

COASTAL TEXAS STUDY SEDIMENT NEEDS

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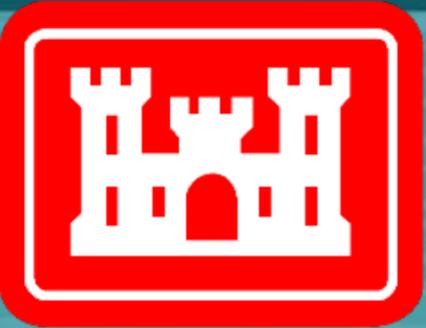
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USACE Galveston District

WEDA Dredging Summit (Virtual)

June 17, 2021

COASTAL TEXAS STUDY



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



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.

Study Name: Coastal Texas Protection & Restoration Feasibility Study

Authorization: Sec. 4091, Water Resources Development Act (WRDA) of 2007 Public Law 110-114

Appropriation: 2014-2019 yr increments thru public law
2020-2021 thru Bipartisan Budget Act of 2018

Budget: \$20.18 Million (\$12.282 Federal: \$7.898 Cost-shared)

Non-Federal Sponsor: Texas General Land Office

Schedule: Recon: 2014-2015
Feasibility Study Start: Oct 2016
Scheduled Completion: May 2021

Multi-Purpose: Coastal Storm Risk Management and Ecosystem Restoration

Scope:

Develop a **comprehensive plan** to determine the feasibility of carrying out projects for flood damage reduction, **hurricane** and **storm damage reduction**, and **ecosystem restoration** in the coastal areas of the State of Texas.

The comprehensive plan shall provide for the **protection, conservation, and restoration** of wetlands, barrier islands, shorelines, and related lands and features that **protect critical resources, habitat, and infrastructure** from the impacts of coastal storms, hurricanes, erosion, and subsidence



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.

BAY DEFENSES

GULF DEFENSES

BAY DEFENSES

GULF DEFENSES

Dickinson Bay Gate System and Pump Station

Nonstructural Improvements

Clear Lake Gate System and Pump Station

Galveston Ring Barrier System

Ecosystem Restoration Measures

Galveston Seawall Improvements

Bolivar Roads Gate System

Bolivar and West Galveston Beach and Dune System

Illustration is representational and not to scale

Sediment Needs: Beach and Dune System

Design & Analyses



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) ?

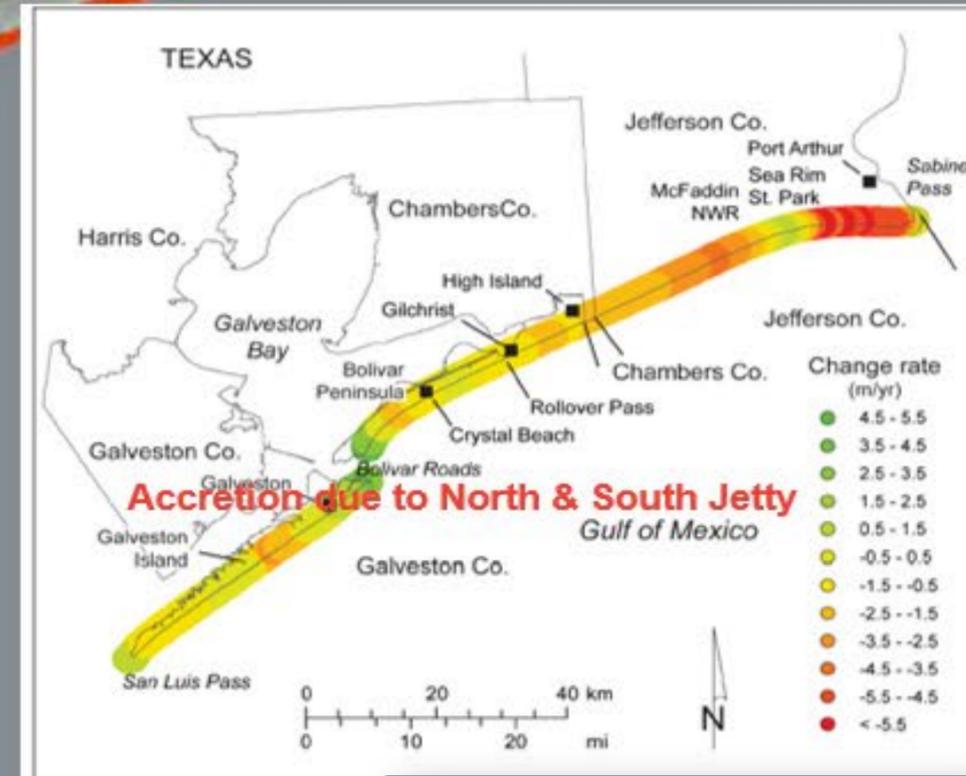
Inlet Structure

Bolivar
~26 mile

Galveston
~19 mile

Challenge:

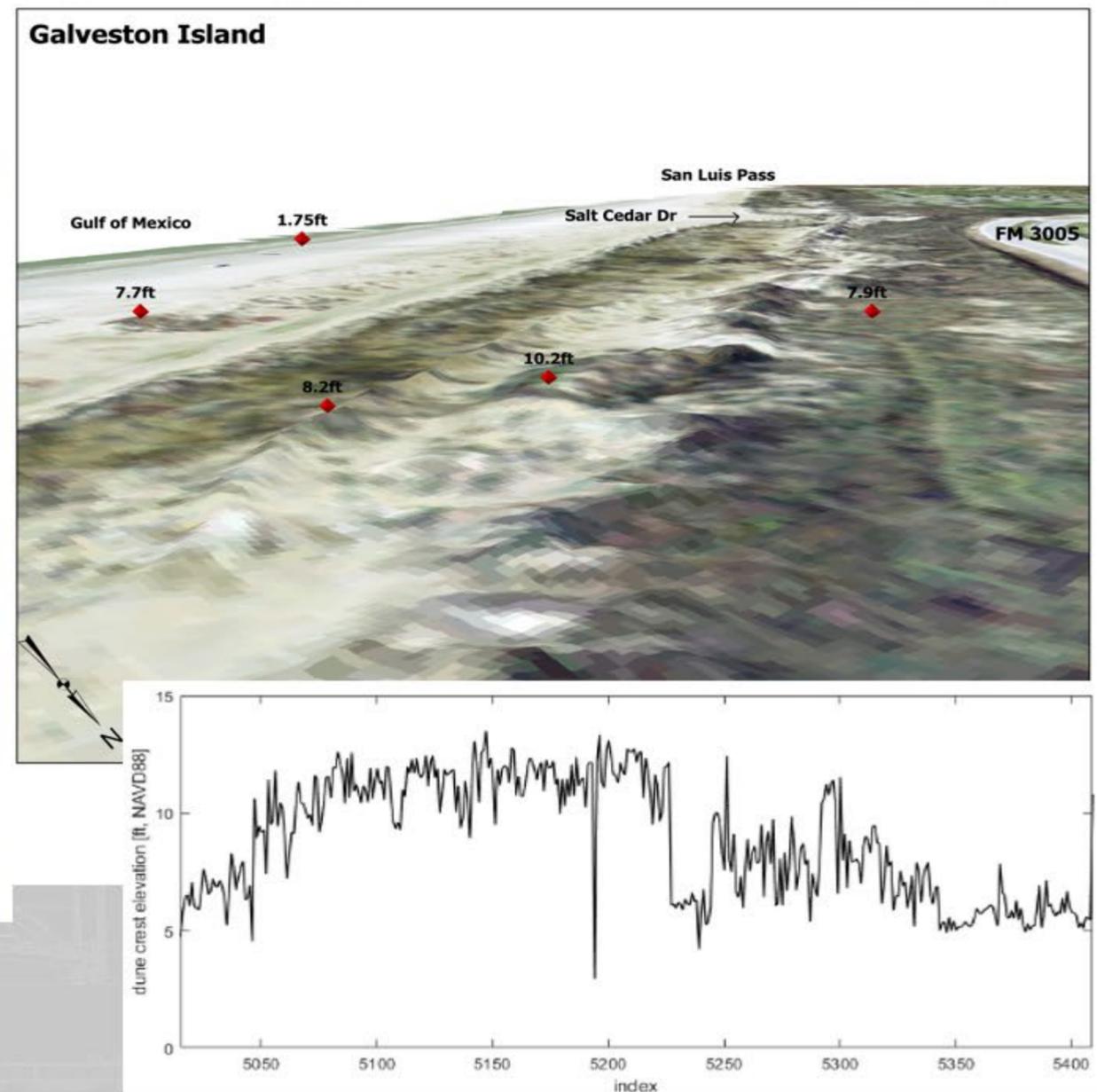
Over 45 miles of coastal spine (beach & dune system) design, Performance & Resiliency check against forcing (Storm, Erosion, RSLC)



We stepped back from 17 ft Levee to Nature Based Solution

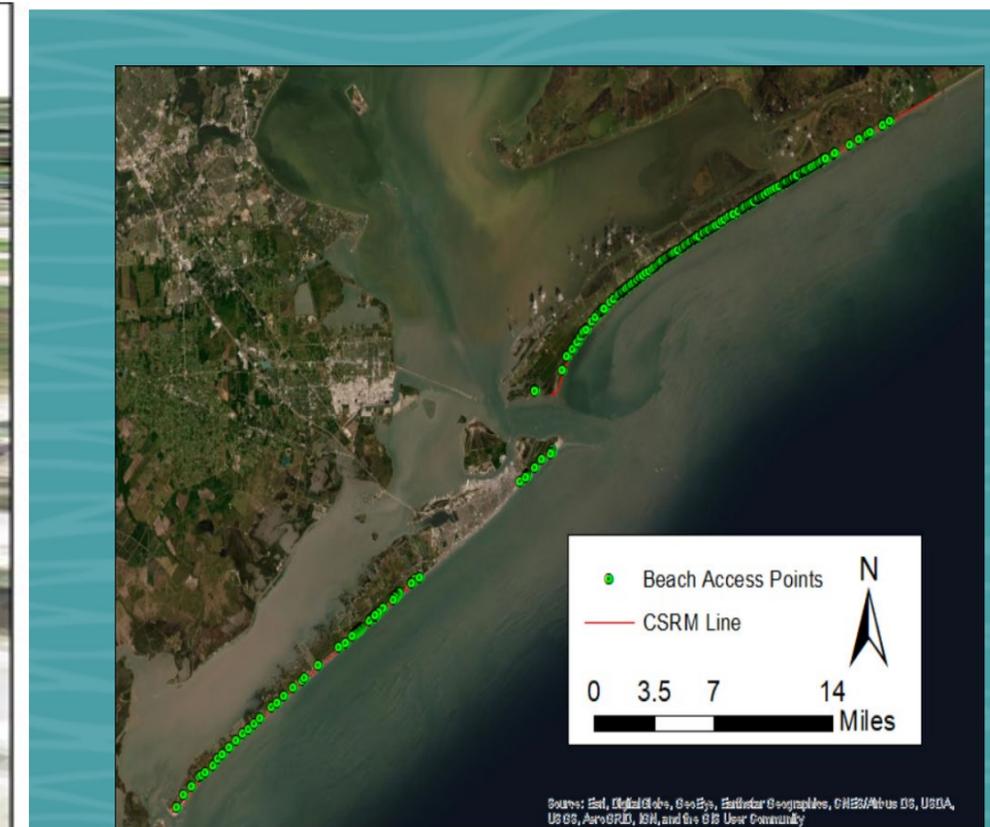
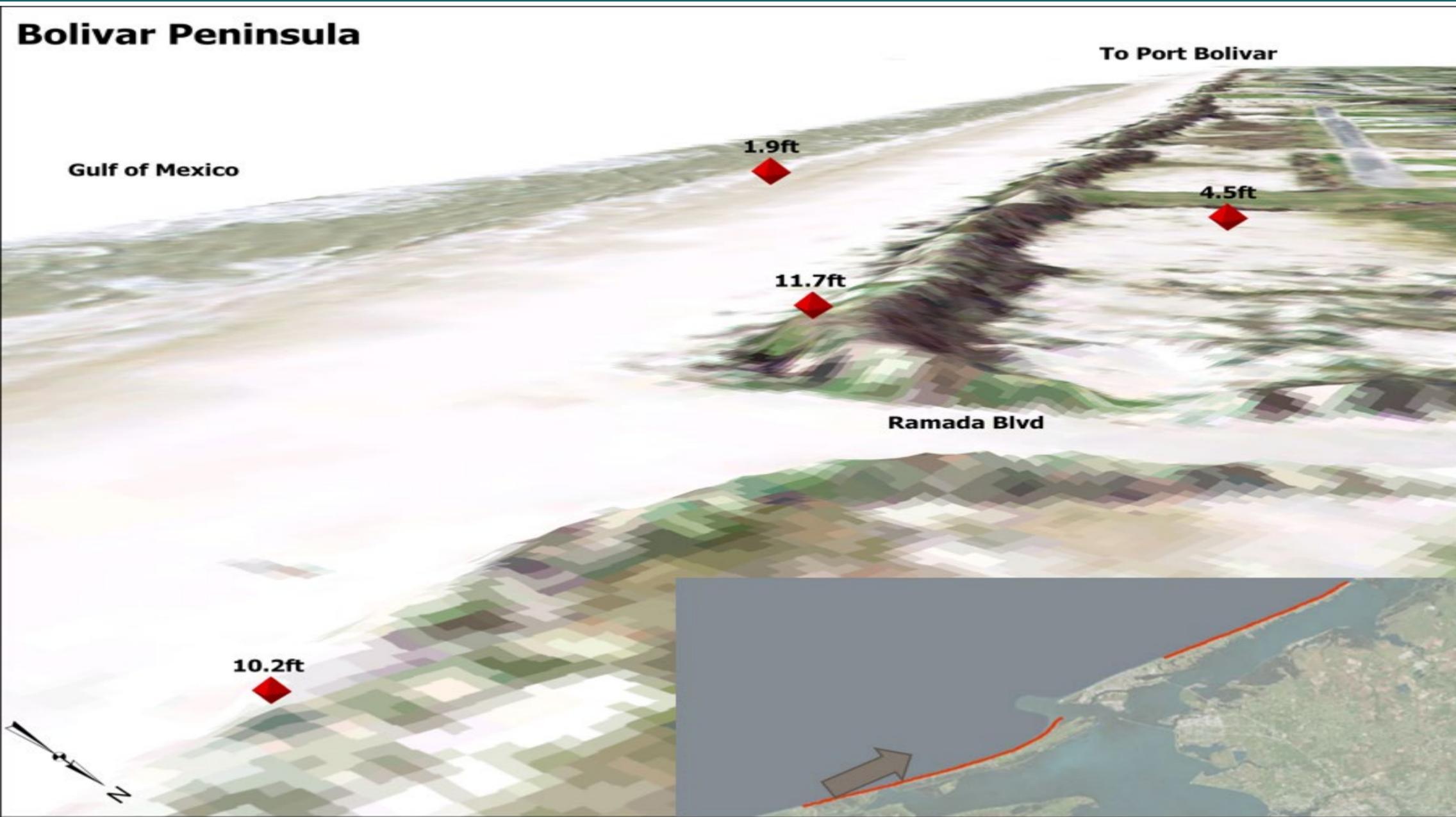
Design Philosophy : Mimic Natural Condition

Topography (2018 LIDAR)



Galveston Island Dune Line (5 to 12 ft)

Design Philosophy : Mimic Natural Condition



**State & Federal
Regulation
on Beach Access**

Bolivar Peninsula Dune Line (~10 ft)

Design & Evaluation Method

1. CEDAS: BMAP, S-Beach

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

2. CSHORE

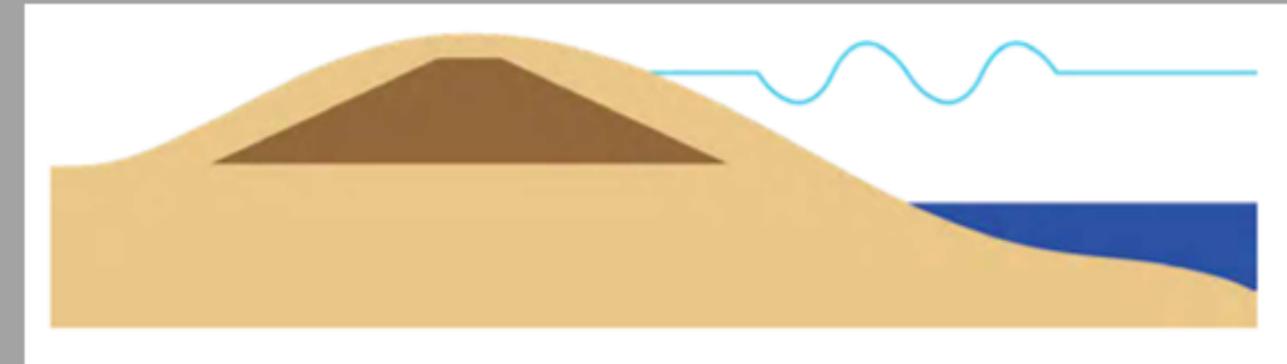
MonteCarlo Probabilistic Simulations
(170 Tropical Storms,
RSLC)

Design Cross Section : Many Cases

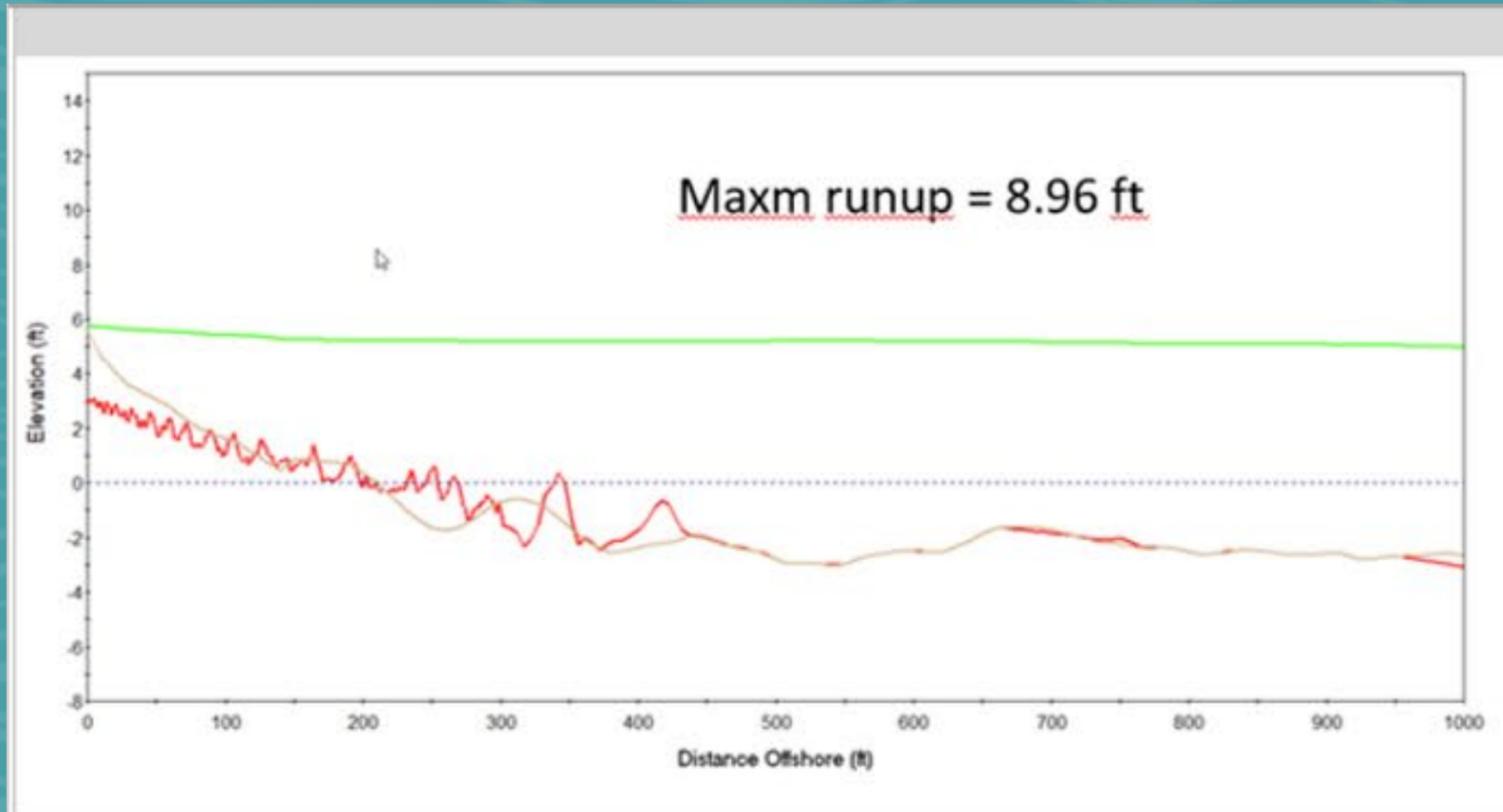
- Existing Condition
- Dune: Sand Only Option (12 ft, 14 ft Dune Height)
- Dune Field: Sand Only Option (12 ft, 14 ft Dune Height)
- Fortified Dune - Hard Core Inside (8 ft, 10 ft, 12 ft)

Question to Answer

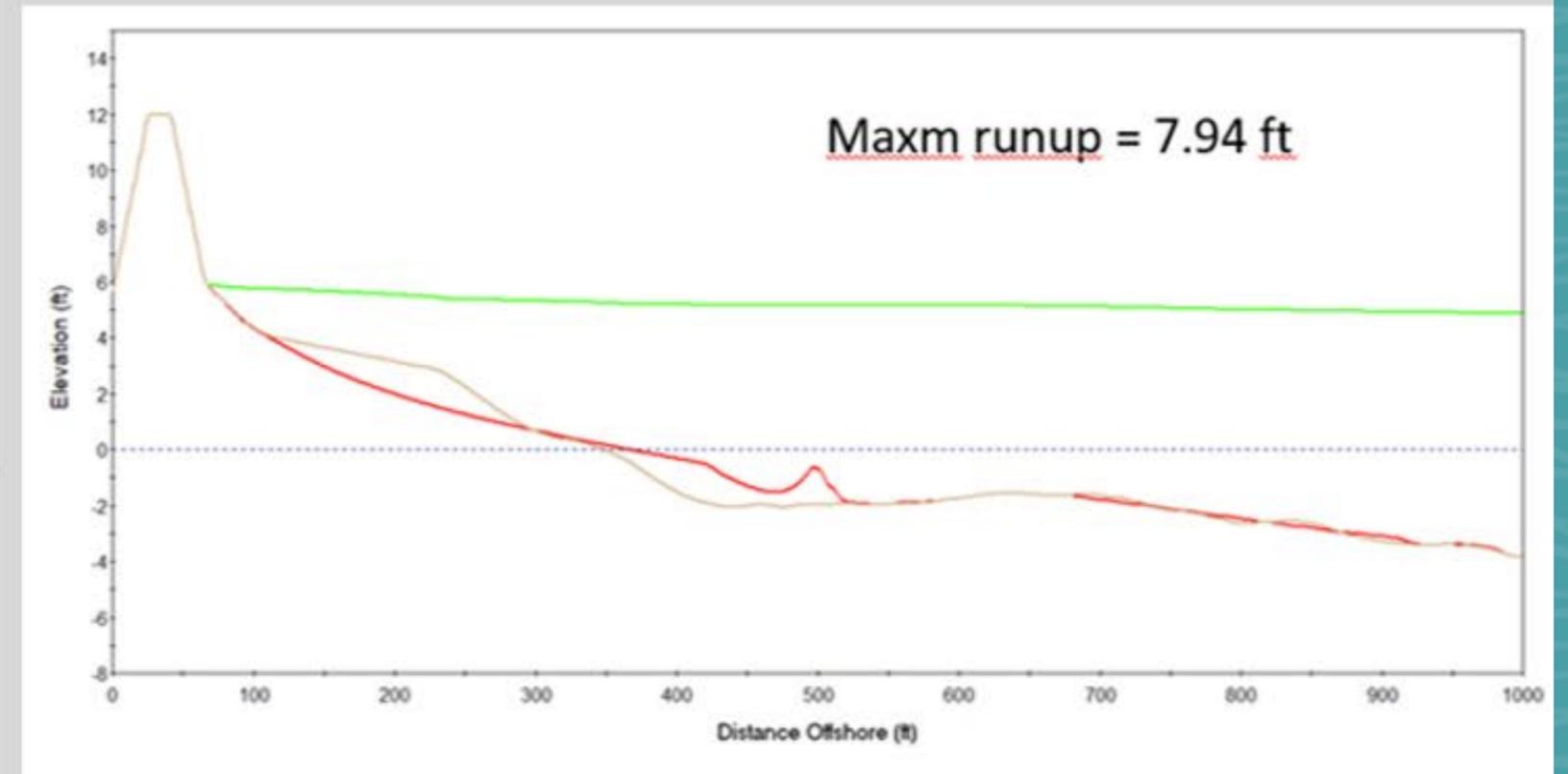
- (a) Initial Quantity (Construction Cost)
- (b) Regular re-nourishment cycle (O&M)



Example Case: 10 year Storm (~Reta)



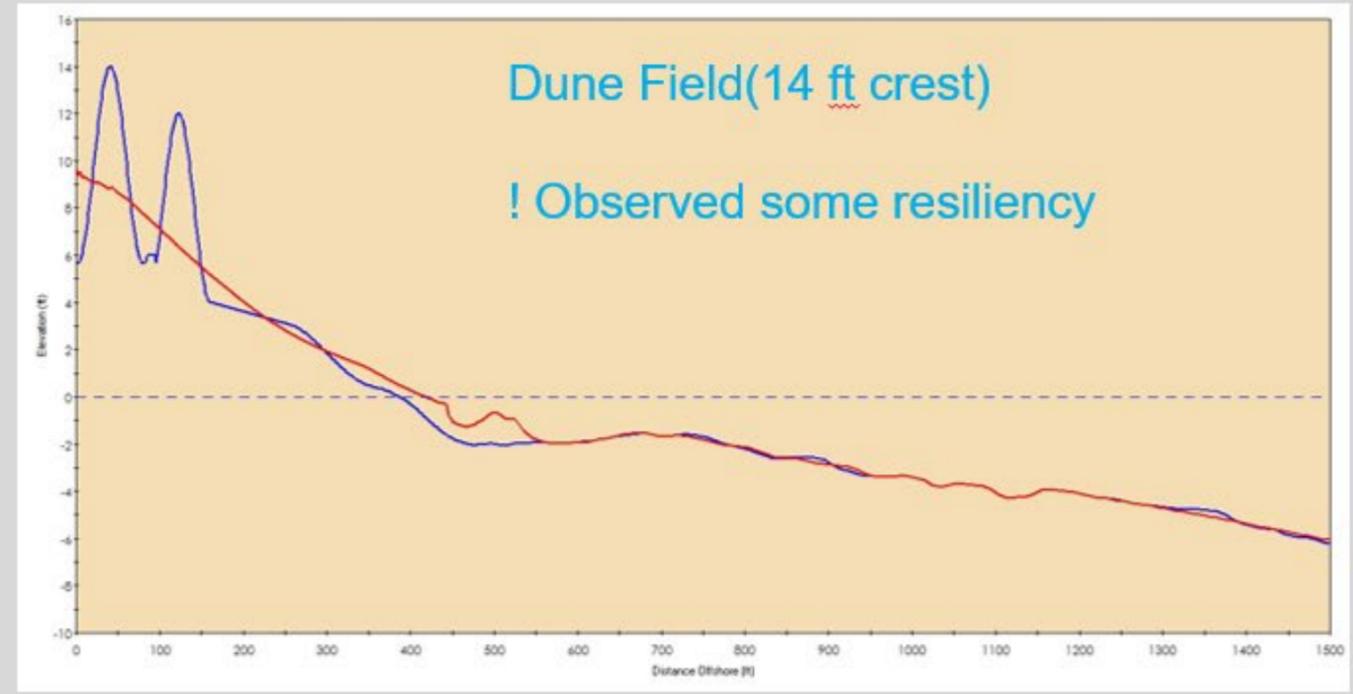
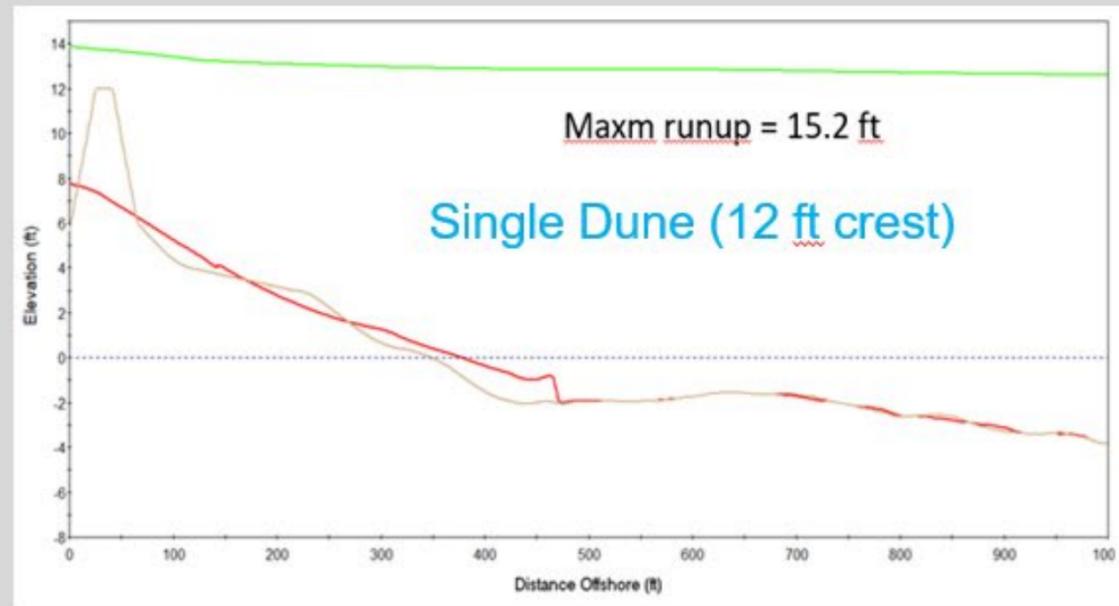
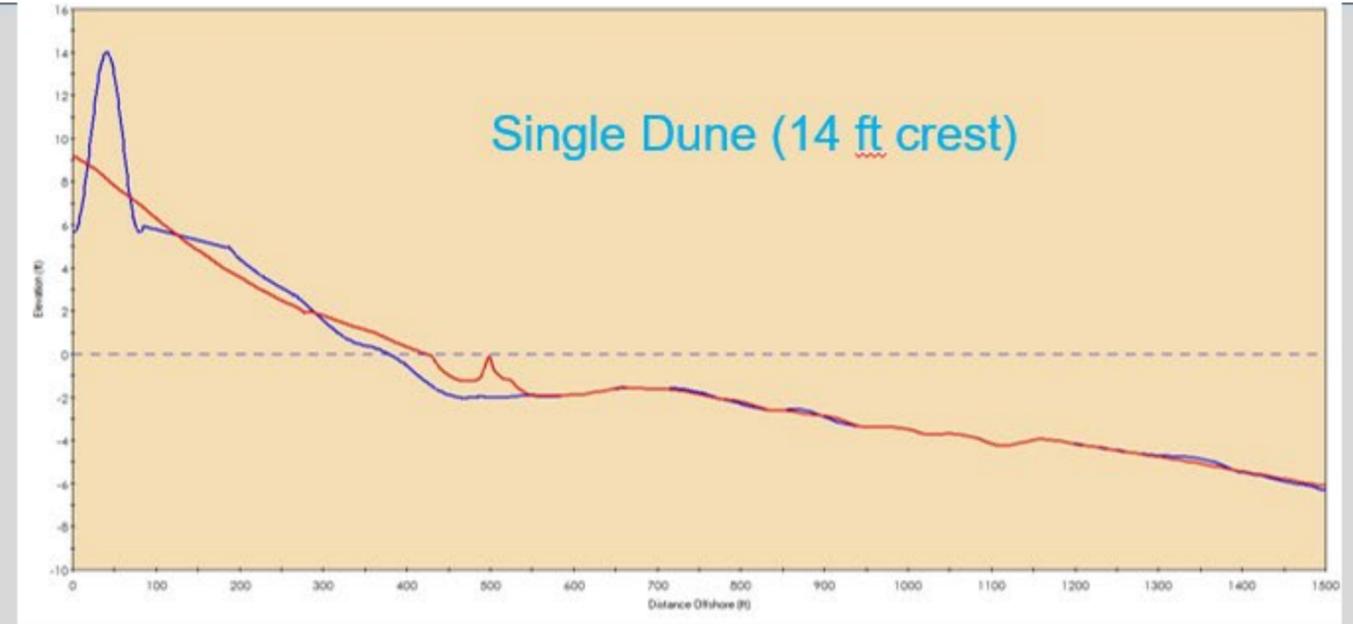
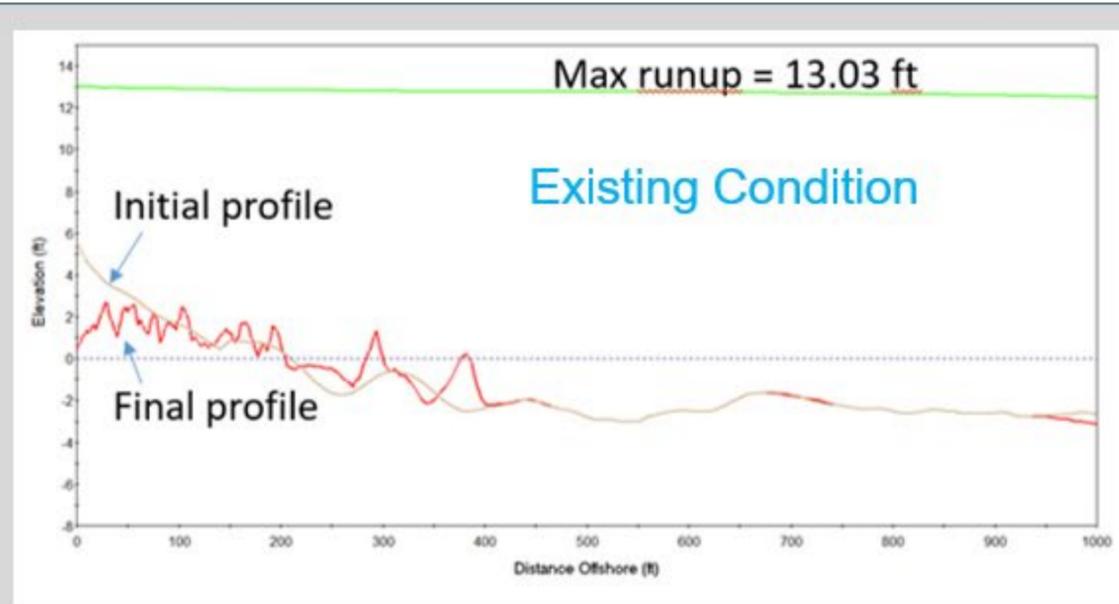
Existing Condition



Single Dune (Sand Only Option)

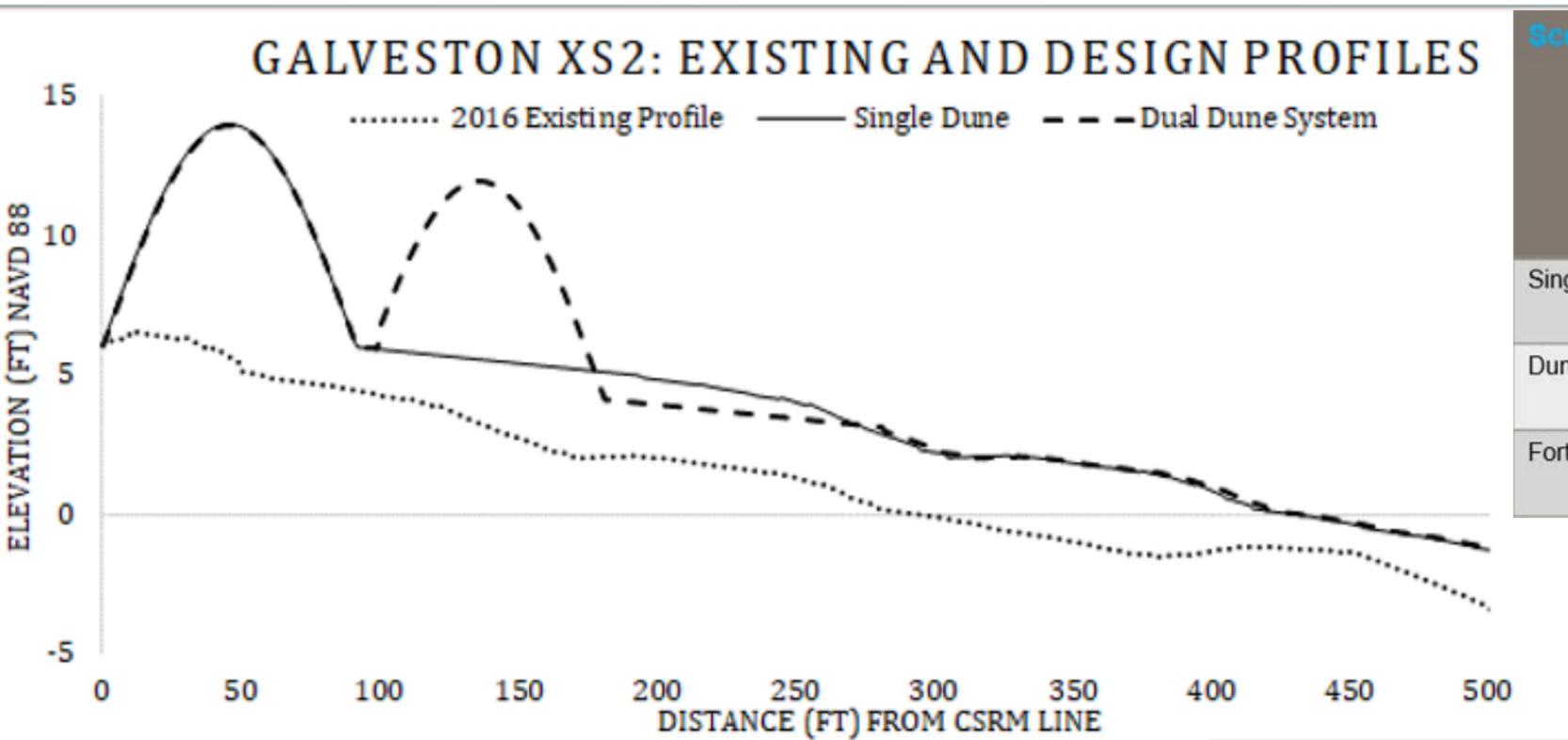
Dunes appears to be intact

Example Case: 100 year Storm (> Ike)



Dunes appear to be compromised in such events

Evaluation Matrix



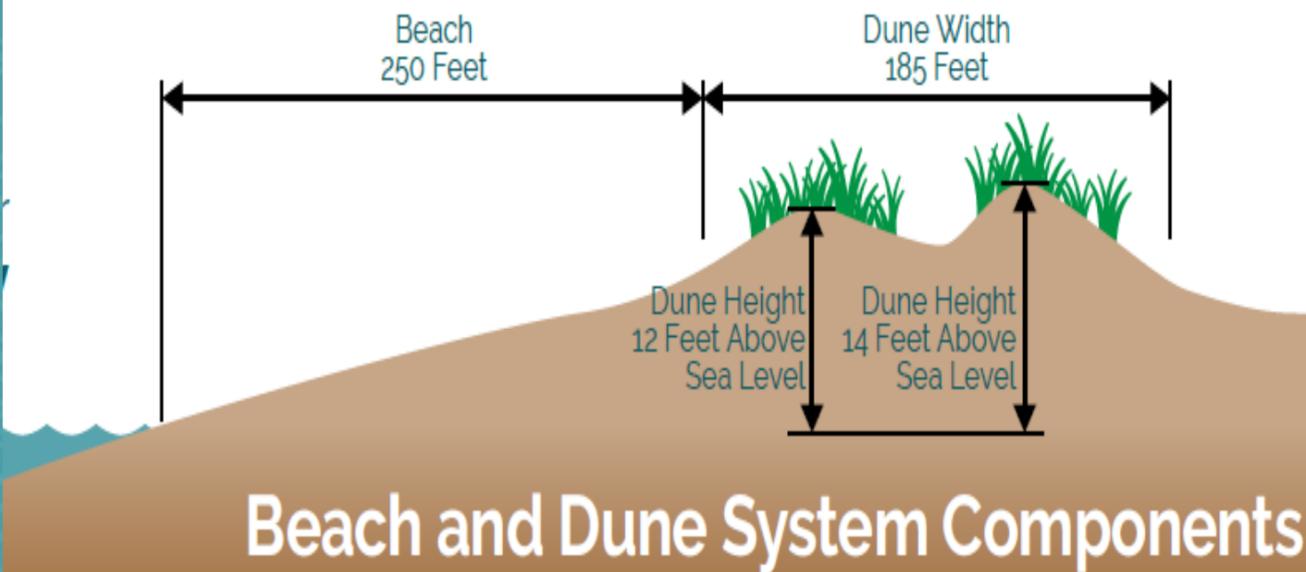
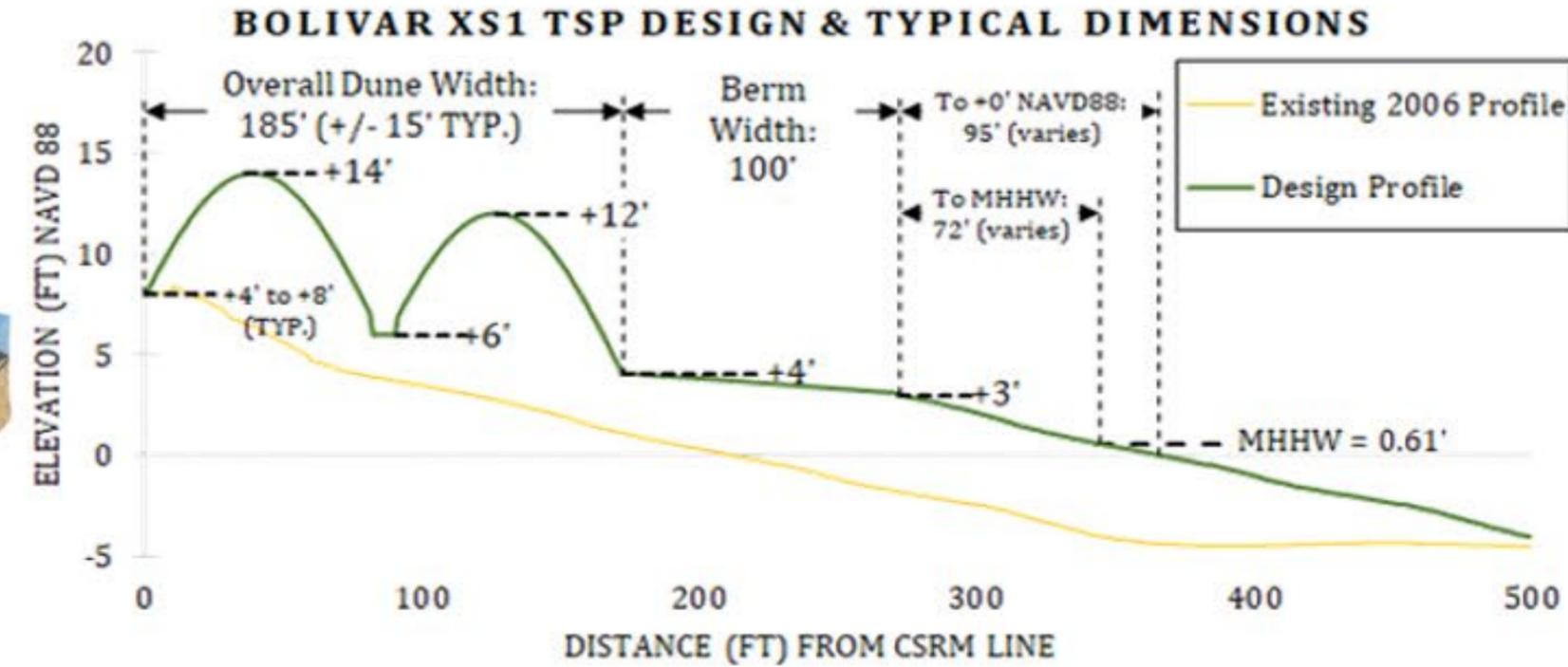
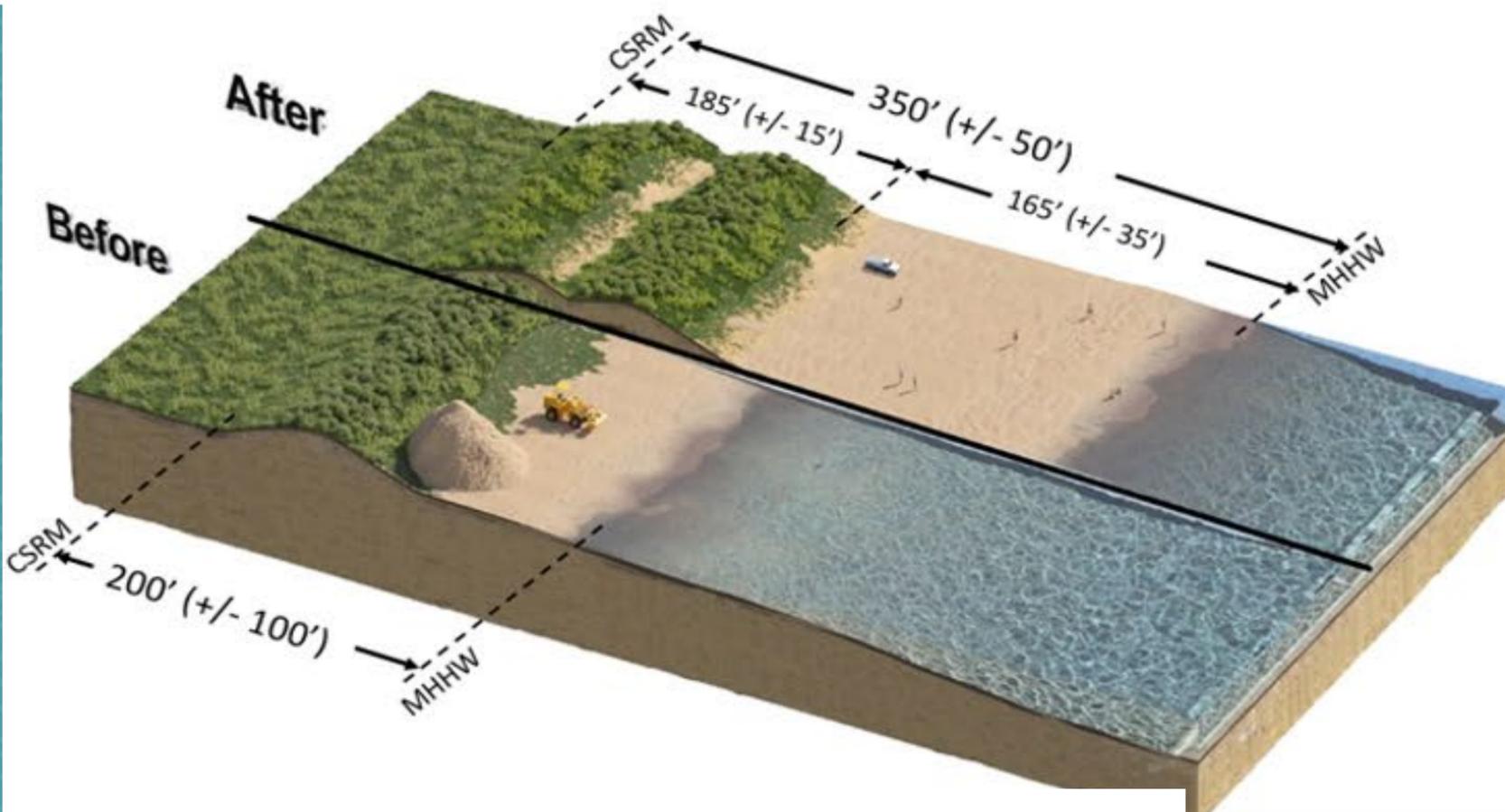
Scenario	Approximate Initial Cost (in Million)	Maintenance Sand Volume (10 yr Int.)	Breaching, Overtopping (100 Yr AEP)	Resiliency	Acceptability/Environmental Compliance
Single Dune	\$ 1,197	Range between 10 and 14 cyd/ft average	Very High	Medium	High
Dune Field	\$ 1,425		High	High	Very High
Fortified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

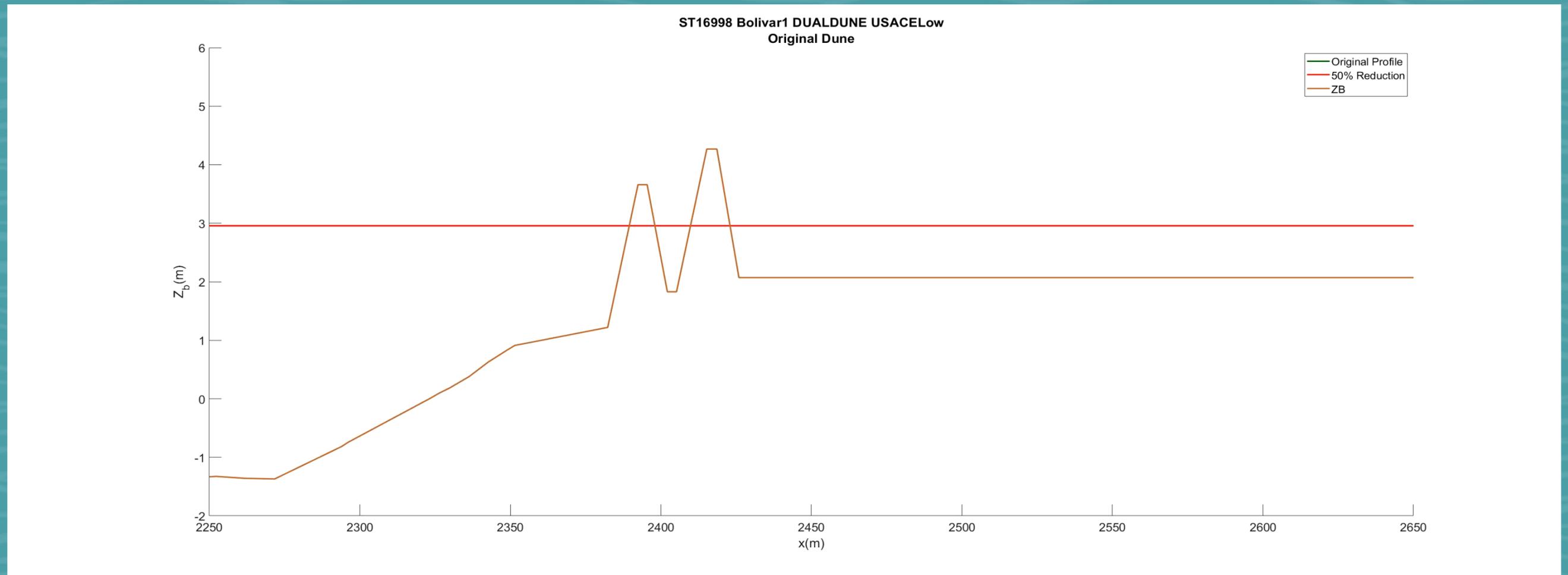
(Drawing is representational and for illustrative purposes only. All dimensions are approximate)

Initial Construction Quantity

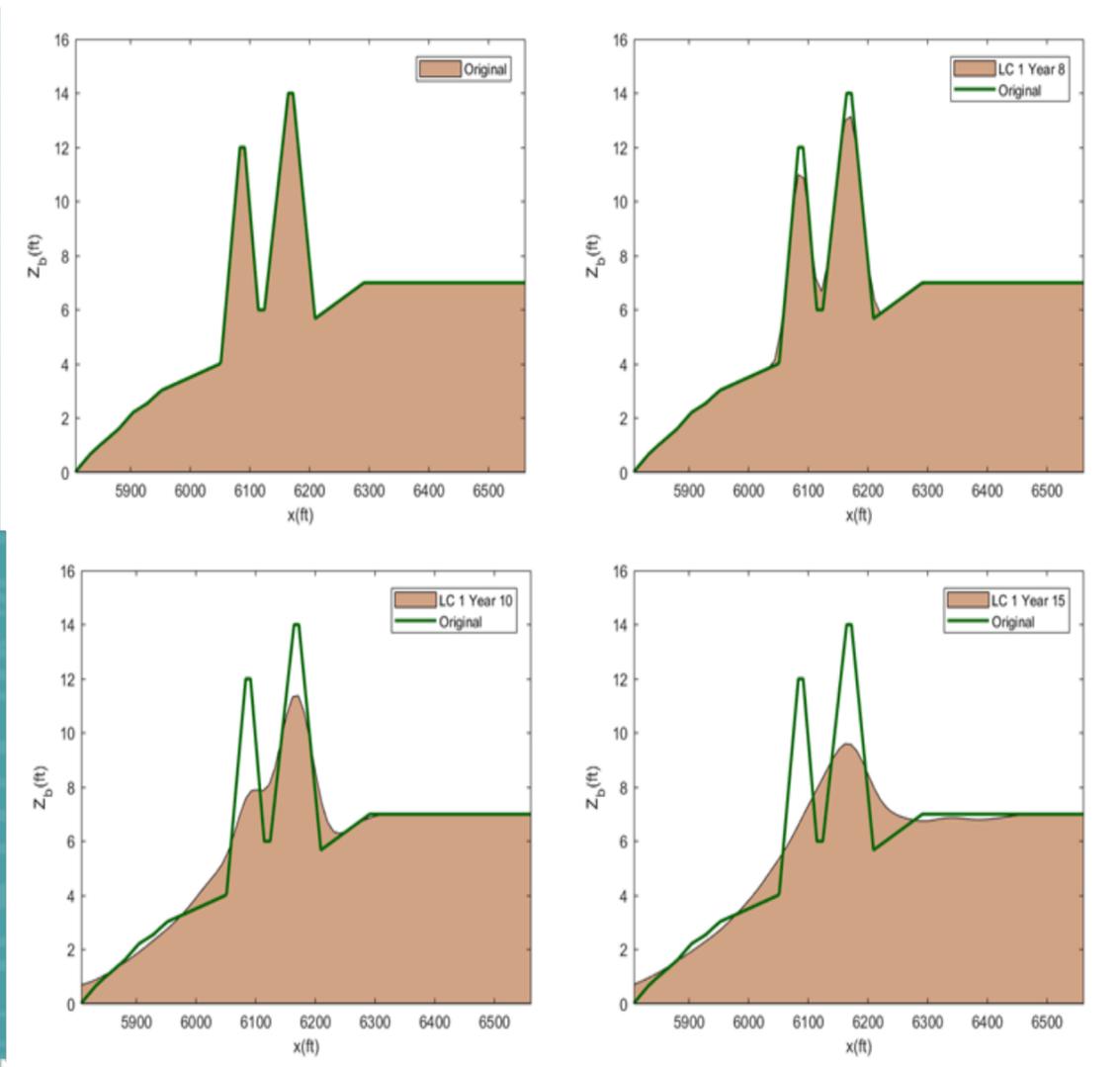
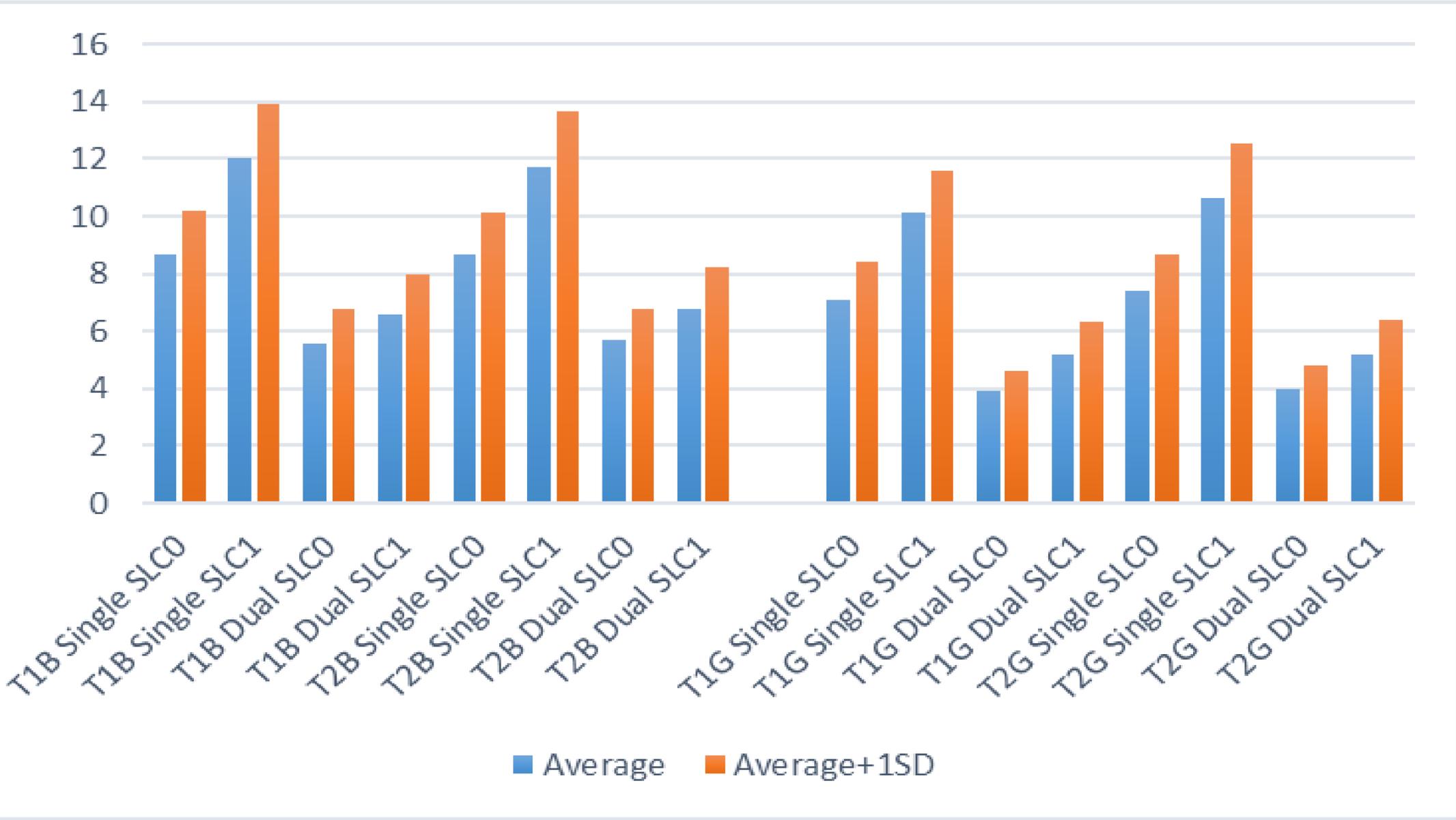
- Galveston Length: 18.35 mile
- Bolivar Length : 25.09 mile
- Galveston initial construction volume including advanced nourishment
17.19 MCYD (Avg. 177.43 CYD/ft)
- Bolivar Initial Construction Volume including advanced nourishment
22.14 MCYD (Avg. 167.12 CYD/ft)
- Total initial construction volume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



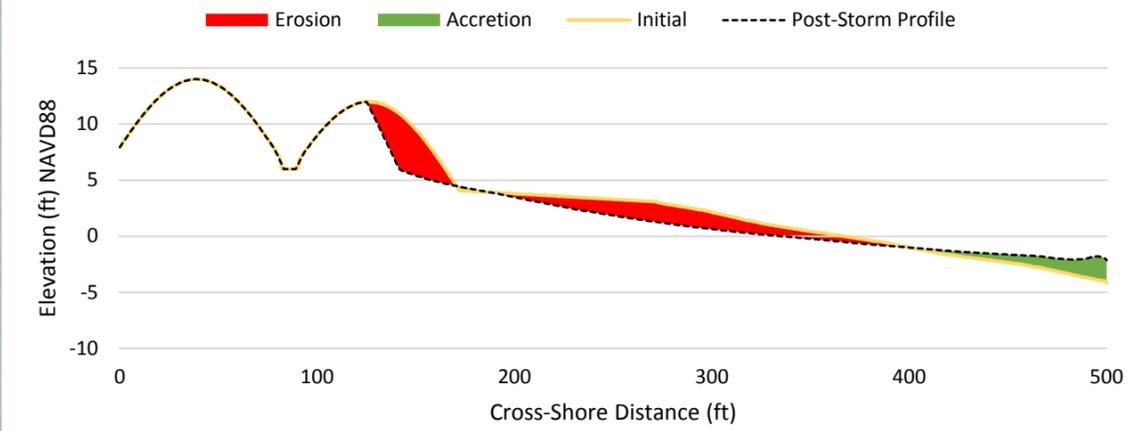
Life Cycle Cost (O&M)



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

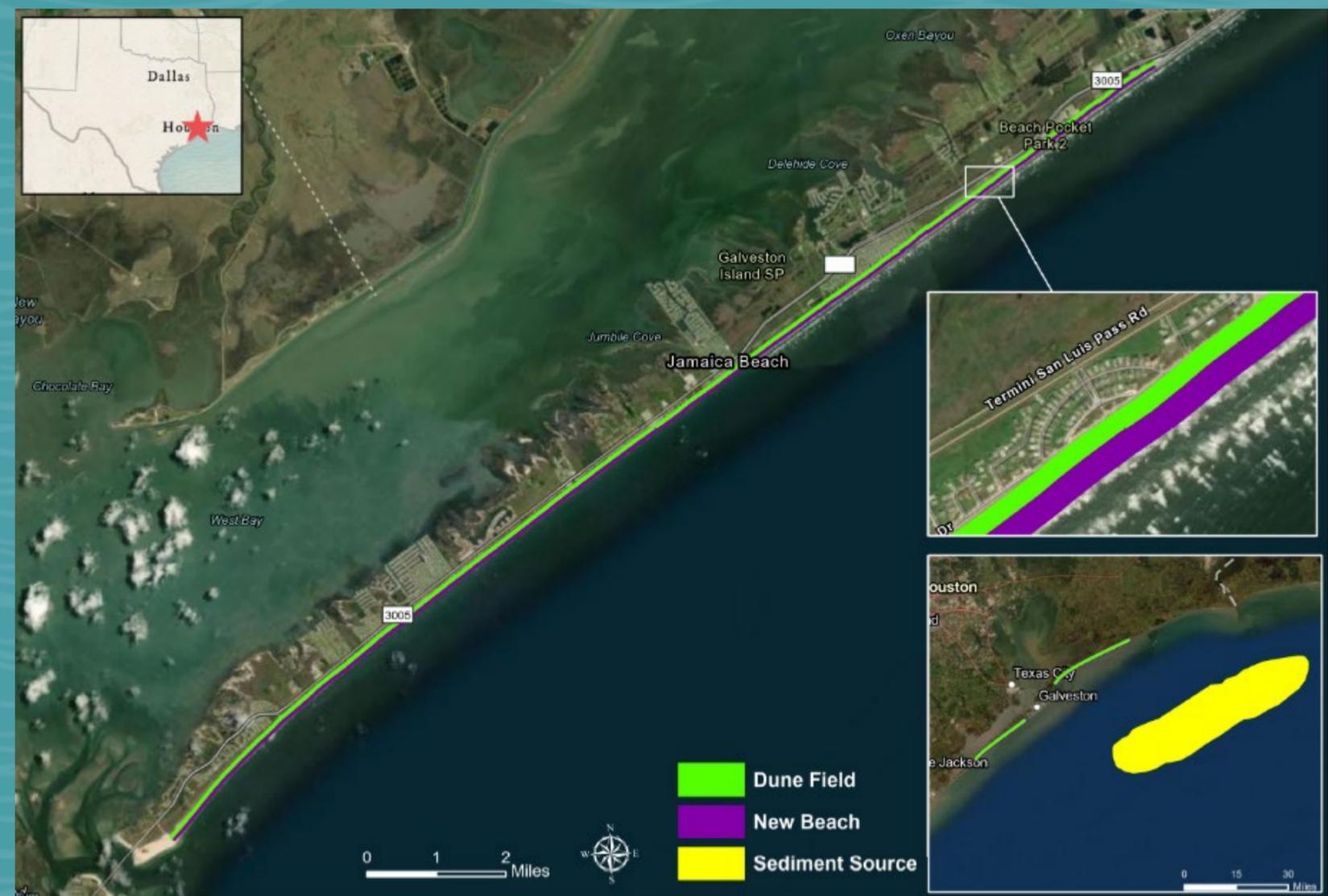
**Bolivar: re-nourish cycle every 6 years @ 1.785
MCYD per rebuild**

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



Sediment Source (>60 MCY for CSR)M)

Feasibility costs are based on sediments at Sabine Heald Banks

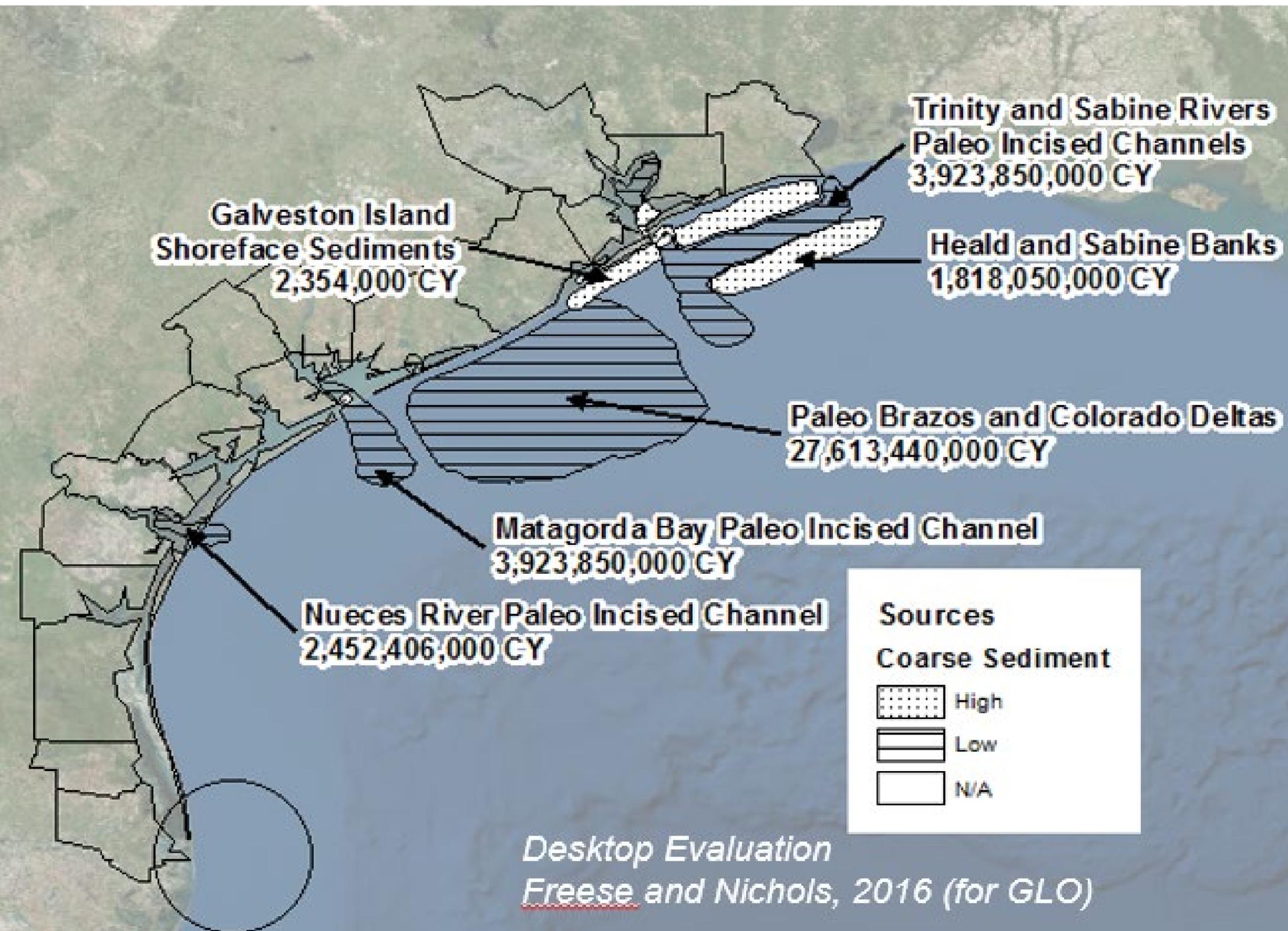


West Galveston



Bolivar Peninsula

Sediment Source (>60 MCY for CSR)

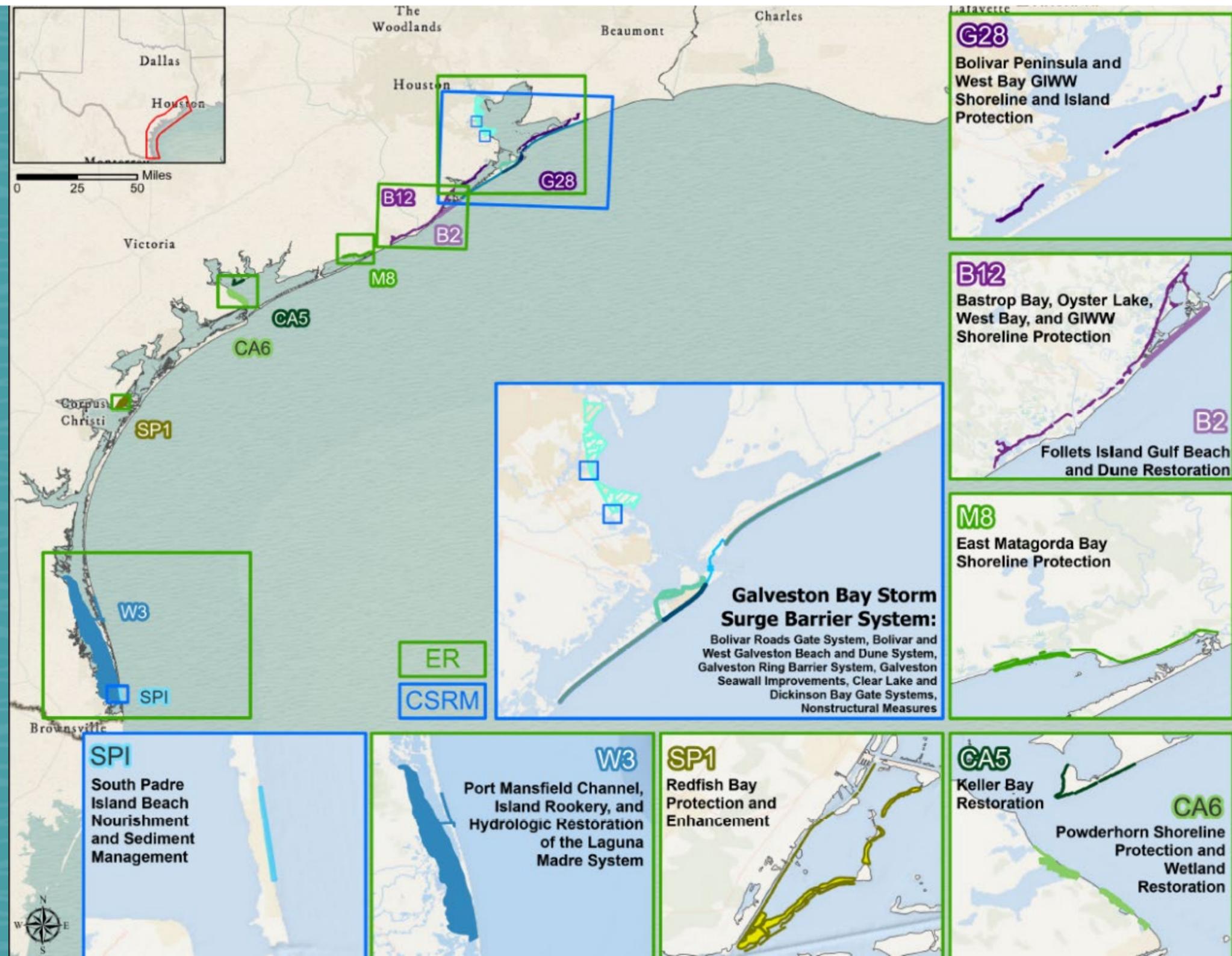


Current costs are based on Sabine Heald Banks.

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



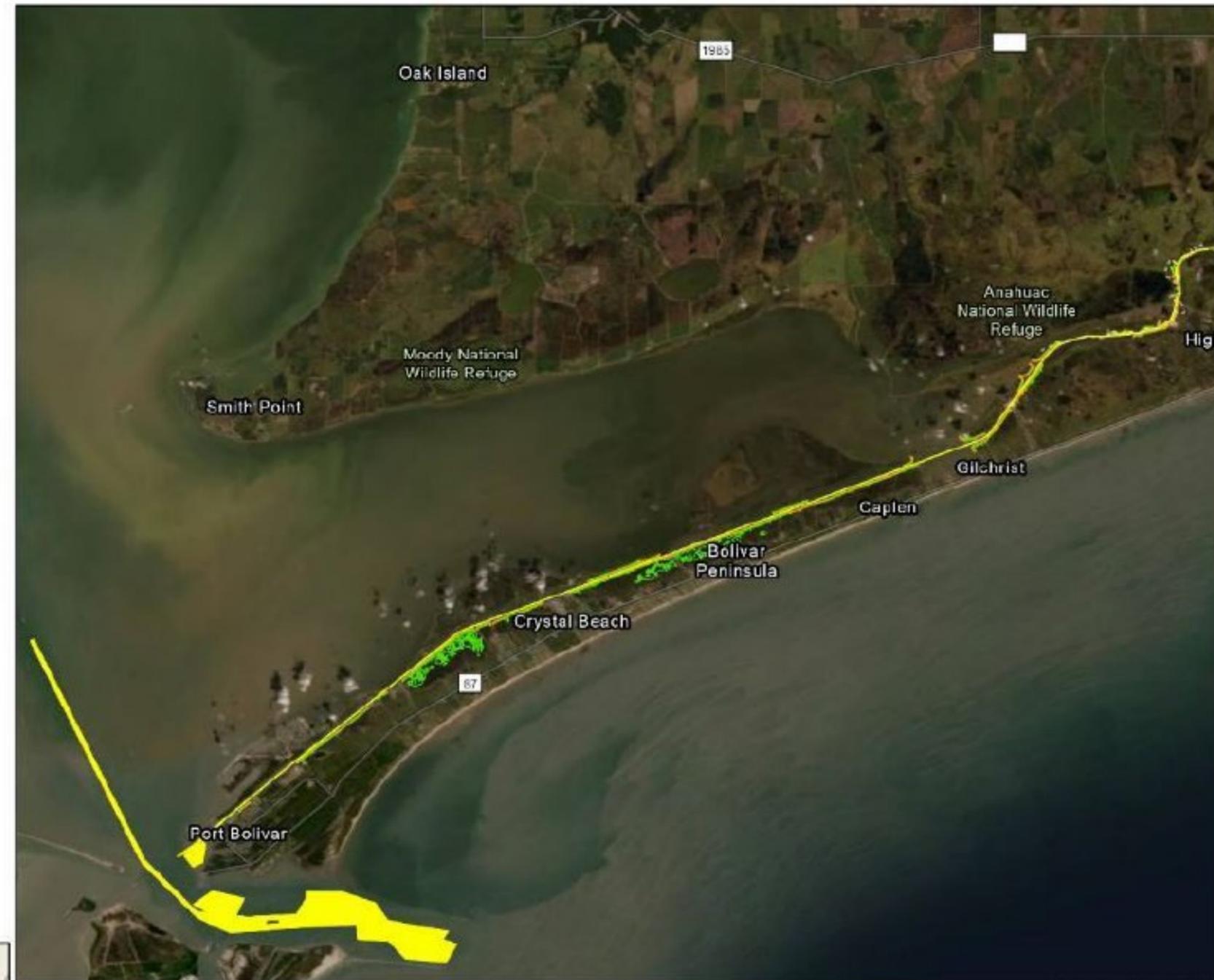
Other Sediment Needs

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

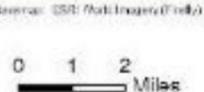
Ecosystem Restoration

G28 - Bolivar GIWW Shoreline and Island Protection

-  Sediment Source
-  Island Restoration
-  Oyster Reef Scaling
-  Revetment / Breakwater
-  Wetland / Marsh Restoration



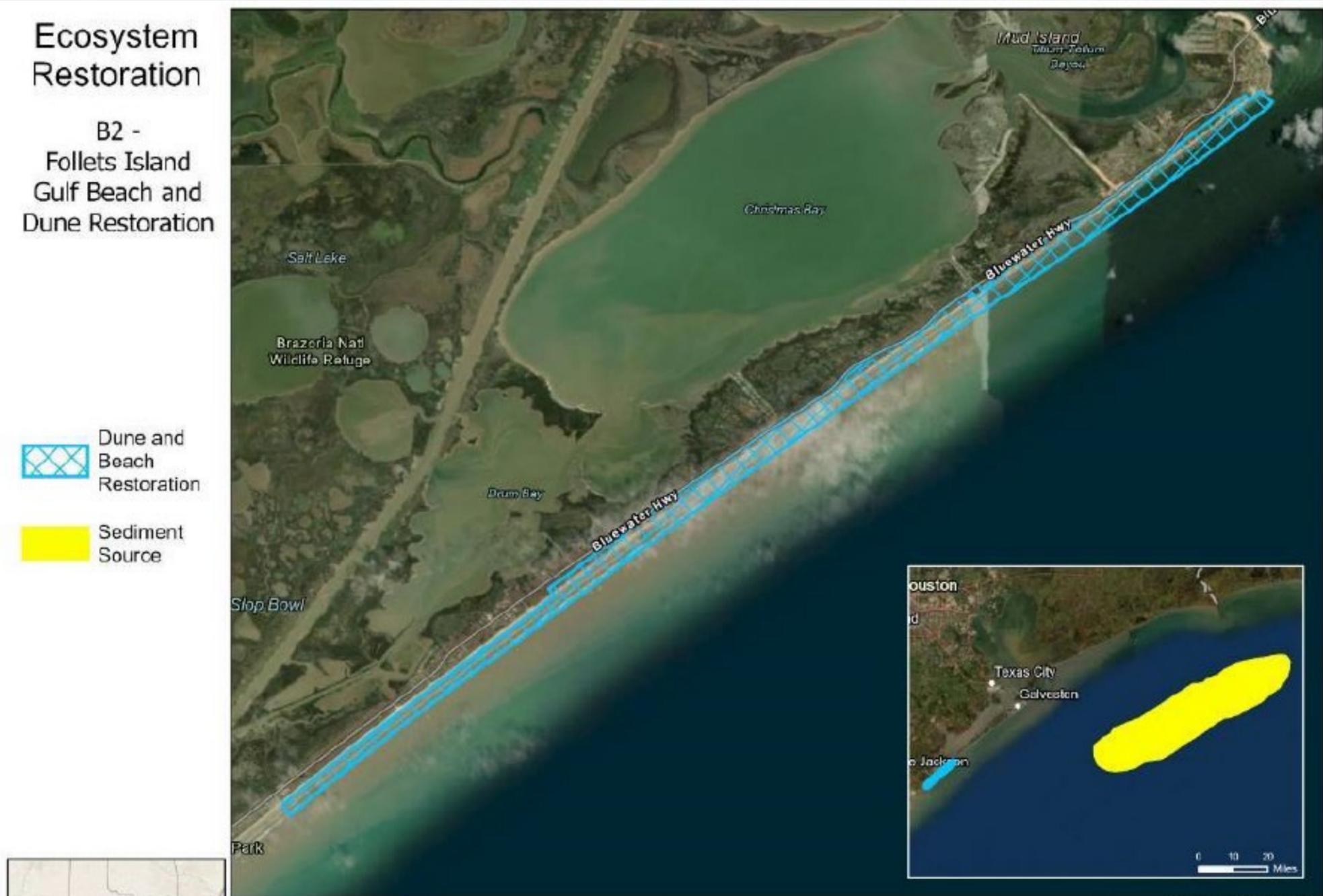
Coastal Texas Protection and Restoration Feasibility Study



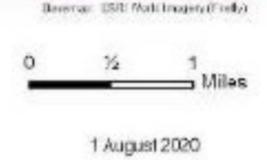
1 August 2020

Other Sediment Needs

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



Coastal Texas Protection and Restoration Feasibility Study



Summary (~70 M CY)

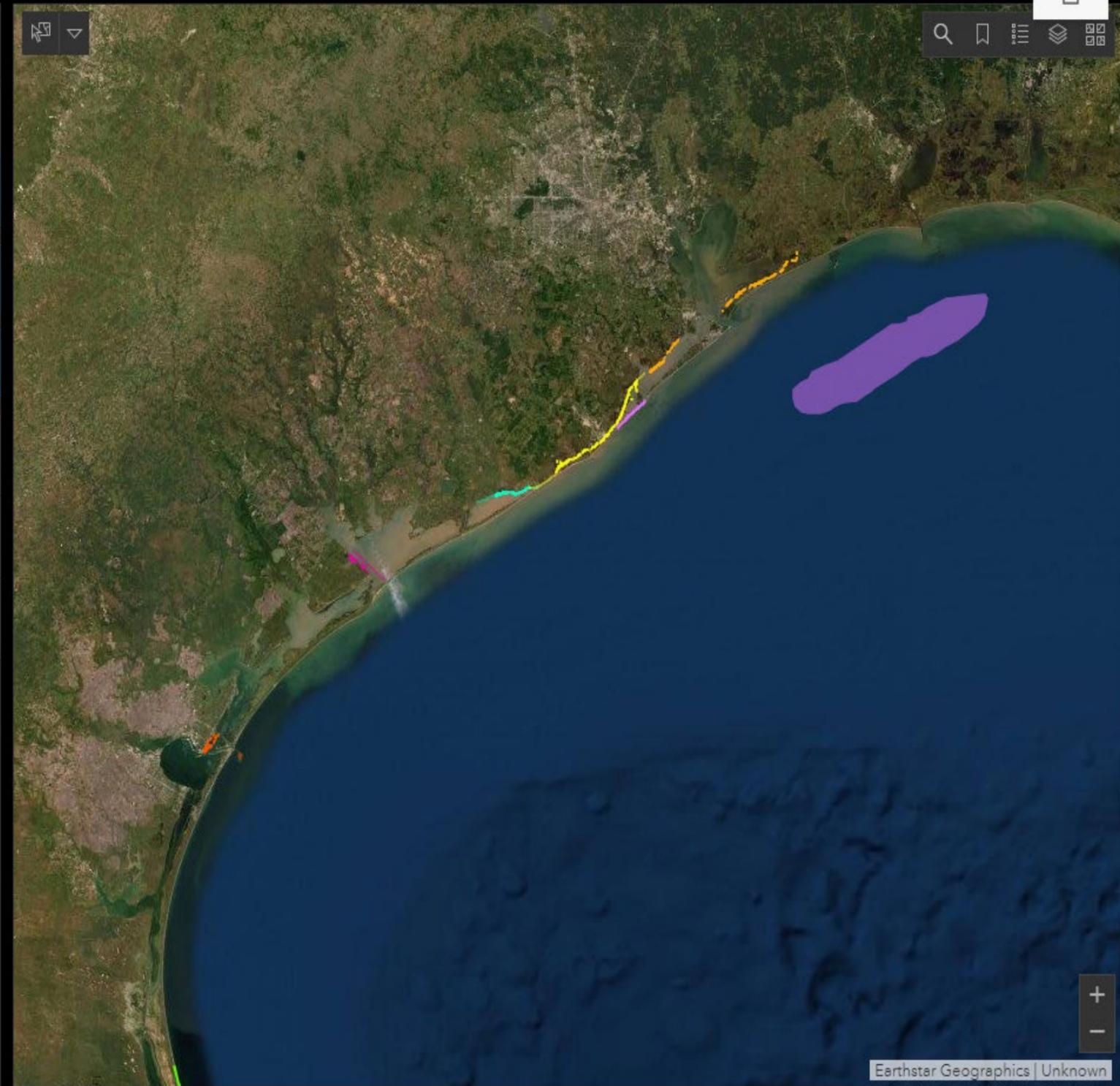
We need lots of sediments.

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

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

Finding the Sediment Source

Legend	
Restoration Sites	Sediment Sources
B2	B2
B12	B12
CA6	CA6
G28	G28
M8	M8
SP1	SP1
W3	W3



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

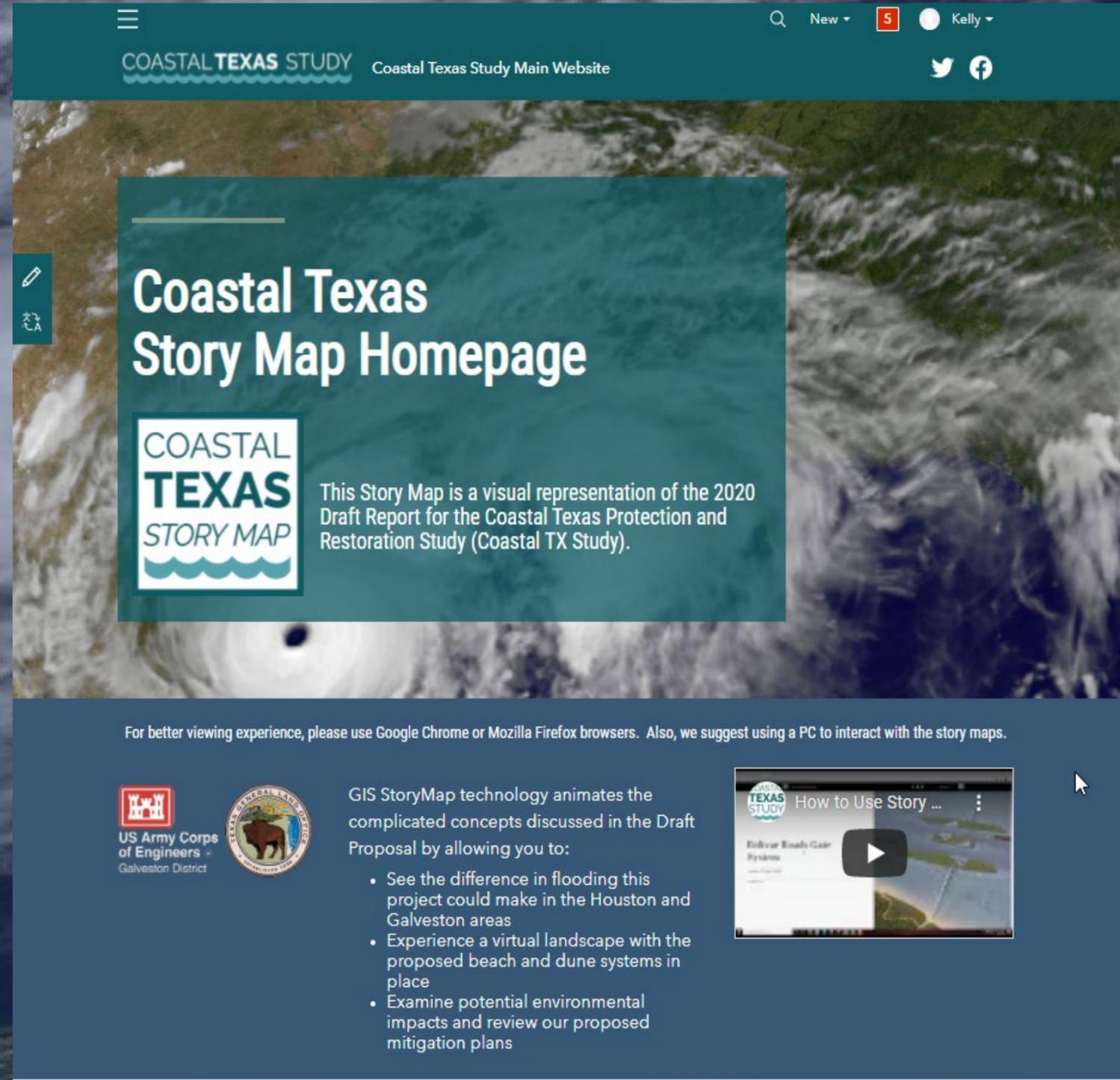
Understand the current problems and why this study was launched.

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.

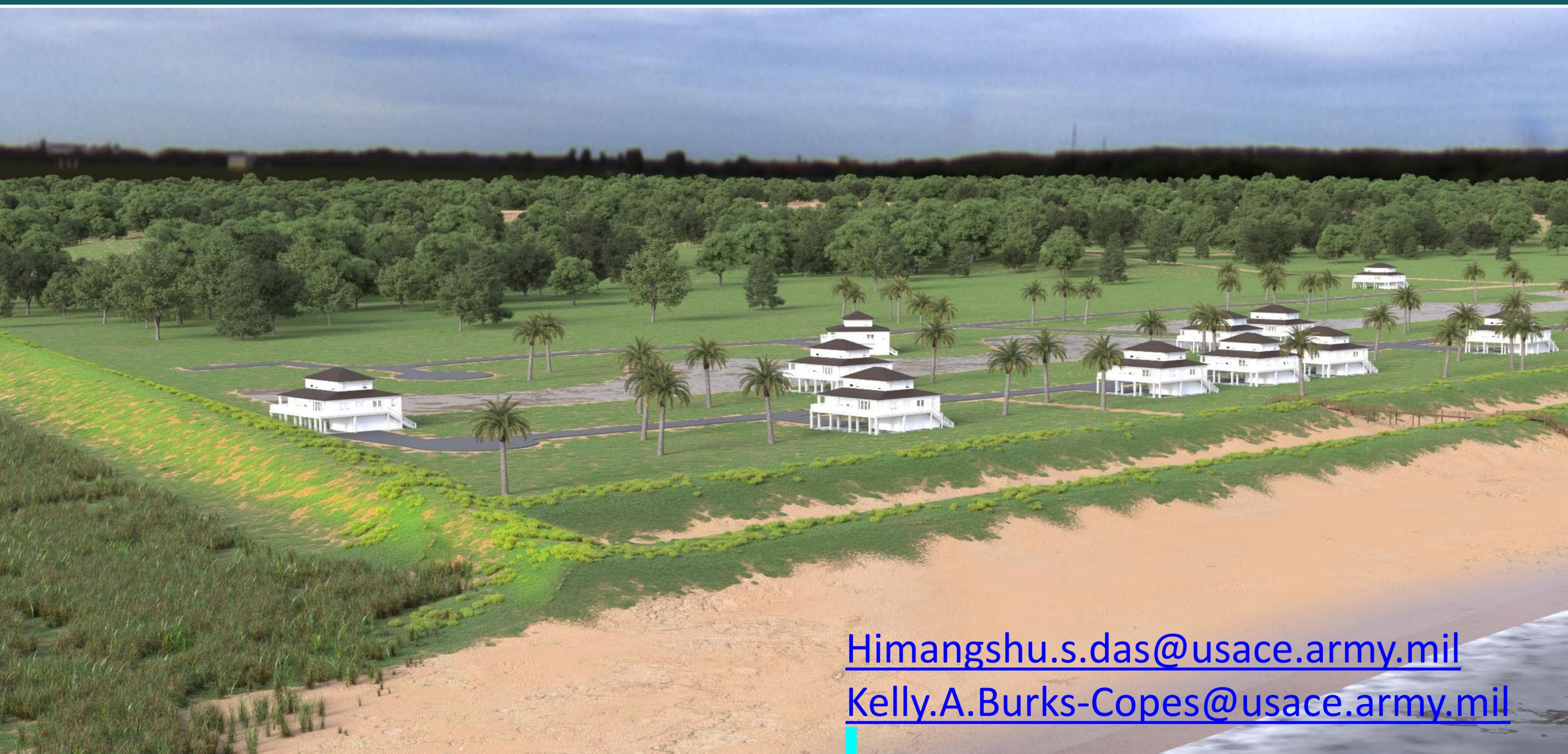
US Army Corps of Engineers Galveston District

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 ...

Closing Remark by Col. Vail



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