



GCCPRD

**The Gulf Coast Community
Protection and Recovery District**

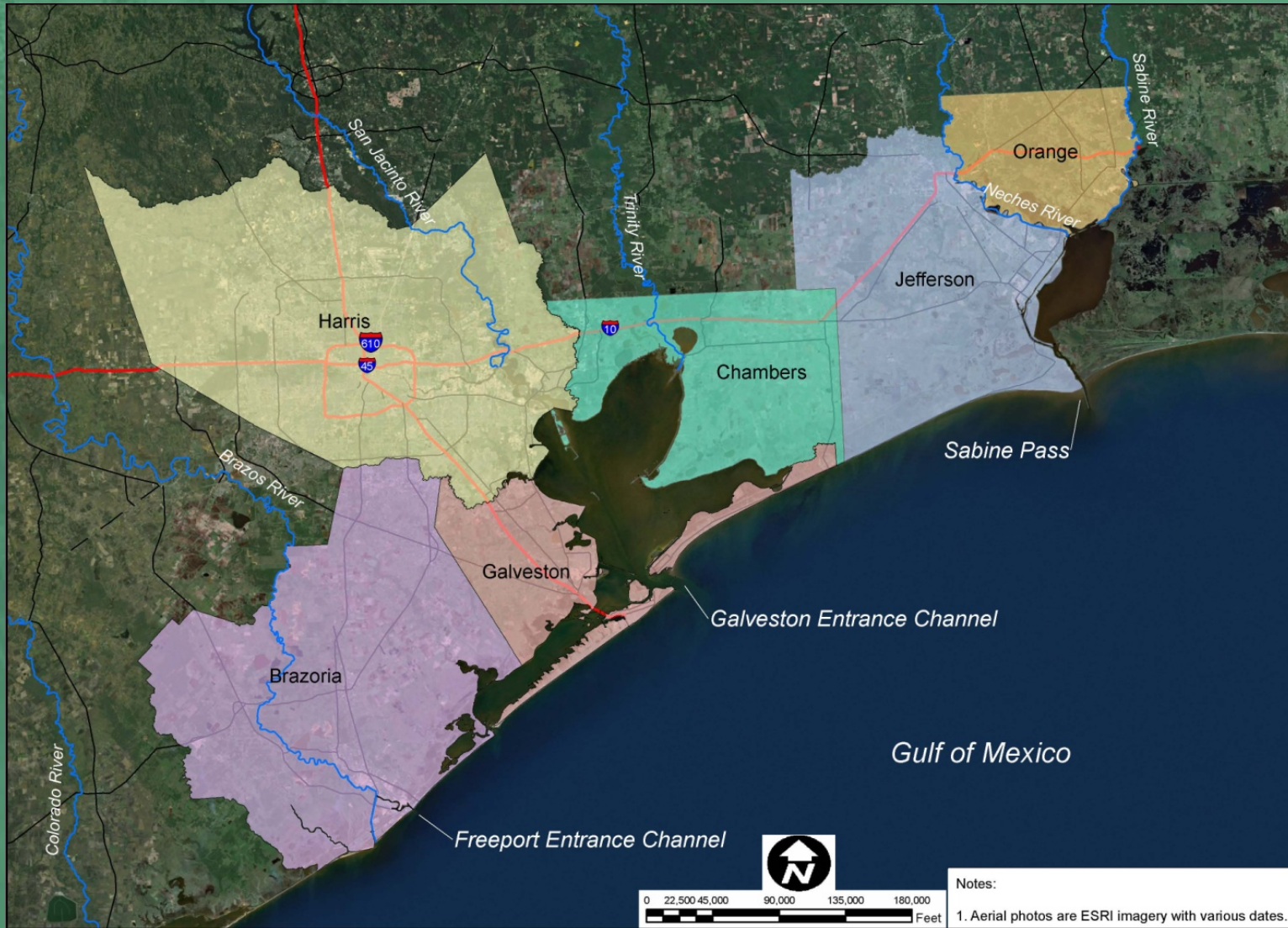
Storm Surge Suppression Study Update

**Houston City Council
Transportation, Technology, and Infrastructure Committee (TTI)
October 16, 2017**

www.gccprd.com



Study Area





Study Purpose

To investigate the feasibility of reducing the vulnerability of the upper Texas coast to hurricane surge and flood damages through the study of an integrated flood protection system that relies on natural or nature based features, nonstructural and structural interventions.



Methodology

To define flood risk management and surge suppression requirements within the region through a technical analysis of potential alternatives.

What is the threat? - Storm Surge Modeling

What needs to be protected? - Economics Modeling

How will we protect? - Technical Analysis of Alternatives



Study Elements

- Alternatives development and analysis:
 - Relative sea level rise analysis - 2035 and 2085
 - Storm and wave modeling - 2035 and 2085
 - Structural component analysis - Levee, T-wall, gates,...
 - Interior drainage analysis to determine pump requirements
 - Navigation gate modeling
- Environmental Analysis - impacts and mitigation costs
- Economic analysis - determine benefit-to-cost ratios
- Public outreach - engagements with state and federally elected officials and agencies, industry, academia,...

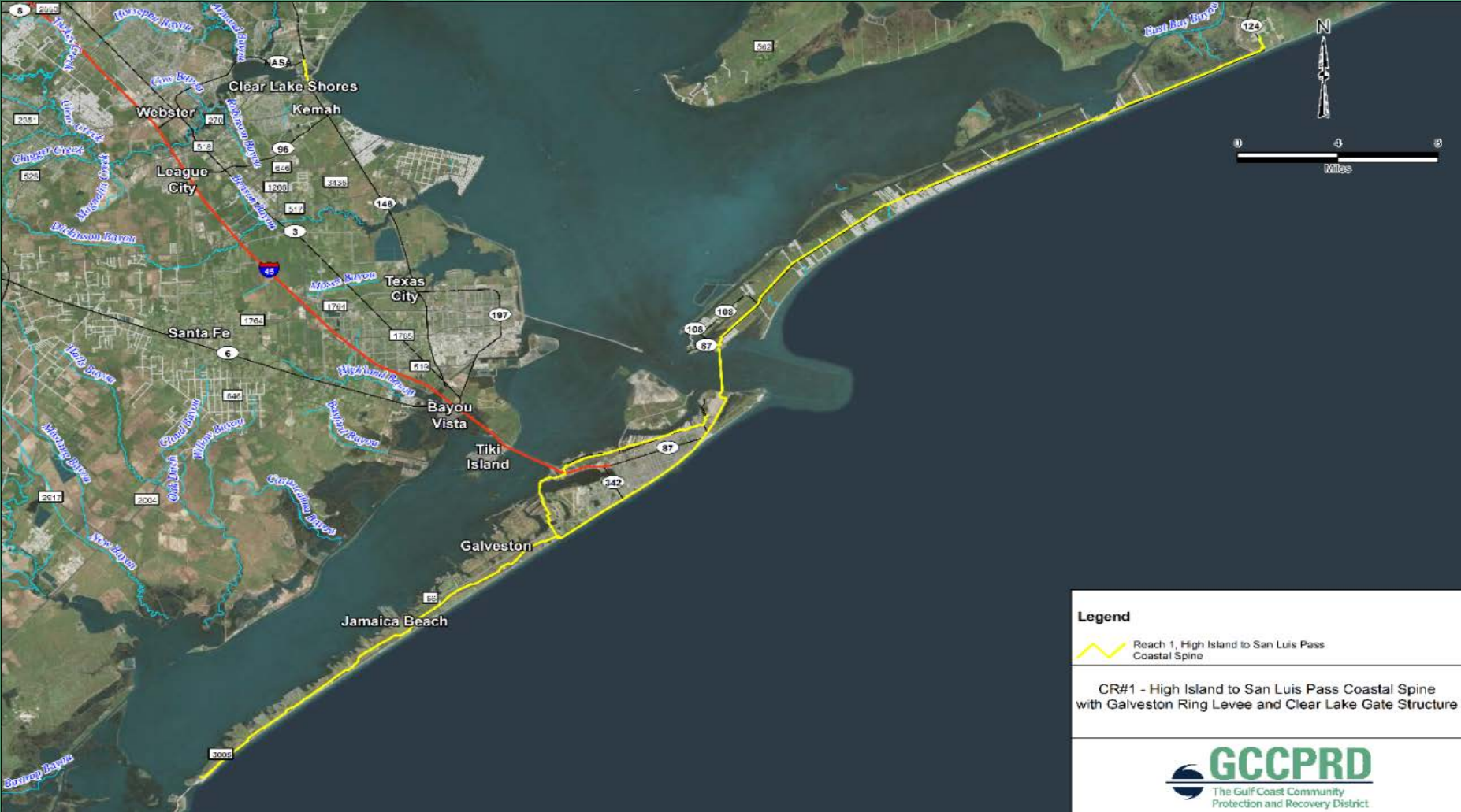


North Region - Orange and Jefferson Counties





Central Region - Galveston, Chambers, and Harris Counties



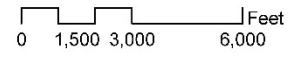


GCCPRD
Galveston Ring Levee



Clear Lake Structure

- Closure Structure
- Floodwall
- Gate
- Levee
- Coastal Spine



1 in = 3,000 ft



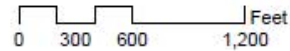


GCCPRD Clear Lake Structure



Clear Lake Structure

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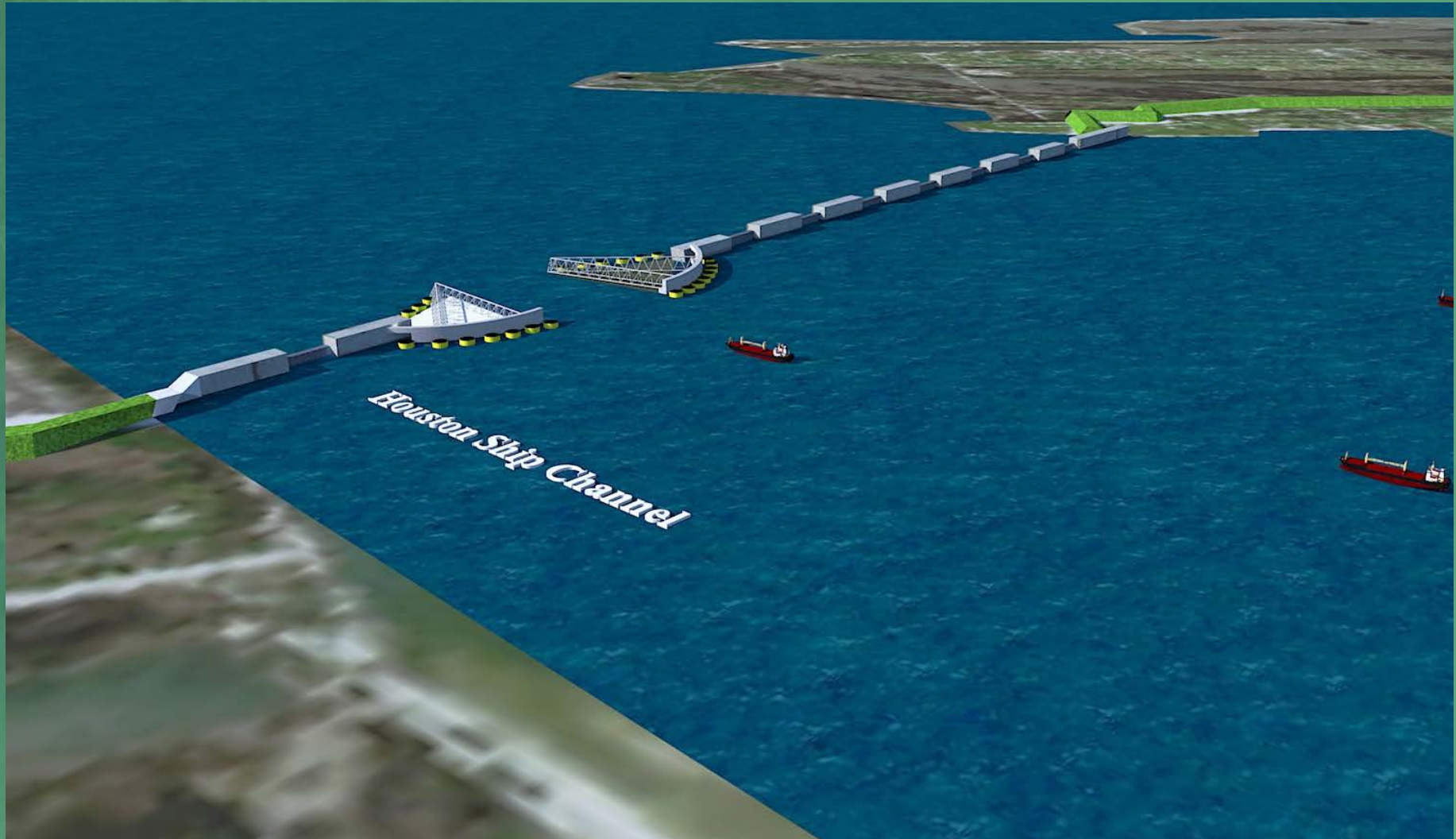


1 in = 600 ft



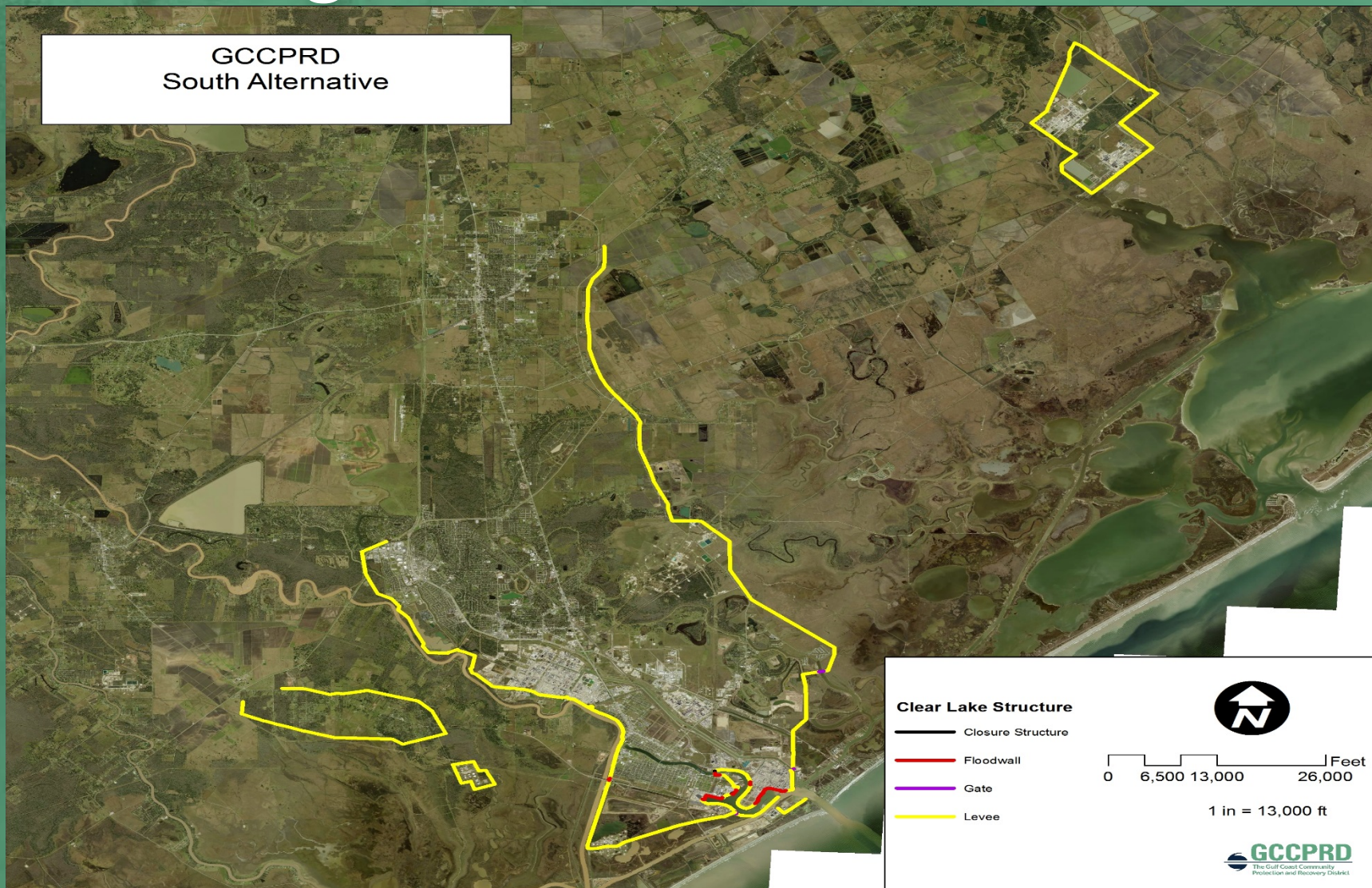


Bolivar Roads Floating Sector Gate

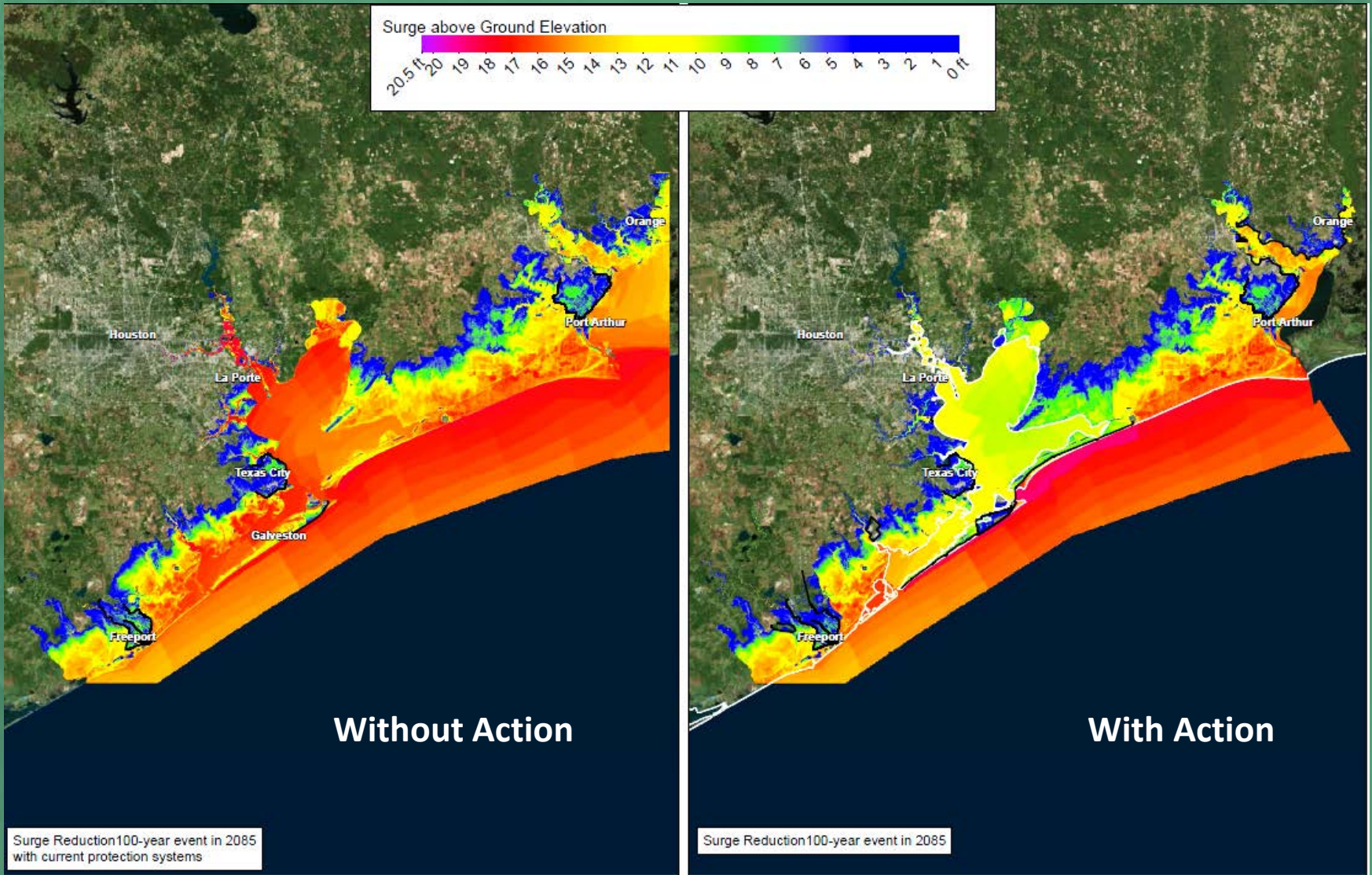




South Region - *Brazoria and Galveston Counties*



REDUCTION IN 100-YEAR EVENT IN 2085





Study Area Summary

| | North Region | Central Region | South Region | Study Area Plan (North + Central + South) |
|--|--------------|----------------|--------------|---|
| Total length of the system (miles) | 92 | 114 | 71 | 277 |
| Right of Way required (acres) | 810 | 1278 | 383 | 2471 |
| Pump stations required / total capacity (CFS) | 14/31,600 | 0/0 | 5/15,100 | 19/46,700 |
| Environmental mitigation required (\$ thousands) | 0 | 72,075 | 0 | 72,075 |
| Construction cost (\$ thousands) | 3,228,579 | 5,832,095 | 2,571,551 | 11,632,225 |
| Annual Operations and Maintenance cost (\$ thousands) | 16,143 | 29,160 | 12,857 | 58,160 |
| Total Annual Costs (TAC) | 176,910 | 319,569 | 140,907 | 637,386 |
| Total Annual Benefits (TAB) | 140,872 | 1,029,399 | 206,654 | 1,296,056 |
| Benefit - Cost Ratio (TAB/TAC) (3.125% Interest Rate) | 0.80 | 3.22 | 1.47 | 2.03 |



Extended Benefits Analysis - BCR

| Impact | Alternative | | | |
|--|-------------|---------|-------|-------------------------|
| | North | Central | South | North + Central + South |
| Benefit - Cost Ratio without GDP Impacts (3.125% Interest Rate) | 0.80 | 3.22 | 1.47 | 2.03 |
| Benefit - Cost Ratio with GDP Impacts (3.125% Interest Rate) | 0.92 | 5.09 | 2.18 | 3.14 |



Phase Four Actions

- Extended environmental analysis
 - Modeling of Galveston Bay
 - WVA model for mitigation requirements
- Optimization of the recommended alternatives
- Geotechnical analysis of subsurface soil conditions
- Improve valuation data and depth-damage curves for petrochemical facilities
- Continue public outreach and stakeholder engagements



A Final Thought

The total cost for implementing the GCCPRD Study Area Plan is \$11.6 billion. Hurricane Ike caused over \$39 billion in damages.

The federal government invested \$14.5 billion dollars for hurricane protection for New Orleans following Hurricane Katrina protecting a population of 900,000 people. The upper Texas Coast has a population of more than six million people, generates over 31 percent of the state's \$1.4 trillion GDP, and has a significant role in our nation's energy and national security.



Questions?

