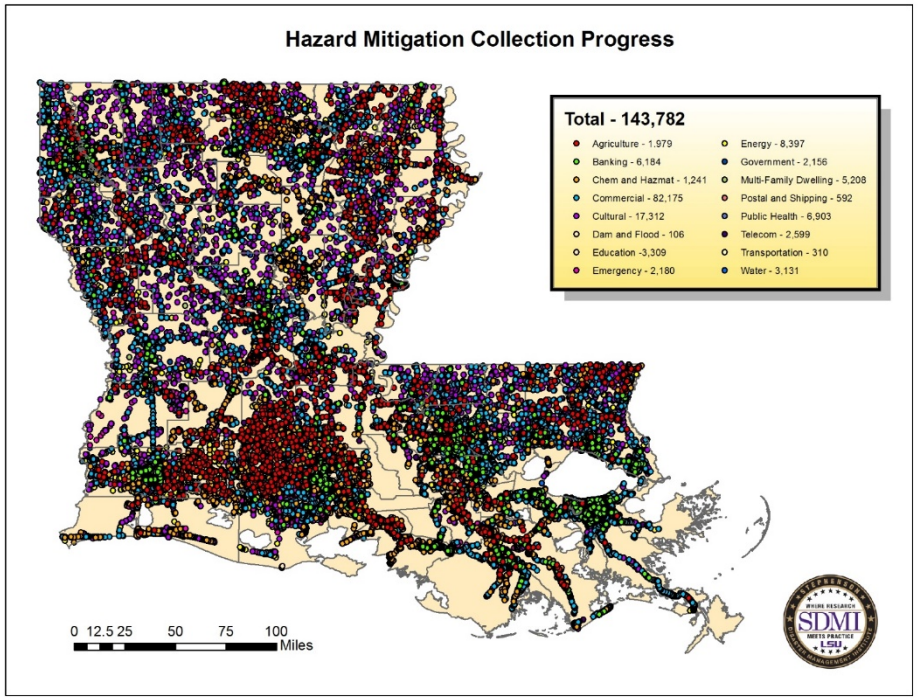
Local Planners –

- Bob Rivers, Planning Director – City of New Orleans
- Louisette Scott, Planning Director – City of Mandeville, LA
- Chris Pulaski, Planning Director – Terrebonne Parish, LA
- Doug Burguires, Assistant Planning Director, Lake Charles, LA
- Jennifer Gerbasi, Terrebonne Parish Recovery Planner
- Dexter Accardo, Director - St. Tammany Parish OHSEP

Outcomes

- Design and build an automated model in ArcGIS to interpret outputs of CERA to analyze the consequences of expected storm surge. (Jan 2017)
- Export CERA website information to consequence analysis of SDMI. Complete cyberinfrastructure development to transfer information from CERA to Consequence Model (GIS platforms) to expand the utility of products associated with critical infrastructure along the coast. (June 2017)
- Test Model utilizing 143,000 point infrastructure database for the State of Louisiana and historical storms to determine effectiveness of consequences. (June 2017)

http://hm-portal.sdmi.lsu.edu/



A FEMA's Hazard Mitigation Grant Program to GOHSEP funded GIS Hazard Mitigation project to accomplish the following:

1) the collection of 6 inch high resolution imagery for the entire state; and
2) collection of critical infrastructure for all 64 parishes.
3) additional imagery consisting of 4 inch resolution for all cities in the state with a population of at least 10,000 and 3 inch resolution for the metropolitan areas of New Orleans and Baton Rouge was also captured in 2014.

Research Work and Accomplishments

- The LSU team worked with the State to select the state's 144k point infrastructure database as the basis on which to build the consequence model.
- The State currently has an infrastructure database which serves as a basis for the consequence model. Additional work is being performed with individual agencies such as DHS Protective Service and USCG District 8 on refining additional infrastructure requirements.

WORKSHOP OUTCOMES

- The focus group agreed with the initial data sets that were identified for consequence model.
- Focus group recommended that available parcel data and building footprints data be added to the consequence model.
- The also emphasized that critical to the locals would be the status of water utilities, sewer treatment plants and any surge that would disrupt their operations.
- Without the ability to provide potable water their ability to recover and sustain their populations would be greatly decreased.

Critical Infrastructure (SWEAT) that is focus of CERA-Planning

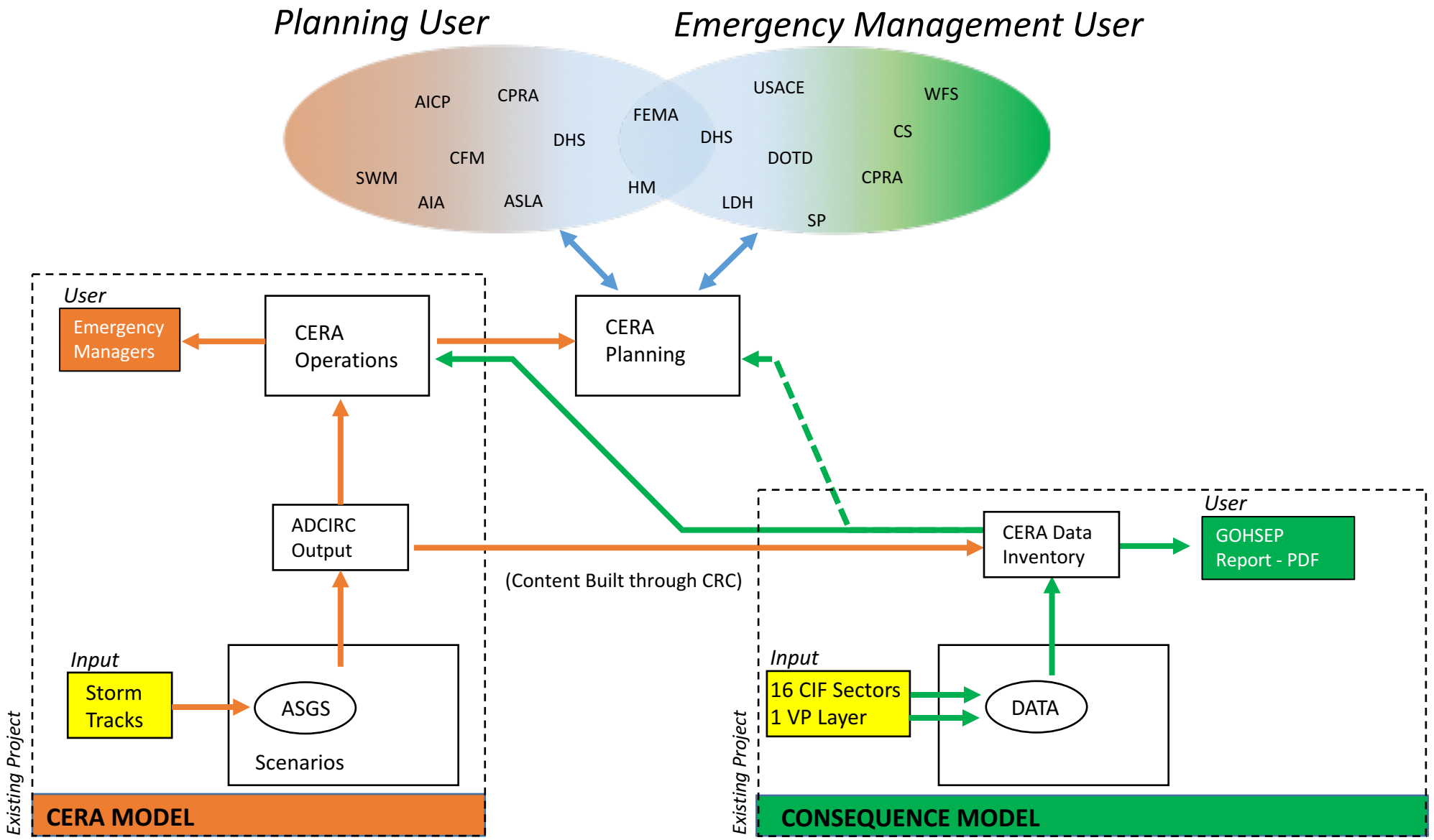
Safety: Nursing homes/hospitals, Fire/police (Brant has this) **Will work on this and consolidate our existing data sets.**

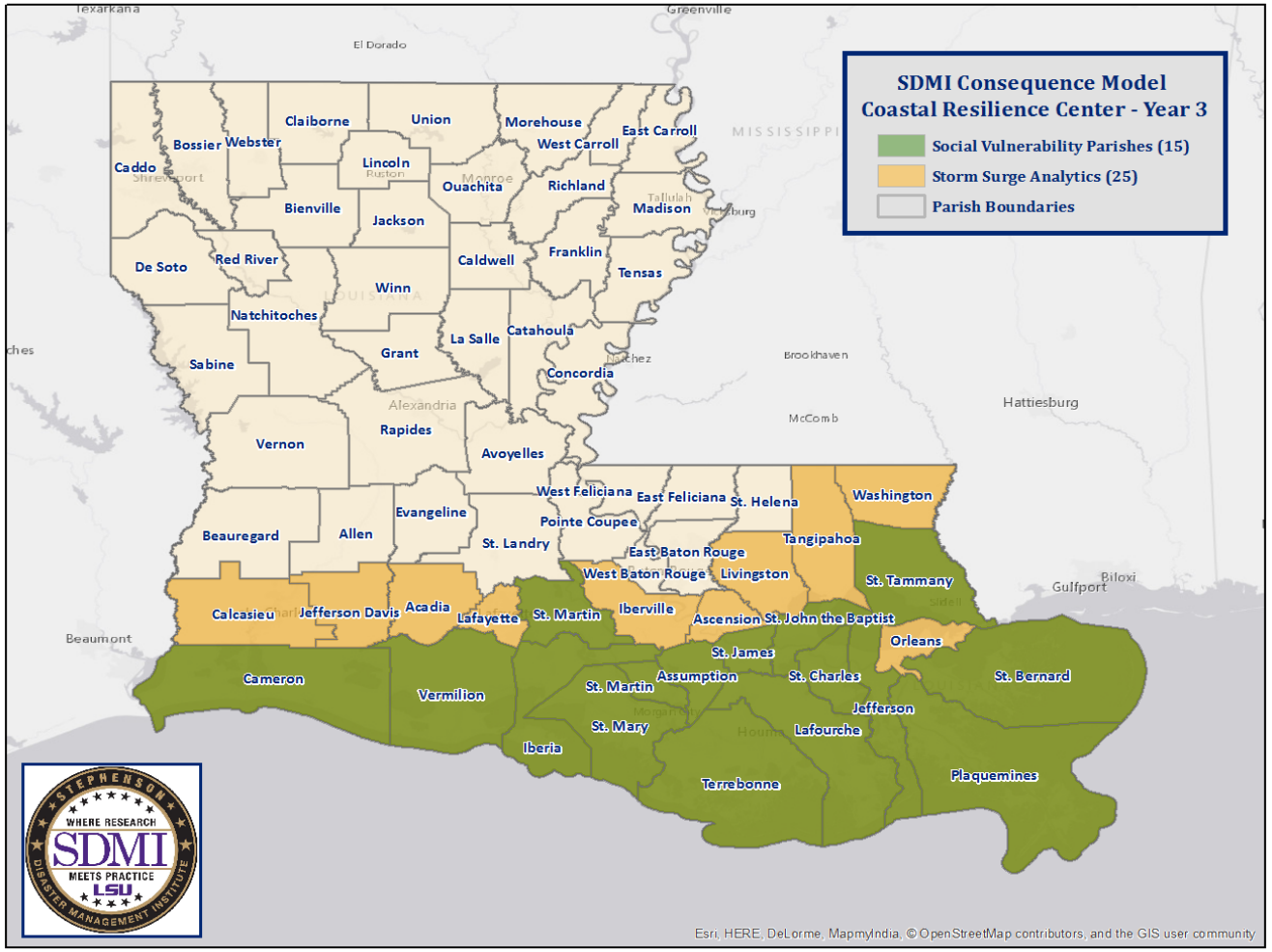
Water: Drinking water and sewerage infrastructure (if possible – I know there was a question of getting complete data sets) **Water intakes are available, and possibly sewage but will need to confirm.**

Energy: pipelines and energy generation **(This data is available in HSIP Gold; however, it is not meant to be publicly available. If we want to include this it would need to be a password protected site)**

Accessibility: airports, roads, ports, rail, evacuation routes – and in particular major roads and evacuation routes with elevations/flood depths/topo maps so emergency managers can get from point A to point B. **(No problem with the different modals, I'm working on this project for another group I am with. DOTD has a current road layer with a z value for all roads. We will check with DOTD to get that. I also believe we have the evacuation routes as well. Will confirm)**

Telecommunications: telephone and cable **(Private sector data and not publishable. We can include the public sector data such as PSAP boundaries and locations. I also have all the states communications towers (which most locals use) but we can not make publicly available)**

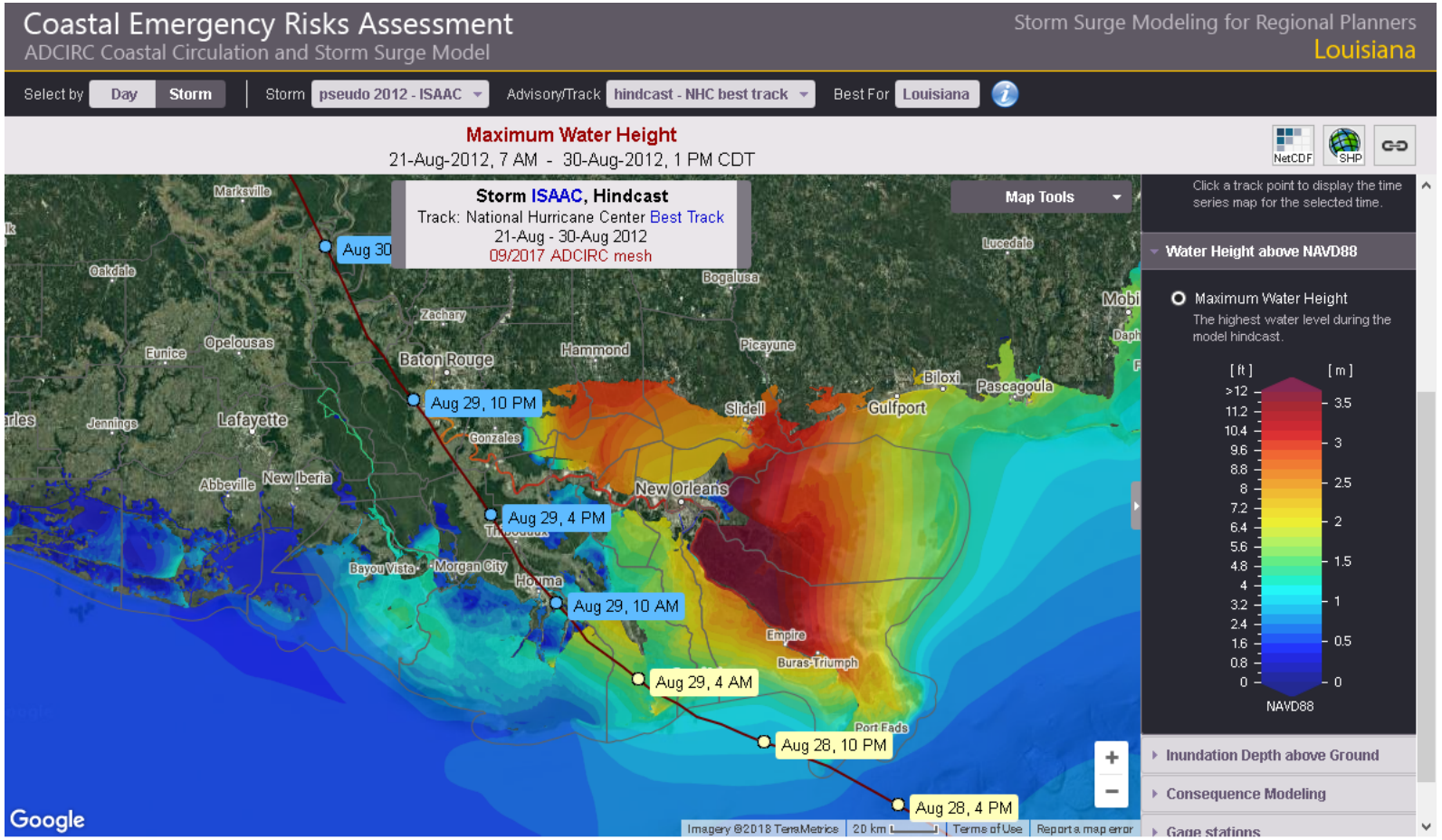

Planning User
Emergency Management User
AICP
CPRA
DHS
CFM
SWM
AIA
ASLA
FEMA
HM
DHS
USACE
WFS
CS
DOTD
CPRA
LDH
SP
User
Emergency Managers
CERA Operations
CERA Planning
ADCIRC Output
(Content Built through CRC)
CERA Data Inventory
User
GOHSEP Report - PDF
Input
Storm Tracks
ASGS
Scenarios
Existing Project
CERA MODEL
Input
16 CIF Sectors
1 VP Layer
DATA
Existing Project
CONSEQUENCE MODEL



Year 3 Goals for the Consequence Model

- Build out the Storm Surge Vulnerability Index for at risk parishes.
- Finalize outputs for Federal, State and Local Leaders
- Leverage Damage Functions from HAZUS to provide damage estimates

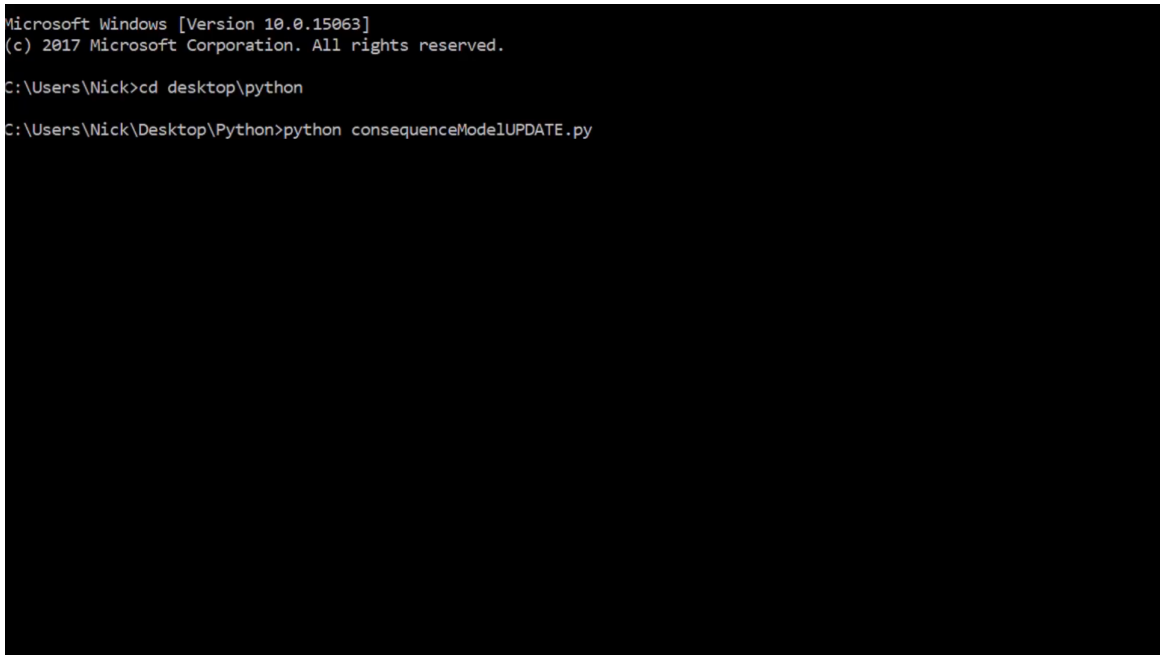
Research Work and Accomplishments



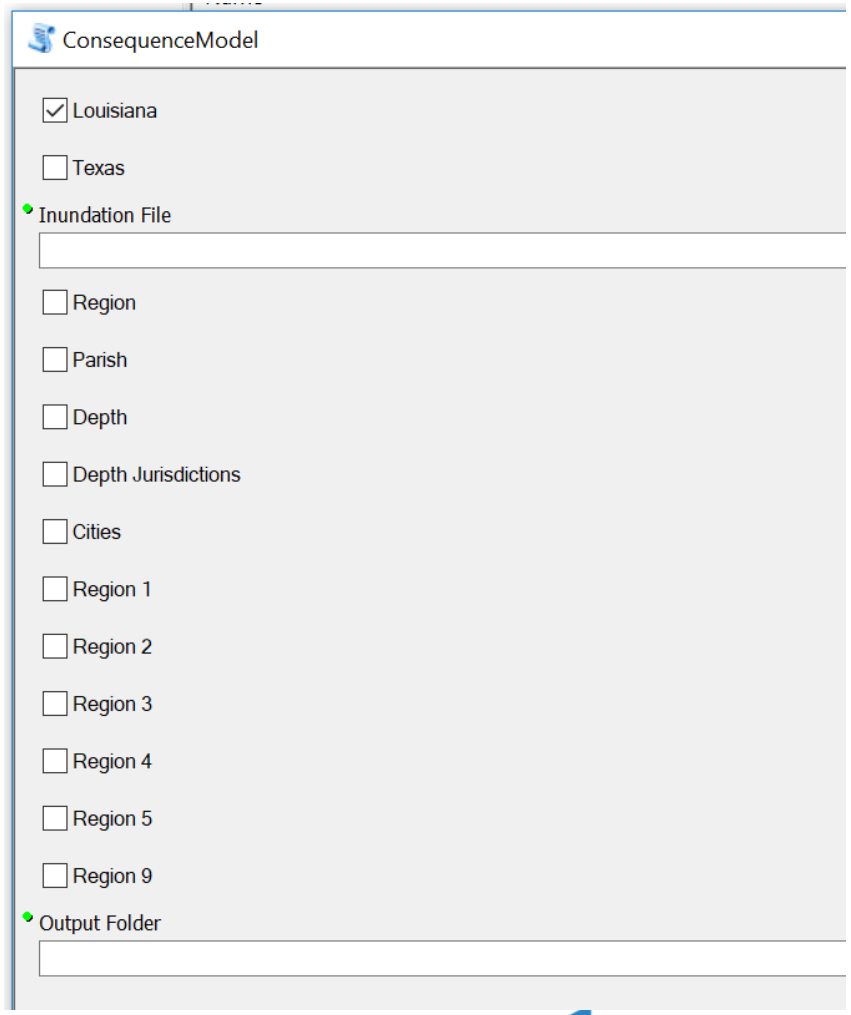
Coastal Emergency Risks Assessment (CERA): Hindcast storm run for Hurricane Isaac 2012 on the latest ADCIRC mesh for Louisiana (2017): Collaboration with Center for Coastal Resiliency@ LSU (Scott Hagen)

LSU
Center for Coastal Resiliency

Consequence Model Python Script

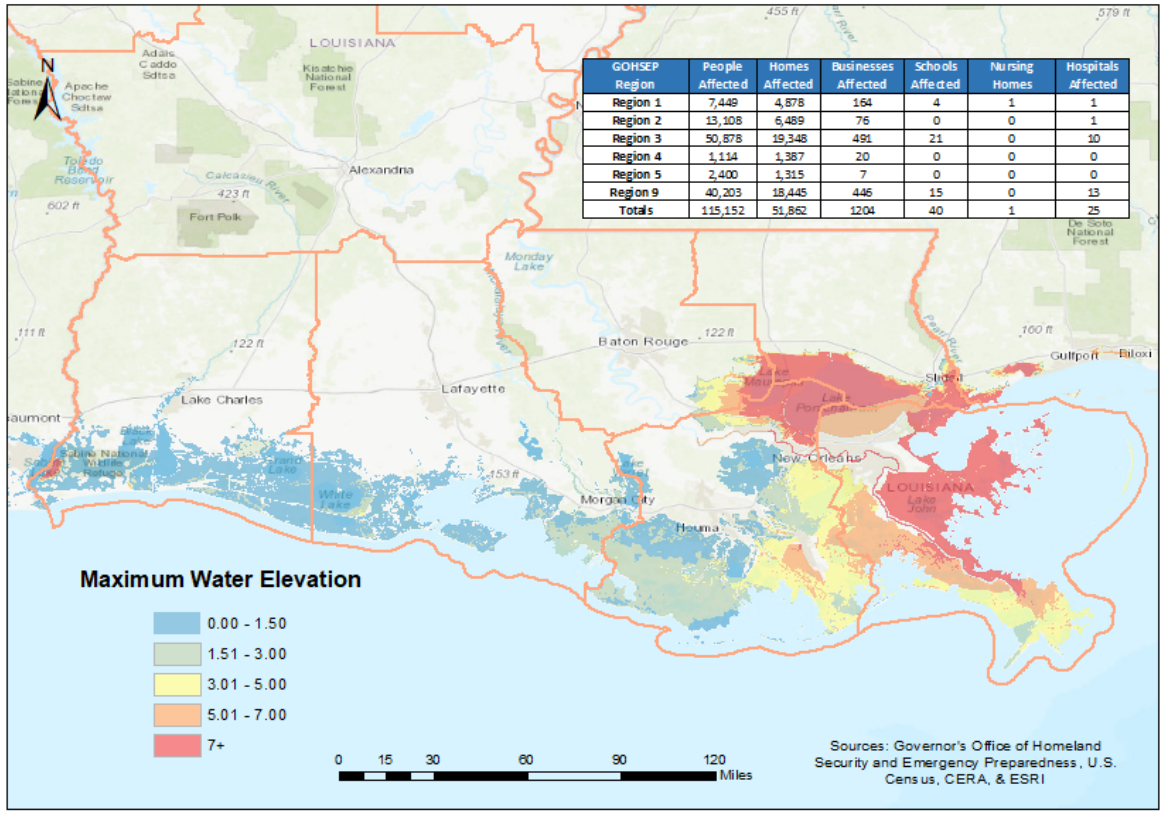


GUI Interface to Initiated the Scripts



Pre-Landfall – Expected Impacts Statewide

Issac Hindcast Impact Assessment

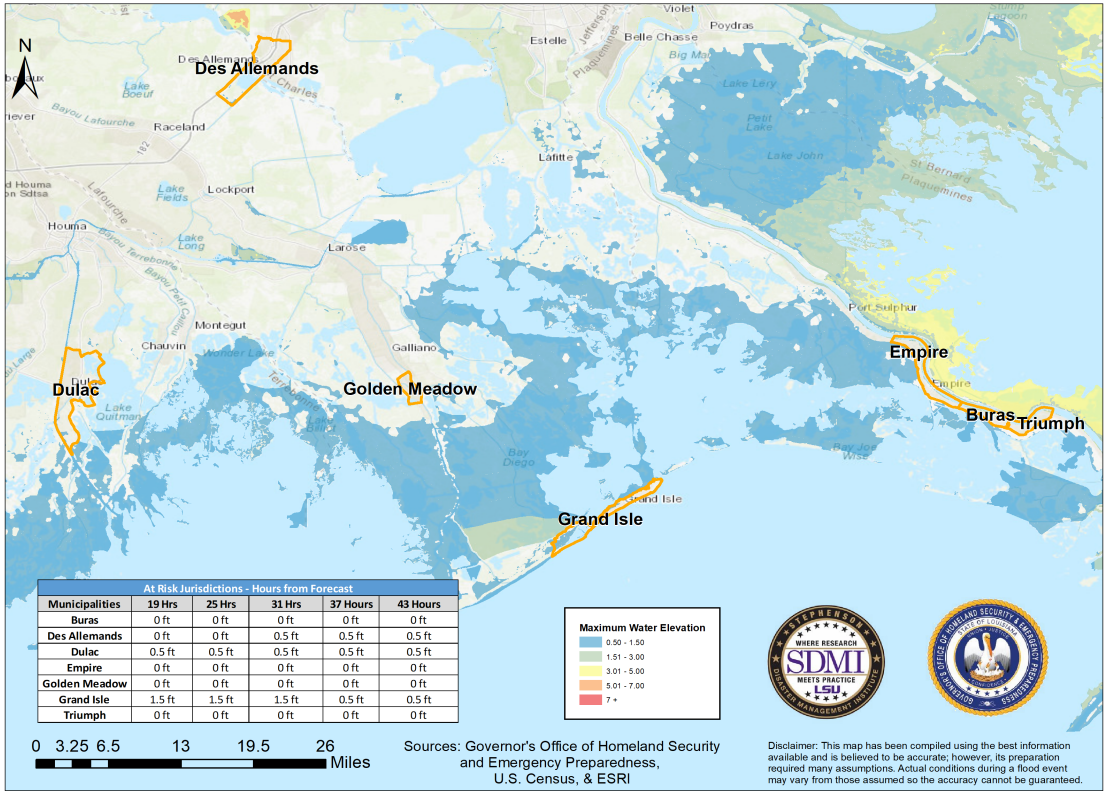


GOHSEP Region	People Affected	Homes Affected	Businesses Affected	Schools Affected	Nursing Homes	Hospitals Affected
Region 1	7,449	4,878	164	4	1	1
Region 2	13,108	6,489	76	0	0	1
Region 3	50,878	19,348	491	21	0	10
Region 4	1,114	1,387	20	0	0	0
Region 5	2,400	1,315	7	0	0	0
Region 9	40,203	18,445	446	15	0	13
Totals	115,152	51,862	1204	40	1	25

Pre-Landfall – Early Warning

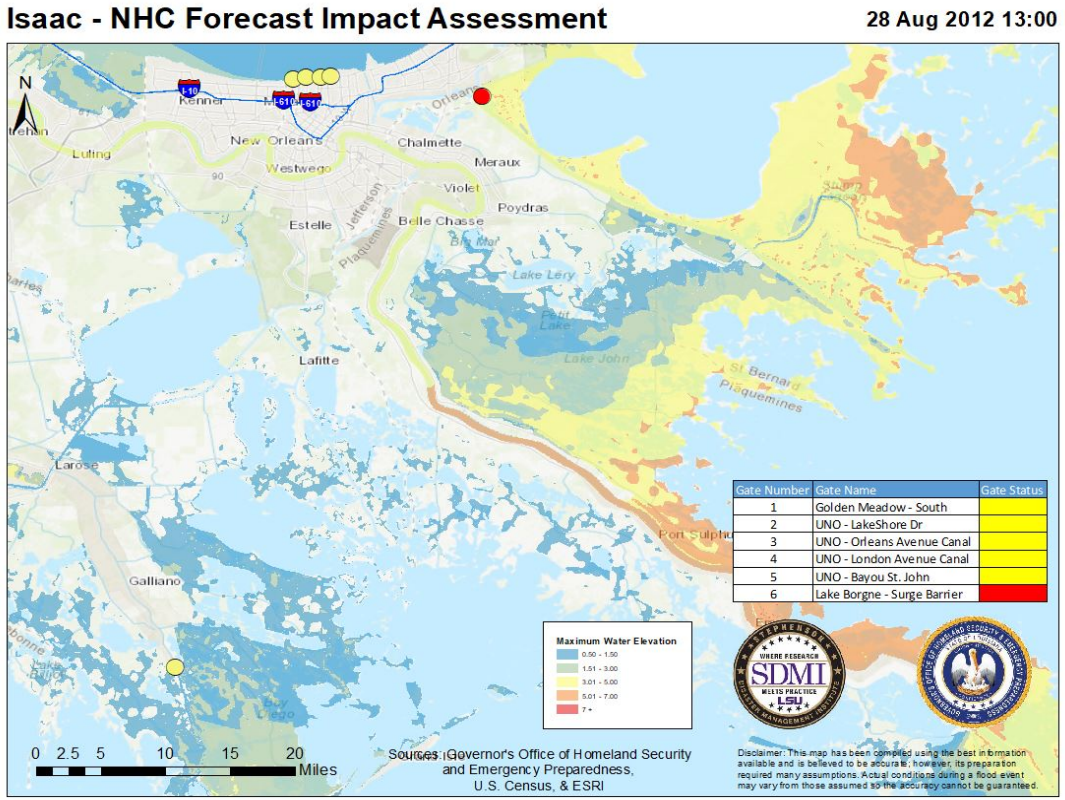
Nate 9 - NHC Forecast Impact Assessment

06 Oct 2017 10:00 / H-33



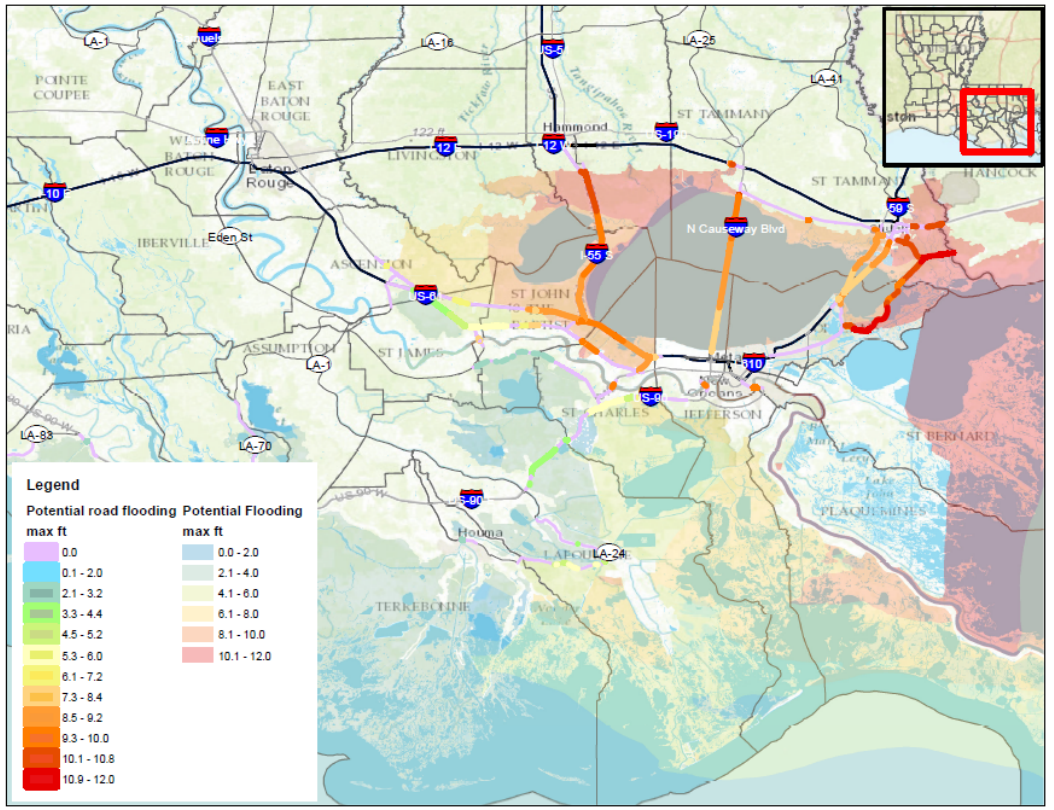
At Risk Jurisdictions - Hours from Forecast					
Municipalities	19 Hrs	25 Hrs	31 Hrs	37 Hours	43 Hours
Buras	0 ft	0 ft	0 ft	0 ft	0 ft
Des Allemands	0 ft	0 ft	0.5 ft	0.5 ft	0.5 ft
Dulac	0.5 ft	0.5 ft	0.5 ft	0.5 ft	0.5 ft
Empire	0 ft	0 ft	0 ft	0 ft	0 ft
Golden Meadow	0 ft	0 ft	0 ft	0 ft	0 ft
Grand Isle	1.5 ft	1.5 ft	1.5 ft	0.5 ft	0.5 ft
Triumph	0 ft	0 ft	0 ft	0 ft	0 ft

Pre-Landfall – Expected Infrastructure Impacts – Flood Gates



Gate Number	Gate Name	Gate Status
1	Golden Meadow - South	
2	UNO - LakeShore Dr	
3	UNO - Orleans Avenue Canal	
4	UNO - London Avenue Canal	
5	UNO - Bayou St. John	
6	Lake Borgne - Surge Barrier	

Pre-Landfall – Expected Infrastructure Impacts - Roadways

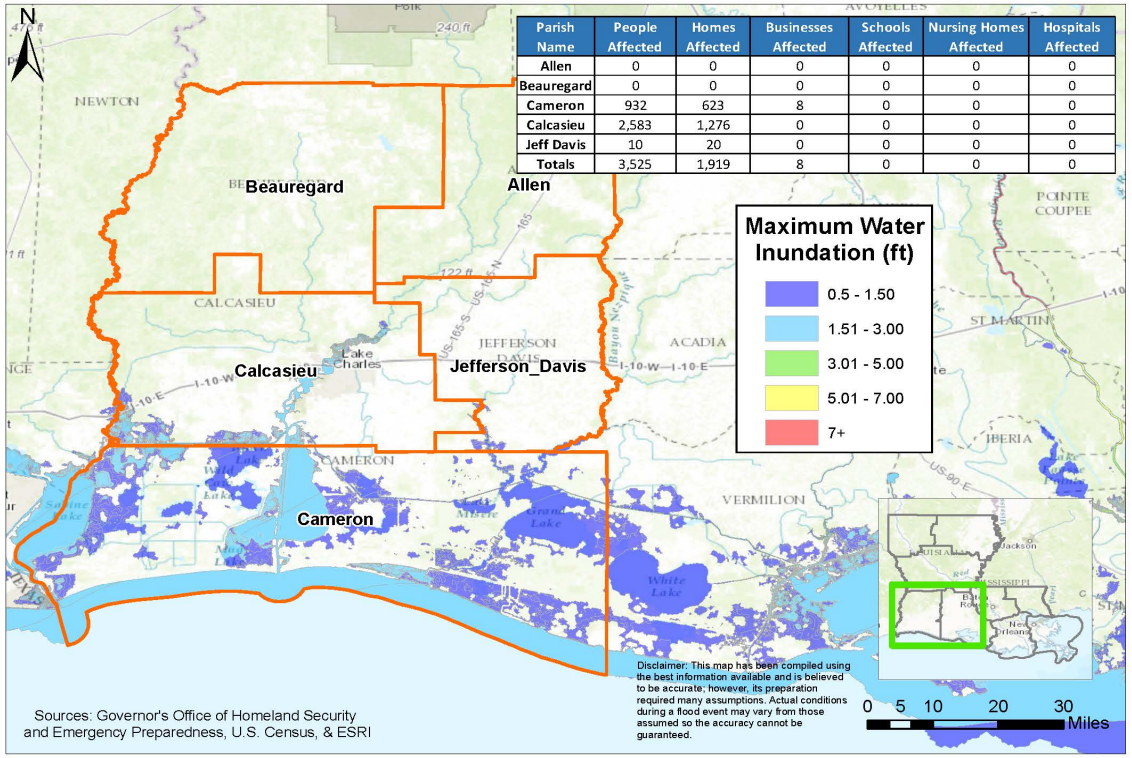


Pre-Landfall – Expected Impacts
Region Level

Region 5
Harvey Potential Flood Impact Assessment

Potential Impacts
26 August 2017 - 04:00
NHC Advisory #24

Parish Name	People Affected	Homes Affected	Businesses Affected	Schools Affected	Nursing Homes Affected	Hospitals Affected
Allen	0	0	0	0	0	0
Beauregard	0	0	0	0	0	0
Cameron	932	623	8	0	0	0
Calcasieu	2,583	1,276	0	0	0	0
Jeff Davis	10	20	0	0	0	0
Totals	3,525	1,919	8	0	0	0

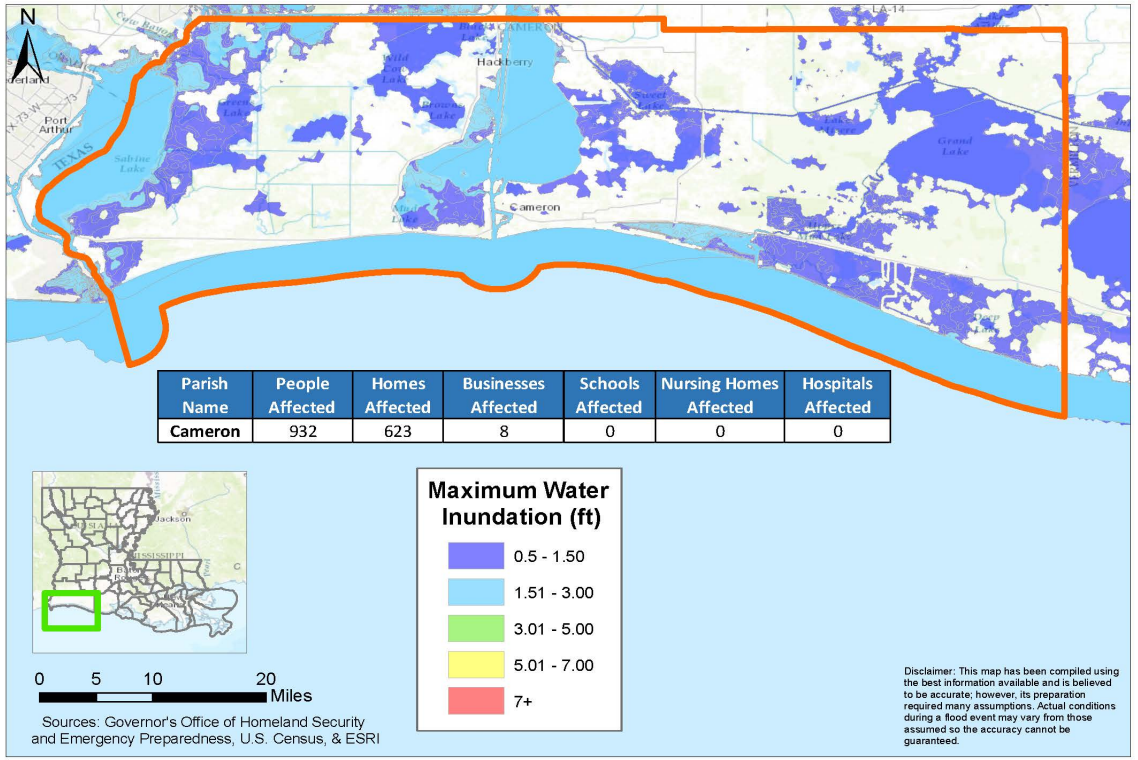


Pre-Landfall – Expected Impacts
Parish Level

Cameron Parish
Harvey Potential Flood Impact Assessment

Potential Impacts
26 August 2017 - 04:00
NHC Advisory #24

Parish Name	People Affected	Homes Affected	Businesses Affected	Schools Affected	Nursing Homes Affected	Hospitals Affected
Cameron	932	623	8	0	0	0

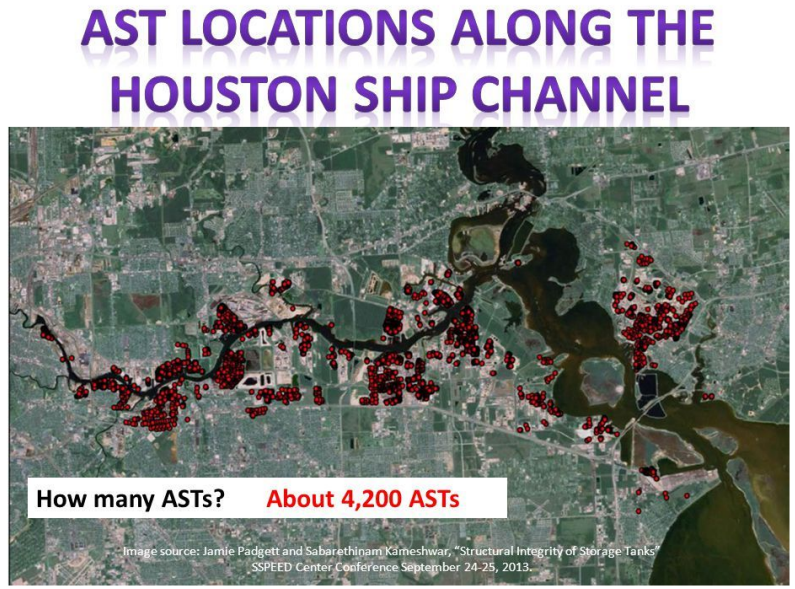


Outreach activities

Identify the needs of regional planners and users of the CERA tool:

TX site visits 09 Jan 2018

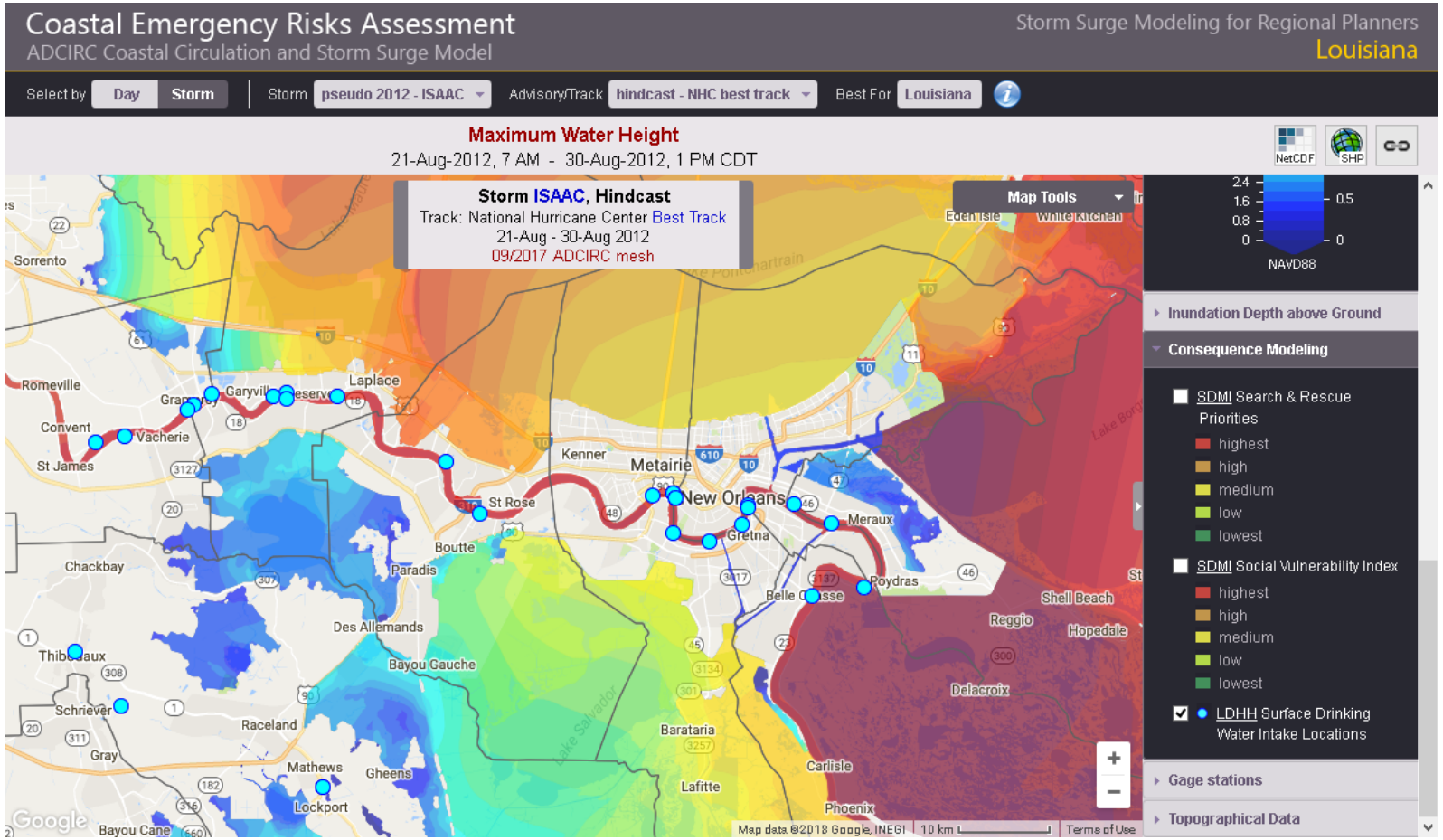
- **Coast Guard Sector Houston-Galveston**
  gathered information about operational need for an organized GIS database of vulnerable coastal infrastructure including tanks and pipelines
- **Rice University**
  building a database of Above ground Storage Tanks (ASTs)



TRANSITION

- CERA-Planning will be tested by professional planners, planning directors, and professional organizations at Louisiana Emergency Preparedness Association (LEPA) Conference in May 2018.
- Improve the integration critical infrastructure capturing the learning from CERA/ASGS operations during Hurricane Harvey.
- Improve the integration of SWEAT infrastructure into the hindcast of Hurricane Issac as prototype of CERA-Planning to be presented to planners.

Research Work and Accomplishments



Coastal Emergency Risks Assessment (CERA): Overlay of critical LA infrastructure features , e.g., water intake locations (in progress)

Attendees for the LEPA/Urban Planning focus group to review the Consequence Planning Tool:

St Tammany Parish:

- Louisiette Scott (City of Mandeville)
- Nahketah Bagby (City of Covington)
- Tara Ingram-Hunter (City of Slidell)
- Jewell Chatellier (Town of Madisonville)
- Sidney Fontenot (Parish Planning)

Tangipahoa Parish

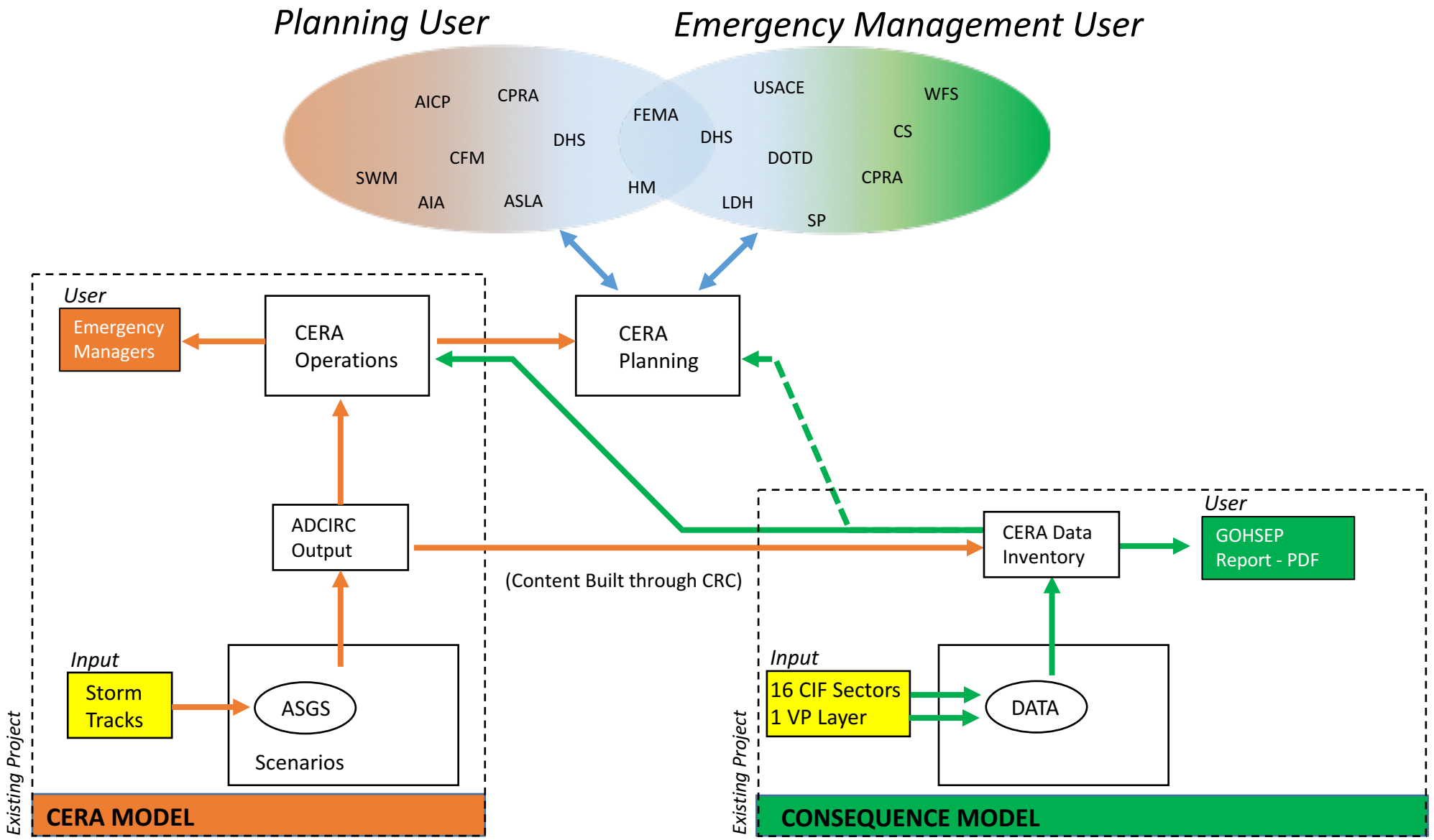
- Tracie Schillace (City of Hammond)
- Chris Winburn (City of Ponchatoula)
- Bridget Bailey (Parish Planning)
- Lauren Brinkman (Parish Planning)

Regional Planning Commission

- Lynn Dupont (NORPC)
- Drew Ratliff (Capital Regional Planning)

State Agents

- Carole Frantz (LA Sea Grant)


Planning User
Emergency Management User
AICP
CPRA
DHS
CFM
SWM
AIA
ASLA
FEMA
HM
DHS
USACE
DOTD
LDH
WFS
CS
CPRA
SP
User
Emergency Managers
CERA Operations
CERA Planning
ADCIRC Output
(Content Built through CRC)
CERA Data Inventory
User
GOHSEP Report - PDF
Input
Storm Tracks
ASGS
Scenarios
Existing Project
CERA MODEL
Input
16 CIF Sectors
1 VP Layer
DATA
Existing Project
CONSEQUENCE MODEL

GOHSEP Unified Command Group Planned Products and Timeline

Timeline	ADCIRC / CERA	Consequence Model (CM)- Evacuation Support	CM – Infrastructure Impact Support	CM – Damage Assessment Support	CM – Search and Rescue Support	CM – Transportation and LWIN Support	Actual Flood Impact
> H-72	X						
H-72 – H-24	X	X	X			X	
H-24 – H+12	X		X	X	X	X	
H+12 – H+72							X

GOHSEP Unified Command Group Daily Battle Rhythm

Timeline (Central)	ADCIRC / CERA	Consequence Model - Normal Track (UCG Report)	Significant Differences for Eastern Deviation	Significant Differences for Western Deviation	Changes from 10:00 Advisory
04:00	X				X
07:00					
10:00	X	X	X	X	
13:00					
16:00	X				X
19:00					
21:00	X				X
24:00					

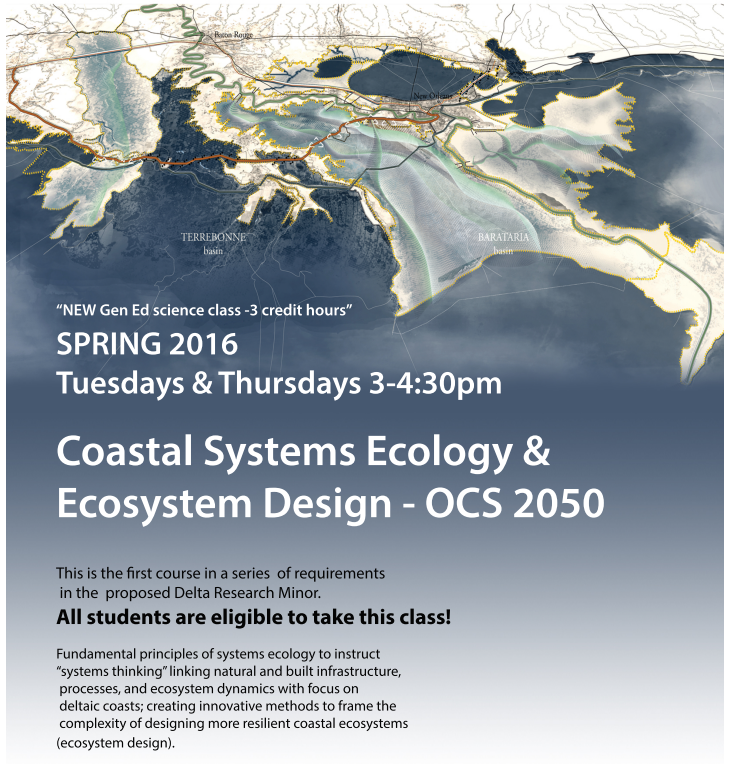
2018 spring 2018 RETALK (Research Talks)

Zoom Conference call testing for our Computer Science seminar on Thursday 02/22/2018 from 11.00am - 11.50am.

Computer Science, Johnson C Smith University
Thanks and Regards,
Dr. Suryadip Chakraborty

Hang Chen, Ph.D.
Dean, College of Science, Technology, Engineering and Mathematics (STEM)
Johnson C. Smith University
(704)-378-1049

TRANSITION



For more information contact Dr. Robert Twilley | rtwilley@lsu.edu | Ph. (225)-578-6445

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Proposed Follow-on Work

1. Utilize discussions with CRC leadership to determine how the outcomes of consequence model and CERA Planning tool can be integrated into existing systems and training opportunities to improve planning actions creating more resilient communities.
2. Collaborating with the APEX group would be helpful to our project - integrate the results of this project with existing tools currently used or developed by DHS
3. Focus on the analysis of capabilities of those tools specifically based on the following criteria: Do the tools allow Application Programming Interfaces (APIs) to integrate external data and services provided by CERA? Is the source code of these tools available under the Open Source license to integrate data with CERA? Can the tools extract the data to be displayed on the CERA tool or allow the display of CERA data in real-time?
4. **Using CERA-Planning to inform other tool development programs on what specific information may be most effective in changing the perspective of planning process. CERA Planning is a tool that is testing a variety of techniques to be more effective in communicating the risk of flooding on planning decisions.**

Questions