

# Non-Structural Concepts from The SSPEED Center Project “After Hurricane Ike”

Research Funded by Houston Endowment Inc.



Presentation By Jim Blackburn

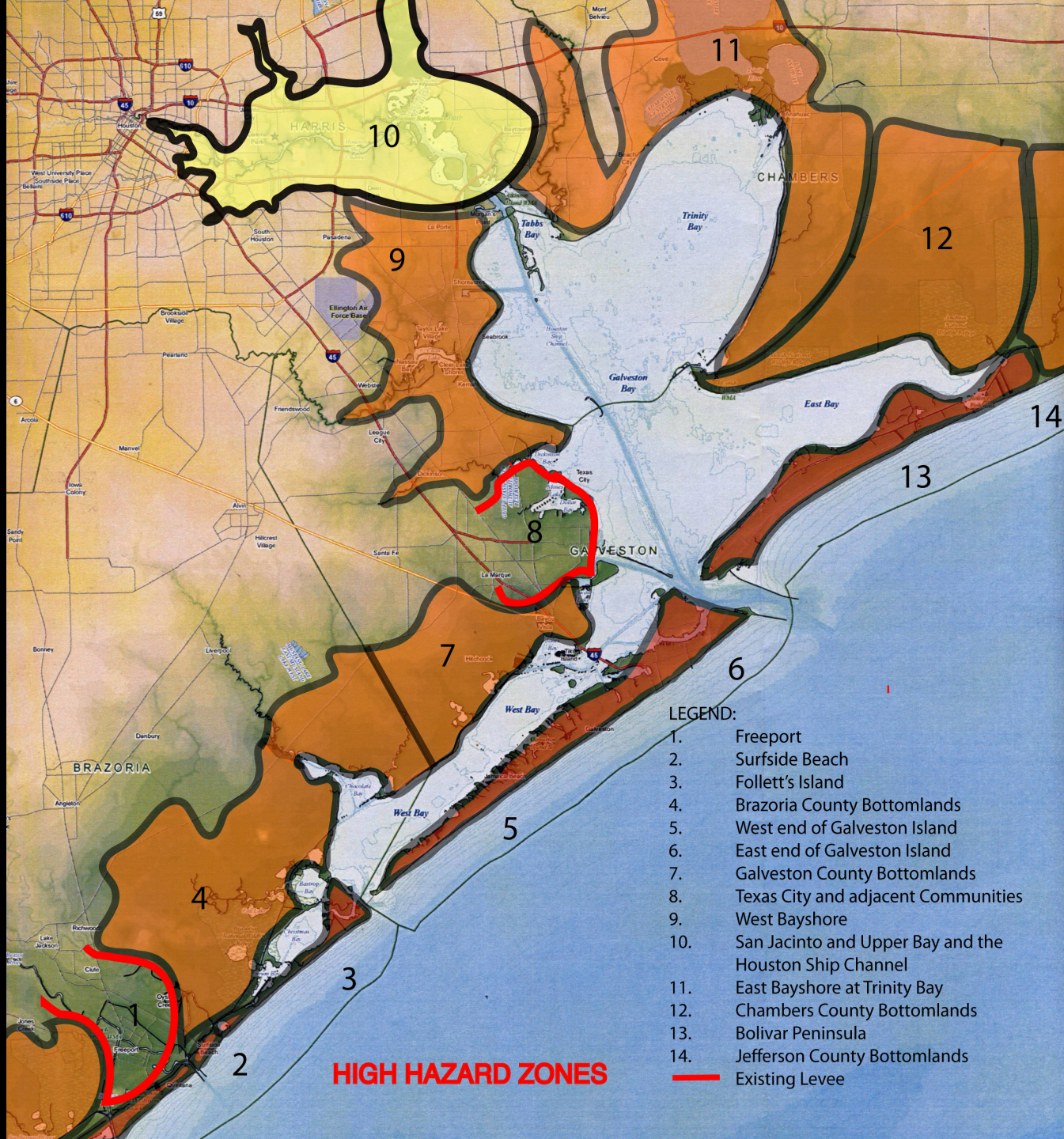
Severe Storm Prediction, Education, and  
Evacuation from Disasters (SSPEED) Center  
Rice University, Houston, Texas



# SSPEED Center

## Flood Solution Design Team

Dr. Phil Bedient	Hydrology, Rice Univ.
Jim Blackburn	Environmental Law, Rice Univ.
Dr. Sam Brody	Planner, Texas A&M Galveston
Kevin Shanley	Planner, SWA Architects Houston
Tom Colbert	Planner, U of H School of Architecture
Lynn Scarlett	Institutional Structure and Regs
Dr. Ron Sass	Ecologist, Rice University
Dr. John Jacob	Planner, Texas A&M Sea Grant
Dr. John Anderson	Coastal Geologist, Rice Univ.
Dr. Carol Lewis	Transportation, TSU
Dr. Hanadi Rifai	Hydrology, U of H Civil Engineering
Dr. Jamie Padgett	Bridge Structures, Rice Univ.
Dr. Clint Dawson	Surge Modeling, U.T. Austin
Dr. Gordon Wells	Surge Modeling, U.T. Austin



**LEGEND:**

1. Freeport
  2. Surfside Beach
  3. Follett's Island
  4. Brazoria County Bottomlands
  5. West end of Galveston Island
  6. East end of Galveston Island
  7. Galveston County Bottomlands
  8. Texas City and adjacent Communities
  9. West Bayshore
  10. San Jacinto and Upper Bay and the Houston Ship Channel
  11. East Bayshore at Trinity Bay
  12. Chambers County Bottomlands
  13. Bolivar Peninsula
  14. Jefferson County Bottomlands
- Existing Levee

**HIGH HAZARD ZONES**

# Hurricane Ike And Other Scenarios

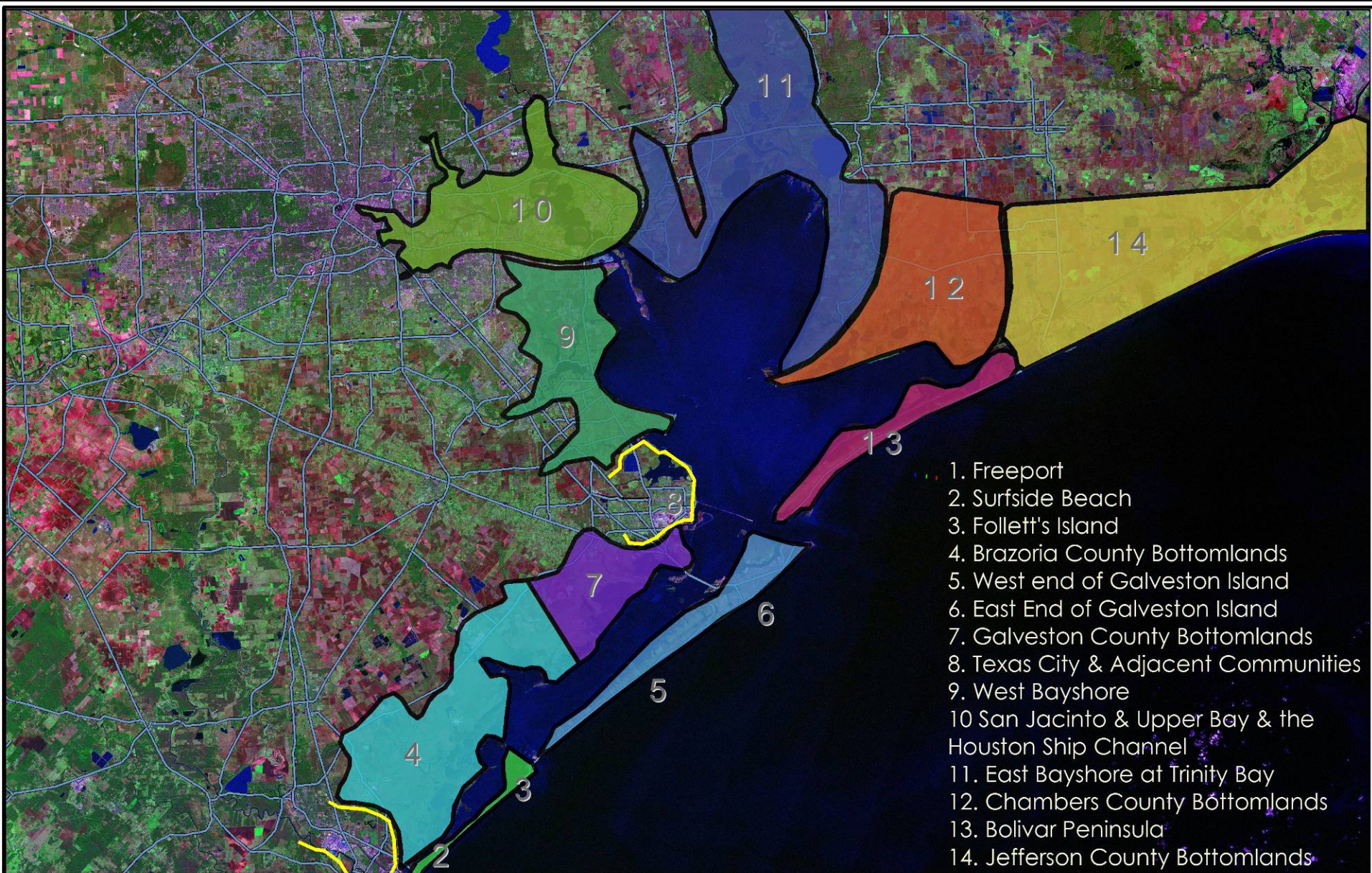


# **Mixed Structural/Non-Structural Alternatives Being Developed/Evaluated**

- Levee for City of Galveston**
- Levee for Upper West Side of Galveston Bay**
- Gate Beneath the Hartman Bridge for the Ship Channel**
- Selective Structures on the Bolivar Peninsula**

# Non-Structural Working Concepts

- Different Solutions for Different Sectors
- Informed by work of Sam Brody, Kevin Shanley and Tom Colbert
- Informed by natural values of ecological system
- Informed by Common Sense
- Focus on cost savings associated with non-structural alternatives
- Focus on speed of implementation
- Science vs. Belief Structure



1. Freeport
2. Surfside Beach
3. Follett's Island
4. Brazoria County Bottomlands
5. West end of Galveston Island
6. East End of Galveston Island
7. Galveston County Bottomlands
8. Texas City & Adjacent Communities
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- 10 San Jacinto & Upper Bay & the Houston Ship Channel
11. East Bayshore at Trinity Bay
12. Chambers County Bottomlands
13. Bolivar Peninsula
14. Jefferson County Bottomlands

# High Hazard Zones

## Conceptual Drawing

### Legend

- Dikes
- HGAC Major Roads
- 0

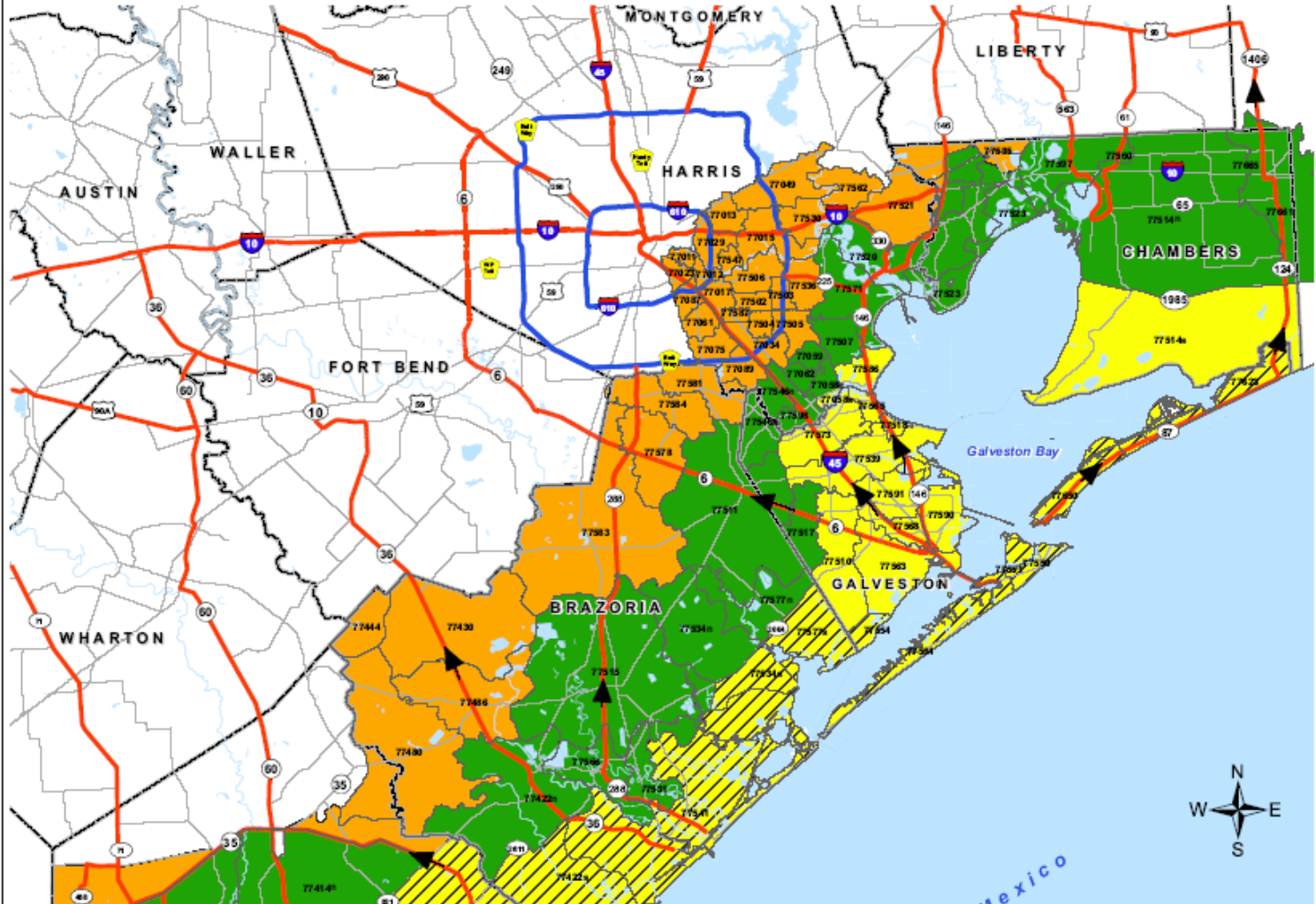


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**BECK GEODETIX**  
ENVIRONMENTAL GIS | GPS MAPPING CONSULTANTS

Drawn By: Bryan Carlie for Jim Blackburn  
 Date: May 22, 2010

**Brazoria, Chambers,  
Galveston, Harris and  
Matagorda  
Hurricane Evacuation  
Zip-Zones  
Coastal, A, B, C**



Zip-Zone Coastal			
77414s	77483	77550	77577s
77422s	77534s	77551	77617
77465s	77541	77554	77623
Zip-Zone A			
77058s	77518	77565	77586
77510	77539	77568	77590
77514s	77563	77573	77591
Zip-Zone B			
77058n	77507	77522	77560
77059	77511	77523	77566
77062	77514n	77531	77571
77414n	77515	77534n	77577n
77422n	77517	77546n	77597
77465n	77520	77546s	77598
Zip-Zone C			
77011	77034	77444	77505
77012	77049	77463	77506
77013	77061	77480	77521
77015	77075	77486	77530
77017	77087	77502	77535
77023	77089	77503	77536
77029	77430	77504	77547

**Route Designation**

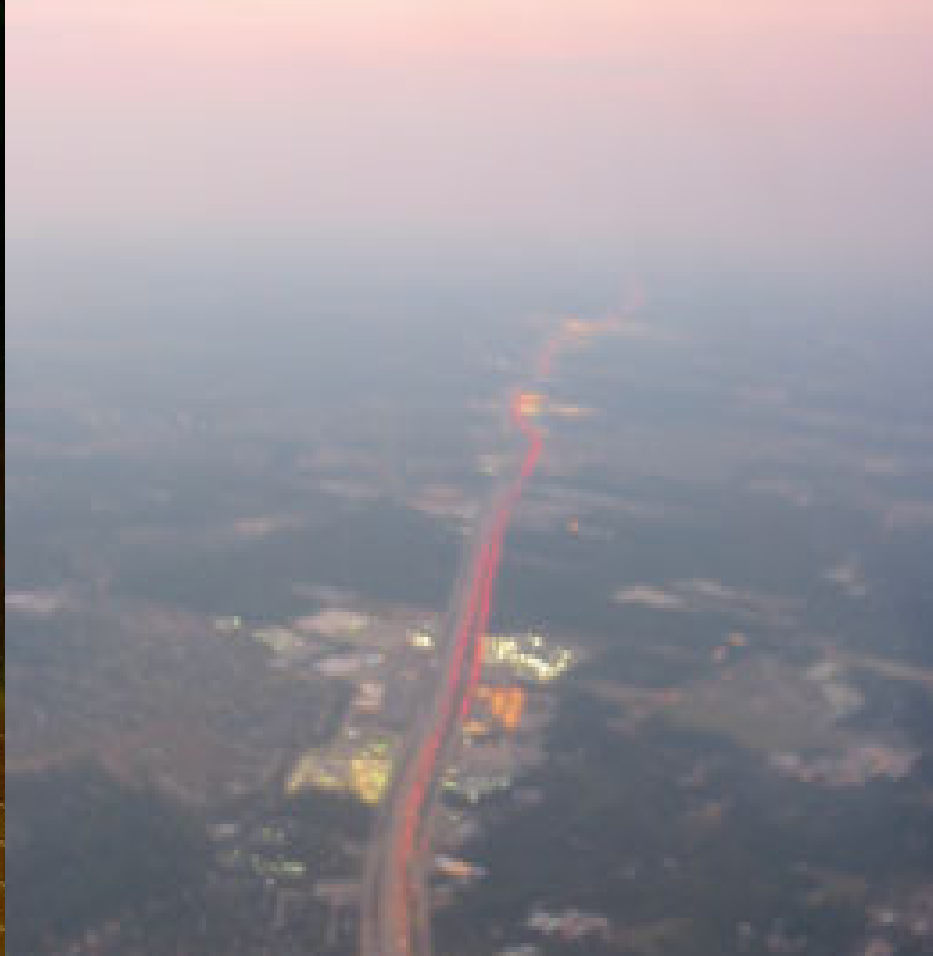
- Evacuation Corridors (Red line with arrow)
- Evacuation Connections (Blue line)
- Other Roads (Grey line)
- County Boundary (Dashed line)



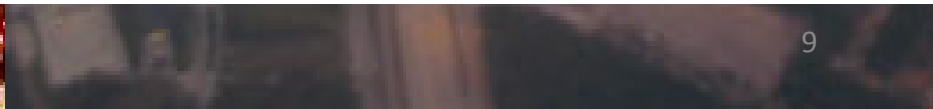
**Inadequate Information  
+/- 500,000 New Residents**



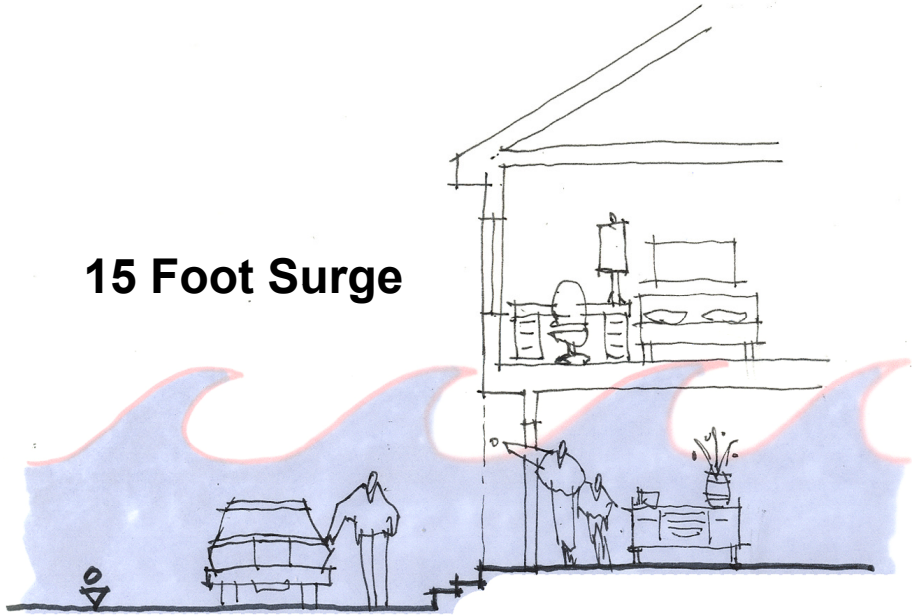




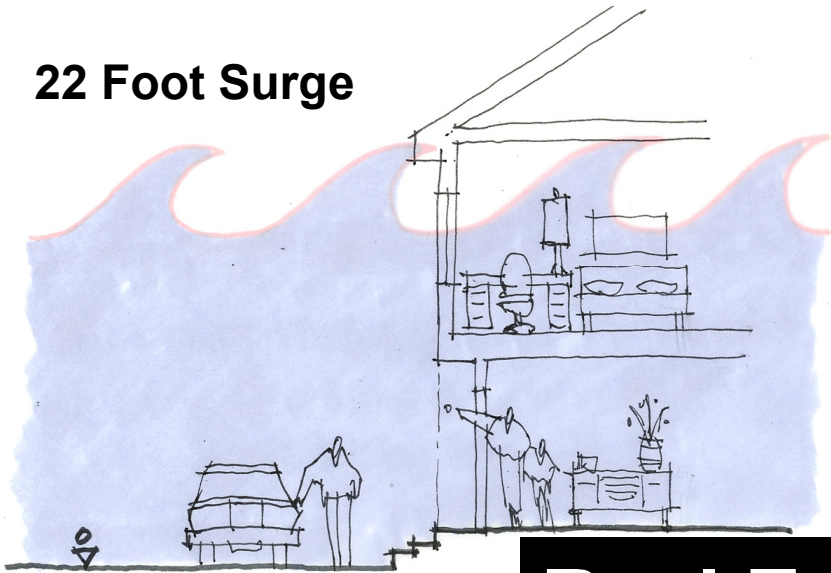
**“We cannot safely evacuate the people currently living in the Hurricane Evacuation Zones much less evacuate another 500,000 persons projected to move into this area”. Dr. Carol Lewis**



**15 Foot Surge**



**22 Foot Surge**



**Real Estate Disclosure**



# High Hazard Zones


## Conceptual Drawing

### Legend

 Dikes  HGAC Major Roads

High Hazard Zones

 0

0 0.51 2 3 4  
 Miles



Sheet No.

1



Drawn By: Bryan Carille for Jim Blackburn

Date: May 22, 2010

Concept-Kevin Shanley, SWA Group Imagery - Land Sat ETM

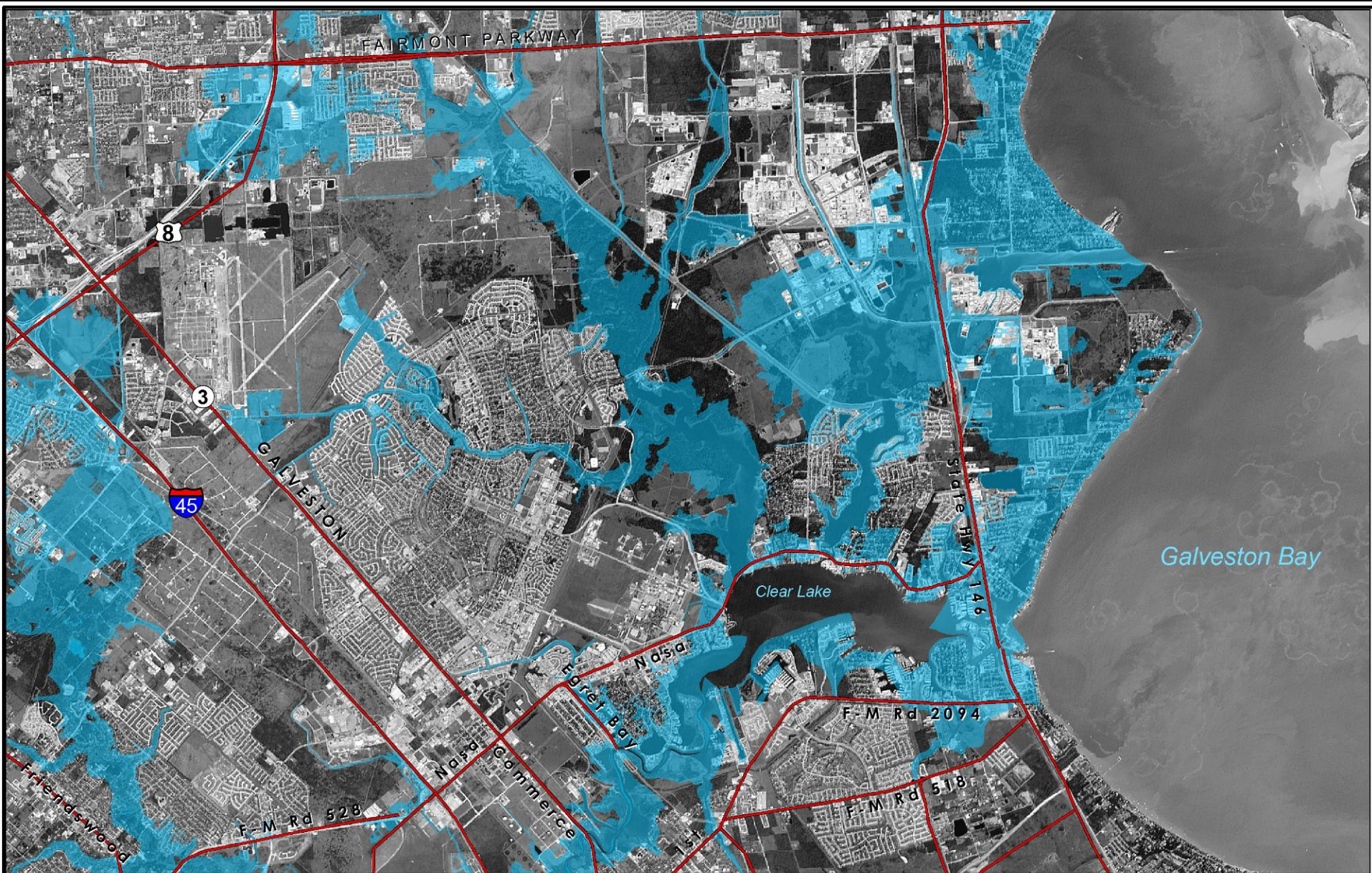
# Flood Plain Information

FIRMs produced in 2007 did not develop new surge-related flood elevations

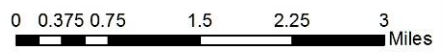
Current FIRMs do not give adequate or accurate information about the potential for flood surge damage

New maps are forthcoming but not sure when

Not sure what surge elevation will be used



Clear Lake, Nasa & Armand Bayou  
Area of Interest - 100 Year Flood Zone

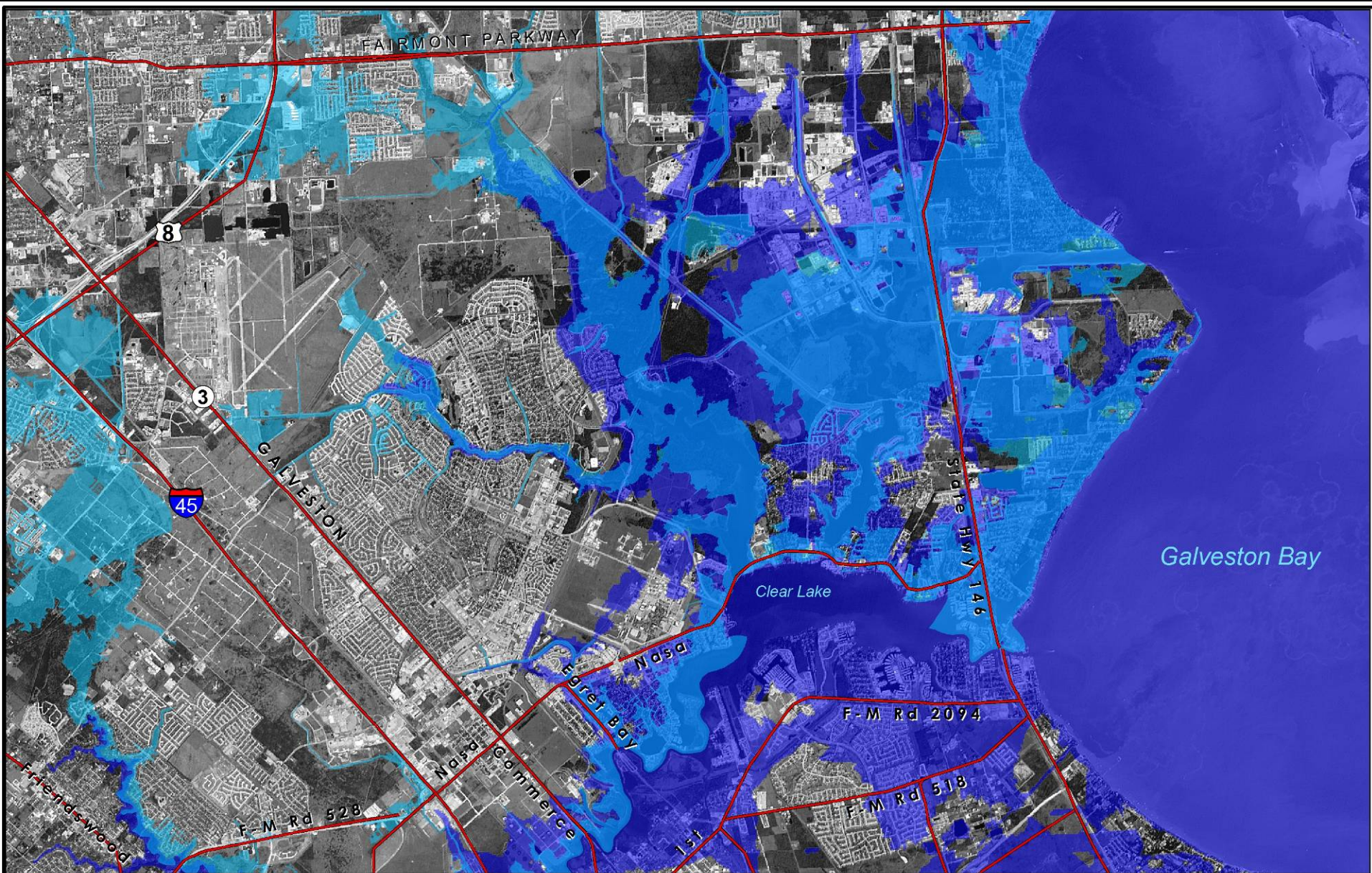


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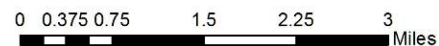
Drawn By: Bryan Carlie for Jim Blackburn

Data Source: SPOT Imagery, Roads: HGAC, Flood Data: H.C.F.C.D. Rev. 2007, FEMA, 2604.

Date: May 22, 2010



Clear Lake, Nasa & Armand Bayou  
 Area of Interest - 16.7 Ft. Storm Surge &  
 100 Year Flood Zone



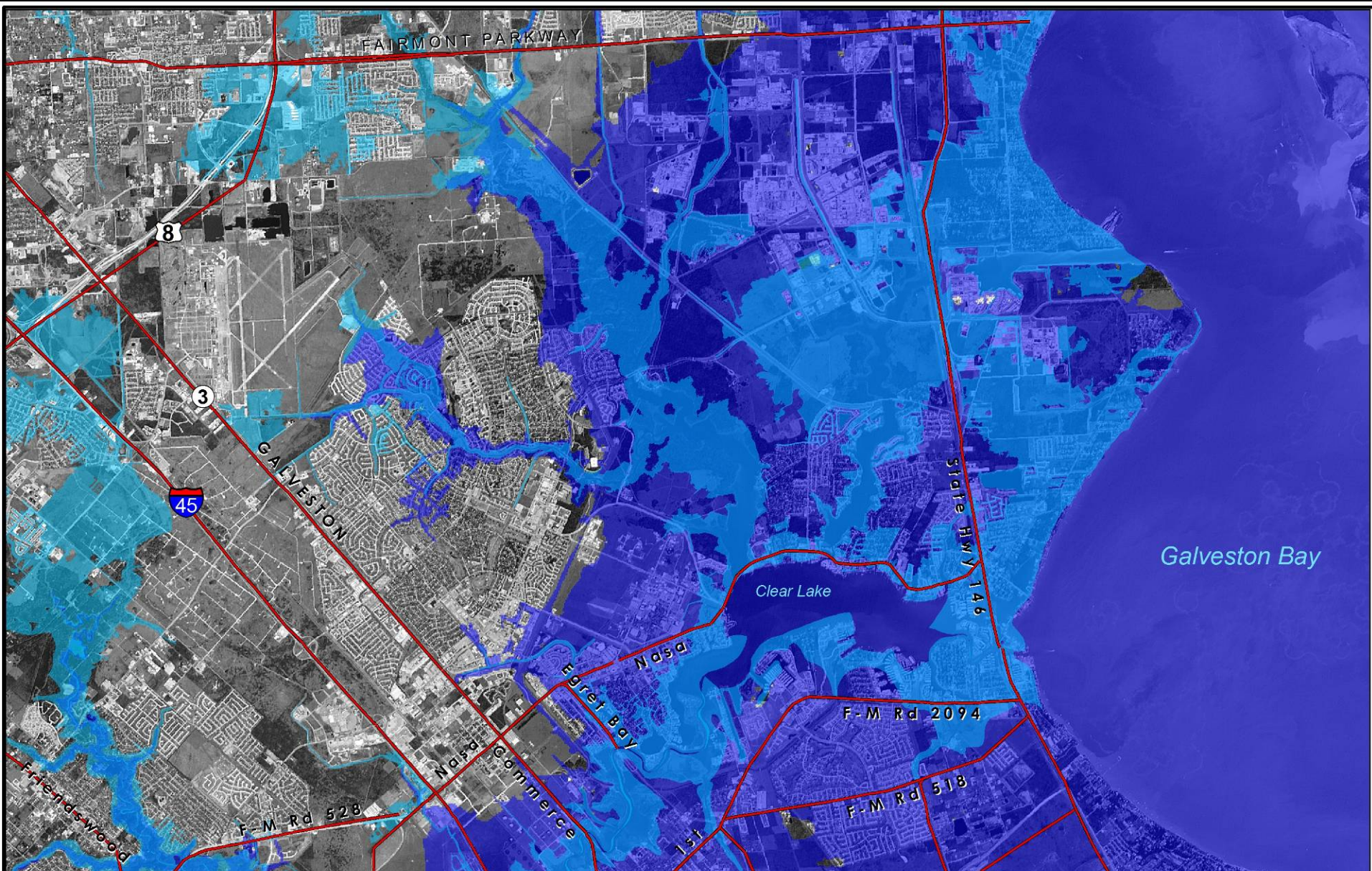
Sheet No.

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Drawn By: Bryan Carlie for Jim Blackburn

Date: May 22, 2010

Data Source: SPOT Imagery, Roads: HGAC, Flood Data: H.C.F.C.D. Rev. 2007. Storm Surge Data: G. Well, UT.

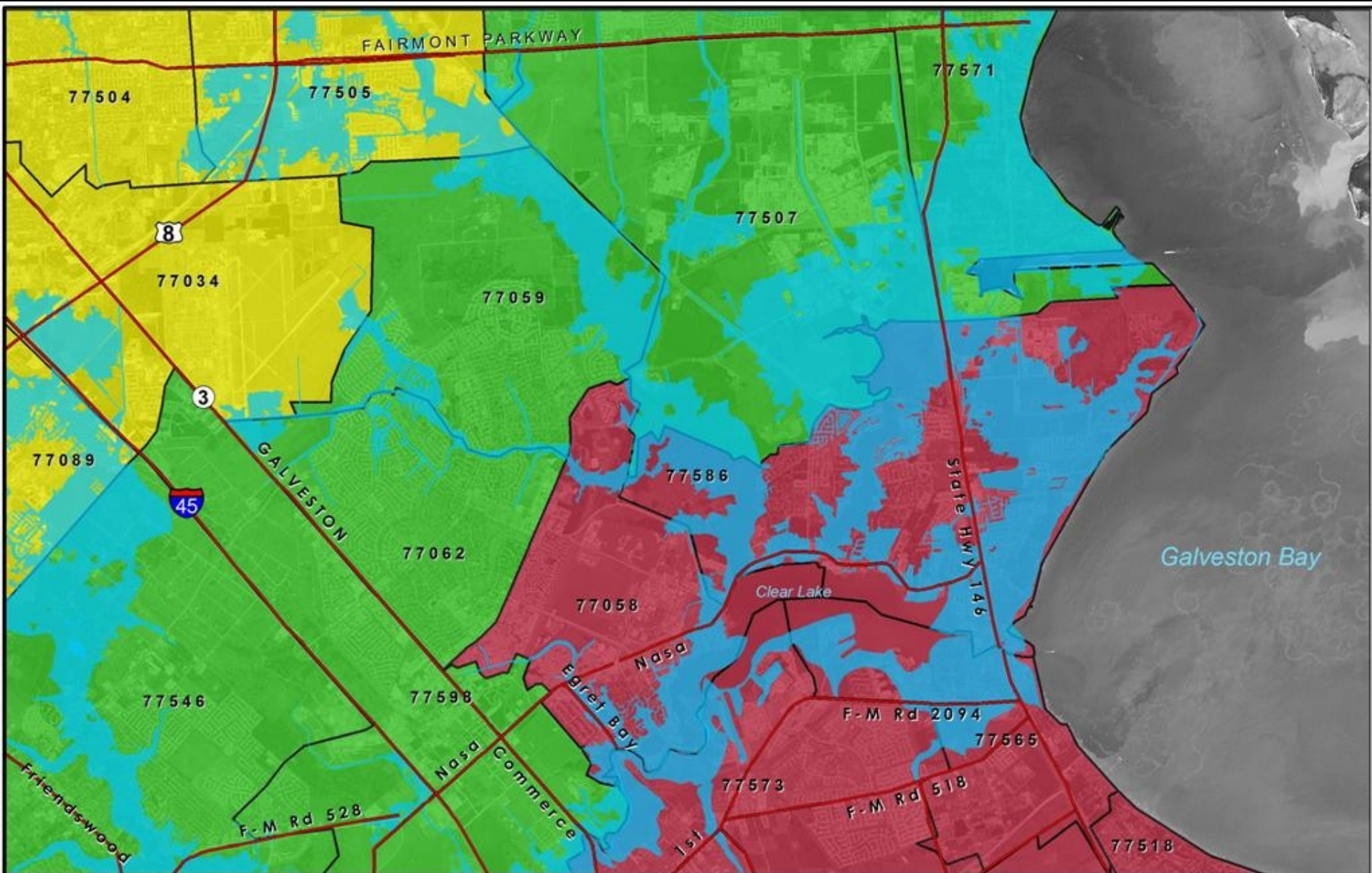


Clear Lake, Nasa & Armand Bayou  
 Area of Interest - 20.4 Ft. Storm Surge &  
 100 Year Flood Zone

0 0.3 0.6 1.2 1.8 2.4 Miles

Data Source: SPOT Imagery, Roads: HGAC, Flood Data: H.C.F.C.D. Rev. 2007, FEMA, 2004,  
 Storm Surge Data: G. Well, UT.

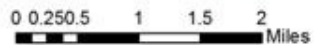
 Sheet No. <b>1</b>	 <b>BECK GEODETIX</b> <small>ENVIRONMENTAL GIS   GPS MAPPING CONSULTANTS</small>
	Drawn By: Bryan Carlie for Jim Blackburn Date: May 22, 2010



Clear Lake, Nasa & Armand Bayou  
 Area of Interest - Hurricane Evacuation  
 Zip Zones - A & B & 100 Year Flood Zones

**ZONE**

<span style="display:inline-block; width:15px; height:15px; background-color:red; border:1px solid black;"></span> A	<span style="display:inline-block; width:15px; height:15px; background-color:yellow; border:1px solid black;"></span> C
<span style="display:inline-block; width:15px; height:15px; background-color:green; border:1px solid black;"></span> B	



Data Source: SPOT Imagery, Roads: HGAC, Flood Data: H.C.F.C.D. Rev. 2007, FEMA, 2004, Storm Surge Data: G. Well, UT Hurricane Evacuation Zone Zip Data - HGAC, 12/2010

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**BECK GEODETIX**  
 ENVIRONMENTAL GIS & UTILITIES CONSULTING

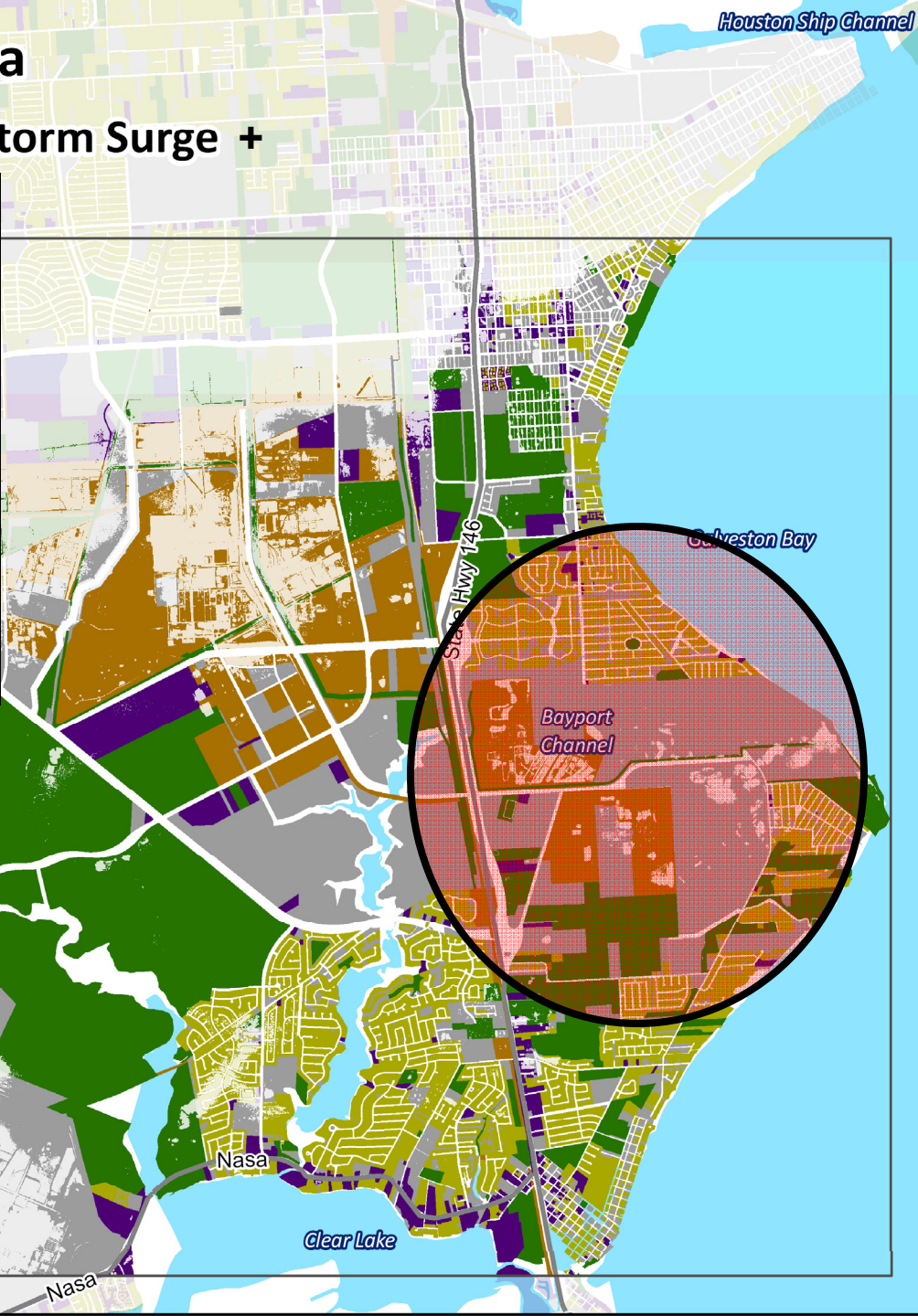
16  
 Drawn By: Bryan Carlie for Jim Blackburn  
 Date: May 22, 2010



# Clear Lake and Galveston Bay Area

Land Parcels Flooded during 15 feet of Storm Surge +

**Buy-Out Zone  
Based On Flooding,  
Noise and Air  
Pollution  
Conserve \$**



## Land Use Category

- Commercial
- Farms, Ranch, Vegetation
- Industrial
- Residential
- Other

Miles






# High Hazard Zones


## Conceptual Drawing

### Legend

 Dikes  HGAC Major Roads

 High Hazard Zones

0

0 0.51 2 3 4  
 Miles



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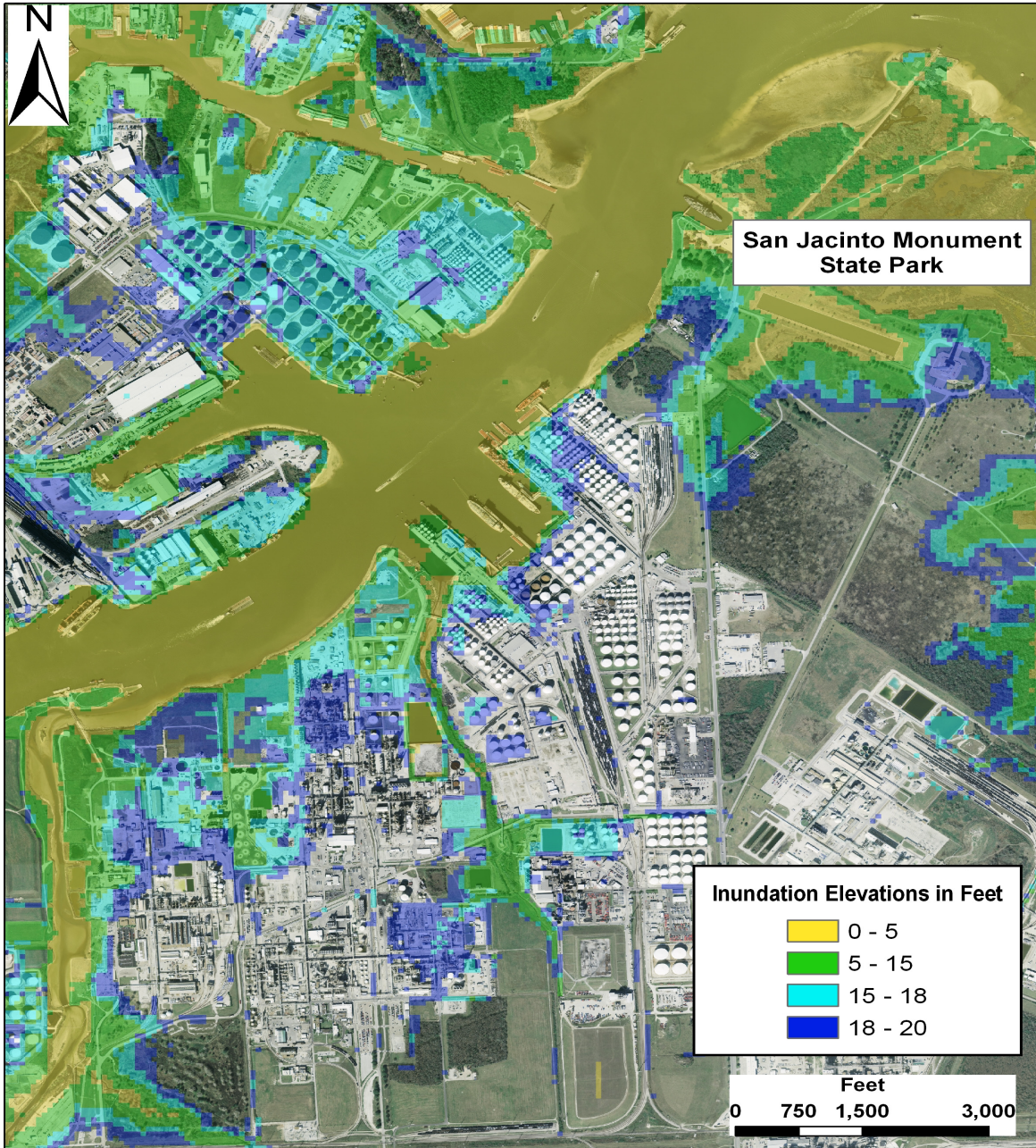
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Drawn By: Bryan Carille for Jim Blackburn

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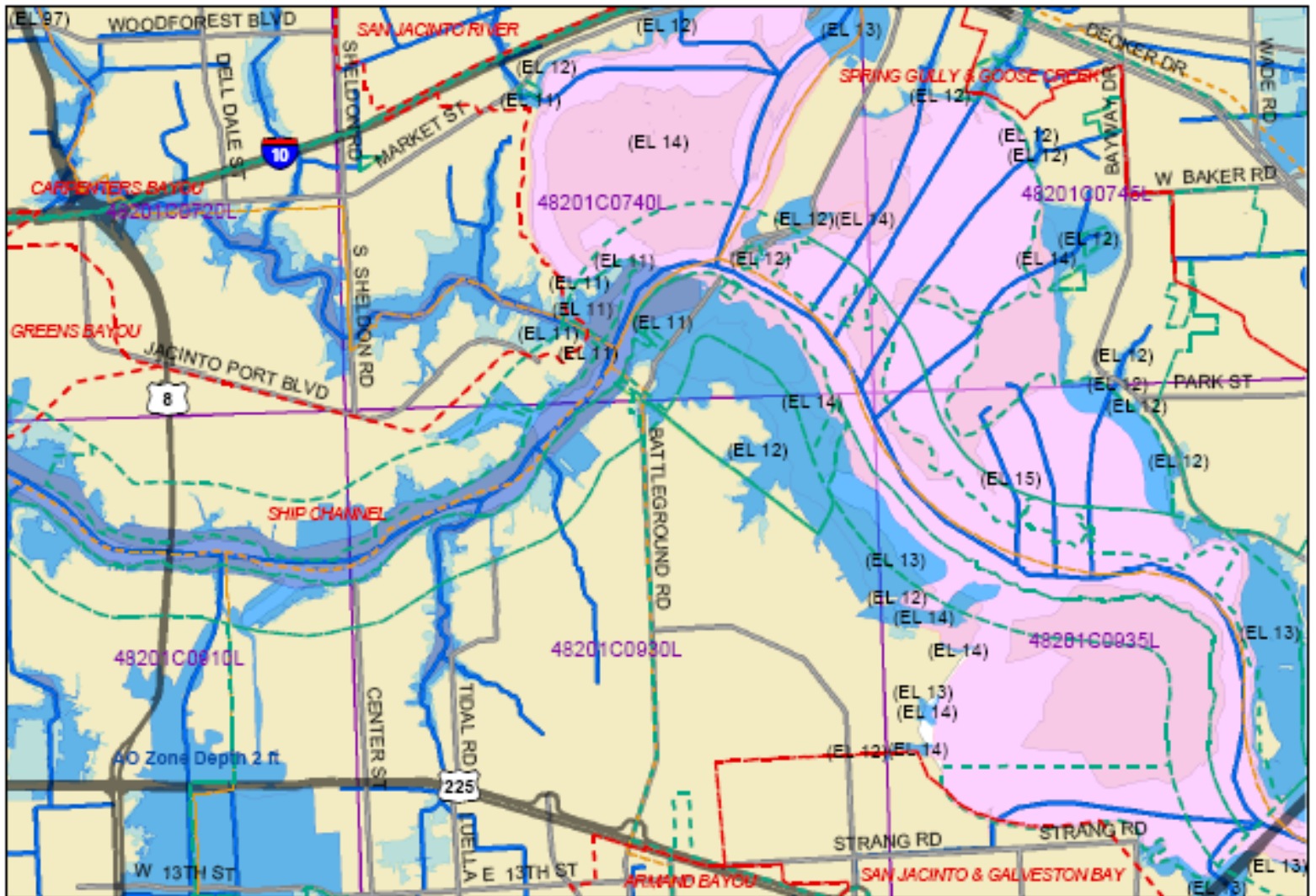
Concept-Kevin Shanley, SWA Group Imagery - Land Sat ETM



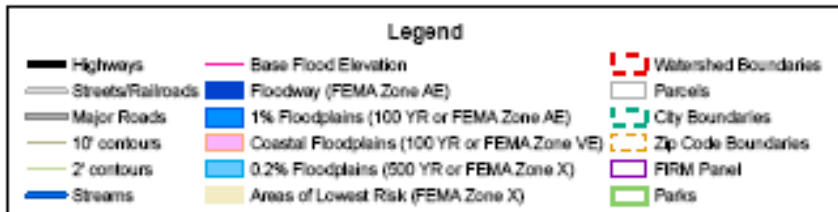
# Inundation Elevations In Ike Geodatabase



# FEMA Floodplains Effective June 18, 2007



All Elevation Data Based on NAVD 1988 2001 Adjustment.



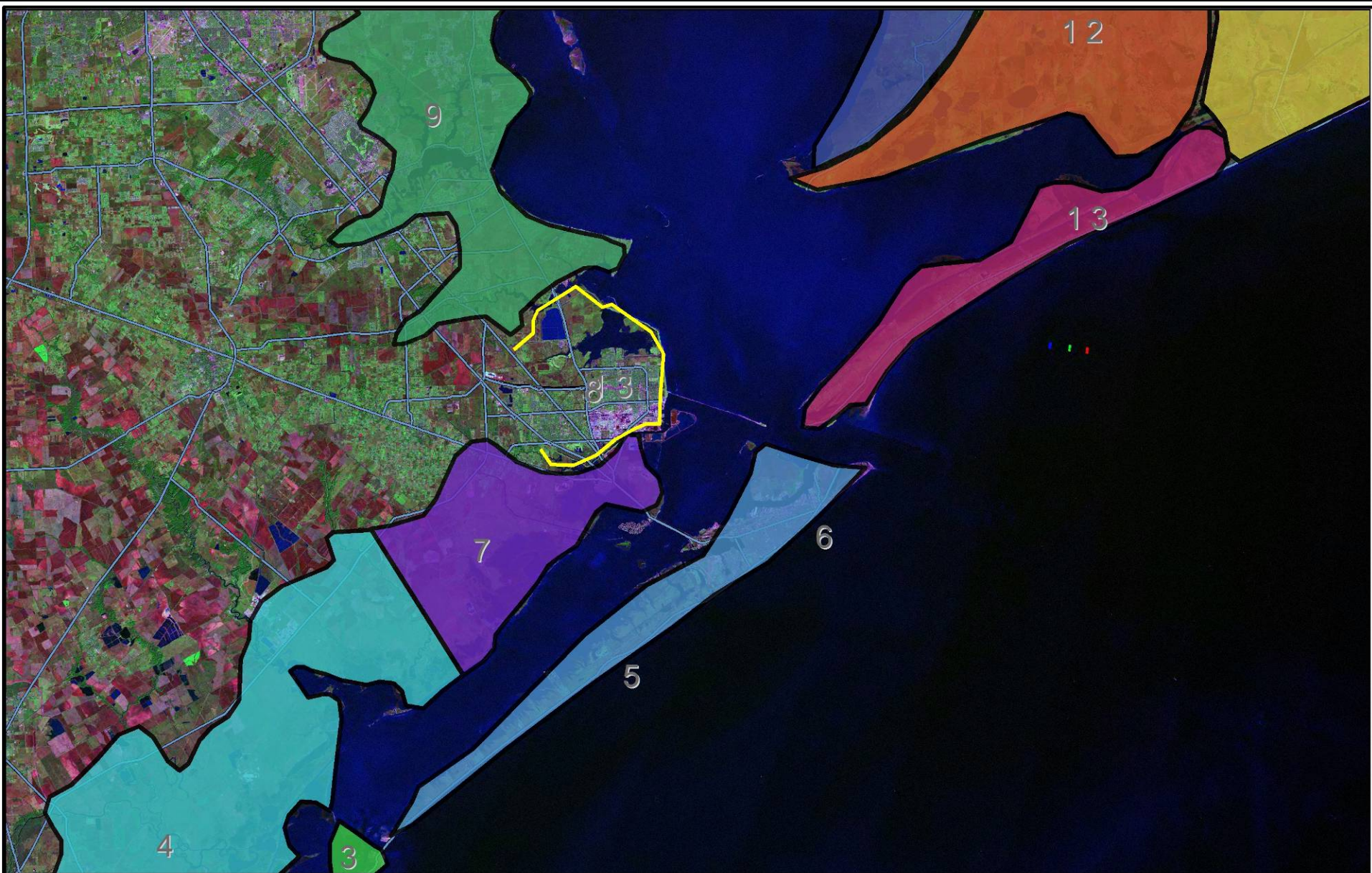
# Non-Structural Alternatives For the Houston Ship Channel

Voluntary Adoption of Higher  
Elevations for Surge

Change in FEMA Flood Maps

Change in Hazardous Waste Rules

Change in SPCC Rules



# High Hazard Zones

## Conceptual Drawing

### Legend

- Dikes
- HGAC Major Roads
- High Hazard Zones
- 0



Sheet No.

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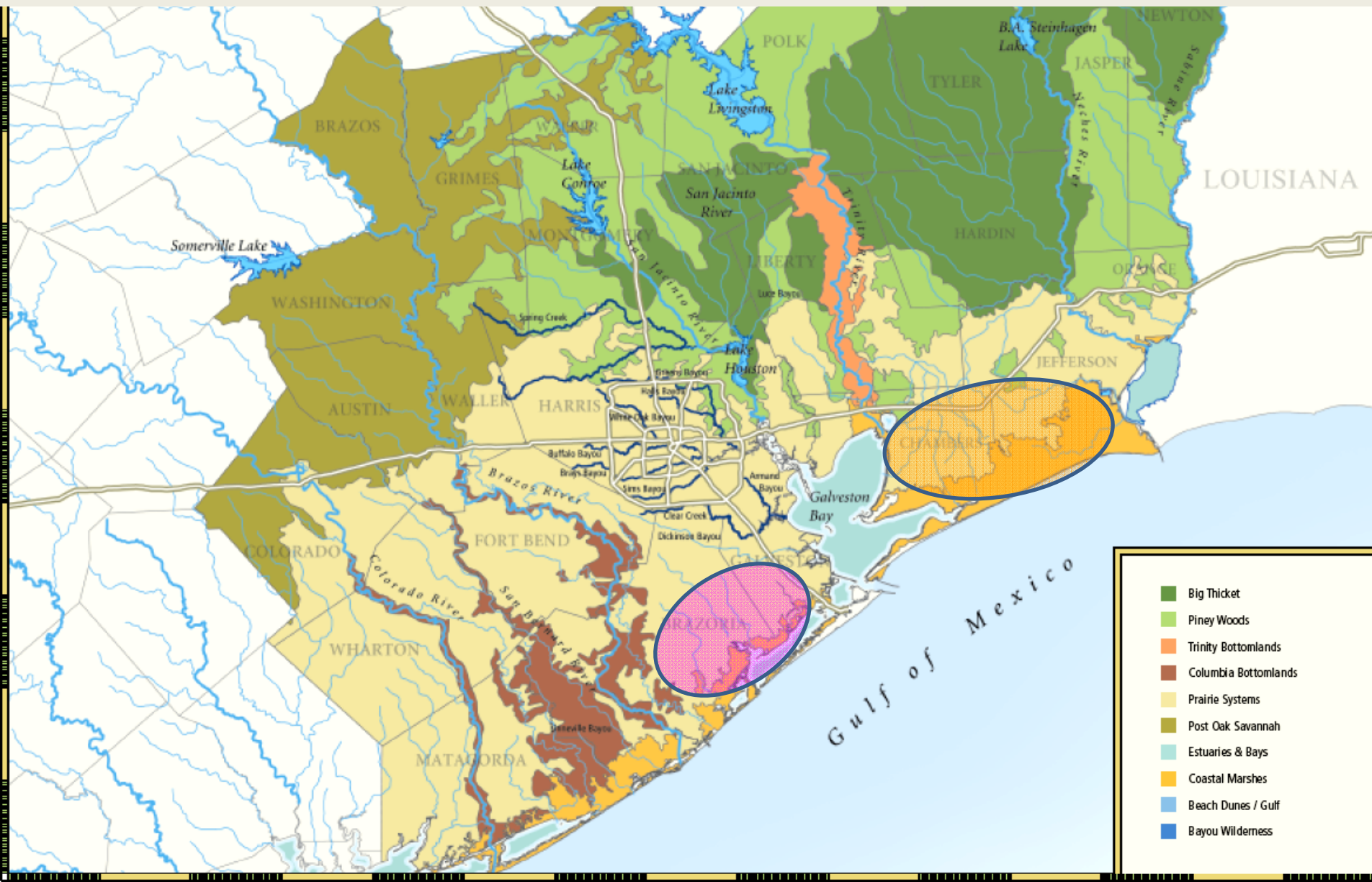


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Concept-Kevin Shanley, SWA Group Imagery - Land Sat ETM

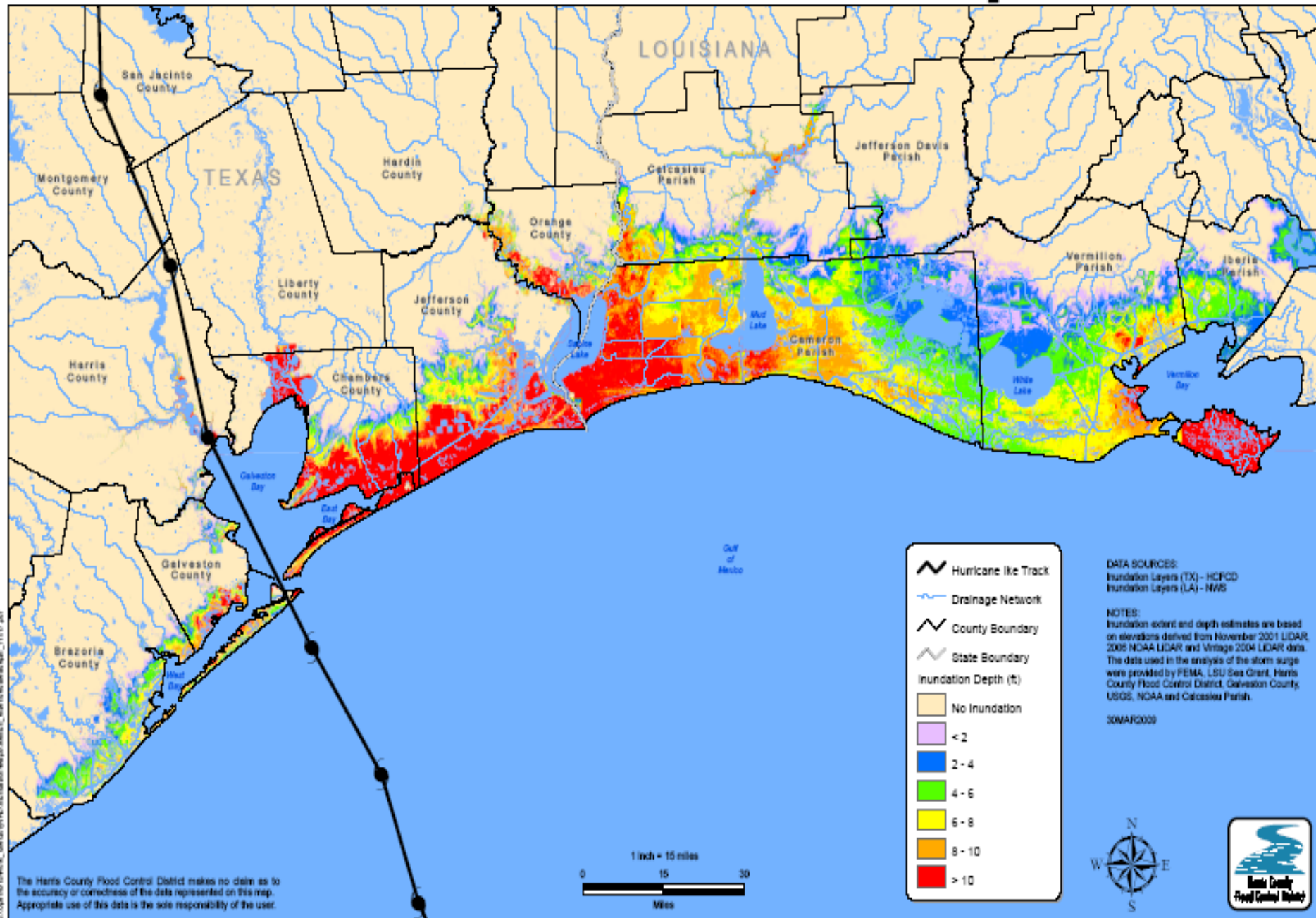
# Capturing the Dollar Value Of Coastal Natural Resource Areas



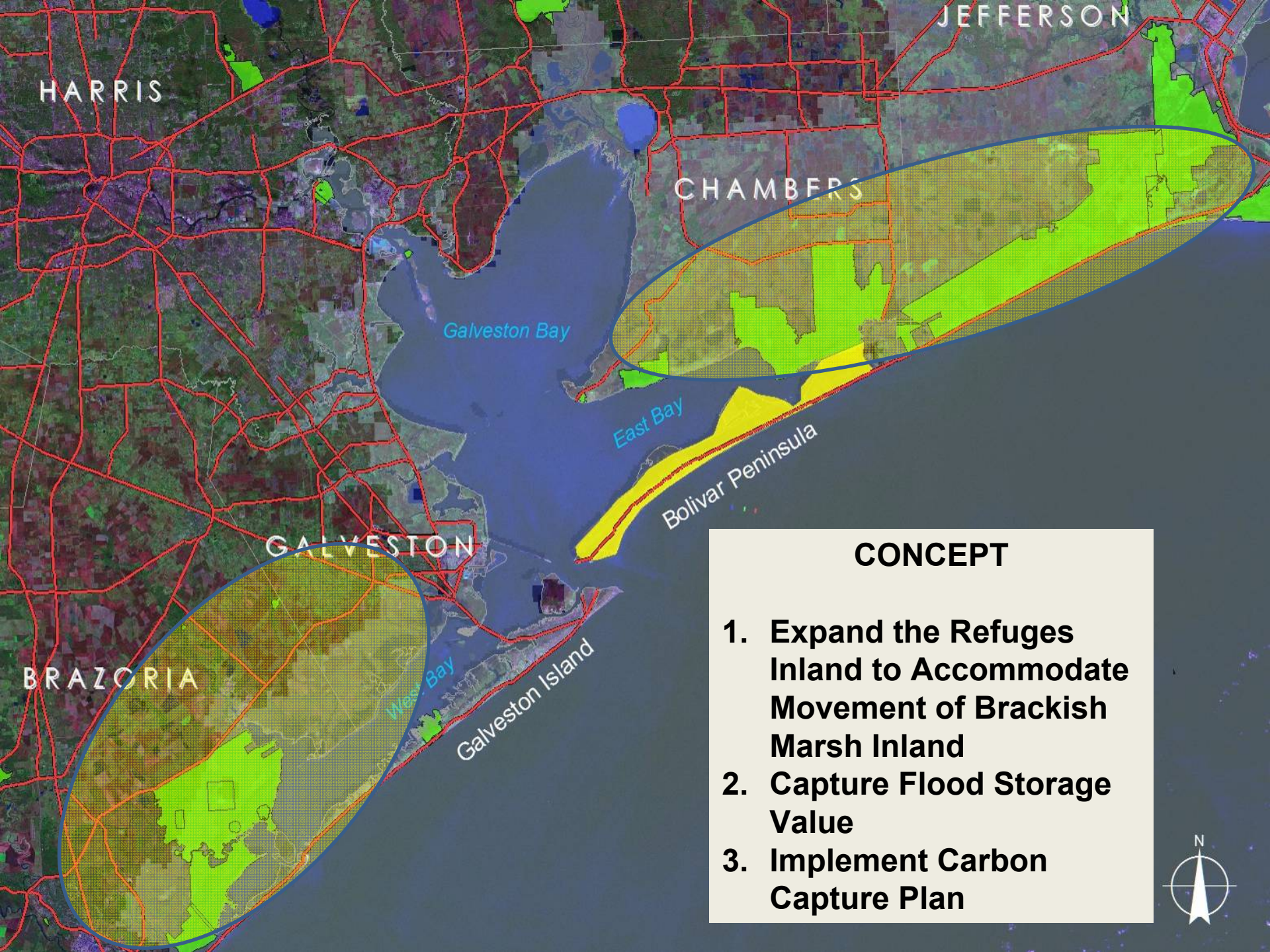




# Hurricane Ike Inundation Depth



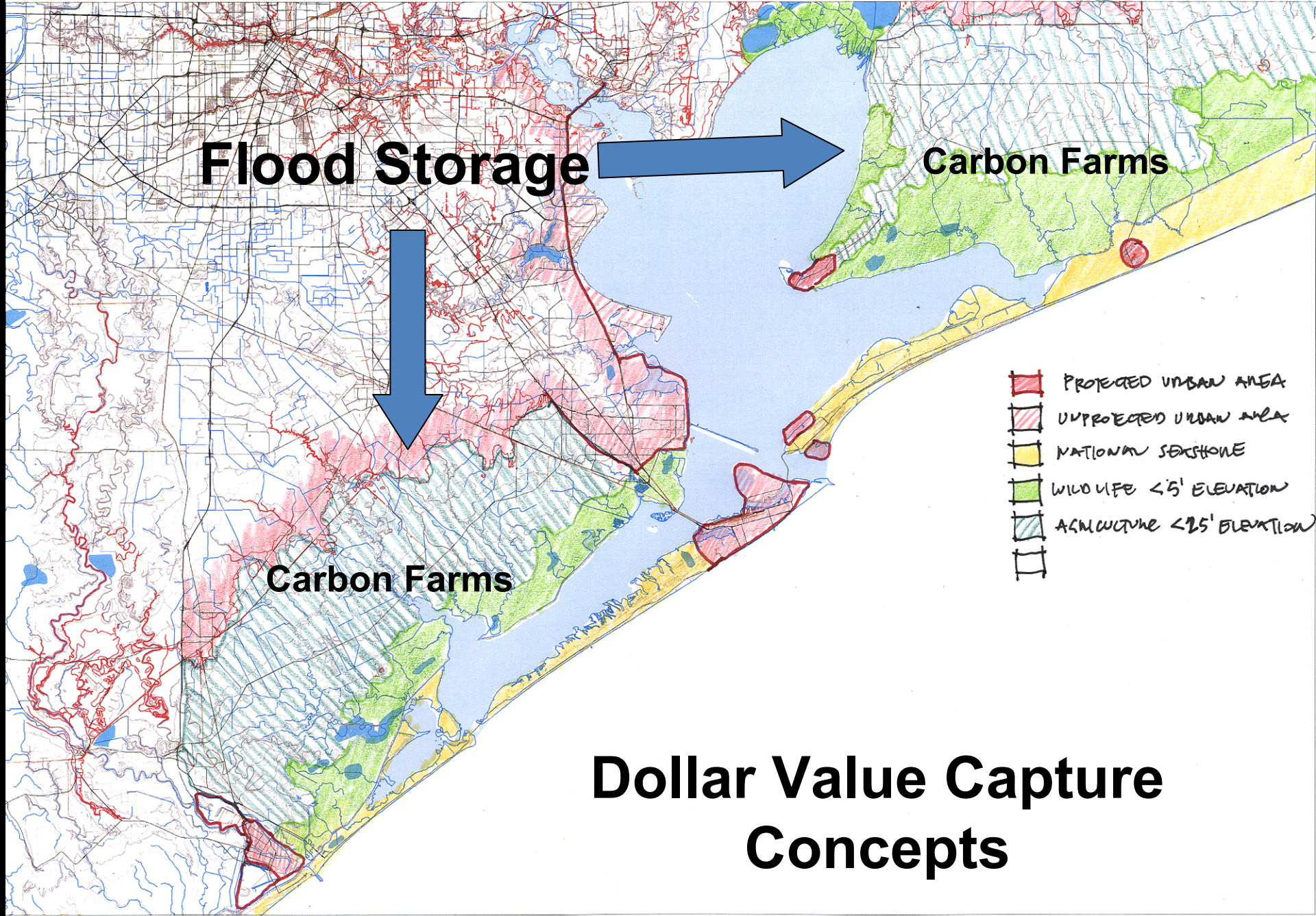




## CONCEPT

1. Expand the Refuges Inland to Accommodate Movement of Brackish Marsh Inland
2. Capture Flood Storage Value
3. Implement Carbon Capture Plan

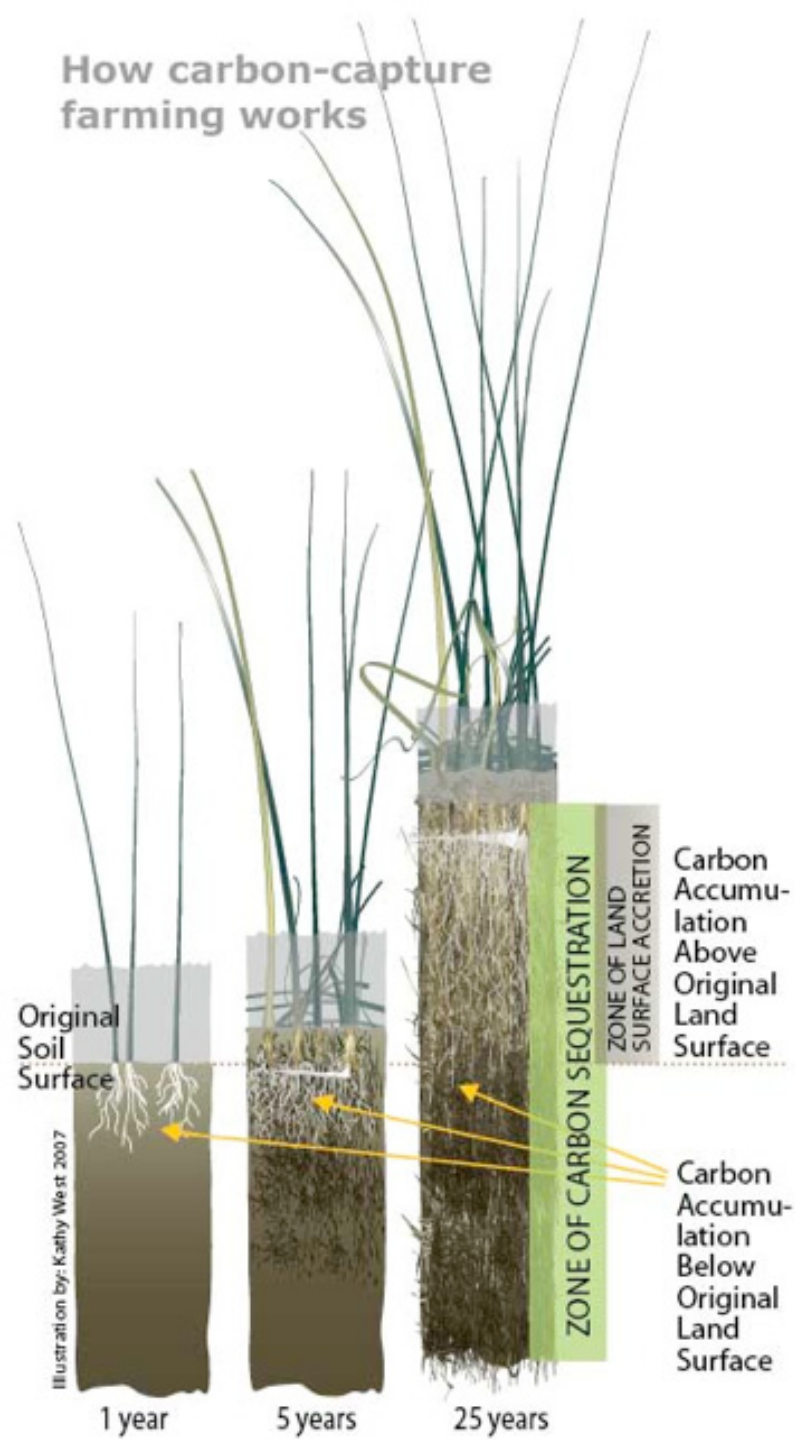




- PROTECTED URBAN AREA
- UNPROTECTED URBAN AREA
- NATIONAL SEASHORE
- WILDLIFE < 5' ELEVATION
- AGRICULTURE < 25' ELEVATION
- 

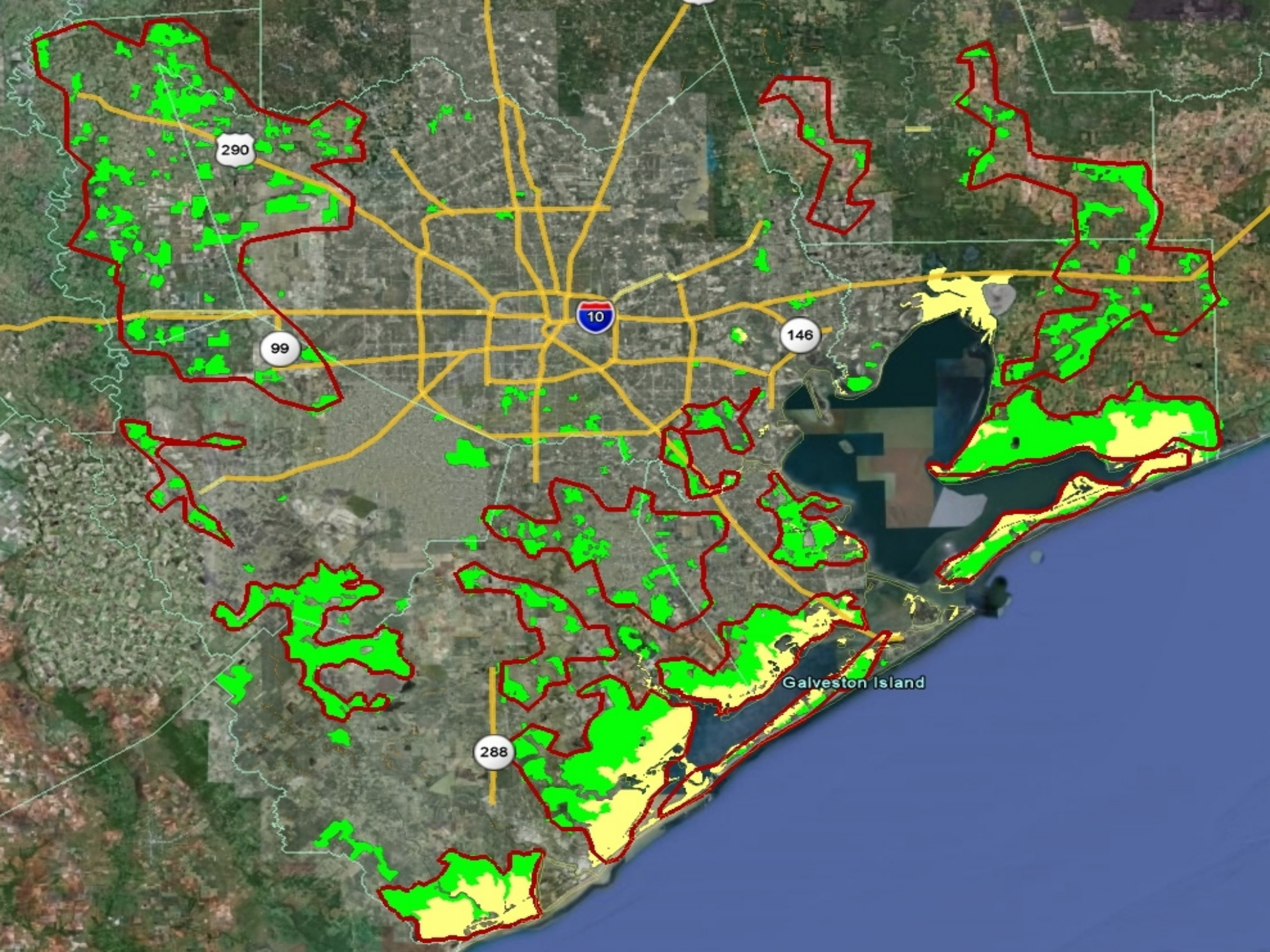


## How carbon-capture farming works



# Sacramento – San Joaquin Delta Study

This study has already shown that the process developed can sequester as much as 25 metric tons of CO<sub>2</sub> per acre per year while nearly eliminating the CO<sub>2</sub> emissions produced by current farming practices. Twenty-five tons CO<sub>2</sub> per acre is equivalent to 6.8 tons C per acre.



290

99

10

146

288

Galveston Island



# High Hazard Zones

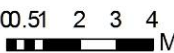
## Conceptual Drawing

### Legend

 Dikes  HGAC Major Roads

High Hazard Zones

 0

 0.5 1 2 3 4 Miles

Concept-Kevin Shanley, SWA Group Imagery - Land Sat ETM



Sheet No.

1



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Date: May 22, 2010

# Bolivar Recreational Area





# **Bolivar Recreation Area**

## **Two Main Institutional Options**

**Model 1: Traditional federal land designations—national seashores, parks, refuges**

**Model 2: Network governance models of shared management & multiple ownerships**

## United States National Seashores

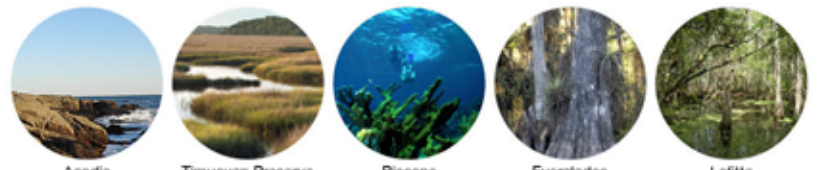
## Additional Shoreline Parks



Cape Cod      Fire Island      Assateague      Cape Lookout      Cape Hatteras



Cumberland Island      Canaveral      Gulf Islands      Padre Island      Point Reyes



Acadia      Timucuan Preserve      Biscane      Everglades      Lafayette

# **Innovative Federal/Local/Private Partnerships**

## ***Ebey's Landing National Historic Reserve***

**Mixes federal, state, county & private property**

**Extensive use of scenic easements for protection**

**Land remains in private ownership and on tax rolls**

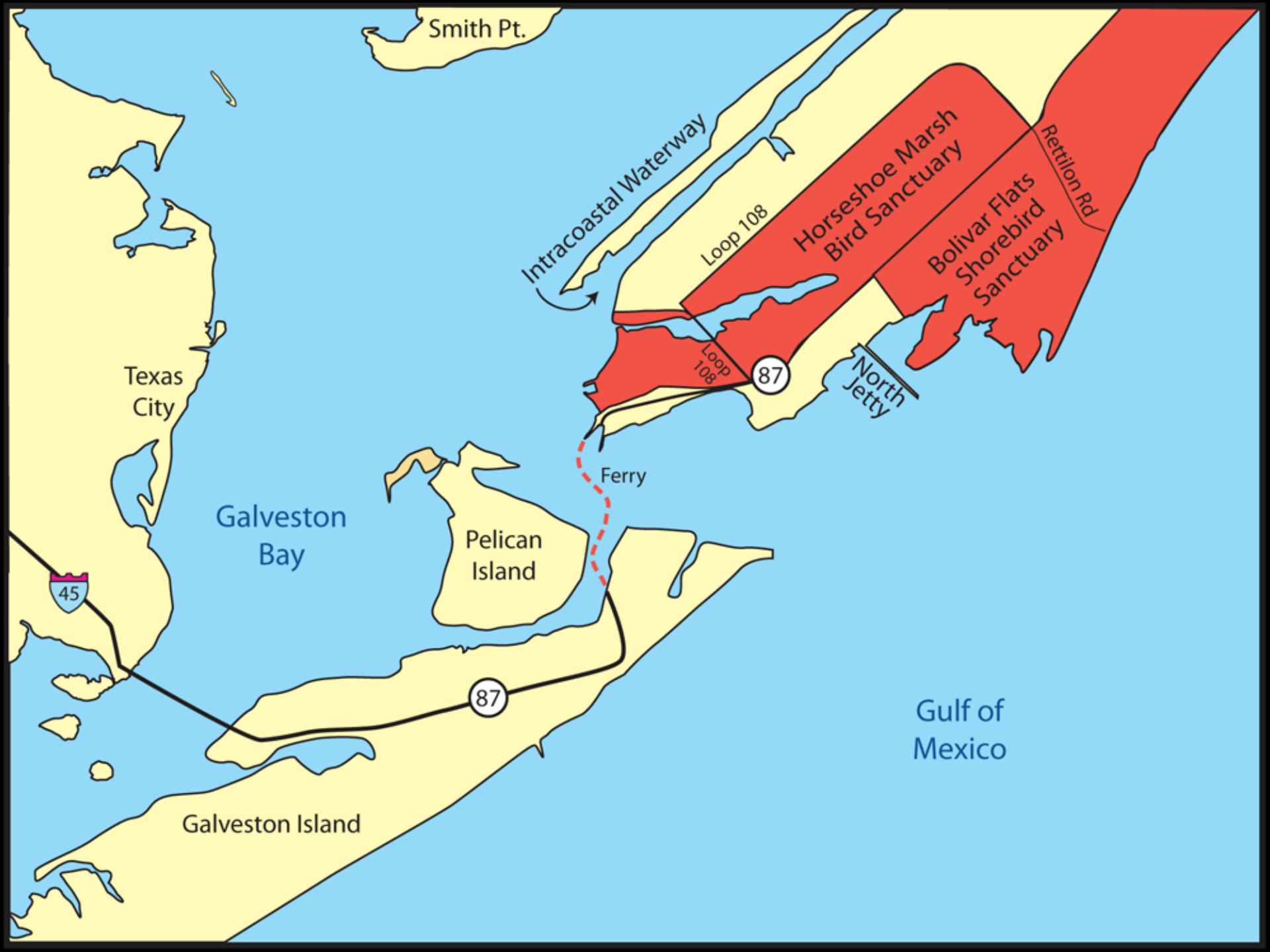
**9-member Trust Board appointed by community governs the Reserve**

## ***Blackfoot Challenge (Montana)***

**Includes over 500 private citizens and landowners, 7 federal agencies, 29 corporations, 45 state and local agencies, 17 foundations, 31 nonprofit organizations**

**Conservation focus on 1.5-million acre watershed along 132 miles of river**

**Within management area, about half of lands federally owned; 7% state-owned; remainder is private**



Smith Pt.

Intracoastal Waterway

Loop 108

Horseshoe Marsh  
Bird Sanctuary

Bolivar Flats  
Shorebird  
Sanctuary

Rettilon Rd

Texas  
City

Loop  
108

87

North  
Jetty

Ferry

Galveston  
Bay

Pelican  
Island

45

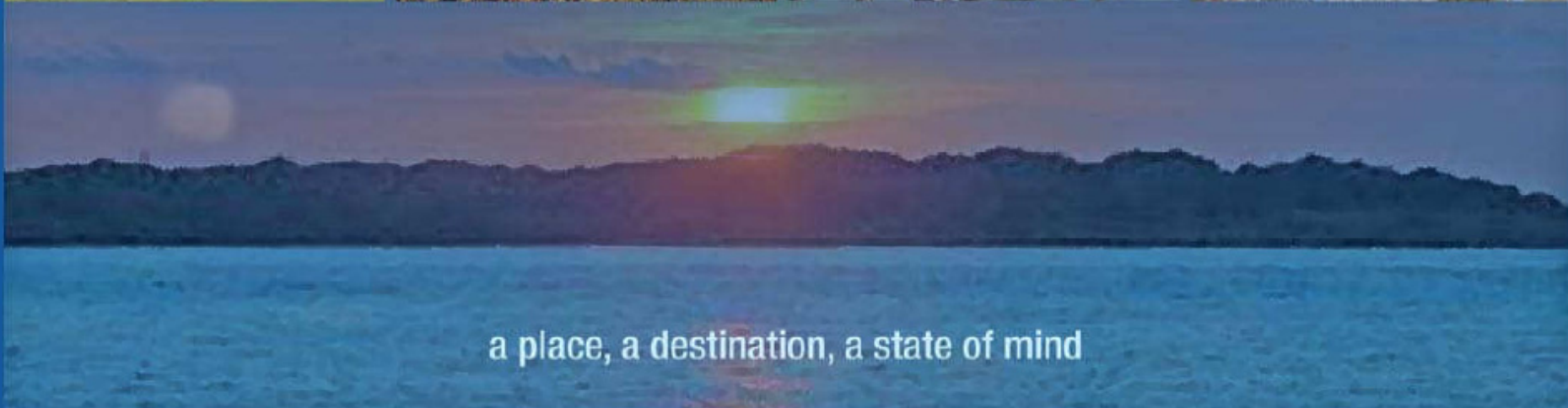
87

Gulf of  
Mexico

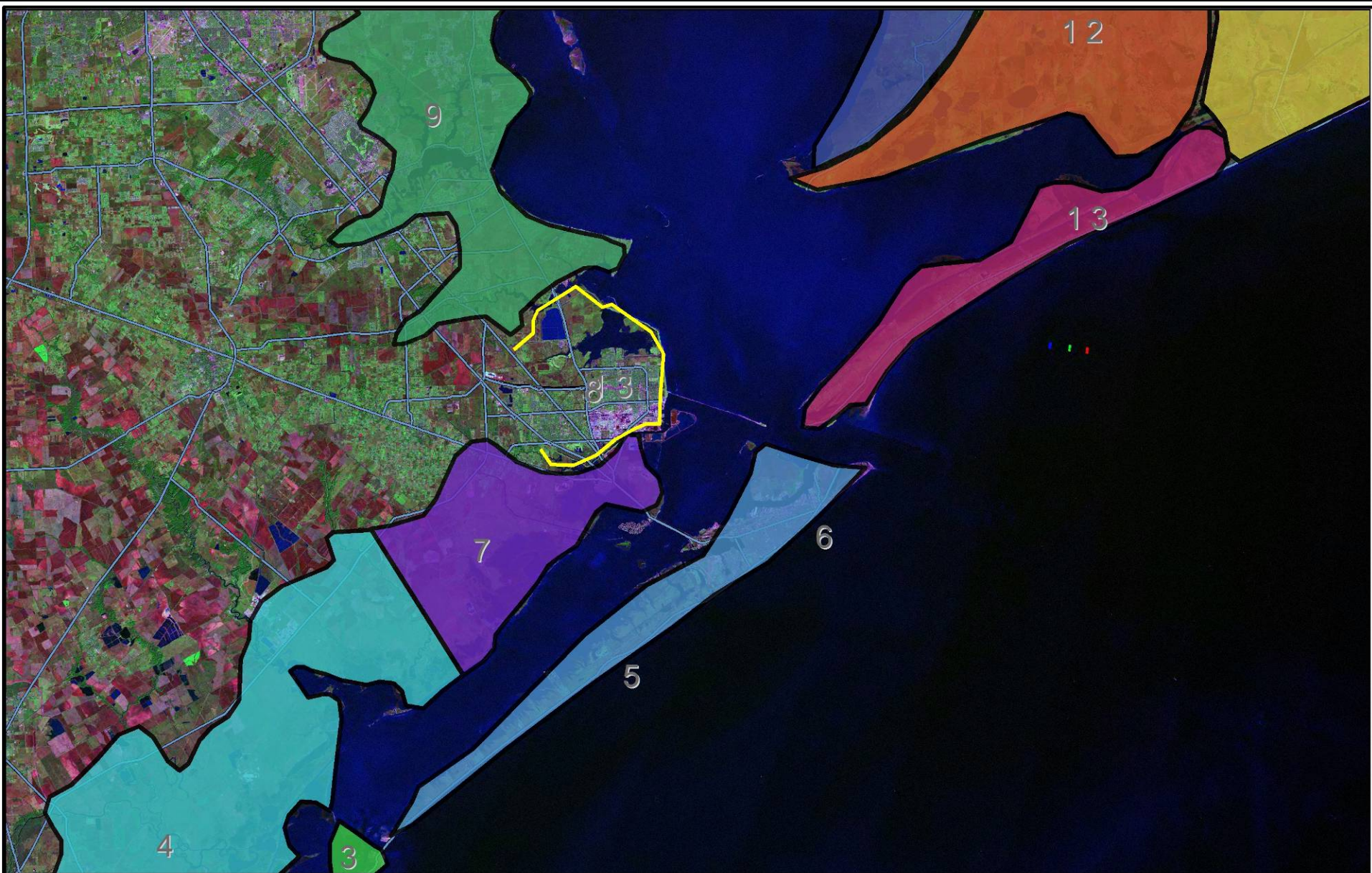
Galveston Island

# Bolivar Blueprint

MAY 2009



a place, a destination, a state of mind

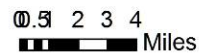


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# JOHN H. CHAFEE COASTAL BARRIER RESOURCES SYSTEM

## TEXAS



# Next Steps

- Complete the development of information and alternatives
- Evaluate effectiveness of structural and non-structural alternatives based on alternative Hurricane Scenarios
- Identify economic, environmental and social issues with each of the alternatives
- Identify the key issues with each alternative









