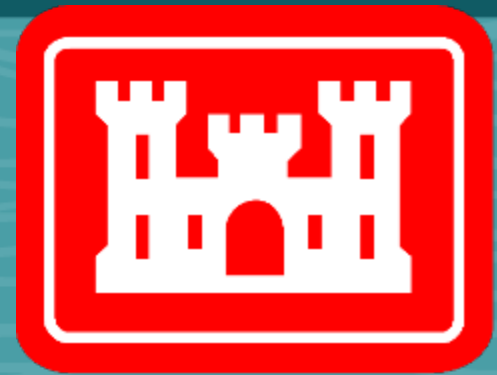


COASTAL TEXAS STUDY SEDIMENT NEEDS

Himangshu S. Das

USACE Galveston District

COASTAL TEXAS STUDY



**US Army Corps
of Engineers®**
Galveston District

[Web: CoastalStudy.Texas.gov](http://CoastalStudy.Texas.gov)

Feasibility Study Start: Oct 2016
Completion: May 2021



The U.S. Army Corps of Engineers has partnered with the Texas General Land Office to identify and recommend feasible projects to reduce risks to public health and the economy, restore critical ecosystems, and to make the Texas coastline more resilient.

Recommended Plan

MULTIPLE LINES OF DEFENSE ON THE TEXAS COAST

The Draft Proposal includes a combination of ER and CSRM features that function as a system to reduce the risk of coastal storm damages to natural and man-made infrastructure and to restore degraded coastal ecosystems through a comprehensive approach employing multiple lines of defense. Focused on redundancy and robustness, the proposed system provides increased resiliency along the Bay and is adaptable to future conditions.



Illustration is representational and not to scale

Sediment Needs: Beach and Dune System



Design of Beach and Dune System

Design Questions

- How much material do we need?
- Sediment Source?
- Will it perform at the design level and sustain over RSLC?
- Beach access?
- Project Cost (Initial, O&M)?

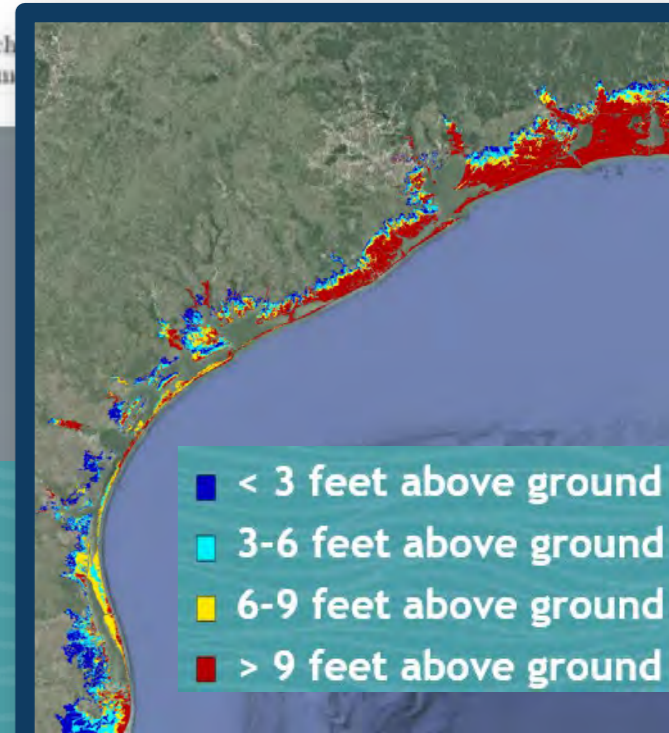
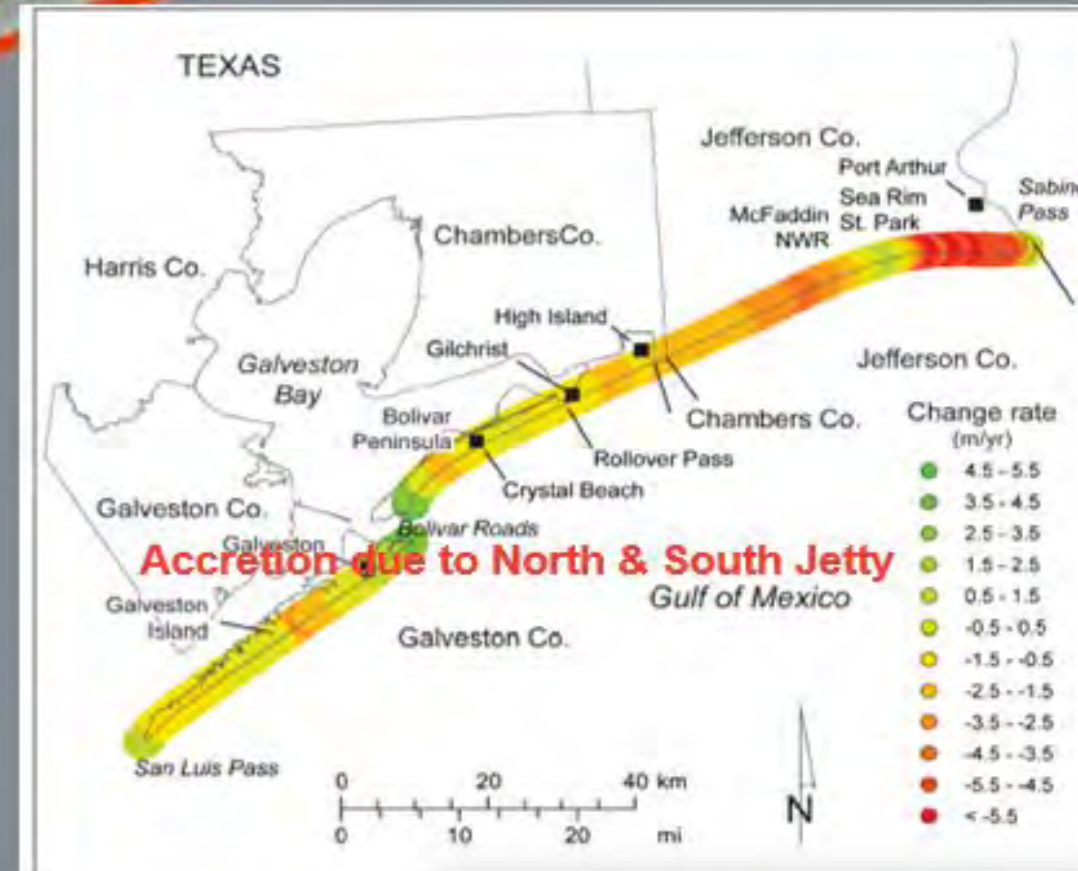
Inlet Structure

Bolivar
~26 mile

Galveston
~19 mile

Challenge:

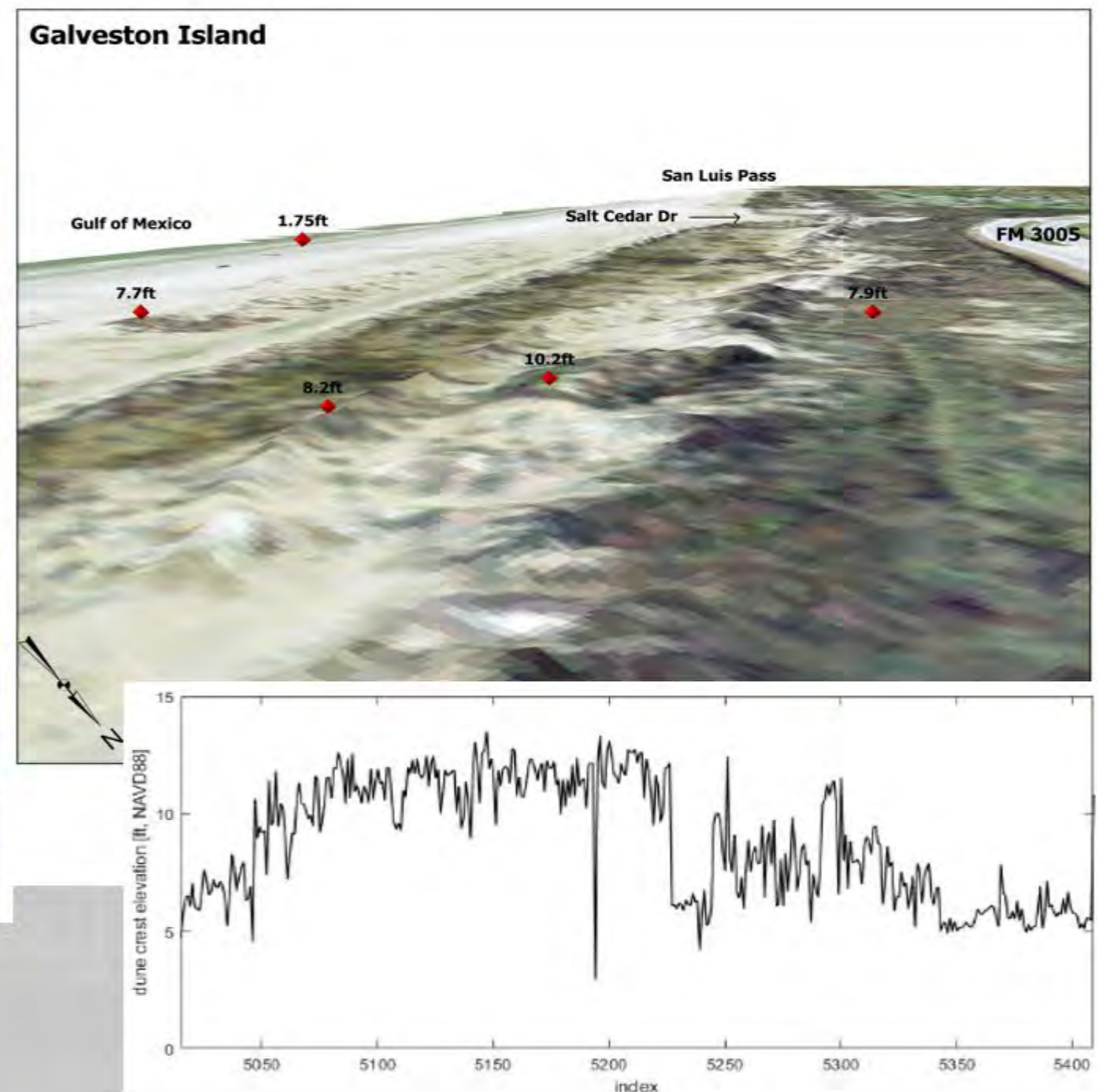
Over 45 miles of coastal spine (beach & dune system) design, Performance & Resiliency check against forcing (Storm, Erosion, RSLC)



We stepped back from 17 ft Levee to Nature Based Solution

Design Philosophy : Mimic Natural Condition

Topography (2018 LIDAR)



Galveston Island Dune Line (5 to 12 ft)

Design & Evaluation Method

1. CEDAS: BMAP, S-Beach

Storm Condition : Event Based
(Ike, Rita, Frances, Allison)

2. CSHORE

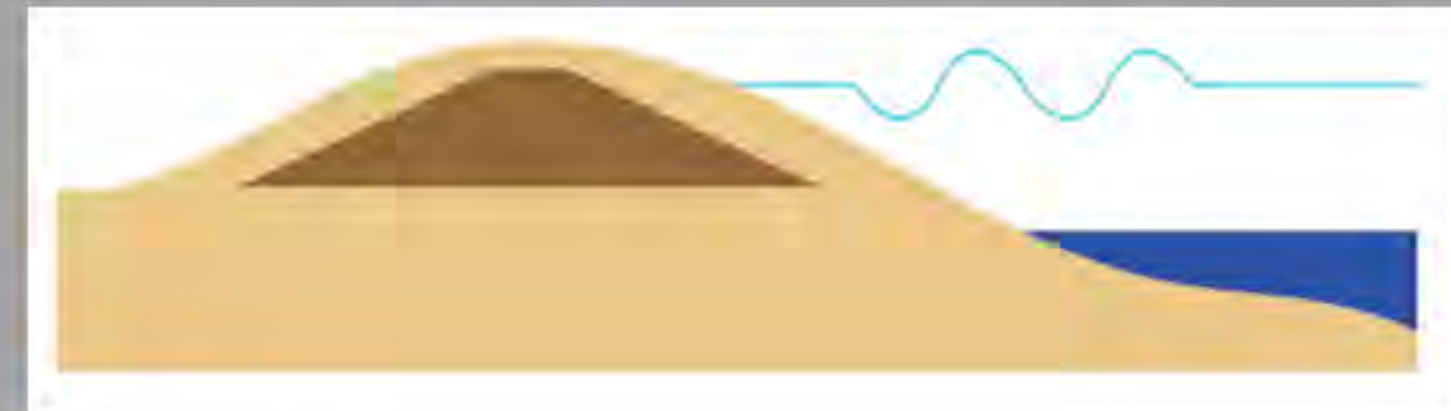
MonteCarlo Probabilistic Simulations
(170 Tropical Storms,
RSLC)

Design Cross Section : Many Cases

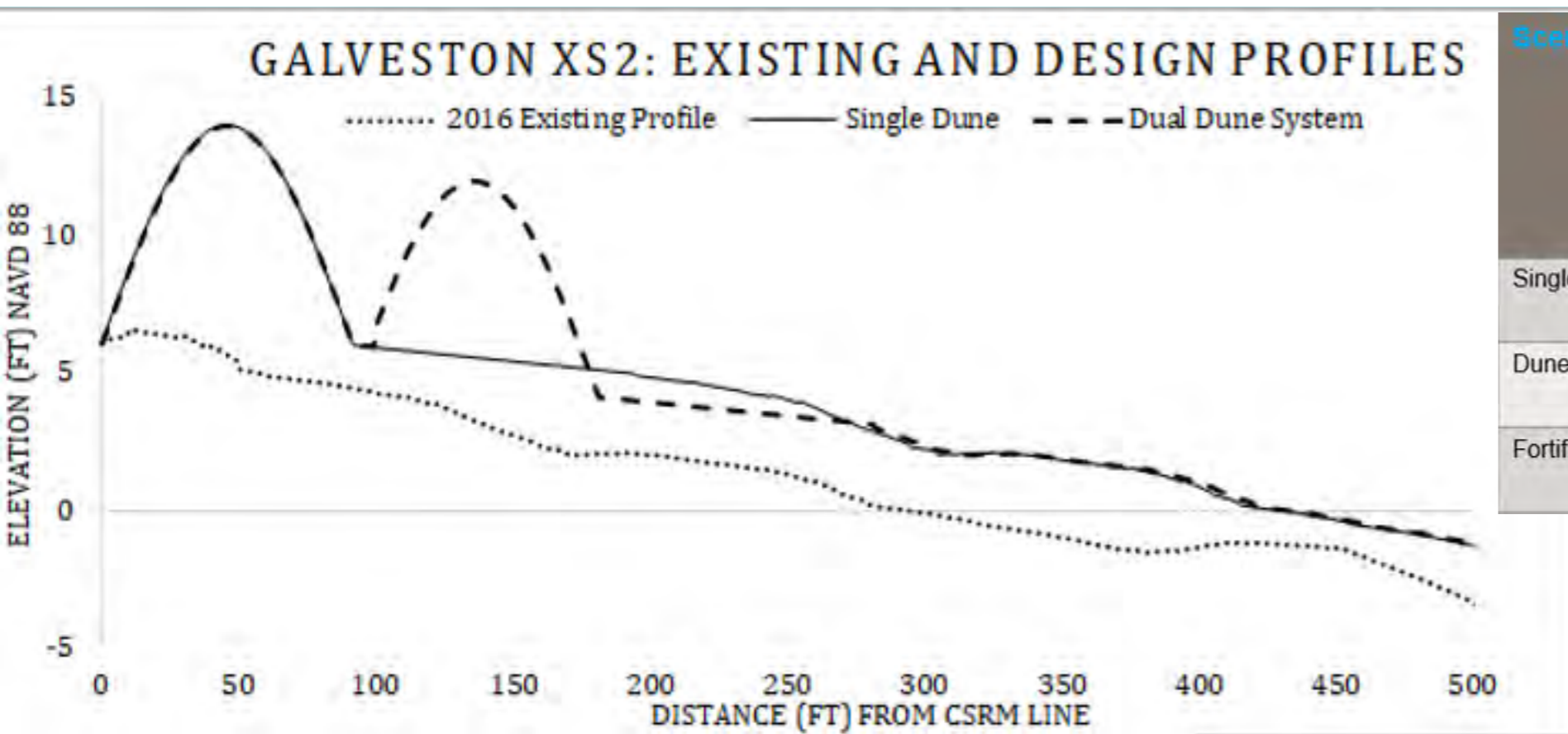
- Existing Condition
- Dune: Sand Only Option (12 ft, 14 ft Dune Height)
- Dune Field: Sand Only Option (12 ft, 14 ft Dune Height)
- Fortified Dune - Hard Core Inside (8 ft, 10 ft, 12 ft)

Question to Answer

- (a) Initial Quantity (Construction Cost)
- (b) Regular re-nourishment cycle (O&M)



Evaluation Matrix



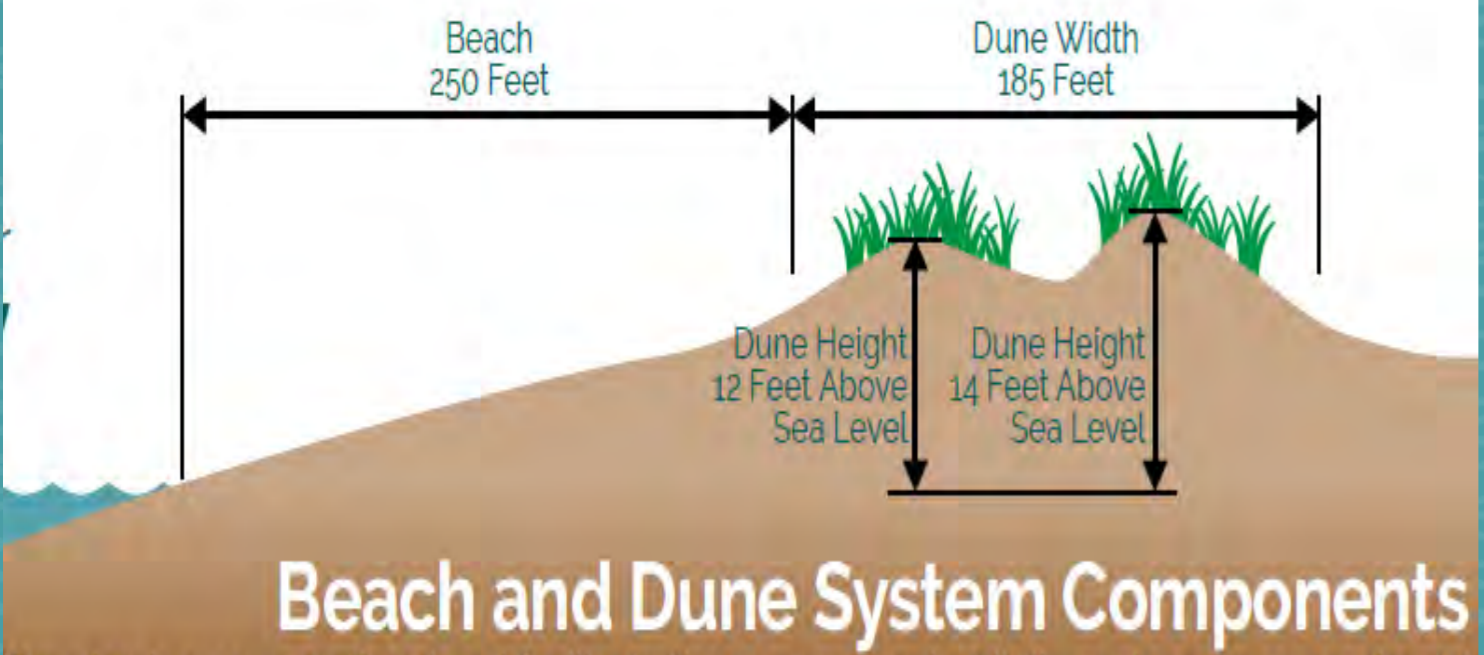
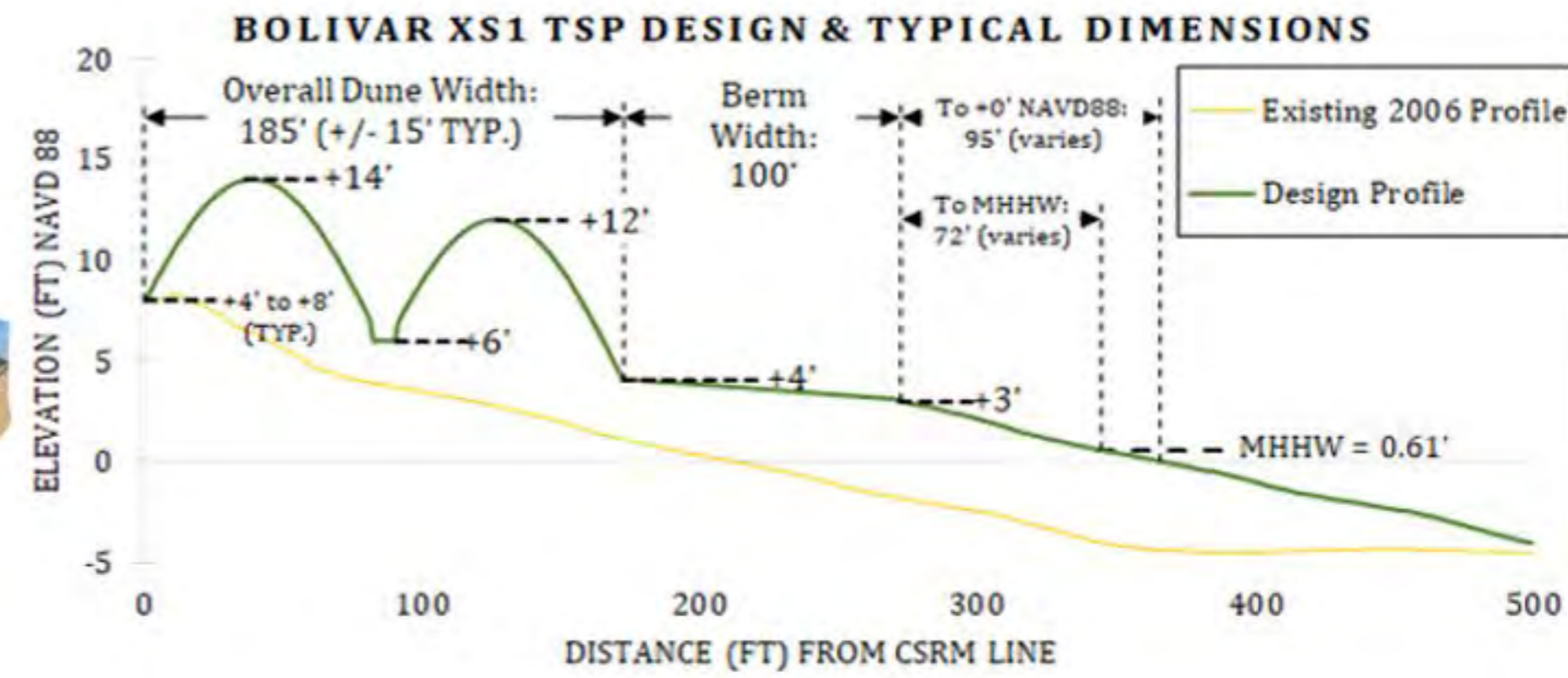
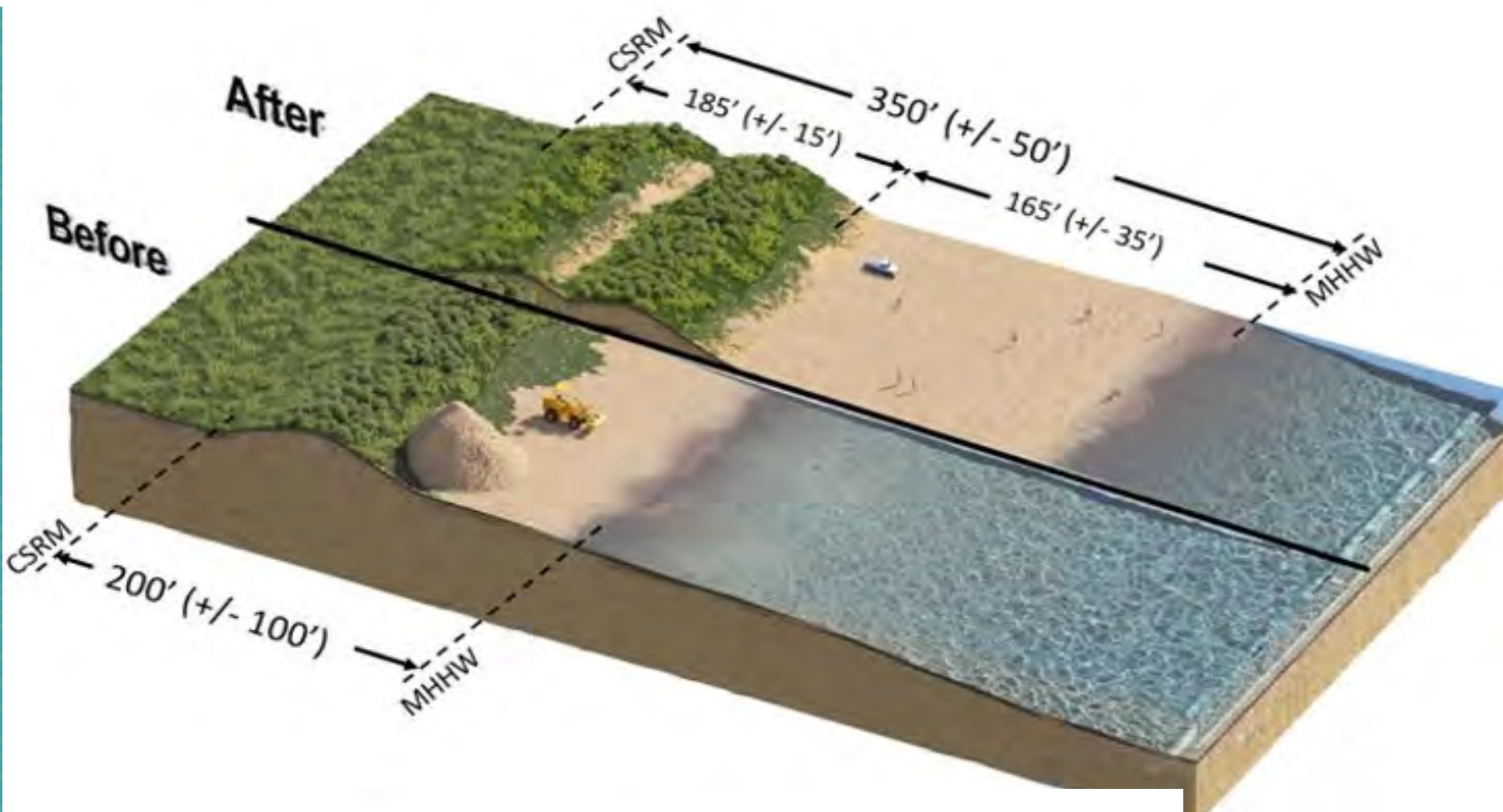
Scenario	Approximate Initial Cost (in Million)	Maintenance Sand Volume (10 yr. int.)	Breaching, Overtopping (100 Yr AEP)	Resiliency	Acceptability/Environmental Compliance
Single Dune	\$ 1,197	Range between 10 and 14 cyd/ft average	Very High	Medium	High
Dune Field	\$ 1,425		High	High	Very High
Fortified Dune	\$ 1,533		Very Low	Very High	Medium

Cost, Performance, Resiliency, Compliance

Profile Configuration		Duration of Inundation (hours)	Max Water Depth at CSRM (feet)	Max Wave Height at CSRM (feet)
Existing Profile	Average	51.75	9.66	4.73
	Minimum	47.25	8.72	4.07
	Maximum	61.5	11.61	5.81
Single Dune Profile	Average	9.56	2.46	1.15
	Minimum	8.25	1.69	0.97
	Maximum	10.5	3.34	1.43
Dual Dune Profile	Average	2.44	1.26	0.82
	Minimum	1.5	0.64	0.45
	Maximum	3.75	2.00	1.08

Observed Resiliency with Dune Field (Ike Simulation)

Recommended Plan

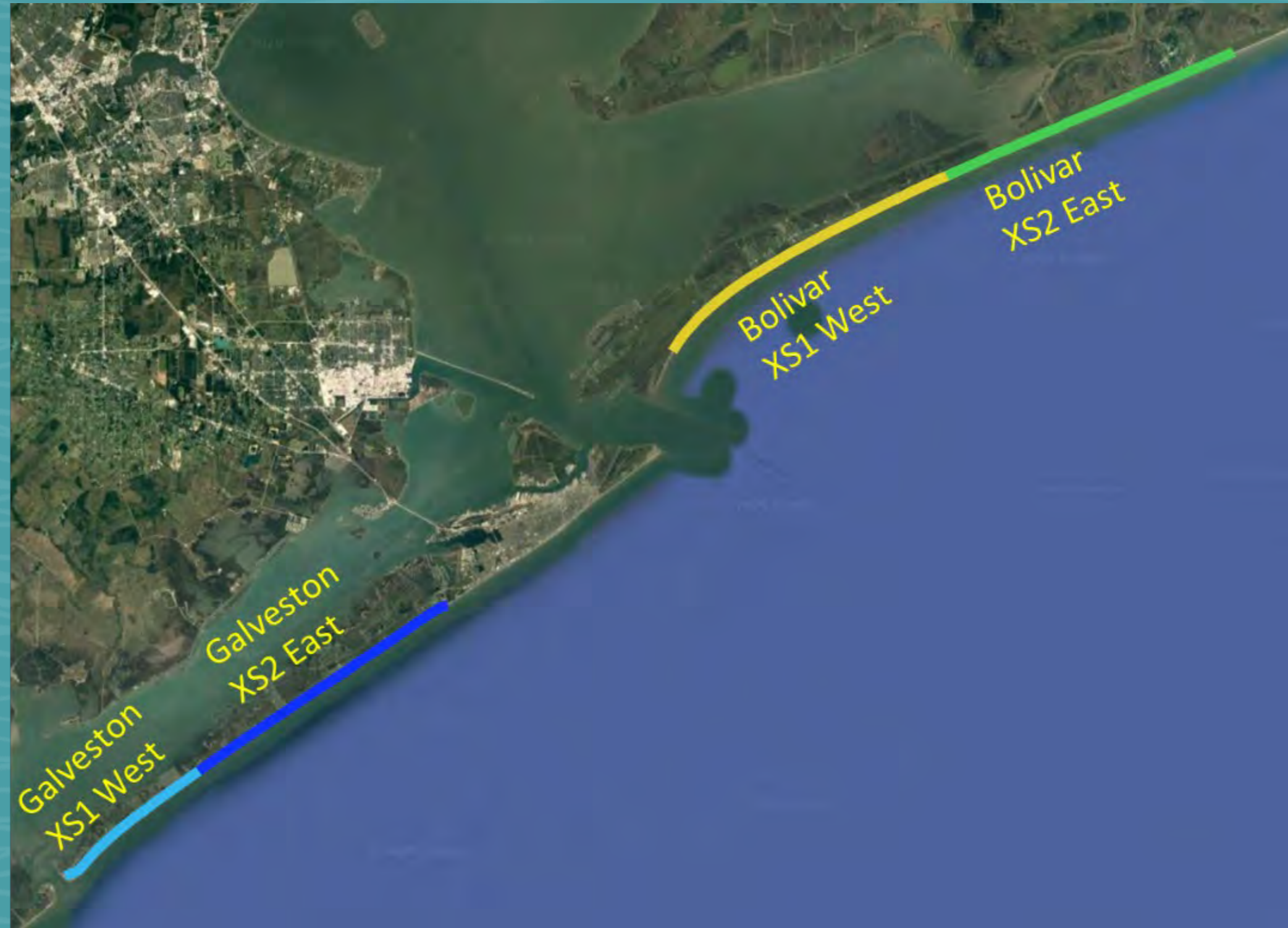


Wide Beach (200 – 250 ft)
Dune Field (12, 14 ft)
Vegetated
Beach Access: Open Beaches Act

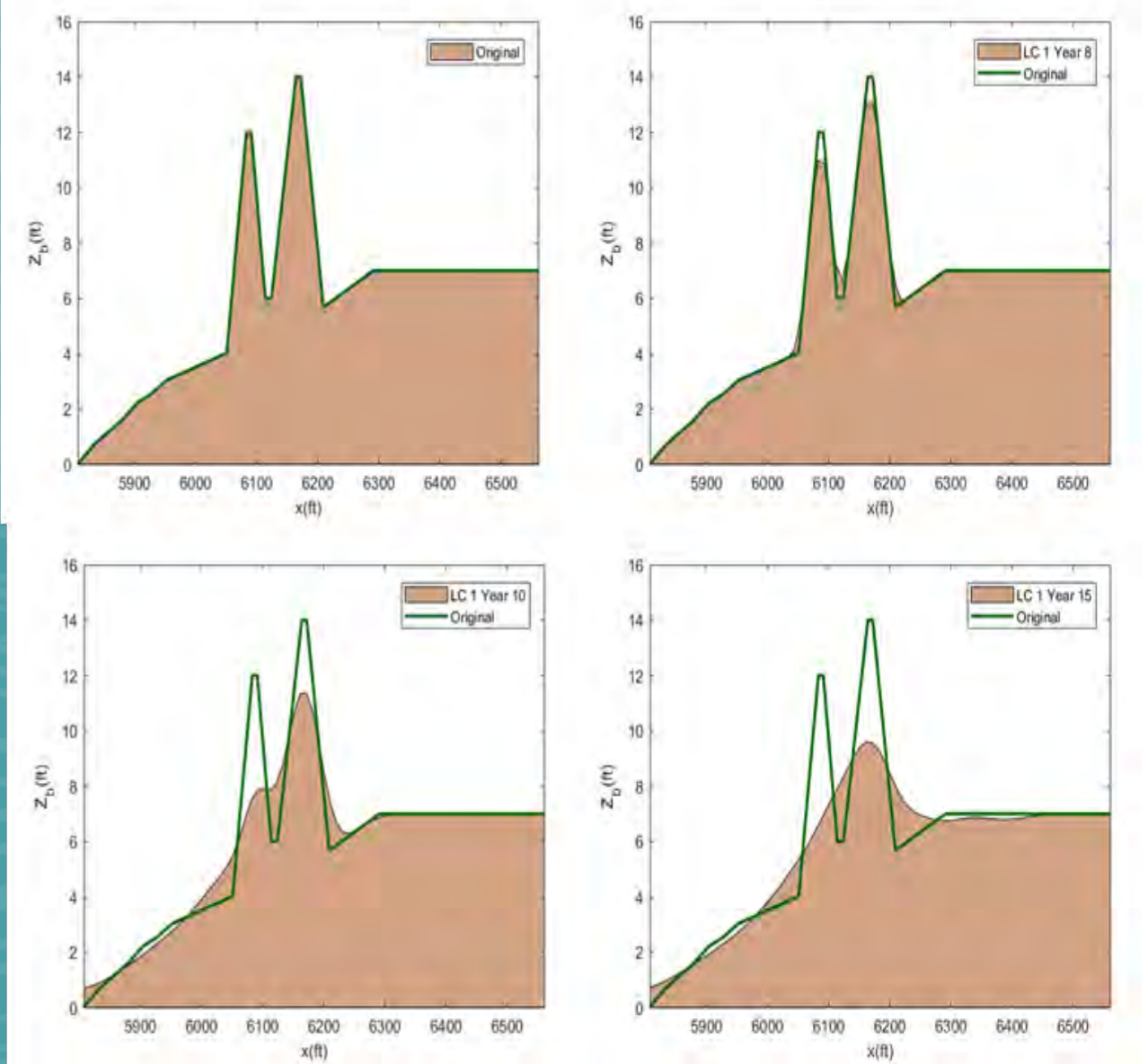
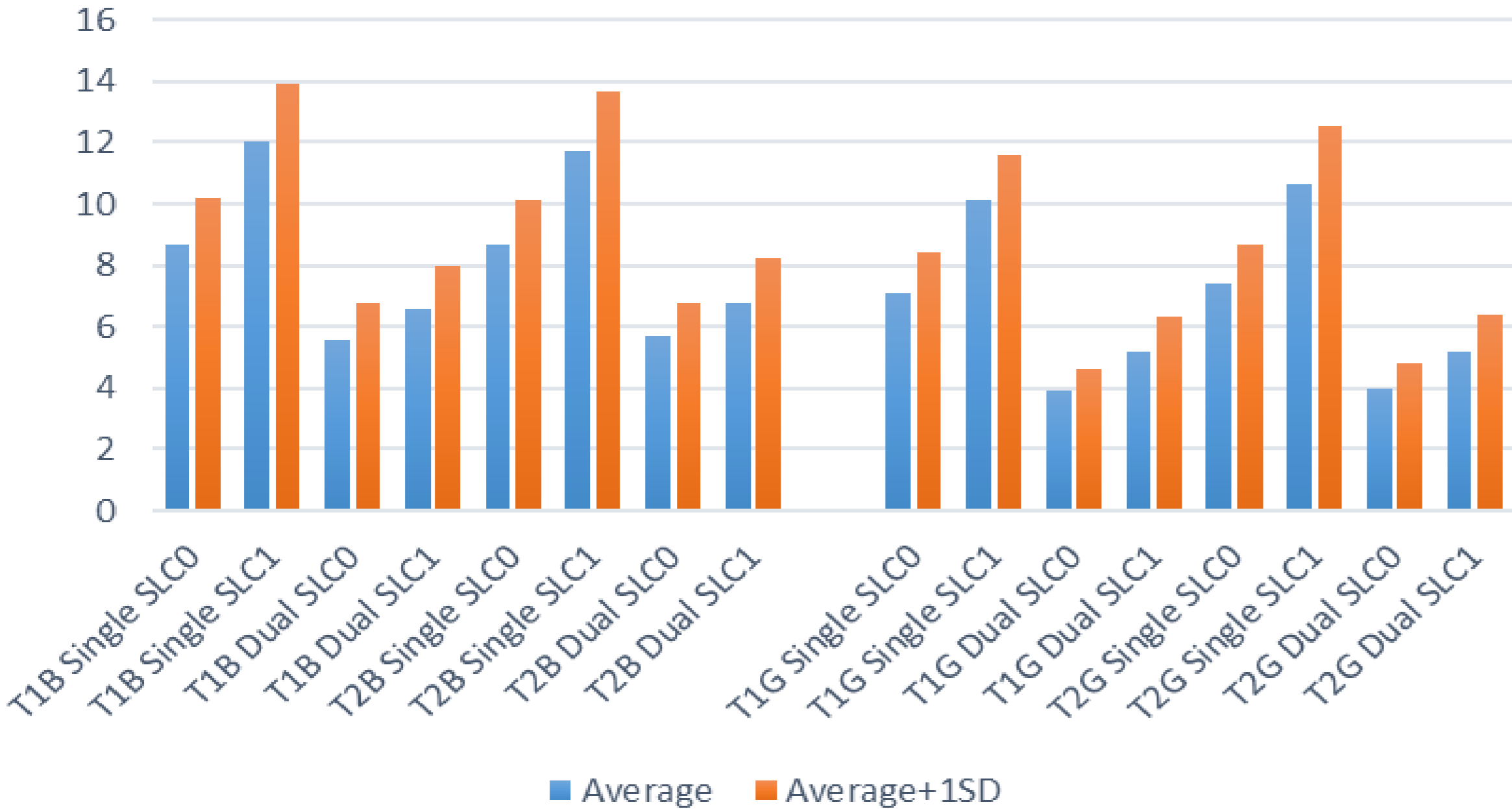
Drawing is representational and for illustrative purposes only. All dimensions are approximate.

Initial Construction Quantity

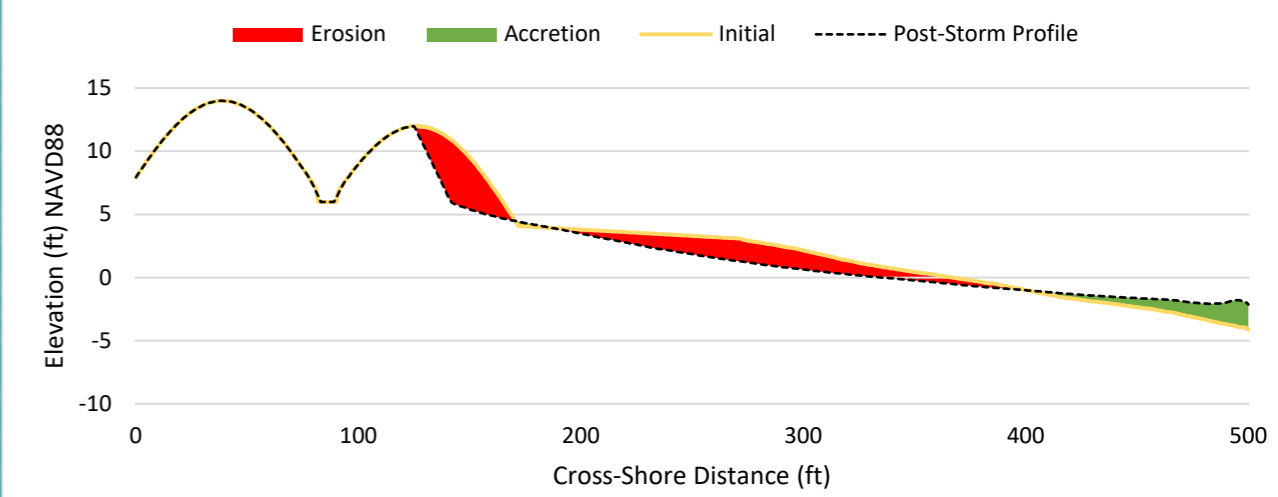
- Galveston Length: 18.35 mile
- Bolivar Length : 25.09 mile
- Galveston initial construction volume including advanced nourishment
17.19 MCYD (Avg. 177.43 CYD/ft)
- Bolivar Initial Construction Volume including advanced nourishment
22.14 MCYD (Avg. 167.12 CYD/ft)
- Total initial construction volume with advanced nourishment
39.33 MCYD
- Volume includes contingency due to bulking factor to voids



Life Cycle Cost (O&M)



Bolivar Peninsula XS1: Storm Induced Design Profile Response to Frances



**Rebuild Cycle : Single Dune @ 5 years
Dune Field @ 7 years**

Life Cycle Cost (Renourish Volume)

Total maintenance volume over
50 year life cycle

Low RSLC

Bolivar: 12.751 MCYD

Galveston: 6.569 MCYD

Total : 19.32 MCYD

High RSLC (including Std. dev)

Bolivar: 15.813 MCYD

Galveston: 9.135 MCYD

Total : 24.948 MCYD

Int. RSLC (including Std. dev)

Bolivar: 14.28 MCYD

Galveston: 7.85 MCYD

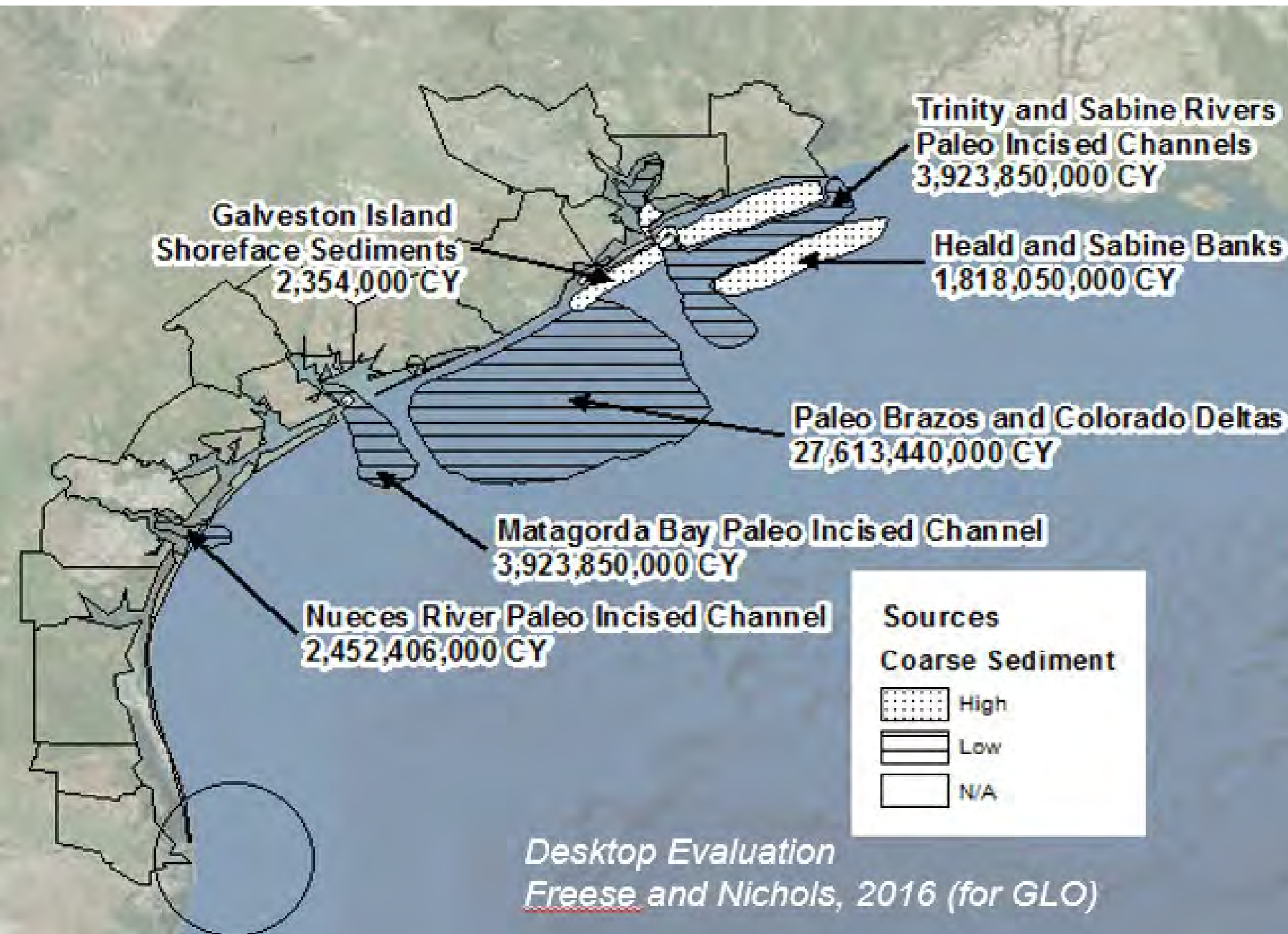
Total : 22.13 MCYD

**Bolivar: re-nourish cycle every 6 years @ 1.785
MCYD per rebuild**

**West Galveston: re-nourish cycle every 7 years
@ 1.04 MCYD per rebuild**



Sediment Source (>60 MCY for CSRMR)

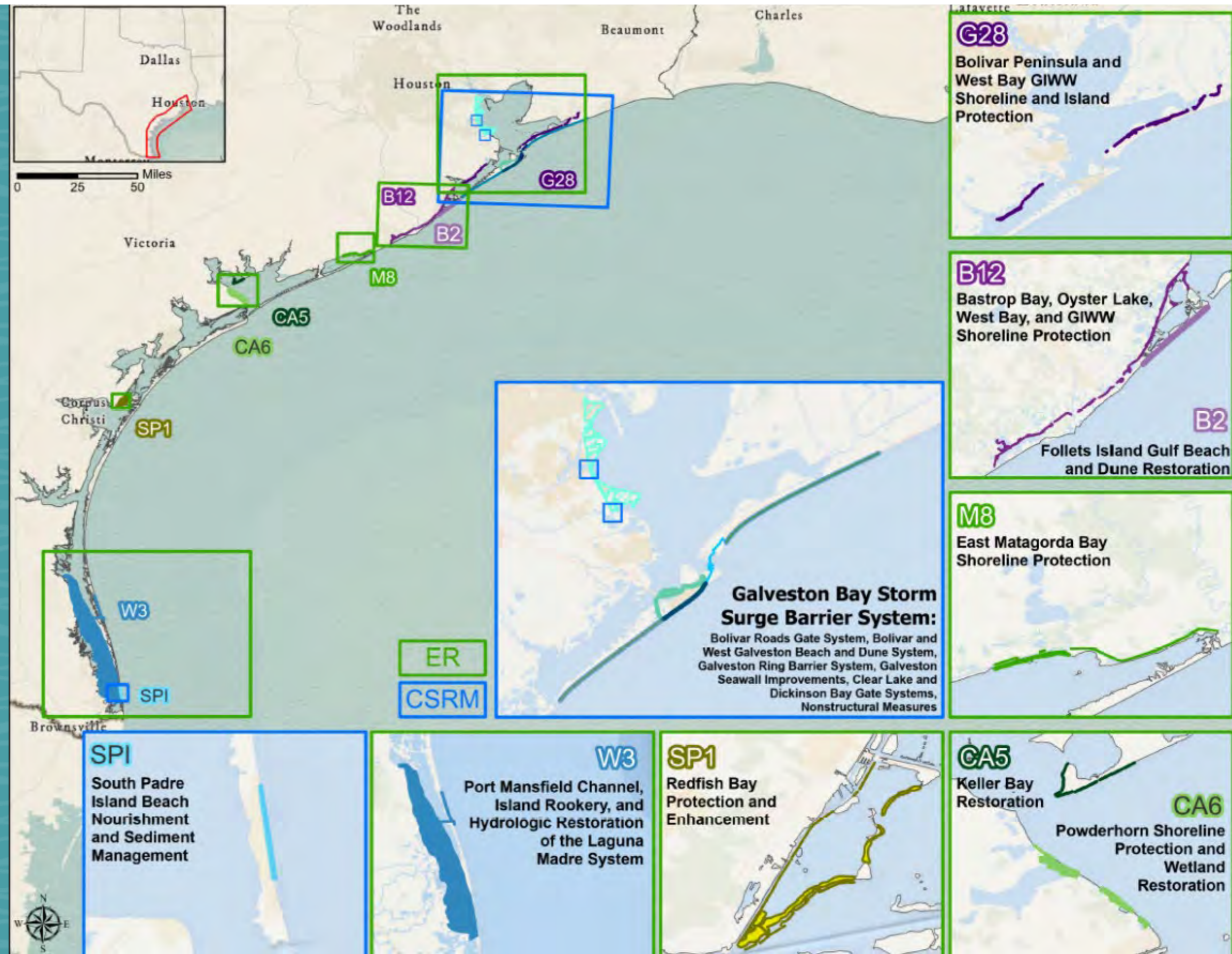


Current costs are based on Sabine Heald Banks.

Cost effective near shore source needs to be explored

Other Sediment Needs (ER)

- Coastwide Ecosystem Restoration
- 8 Separate sites totaling 6600 acres of habitat restoration





Other Sediment Needs


- G28(Marsh restoration)
- Sediment Volume (6.5 MCY)
- HSC, anchorage basin


Ecosystem Restoration

G28 - Bolivar GIWW Shoreline and Island Protection

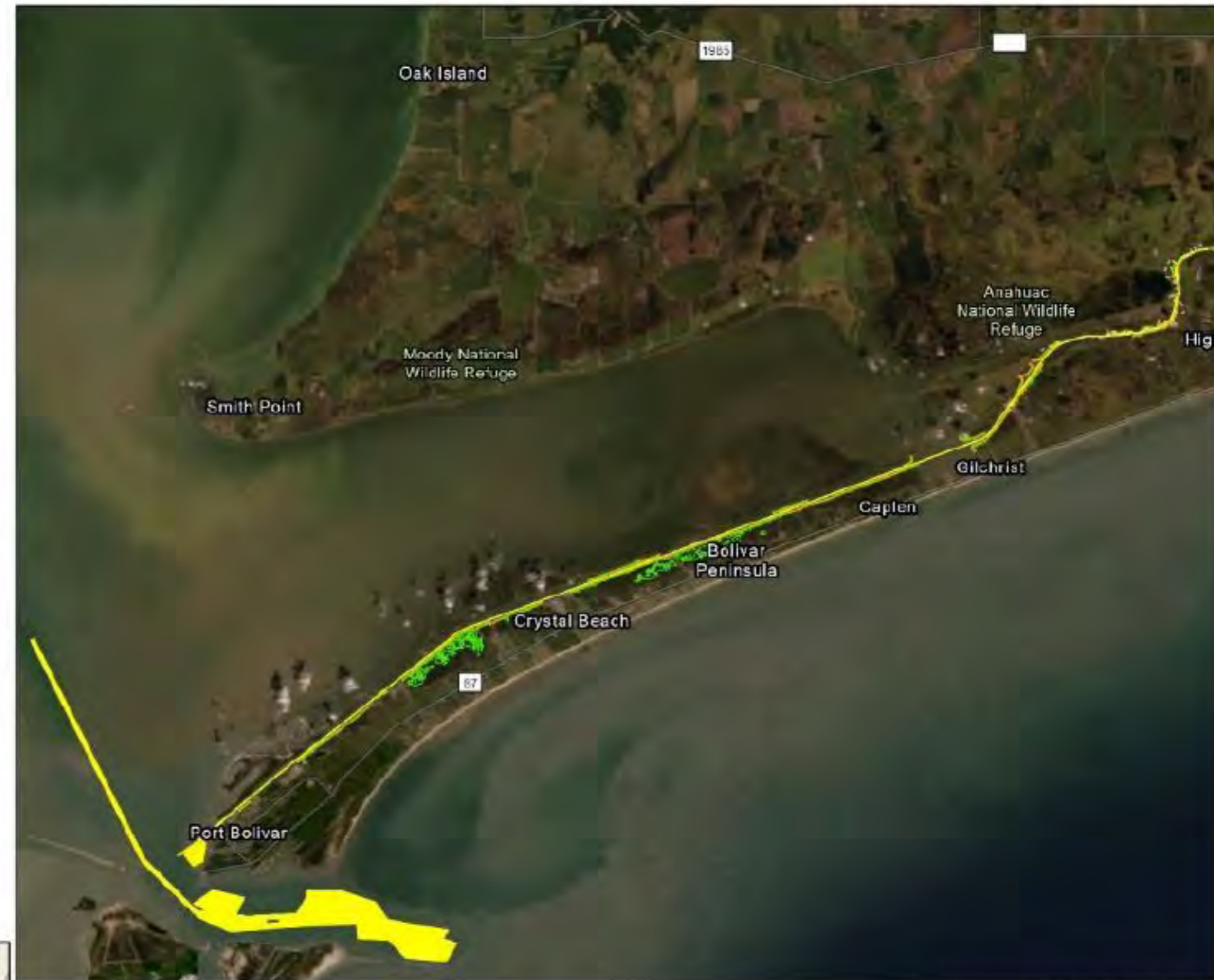
 Sediment Source

 Island Restoration

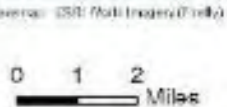
 Oyster Reef Scaling

 Revetment / Breakwater

 Wetland / Marsh Restoration



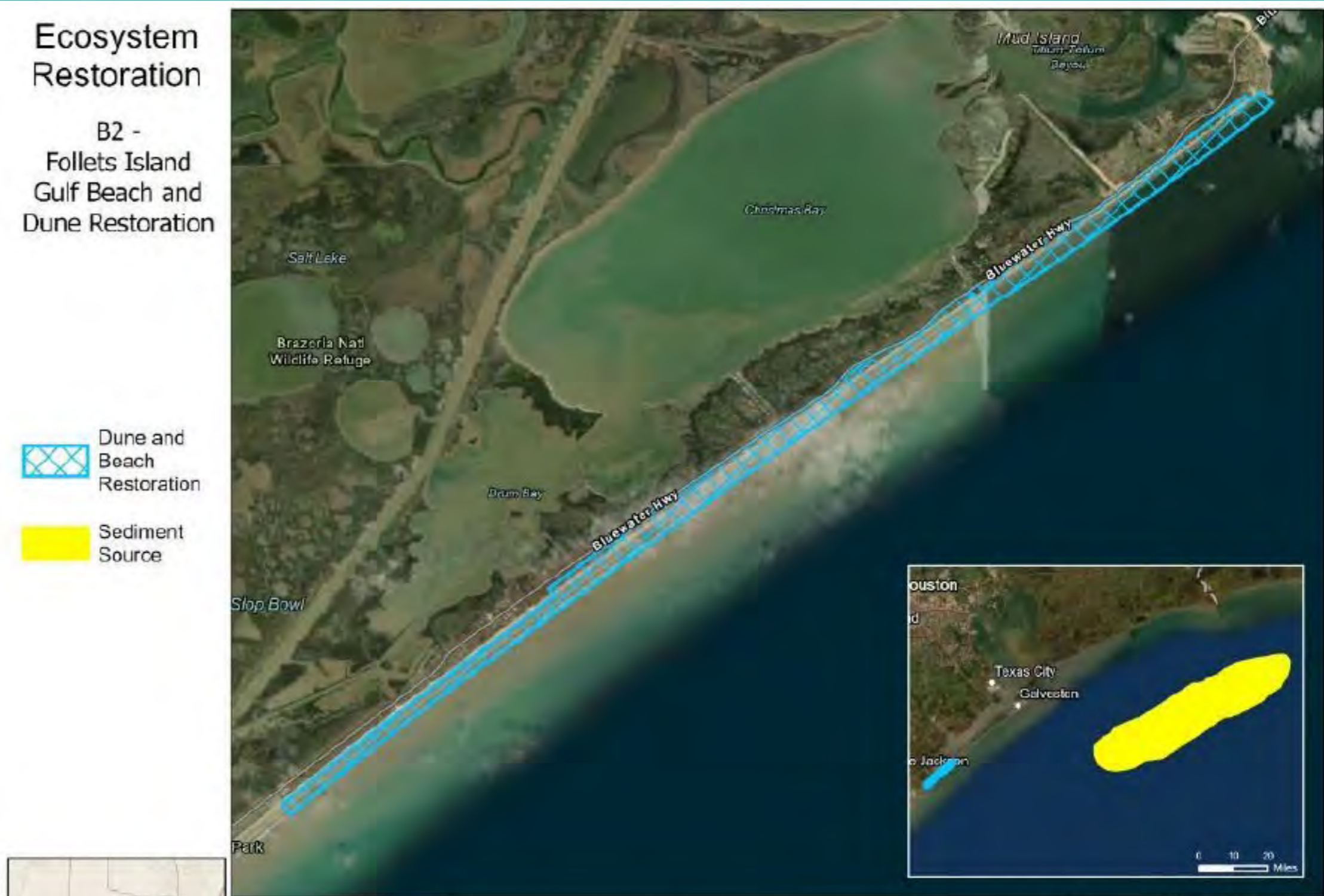
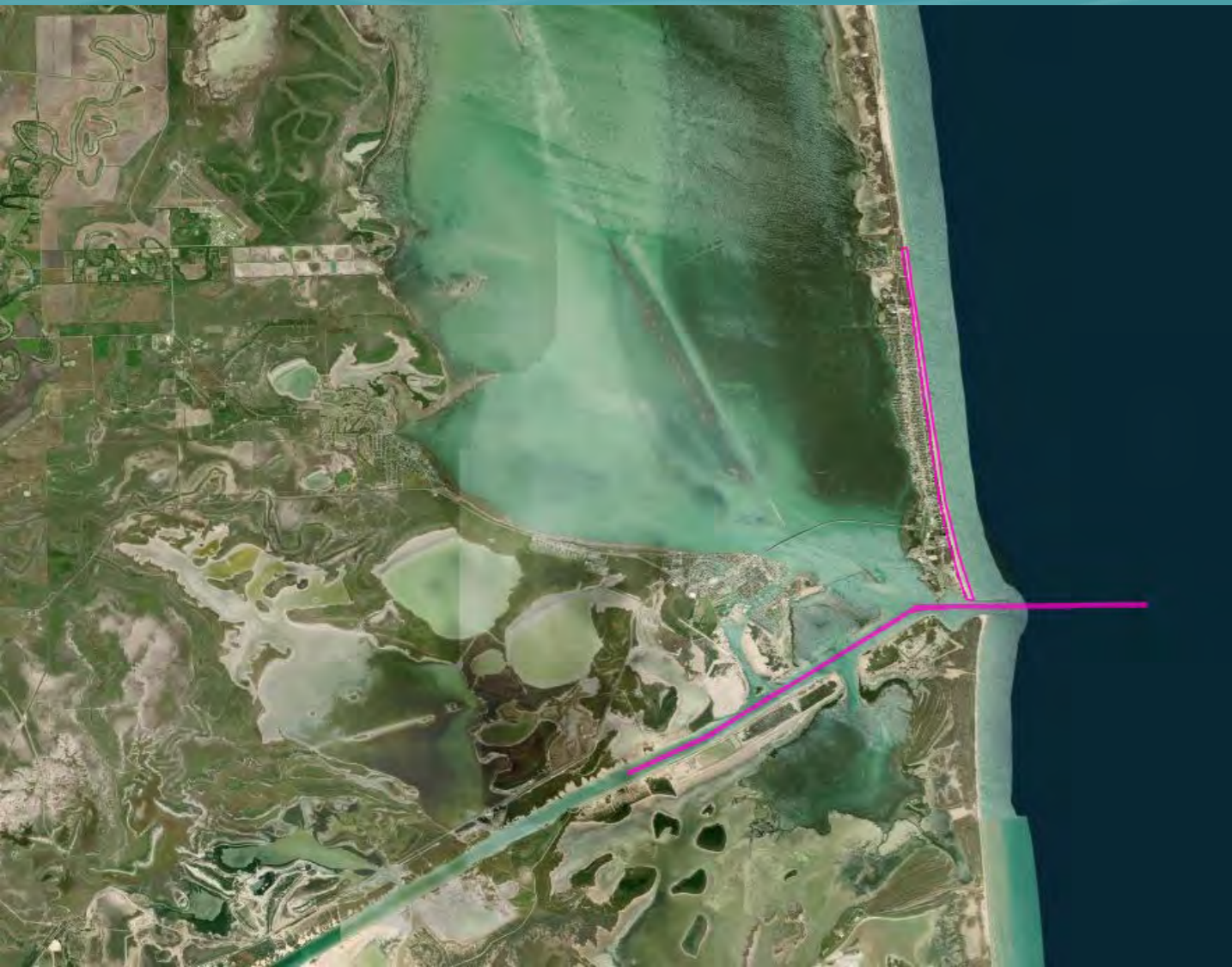
Coastal Texas Protection and Restoration Feasibility Study



1 August 2020

Other Sediment Needs

- B2 (Follets Island, 10 mile)
- (0.8 M CY)
- SPI (Brazos River)



Coastal Texas Protection and Restoration Feasibility Study

DATUM: NAD 1983
PROJECTION: STATE PLANE
ZONE TX-3C4204

1 August 2020

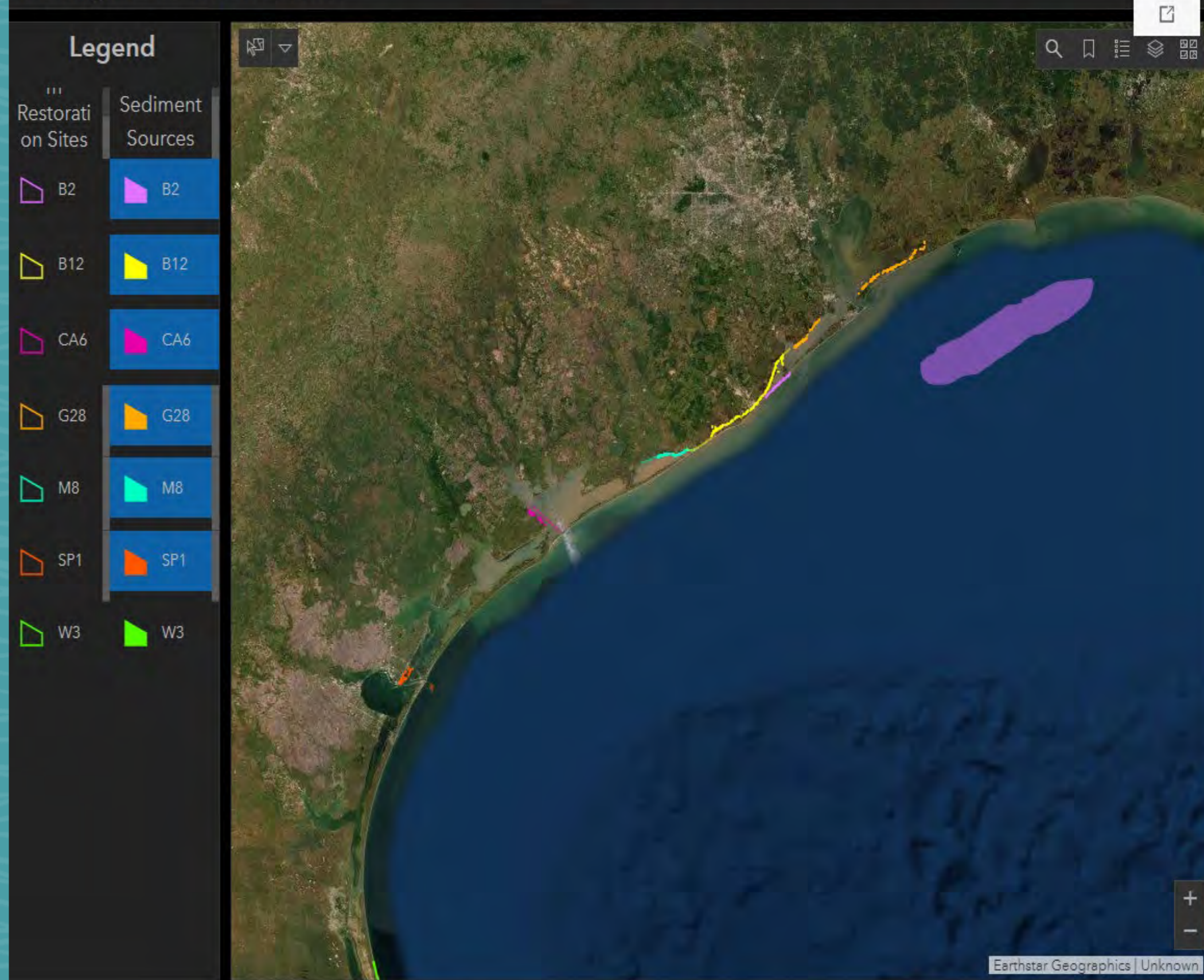
Summary (~70 M CY)

We need lots of sediments.

(This quantity can raise the entire Galveston Island by 1 ft)

<https://storymaps.arcgis.com/stories/bd63f11a9ec34d0dbcbdefc5cc5a6a47>

Finding the Sediment Source



Channel modification



Web: <http://CoastalStudy.Texas.gov>

Coastal TX StoryMaps



COASTAL TEXAS STUDY

About The Study | The Draft Proposal | Get Involved | Resources | Contact

2020 Draft Feasibility Report

The 2020 Draft Feasibility Report is now available to the public.

LEARN MORE

The Need

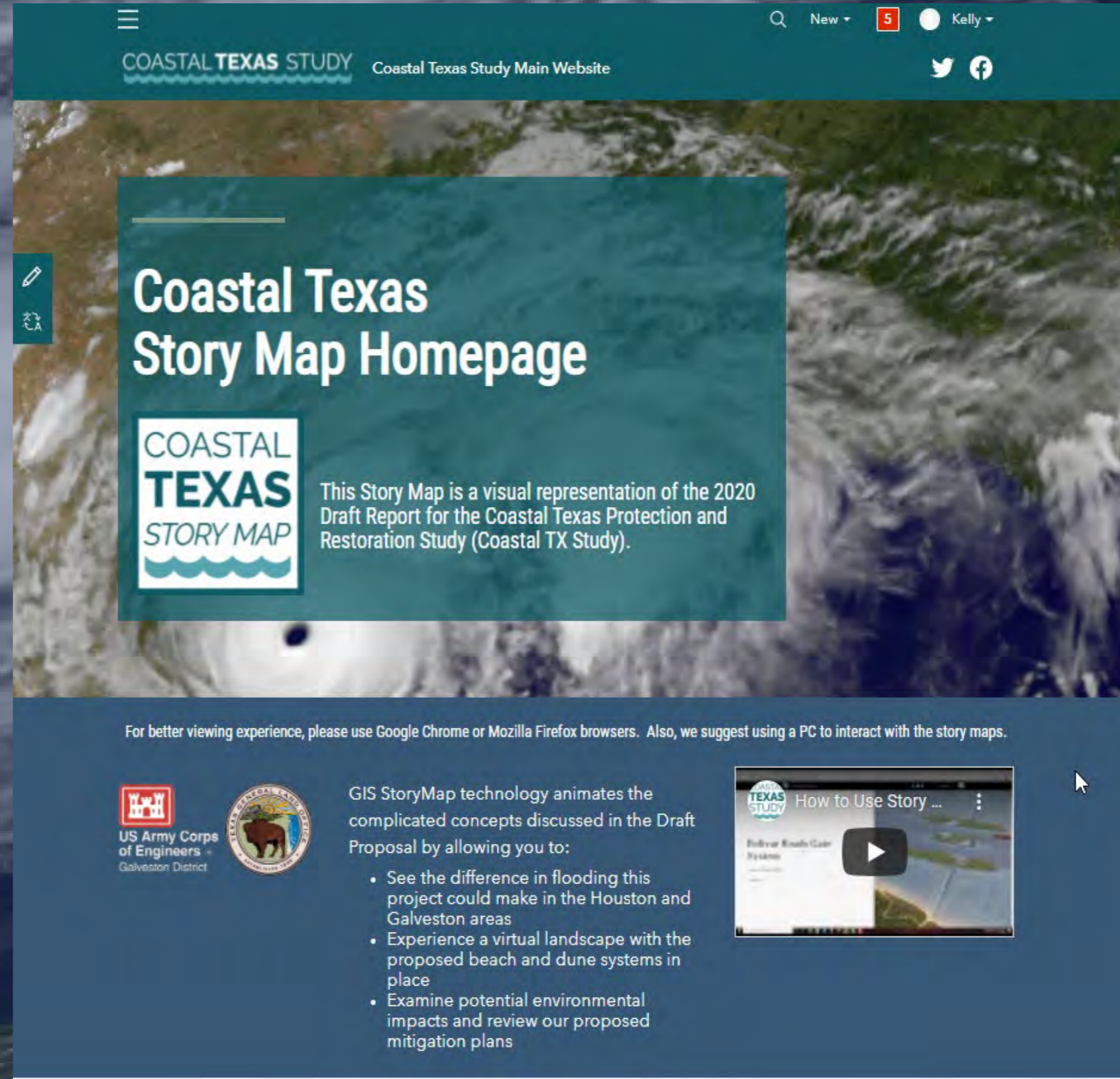
Understand the current problems and why this study was launched.

LEARN MORE

Current Overview

Discover more information about the proposed solutions in your area.

LEARN MORE



COASTAL TEXAS STUDY Coastal Texas Study Main Website

Coastal Texas Story Map Homepage

COASTAL TEXAS STORY MAP

This Story Map is a visual representation of the 2020 Draft Report for the Coastal Texas Protection and Restoration Study (Coastal TX Study).

For better viewing experience, please use Google Chrome or Mozilla Firefox browsers. Also, we suggest using a PC to interact with the story maps.

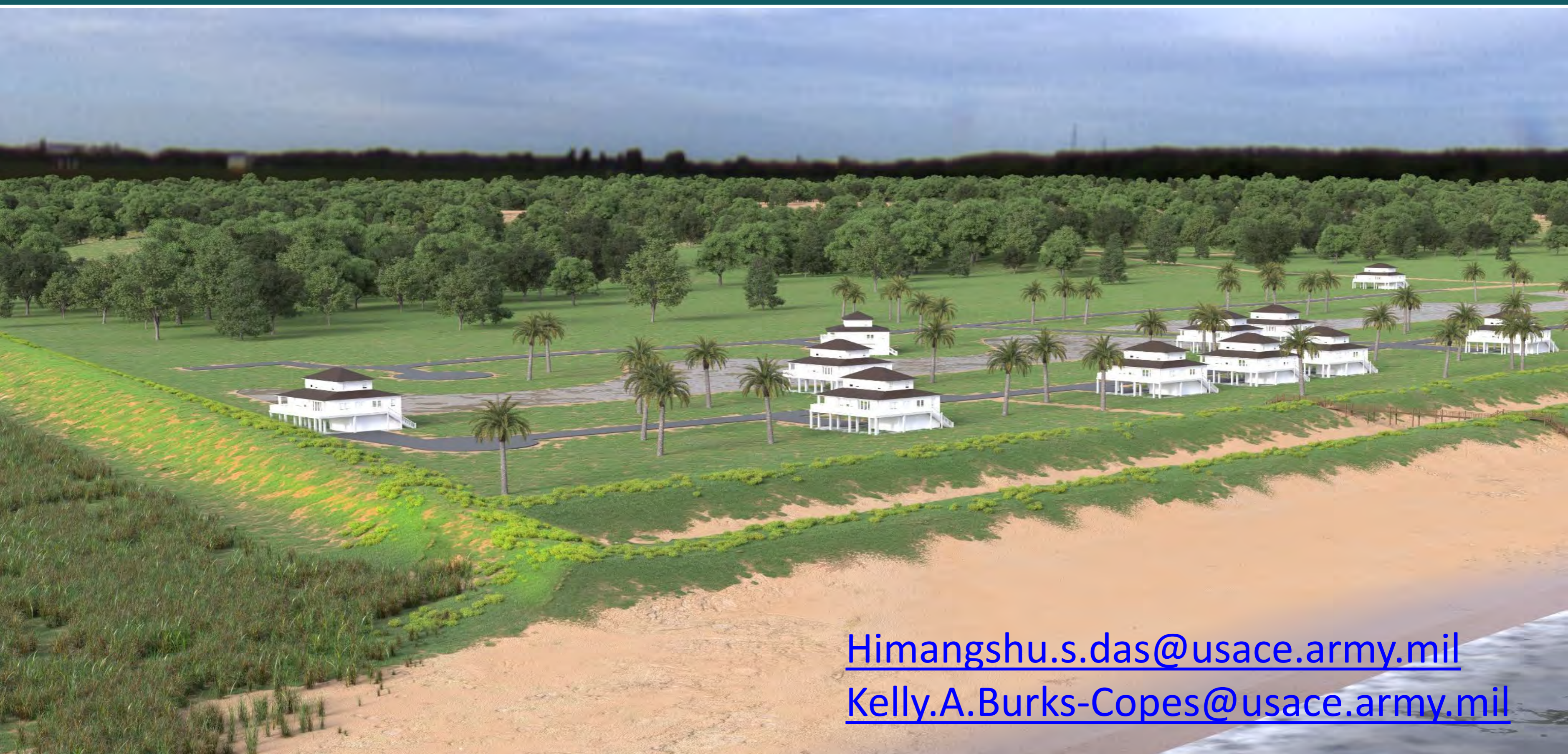
US Army Corps of Engineers Galveston District

GIS StoryMap technology animates the complicated concepts discussed in the Draft Proposal by allowing you to:

- See the difference in flooding this project could make in the Houston and Galveston areas
- Experience a virtual landscape with the proposed beach and dune systems in place
- Examine potential environmental impacts and review our proposed mitigation plans

How to Use Story ...

Question



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