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2023 COASTAL MASTER PLAN  
*COMMITTED TO OUR COAST*

# ILLUSTRATING COASTAL CHANGE USING HIGH TIDE FLOODING AND HISTORIC STORMS

**STUART BROWN**



**MARCH 21, 2024**

**[COASTAL.LA.GOV/OUR-PLAN](https://coastal.la.gov/our-plan)**

**[MASTERPLAN@LA.GOV](mailto:MASTERPLAN@LA.GOV)**

# WHAT IS THE LOUISIANA COASTAL MASTER PLAN?

SCIENCE-BASED, STAKEHOLDER-INFORMED

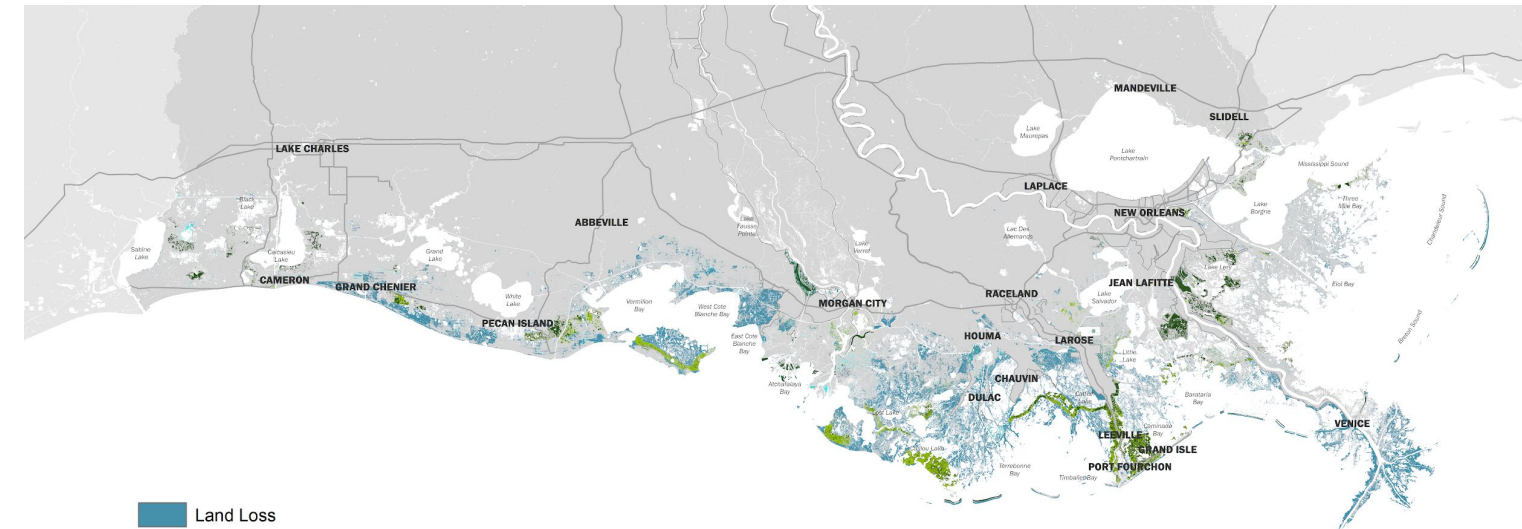
- Prioritization effort
  - How can the state spend its money most cost-effectively over the next 50 years to reduce storm surge-based flood risk and restore and maintain coastal wetlands?
- Developed through a process that ensures adaptive management
  - Required by law to be updated every 6 years
- Built on world class science and engineering
- Advances a comprehensive and integrated approach to restoration and risk reduction
- Incorporates extensive public input and review
- Illustrates how people and communities will experience a changing coast to allow preparation and adaptation into the future



# WHAT IS THE LOUISIANA COASTAL MASTER PLAN?

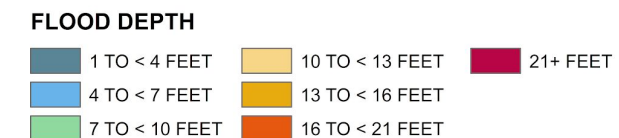
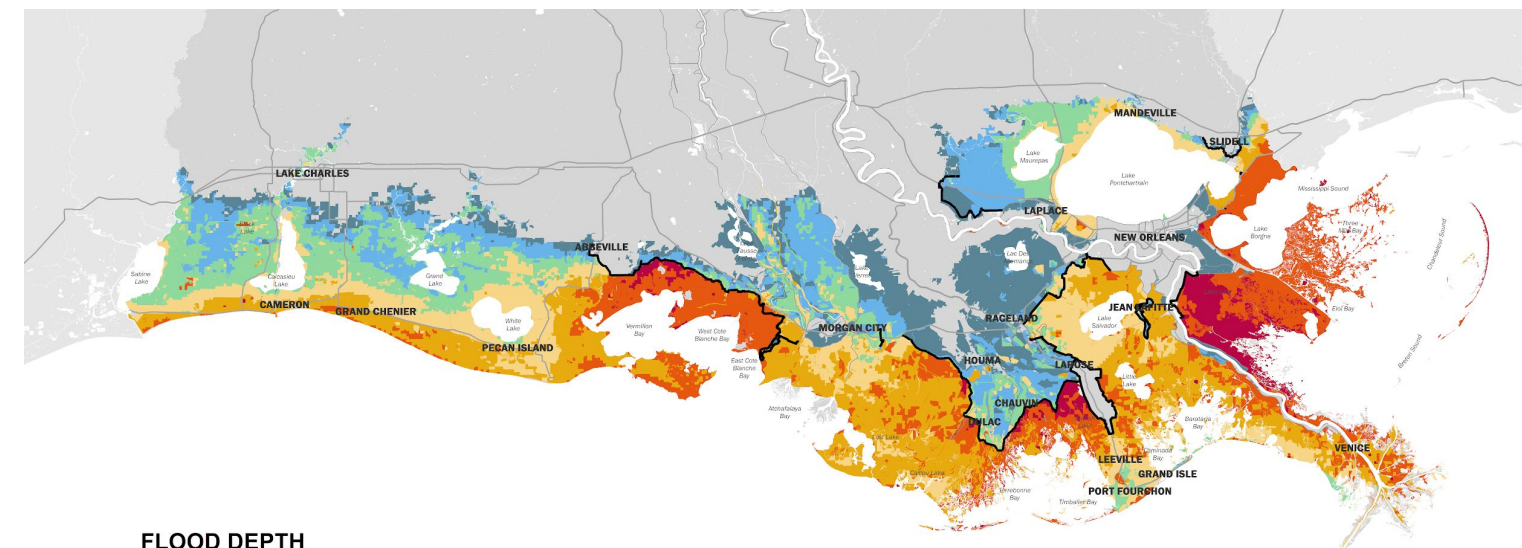
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## 2023 COASTAL MASTER PLAN FUTURE WITH ACTION

LAND CHANGE OVER TIME - YEAR 50  
LOWER PROJECT SELECTION SCENARIO - S07



## 2023 COASTAL MASTER PLAN FUTURE WITH ACTION

1% ANNUAL EXCEEDANCE PROBABILITY - MEDIAN ESTIMATE - YEAR 50  
LOWER PROJECT SELECTION SCENARIO - S07





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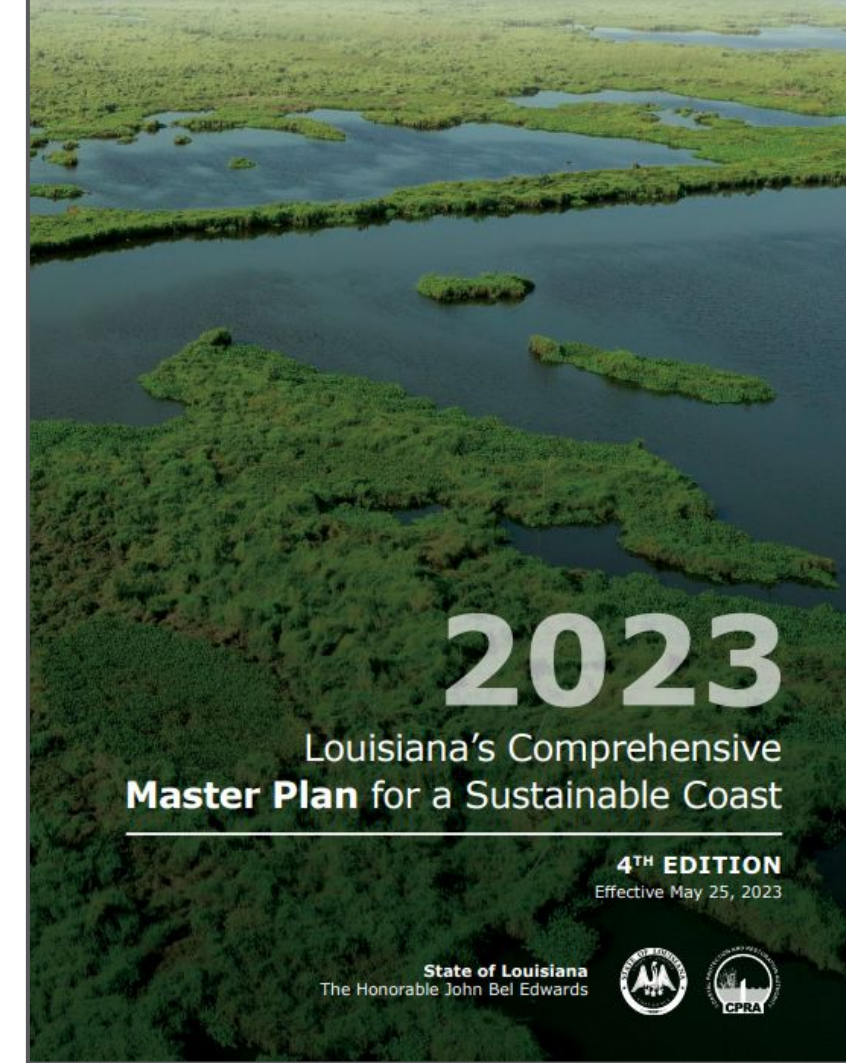


# THE MASTER PLAN AS A RESOURCE

- 2023 Master Plan Resources

*“The master plan is more than a list of projects”*

- Plan, Executive Summaries
- Appendices; Exploratory Analysis
  - HTF, Historic Storms
- Fact Sheets
- Outreach Videos
- Data Viewer
  - <https://mpdv.coastal.la.gov/>
- Data Access Portal
  - <https://mpdap.coastal.la.gov/>



## REGIONAL APPROACH

## ABOUT TERREBONNE

### AN INTRODUCTION

The Terrebonne region is known for its meandering bayous, blackwater swamps, and extensive marshes. This watery landscape supports some of the most productive commercial fisheries in the state. The region's relationship to water also poses challenges for residents, many of whom live outside of levee protection systems. The 2023 Coastal Master Plan proposes a variety of project types to reduce risk for these vulnerable communities.

The Terrebonne region extends from Bayou Lafourche in the east to the Atchafalaya Basin Tchebou, Fourchue Bay, and Oyster Bayou in the west. The region includes parts of seven parishes: Assumption, Iberville, Lafourche, St. Martin, St. Mary, and Terrebonne. The area is often described as being "defined by water." Most communities are on higher land adjacent to natural bayous, such as Bayou Blue and Bayou Black, although thousands live in communities outside of levee protection systems.

The region is home to several groups of Indigenous peoples, including members of the Choctaw, the Biloxi, the Grand Caillou, Grand Band of Biloxi, and the Choctaw. Other peoples have been living in this area since the arrival of Spanish explorers.

For centuries, living by trapping, fishing, hunting, and farming. Their ancestors were primarily of the nations Biloxi, Choctaw, and Choctaw but also Muskogean and Acadian. To the east, the Pointe-au-Chien Indian Tribal Community is located in Terrebonne Parish. The Pointe-au-Chien Indians also descend from the Biloxi, Acadiana, and Muskogean Tribes. Terrebonne is also home to members of the United Houma Nation, a state-recognized tribe. Tribal members reside within a six-parish area along the southwestern coast of Louisiana. Their people have strong cultural ties to the wetlands that are impacted by land loss, changing habitats, and erosion of key cultural sites, such as burial grounds. For these communities and others that call home the Pointe-au-Chien, the de Jean Charles, and Grand Bayou, land loss and rising sea levels pose an existential threat.

Ecosystems in the Terrebonne region include extensive saltwater marshland and wetland forests in the Venice Basin and floating marshes in the Frenchman Bayou. Salt and brackish marshes are prevalent in eastern Terrebonne. The region includes the Barataria Wildlife Management Area in the Venice Basin and Pointe-au-Chien Wildlife Management Area in eastern Terrebonne, as well as the Jean Lafitte National Historical Park and the Mandeville National Wildlife Refuge.



Image: EarthResource for you, 2021, CPRA

Resource-based industries are prevalent in the Terrebonne region's economy, with the shrimp industry and seafood production as primary sources of revenue. Residents of communities like Houma, Chauvin, Cocodrie, and Dulac contribute to the region's productivity, with the area accounting for over 20% of Louisiana's seafood production. Many of the outlying communities are important hubs for commercial fishing, including shrimp, oysters, and crabs. For example, in 2020, almost 38% of total statewide shrimp landings were from the Terrebonne Basin. In 2021, almost 26% of commercial fishers who landed shrimp in Louisiana lived in Terrebonne Parish. The region also has important public and private oyster-growing areas, including Lake Chen and Lake Labon. Other economic activities in the region include agriculture, shipbuilding and fabrication, and support for the offshore energy industry. Major population centers, such as Houma, Bayou La Batre, and Thibodaux, provide services, such as healthcare and retail, to surrounding communities.

Although beautiful, the region's geography and history of flooding and coastal land loss pose challenges for residents. Terrebonne residents and businesses have a long history of living with hurricanes and associated storm surge-based flooding. In what's known as Hurricane Andrew (1992), US (2000), Rita (2005), Gustav and the (2008), and Ida (2012) have all caused extensive flooding. Land loss in the region was extensive during the 20th century in part due to ongoing delta subsidence, saltwater intrusion along the RMC and other canals, historic oil and gas activity, and natural deterioration of barrier islands, contributing to the area's vulnerability. Following Hurricane Jean in 2005, concerted efforts began to reduce the risk of flooding for Bayou communities and the Houma area. The 2023 Coastal Master Plan identifies a number of projects to reduce storm surge risk in the region, including the Mississippi to the Gulf project, which consists of a 98 mi hurricane risk reduction system of gate-coated earthfill levees between U.S. 90 near Sulphur to the west and Highway 1 near Lakeport to the east.

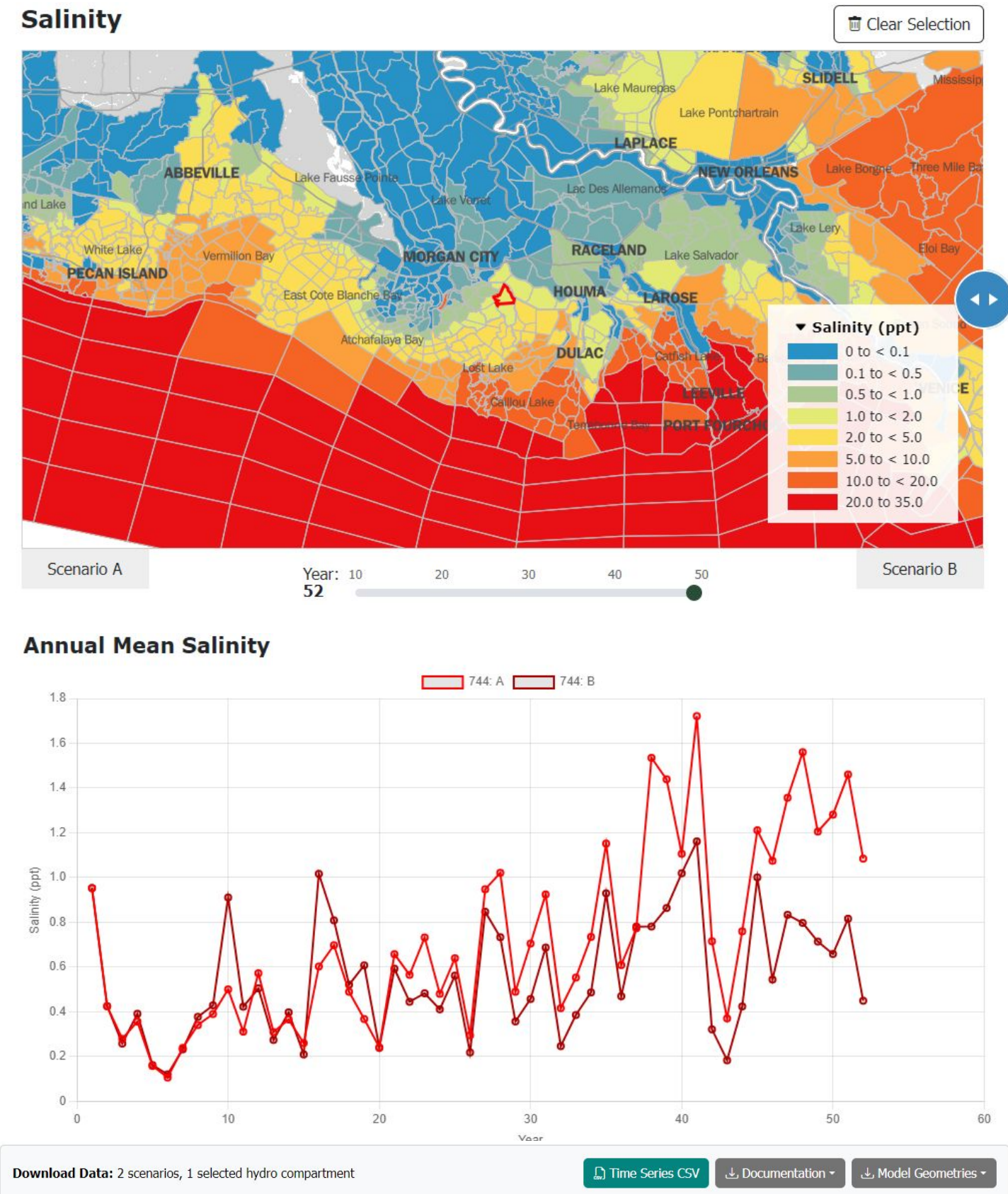
# 2023 MASTER PLAN RESOURCES

- Master Plan Data Viewer  
[MPDV.coastal.la.gov](https://MPDV.coastal.la.gov)

# 2023 MASTER PLAN RESOURCES

- Master Plan Data Access Portal
  - Explore and download model outputs
    - Land Change
    - Vegetation Type (FFIBS)
    - Vegetation Type (VCT)
    - Flood Depth
    - Estimated Annual Damages, Dollars
    - Flood Exposure
    - Salinity
    - Water Level
    - Total Suspended Solids
  - Bulk download inputs and reference files
    - Model geometries
    - Subsidence
    - Historic Marsh edge erosion
    - Initial conditions vegetation, land/water, FFIBS

[MPDAP.coastal.la.gov](https://MPDAP.coastal.la.gov)





# THE MASTER PLAN AS A RESOURCE

- 2023 Master Plan Resources

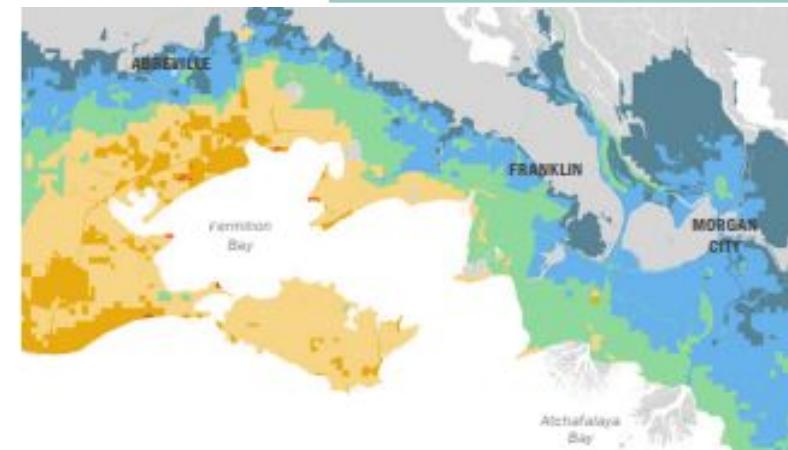
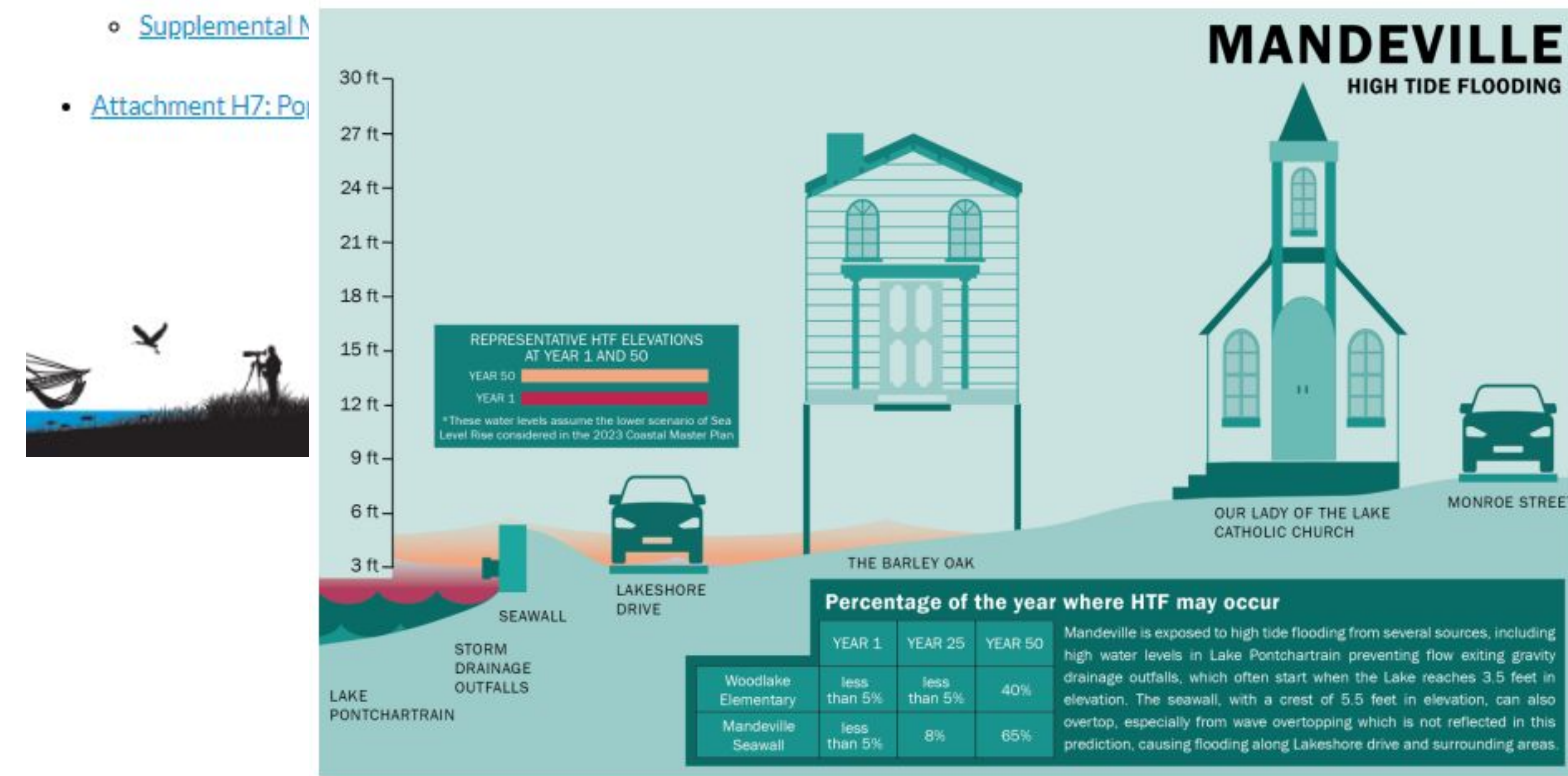
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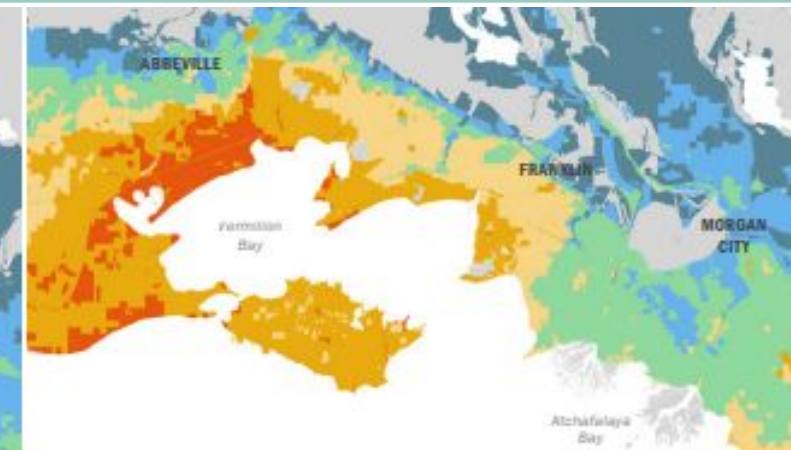
## APPENDIX H: EXPLORATORY ANALYSIS

Additional attachments and supplemental materials are still in development and will be made available. Please note some of these materials are draft and subject to be updated.

- Attachment H1: Future without Currently Funded Projects
- [Attachment H2: ICM-High Tide Flooding Approach](#)
- [Attachment H3: High Tide Flooding Report](#)
- Attachment H4: Alternative Environmental Scenarios - ICM
- [Attachment H5: Alternative Environmental Scenarios - Risk](#)
- Attachment H6: Case Studies
  - [Supplemental Material H6.1: Historic Storm Run - Ike](#)
  - [Supplemental Material H6.2: Historic Storm Run - Rita](#)
  - [Supplemental Material H6.3: Historic Storm Run - Barry](#)
  - [Supplemental Material H6.4: Historic Storm Run - Ida](#)
  - [Supplemental Material H6.5: Historic Storm Run - Isaac](#)
  - [Supplemental Material H6.6: Restoration Impacts on Surge and Risk - Barataria Barrier Islands](#)
  - [Supplemental Material H6.7: ...](#)
- [Attachment H7: Po...](#)



Map 6.6: Hypothetical Hurricane Rita Impacts on Initial Conditions Landscape, Lower Scenario.



Map 6.7: Hypothetical Hurricane Rita Impacts on a Future Landscape, Future Without Action, Lower Scenario, Year 50.

A scenic view of a coastal waterway. In the foreground, there's a body of blue water with gentle ripples. To the left, a cluster of tall, dry, golden-brown reeds stands in the water. In the middle ground, a white boat with a green canopy and an outboard motor is moving from right to left, leaving a white wake. The background features a dense line of green trees and a clear blue sky with a few wispy clouds. A dark green rectangular box is overlaid on the center of the image, containing white text.

# **EXPLORATORY ANALYSIS: HIGH TIDE FLOODING**

# HIGH TIDE FLOODING

## EXPLORATORY ANALYSIS

### How will communities experience a changing coast?

Public feedback highlighted a concern over increasing frequency of “sunny day” flooding events.

Existing products were simple, imprecise in coastal Louisiana.



HTF at the lakefront seawall in New Orleans, LA



HTF at the LUMCON in Cocodrie, LA

# HIGH TIDE FLOODING

## EXPLORATORY ANALYSIS

Selected a set of communities to be evaluated to show the projected impacts of high tide flooding across the coast

- Cameron
- Delcambre
- Amelia
- Dulac
- Mandeville
- Grand Isle
- Slidell
- Delacroix

Two Categories of analysis:

- Frequency Analysis
- Network Analysis

## Appendix H, Attachment H3



HTF near Delacroix, LA



HTF along LA HWY 1, Golden Meadow, LA

# HIGH TIDE FLOODING

## EXPLORATORY ANALYSIS

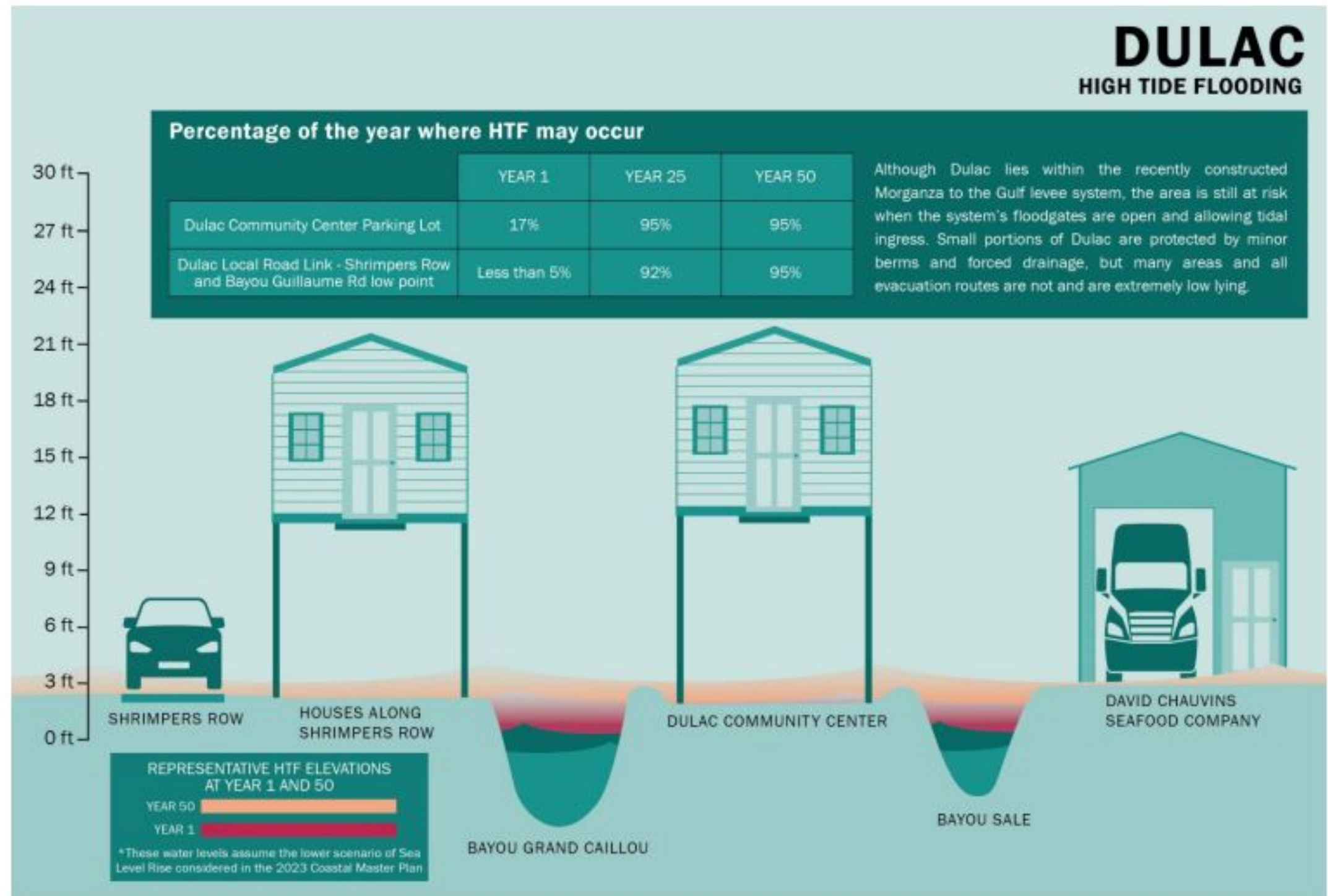
### Frequency Analysis/Community Vignettes - How frequently local landmarks will experience high tide flooding

Example:

#### Dulac Community Center Parking Lot

Currently sees HTF ~17% of days.

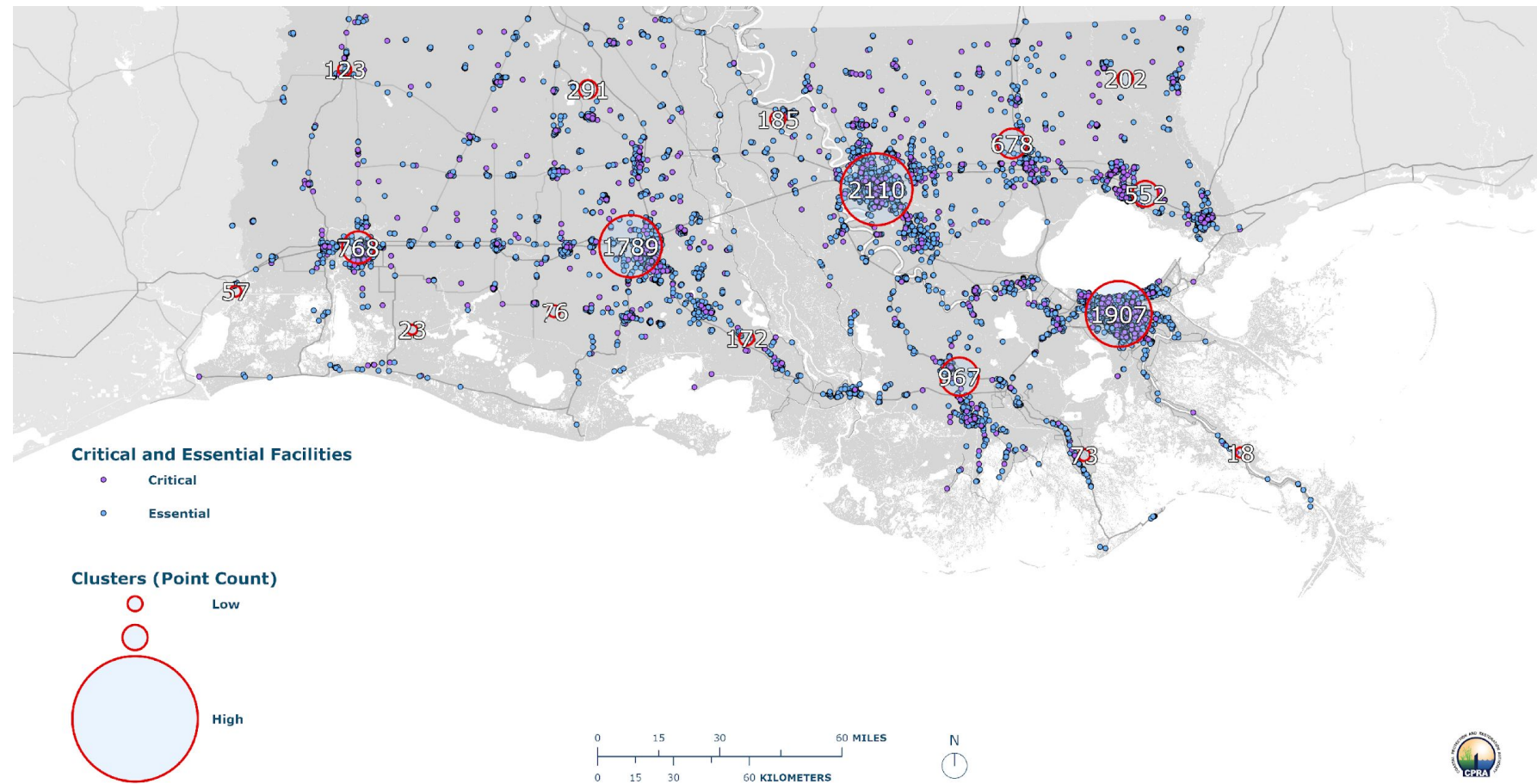
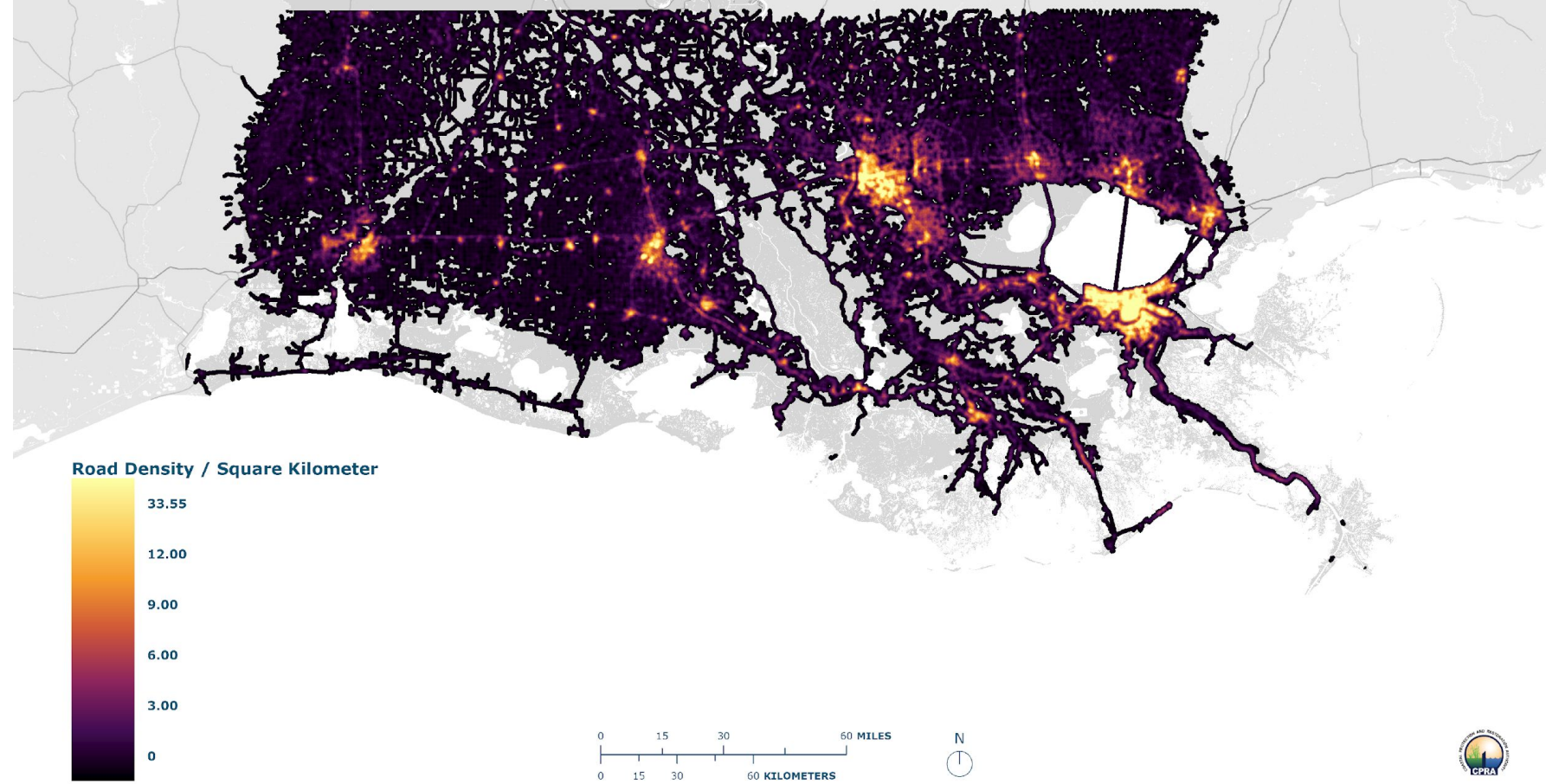
Without action: In 25 years projected to see HTF ~95% of days.



# HIGH TIDE FLOODING

## EXPLORATORY ANALYSIS

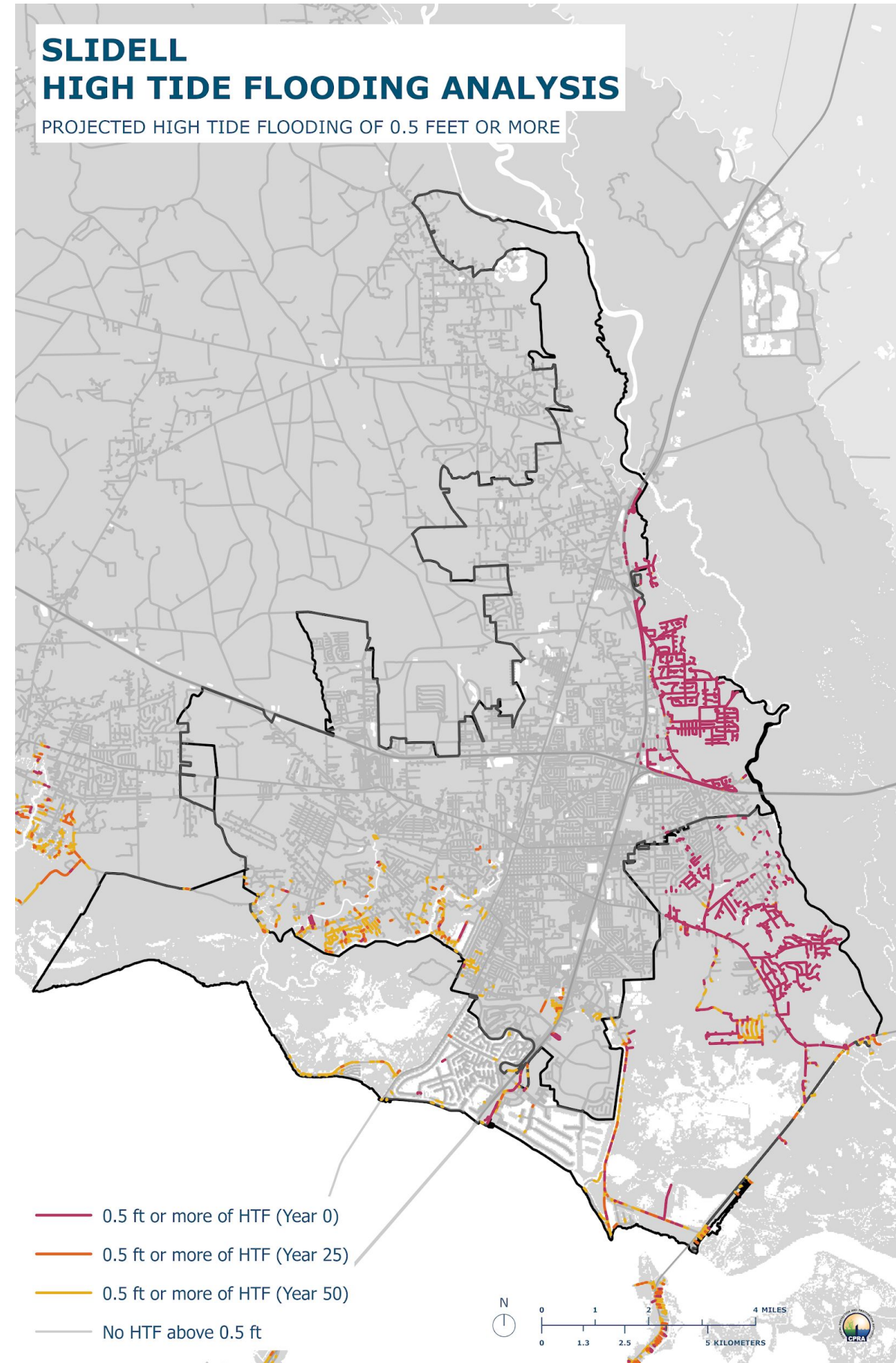
**Network Analysis** - How does HTF affect drive times to critical and essential facilities?



# HIGH TIDE FLOODING

## EXPLORATORY ANALYSIS

Roadway flooding of greater than 0.5 ft at Years 0, 25, 50 (right)



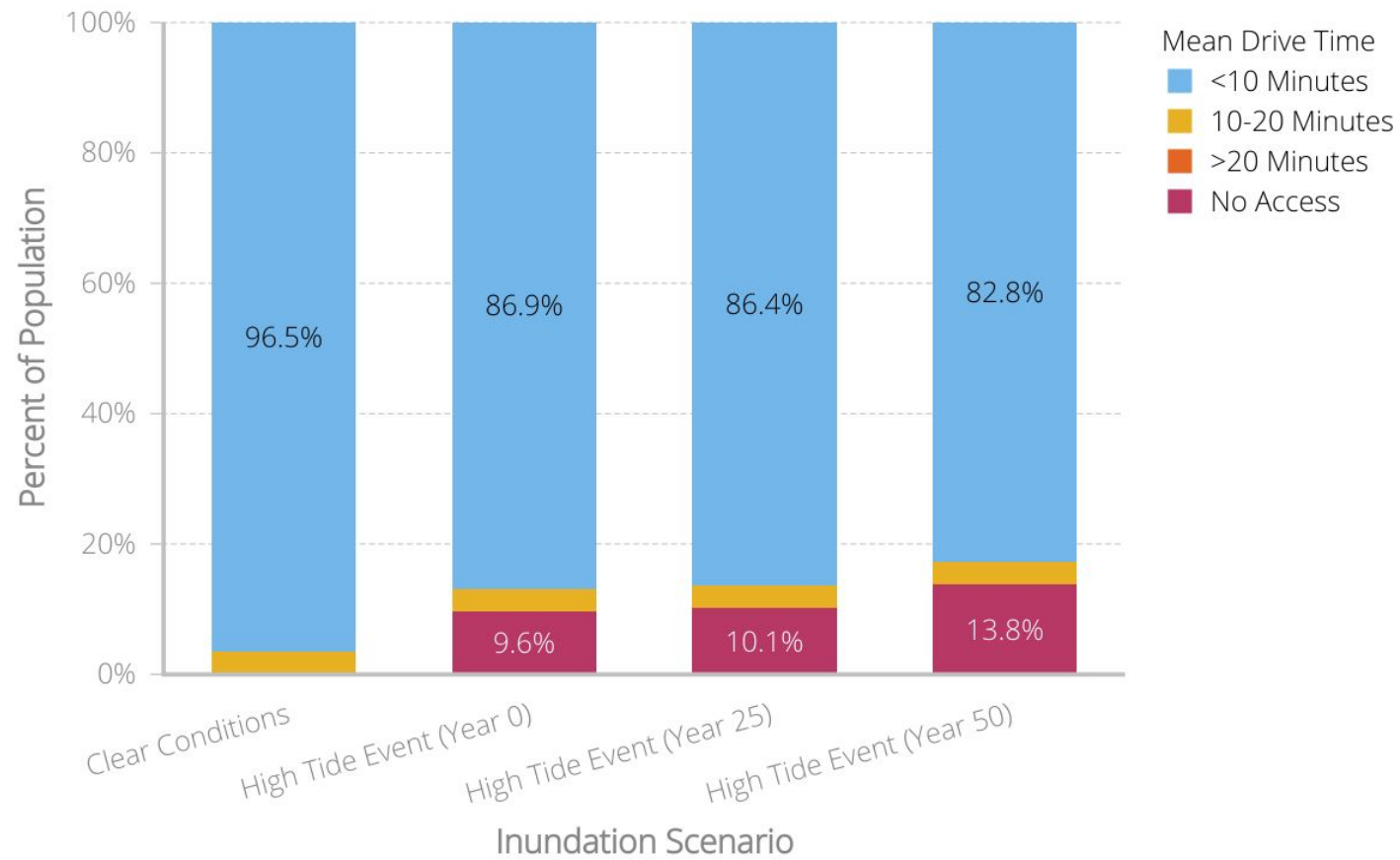
# HIGH TIDE FLOODING

## EXPLORATORY ANALYSIS

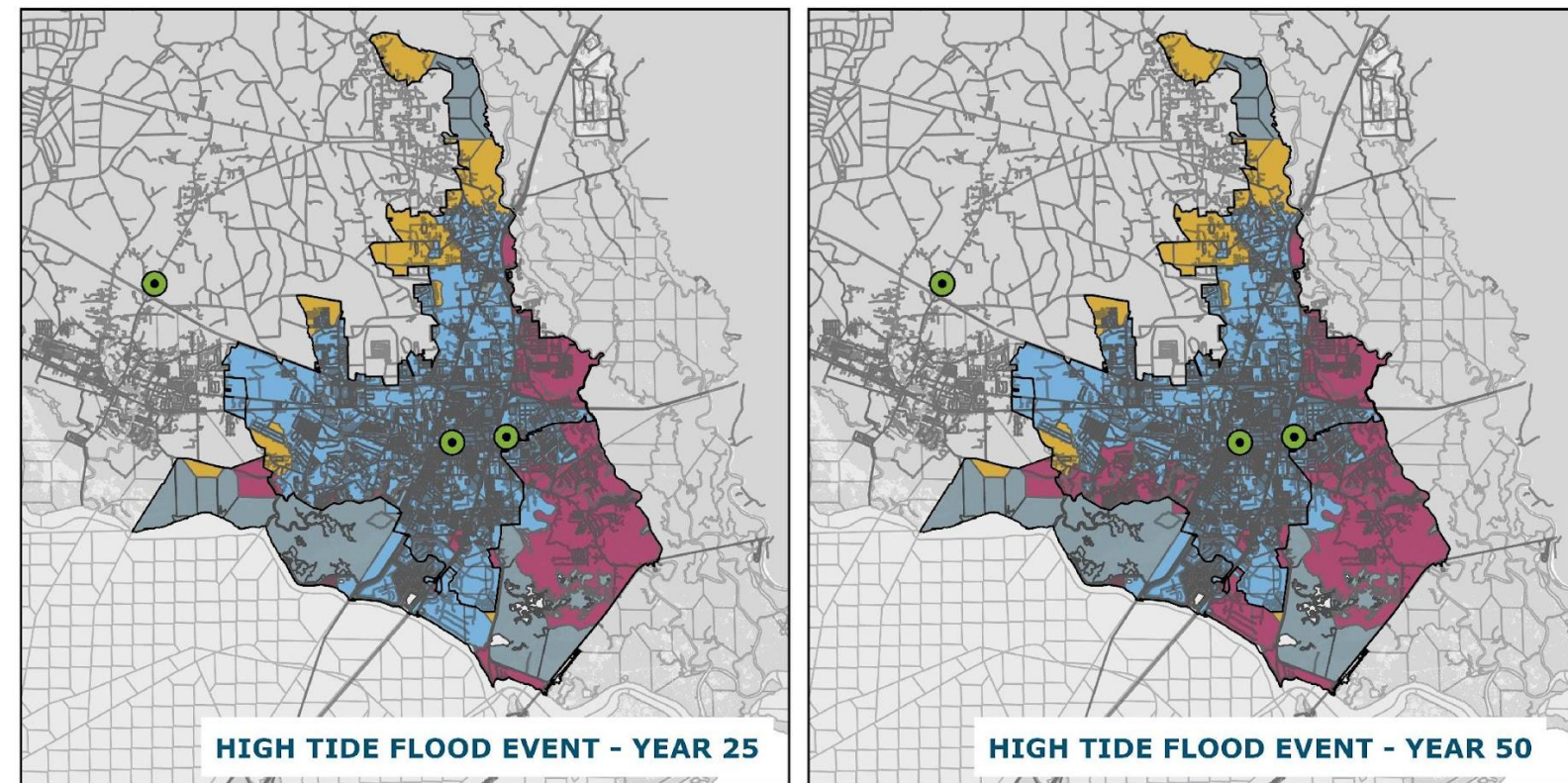
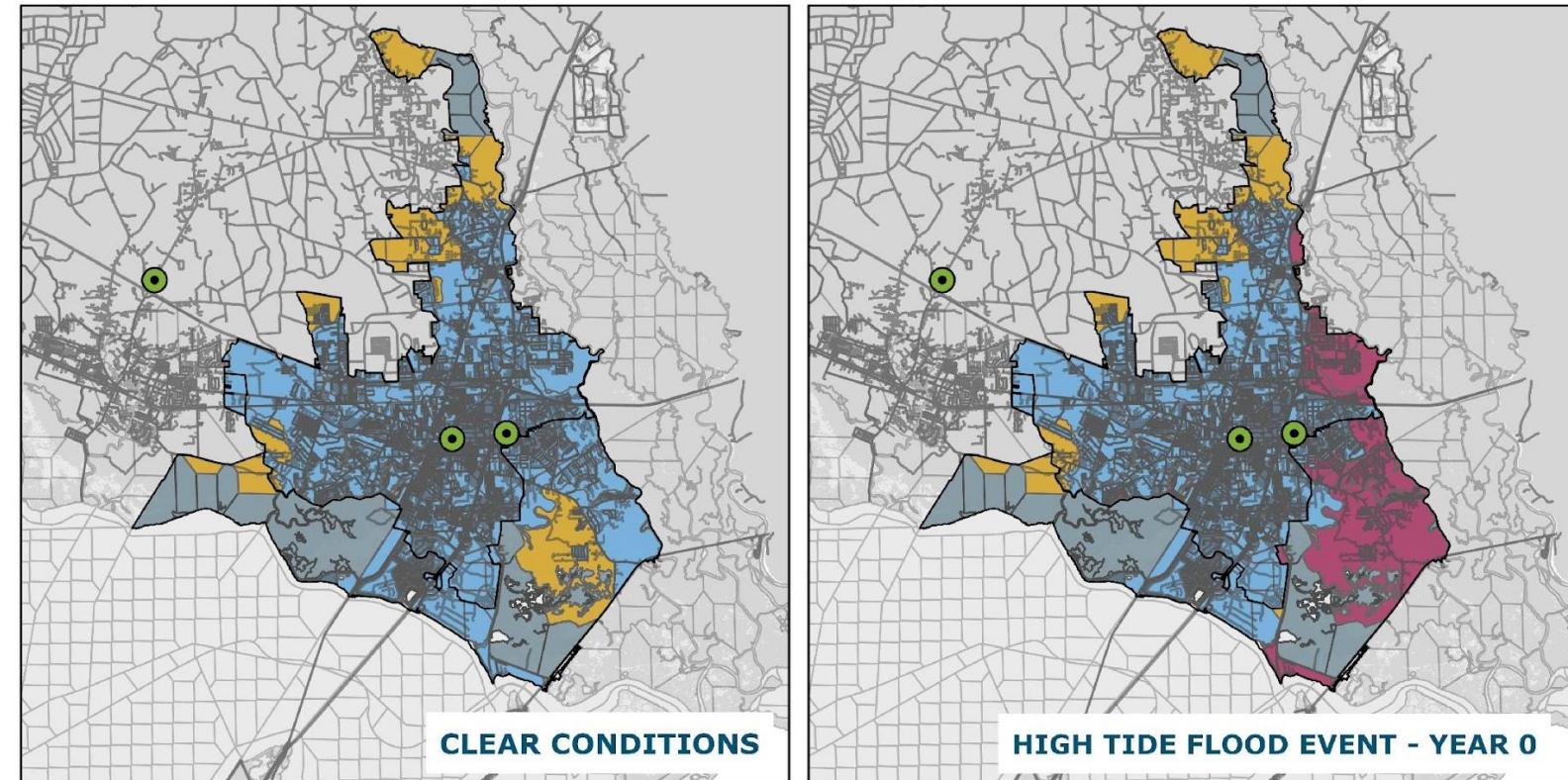
### Drive time to Tier 1 Hospitals

### Access to Nearest LERN Tier 1 Hospital

Slidell, Louisiana



Drive time access to nearest LERN Tier 1 hospital by percent of population in Slidell, Louisiana.



- LERN Tier 1 Hospitals
- Drive Time**
- Less than 10 minutes
- 10 to 20 minutes
- Greater than 20 minutes
- No Access
- Only accessible via tracks and paths





# ACKNOWLEDGEMENTS

## Contributing Team Members

- Water Institute
  - Yushi Wang\*
  - Scott Hemmerling
  - Harris Bien
  - Dexter Ellis
  - Zach Cobell
  - Ioannis Georgiou
  - Jordan Fischbach
  - Shan Zhou\*
- CPRA
  - Eric White
  - Sam Martin
  - Krista Jankowski\*
  - Stuart Brown
  - Elizabeth Jarrell\*
  - Rachelle Sanderson\*

\* Denotes former team members

[coastal.la.gov/our-plan/2023-coastal-master-plan/2023-plan-appendices/](https://coastal.la.gov/our-plan/2023-coastal-master-plan/2023-plan-appendices/)

**Appendix H, Attachment H3**

A scenic view of a coastal waterway. In the foreground, a white boat with a green canopy is moving through the water, leaving a white wake. To the left, there is a large clump of tall, dry reeds. The water is a deep blue. In the background, there is a dense line of green trees and a small body of water. The sky is a clear, bright blue with a few wispy clouds. A dark green rectangular box is overlaid on the center of the image, containing the text "EXPLORATORY ANALYSIS: HISTORIC STORMS" in white, bold, sans-serif capital letters.

# EXPLORATORY ANALYSIS: HISTORIC STORMS

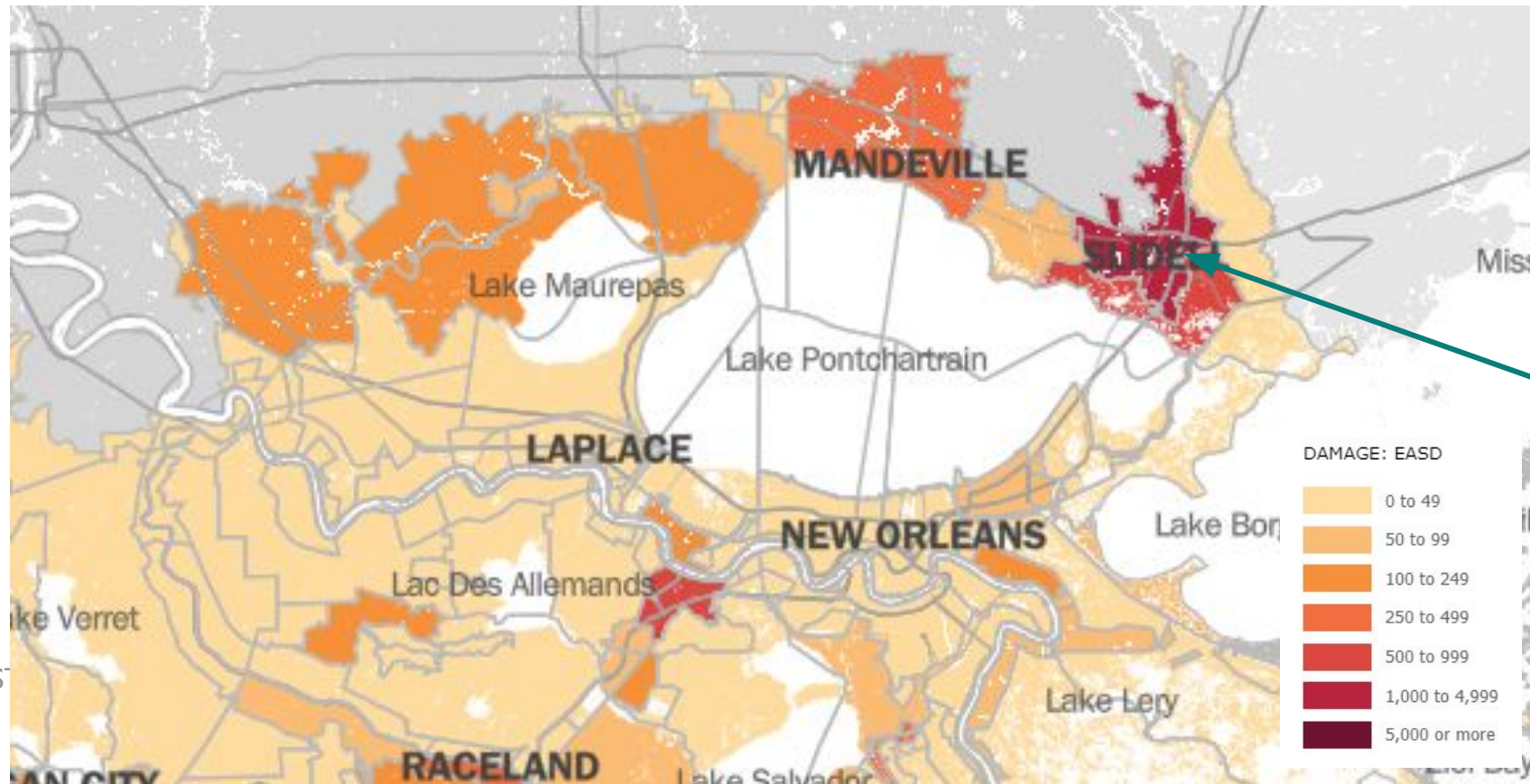
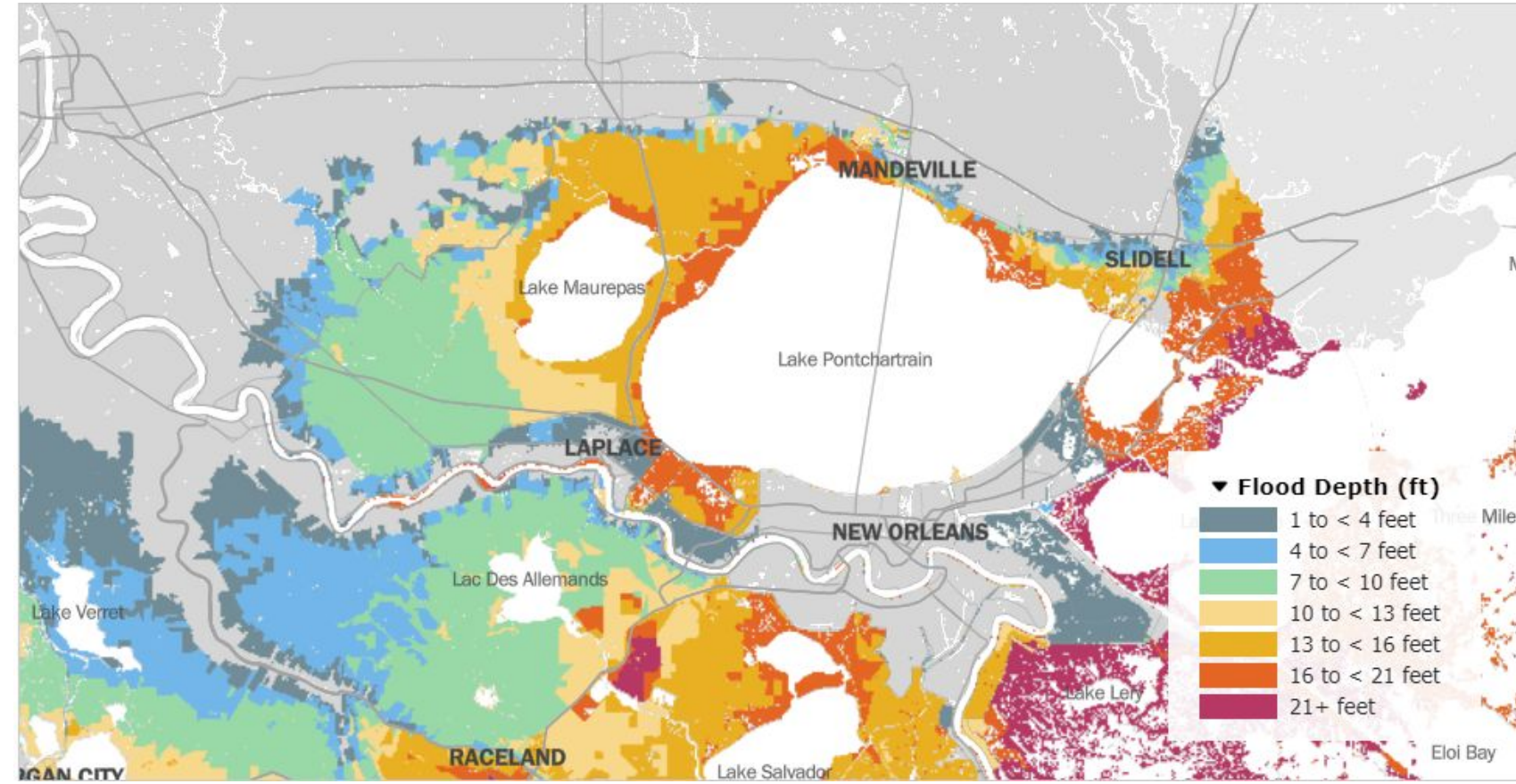
# HISTORIC STORM ANALYSIS

## EXPLORATORY ANALYSIS

How will future coastal change affect hurricane impacts?

Flood depth exceedance probabilities

Annualized damage estimates



# HISTORIC STORM ANALYSIS

## EXPLORATORY ANALYSIS

### How will future coastal change affect hurricane impacts?

Use historic storms as a reference. Model the windfields to see how they will impact the coast today, and how they will impact the coast 50 years from now with and without action.

- Rita
- Ike
- Isaac
- Barry
- Ida

## Appendix H, Attachment H6.1-5



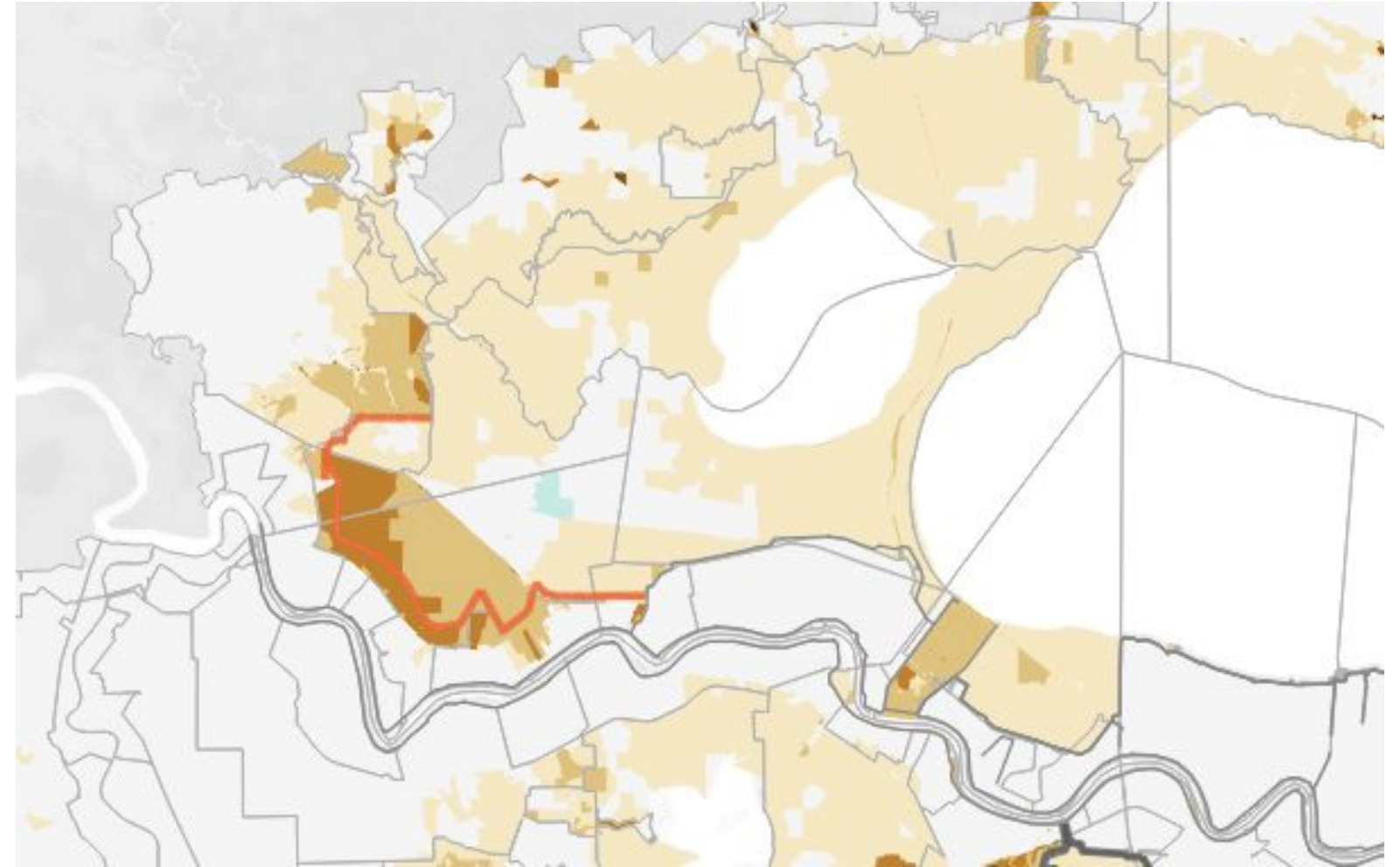
Image: Lafitte, Post Hurricane Ida, 2021 (CPRA)

# HISTORIC STORM ANALYSIS

## EXPLORATORY ANALYSIS

### Hurricane Isaac

In 50 years, without action, Hurricane Isaac would produce flood depths up to 4.5 feet greater than today.



Depth... -10.0 10.0

Hurricane Isaac Depth Difference Year 50 - Year 0

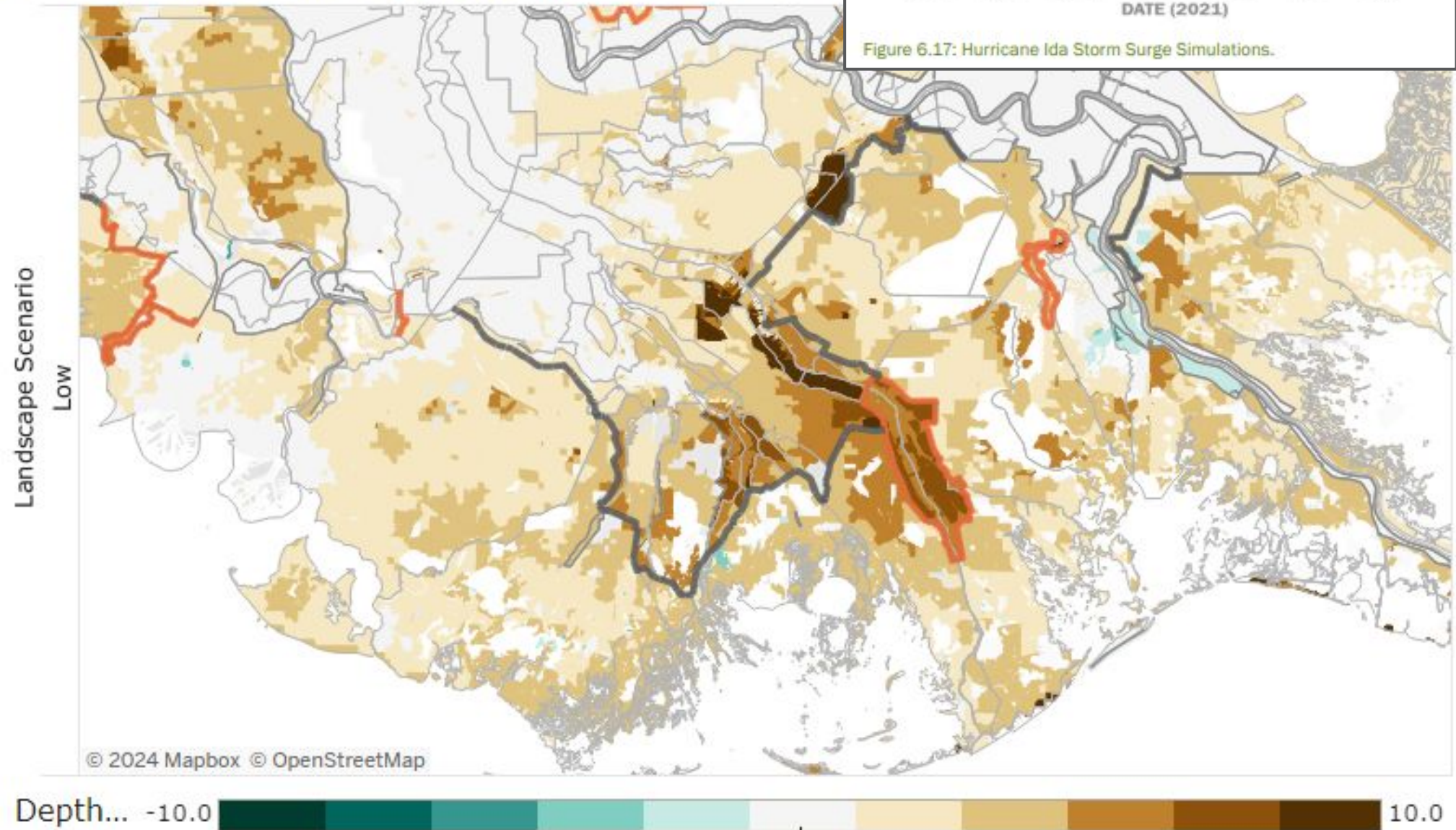
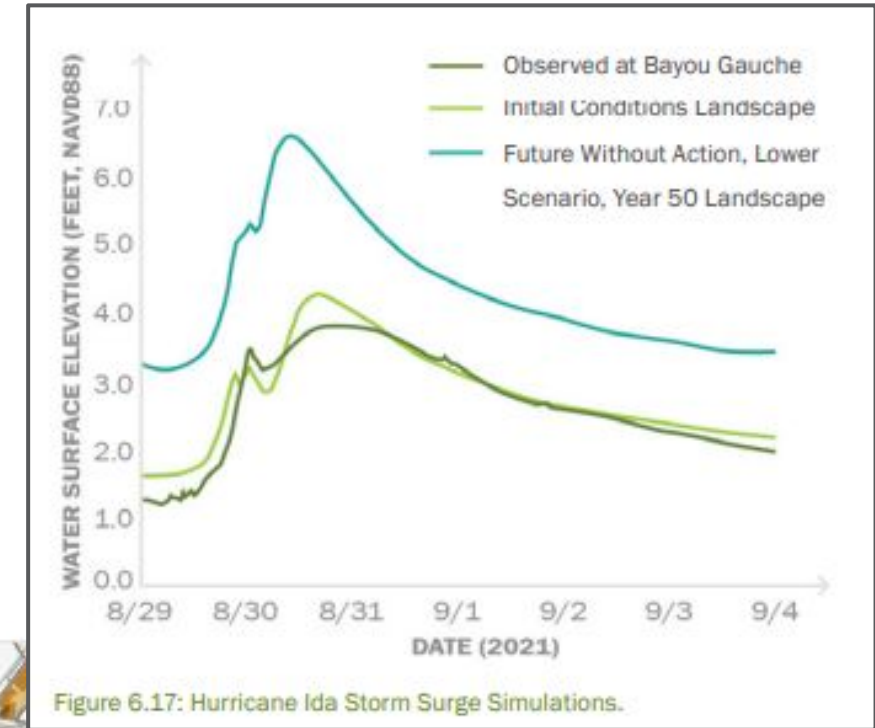
# HISTORIC STORM ANALYSIS

## EXPLORATORY ANALYSIS

### Hurricane Ida

In 50 years without action, we are projecting an additional 3-4ft of storm surge near Lafitte.

Areas near the Larose to Golden Meadow system would see an additional 3-5 ft of storm surge that would overtop the existing levee and cause extensive flooding.



Hurricane Ida Depth Difference Year 50 - Year 0

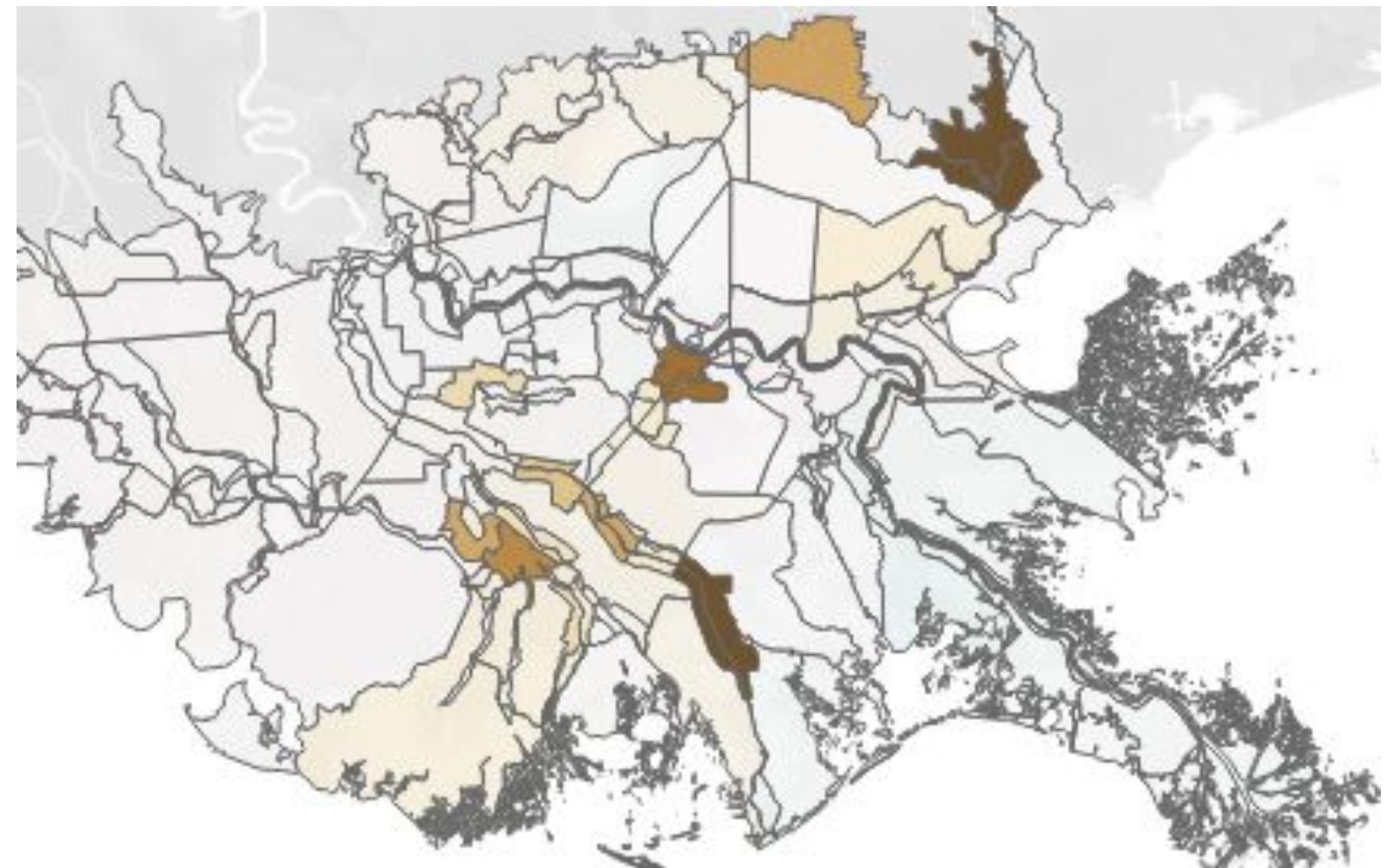
# HISTORIC STORM ANALYSIS

## EXPLORATORY ANALYSIS

### Hurricane Ida

Without action the areas around Larose to Golden Meadow system would see an additional 3-5 ft of storm surge that would overtop the existing levee and cause extensive flooding and an estimated \$1.6 billion in damage.

We also see increased flood damage from Houma to the North Shore



Hurricane Ida Flood Damage Year 50 - Year 0

# ACKNOWLEDGEMENTS

## Contributing Team Members

- Water Institute
  - Zach Cobell
  - Ovel Diaz
  - Jordan Fischbach
  - Scott Hemmerling
  - Patrick Kane
  - Abby Littman
- Purdue University
  - David R. Johnson
  - Jingya Wang
- CPRA
  - Stuart Brown
  - Ashley Cobb
  - Madeline LeBlanc Hatfield
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**THANK YOU!**

