



Management of Natural and Nature Based Features

Case Studies in southwest Florida Post Hurricanes Ian and Idalia

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Coastal Storms considerations

□ Named Storms

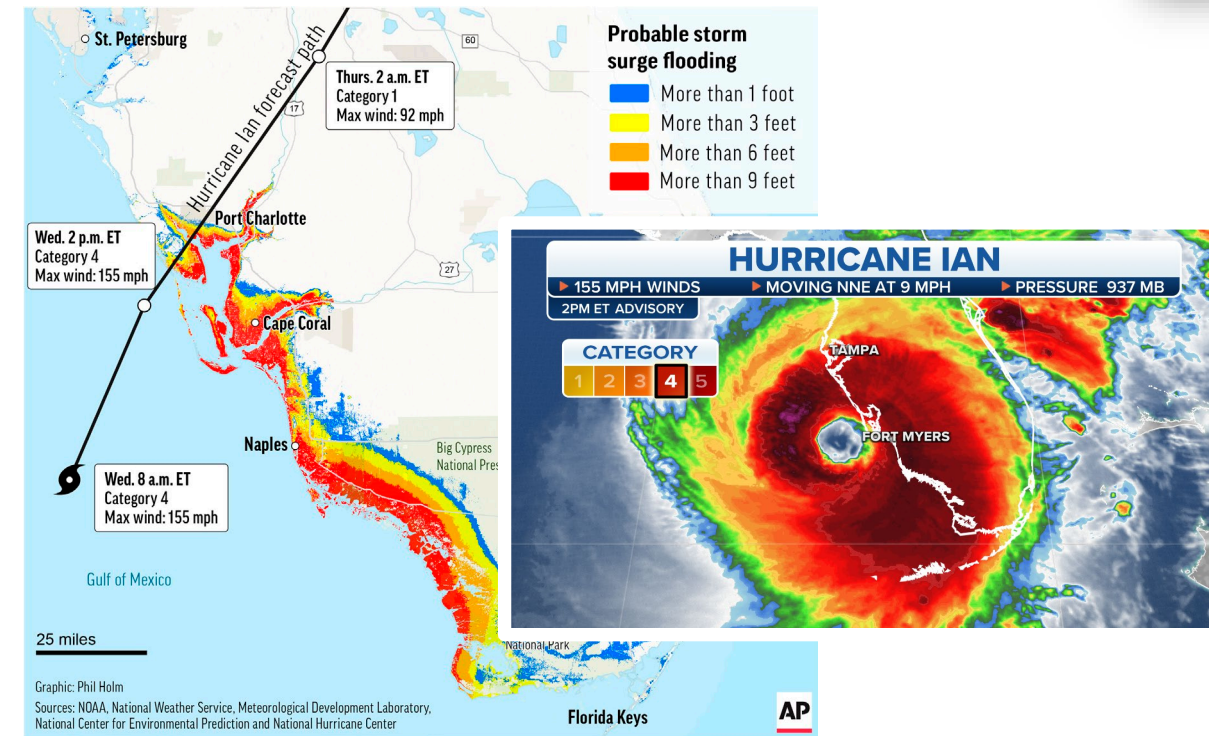
- **Hurricane Ian (September 2022)**
 - *Low frequency event*
 - *Storm Surge, wind and waves*
 - *Natural systems Vs Upland impacts*
- **Hurricane Idalia (August 2023)**
 - *High frequency event*
 - *Offshore storm*
 - *Storm Surge, wind and waves*

□ Unnamed Storms

- *Winter storms*
- *Cold fronts*

□ Resiliency Considerations

- *Storm frequency vs damage*
- *Structural protection measures*
- *Natural and Nature Based Features*



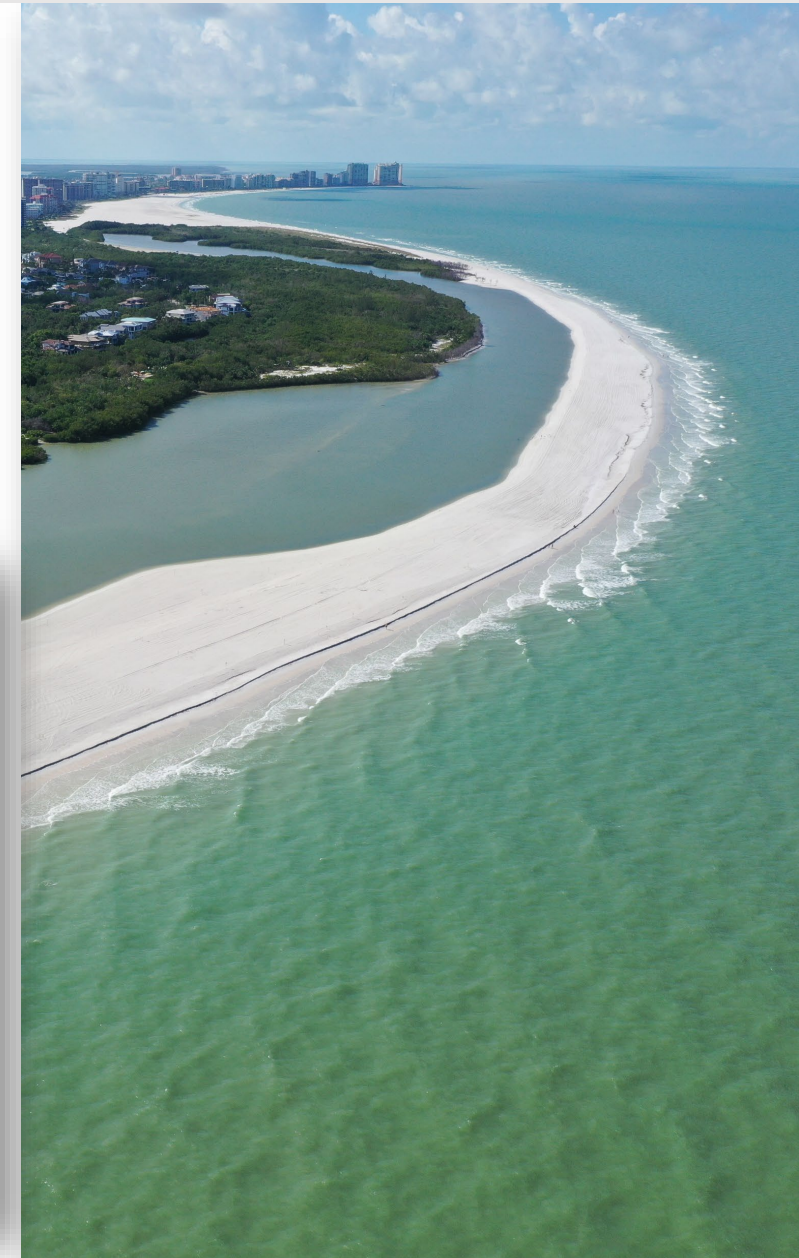
NNBF Concept: to utilize natural landscape features instead of hard structures to reduce risk of damage caused by coastal storms

□ **Types**

- ***Beaches and dunes***
- ***Wetlands***
- ***Coastal vegetation***
- ***Reefs***
- ***Barrier islands***

□ **Function**

- ***Energy dissipation***
- ***Reduce risk of flooding***
- ***Evolve with changing hydrodynamics***
- ***Adaptability to future conditions***



□ Challenges

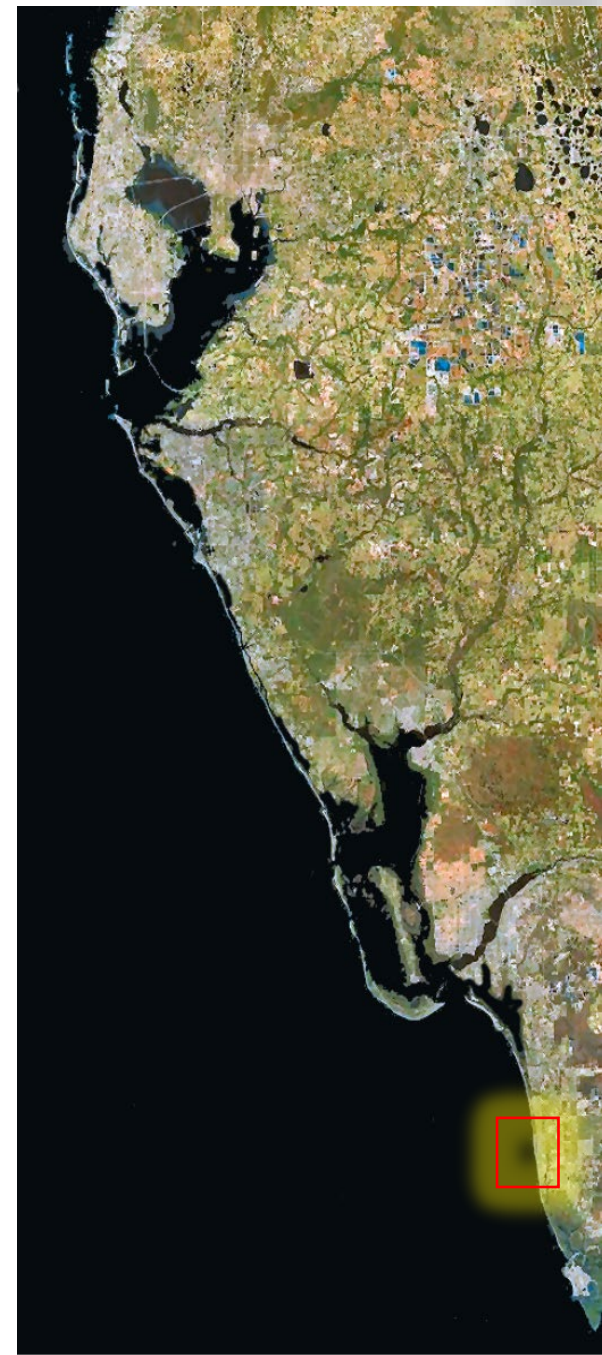
- *Effectiveness*
- *Spatial coverage and availability*
- *Feasibility to construct and maintain*
- *Cost and funding sources*

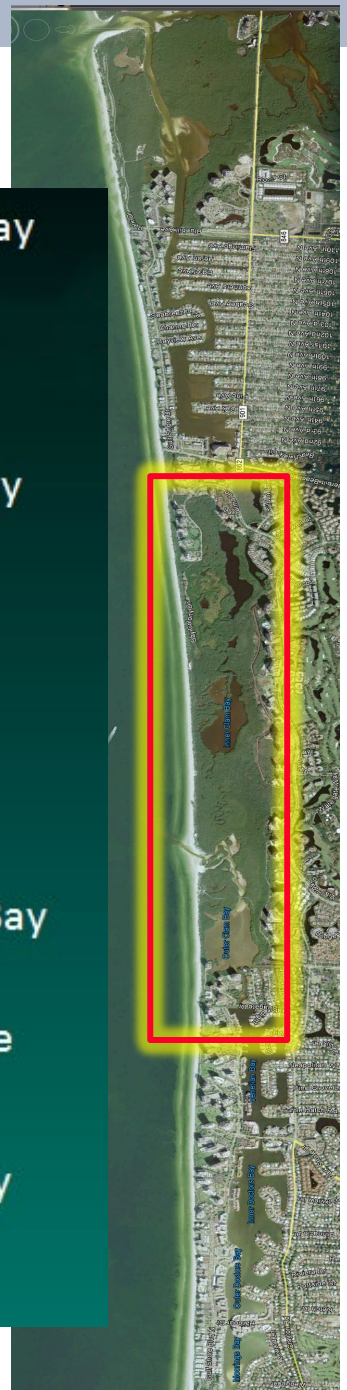
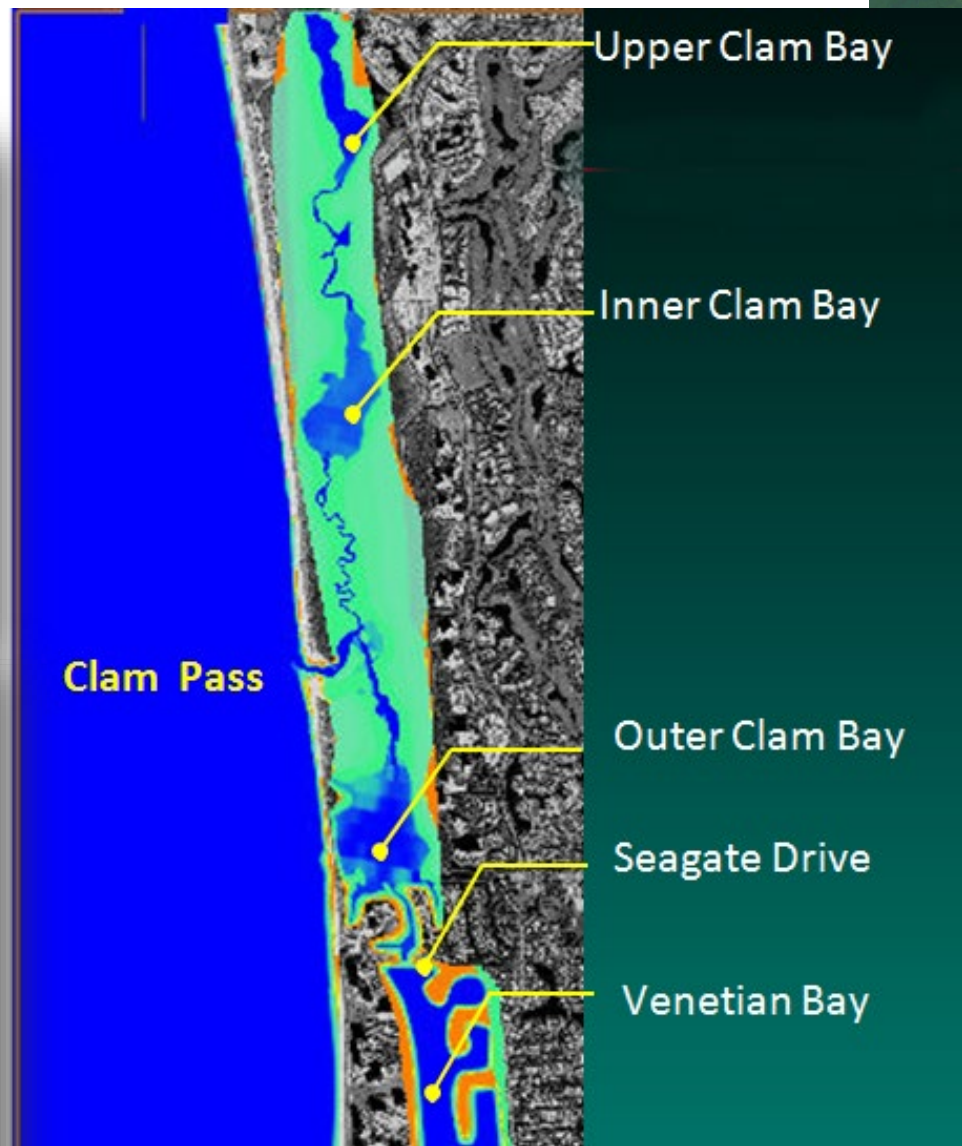
□ Opportunities

- *Conservation of existing features*
- *Restoration and maintenance*



- *Collier County Clam Bay
Natural Resource Protection Area*





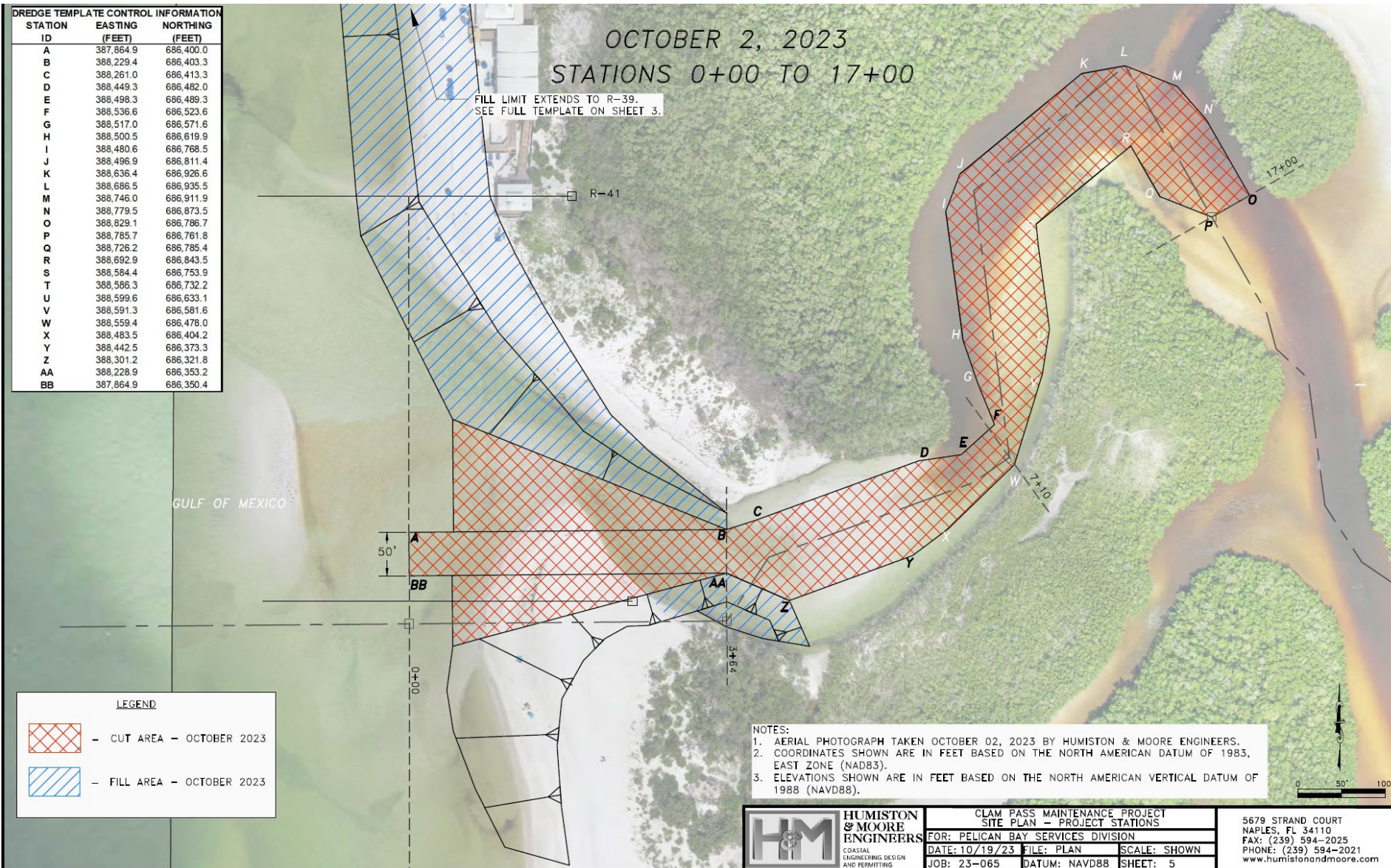


- *Major Hurricane*
- *Large surge event (8+ ft)*
- *Inlet scour*
- *Dune and costal
vegetation impacts*



- *Offshore Hurricane*
- *Wave event*
- *Inlet shoaling*

DREDGE TEMPLATE CONTROL INFORMATION		
STATION	EASTING (FEET)	NORTHING (FEET)
A	387,864.9	686,400.0
B	388,229.4	686,403.3
C	388,261.0	686,413.3
D	388,449.3	686,482.0
E	388,498.3	686,489.3
F	388,536.6	686,523.6
G	388,517.0	686,571.6
H	388,500.5	686,619.9
I	388,480.6	686,768.5
J	388,496.9	686,811.4
K	388,636.4	686,926.6
L	388,686.5	686,935.5
M	388,746.0	686,911.9
N	388,779.5	686,873.5
O	388,829.1	686,786.7
P	388,765.7	686,761.8
Q	388,726.2	686,785.4
R	388,692.9	686,843.5
S	388,584.4	686,753.9
T	388,586.3	686,732.2
U	388,599.6	686,633.1
V	388,591.3	686,581.6
W	388,559.4	686,478.0
X	388,483.5	686,404.2
Y	388,442.5	686,373.3
Z	388,301.2	686,321.8
AA	388,228.9	686,353.2
BB	387,864.9	686,350.4

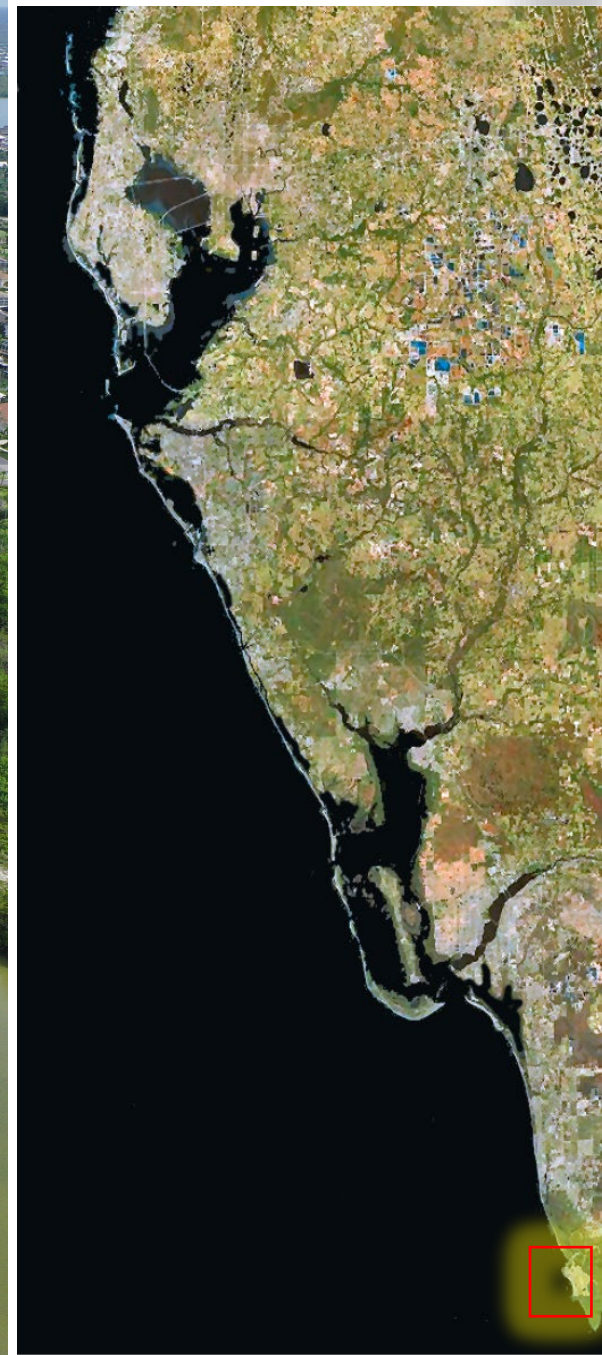


- Annual monitoring
- Inlet dredging
- Beach/ Dune and Vegetation restoration

NOTES:
 1. AERIAL PHOTOGRAPH TAKEN OCTOBER 02, 2023 BY HUMISTON & MOORE ENGINEERS.
 2. COORDINATES SHOWN ARE IN FEET BASED ON THE NORTH AMERICAN DATUM OF 1983, EAST ZONE (NAD83).
 3. ELEVATIONS SHOWN ARE IN FEET BASED ON THE NORTH AMERICAN VERTICAL DATUM OF 1988 (NAVD88).

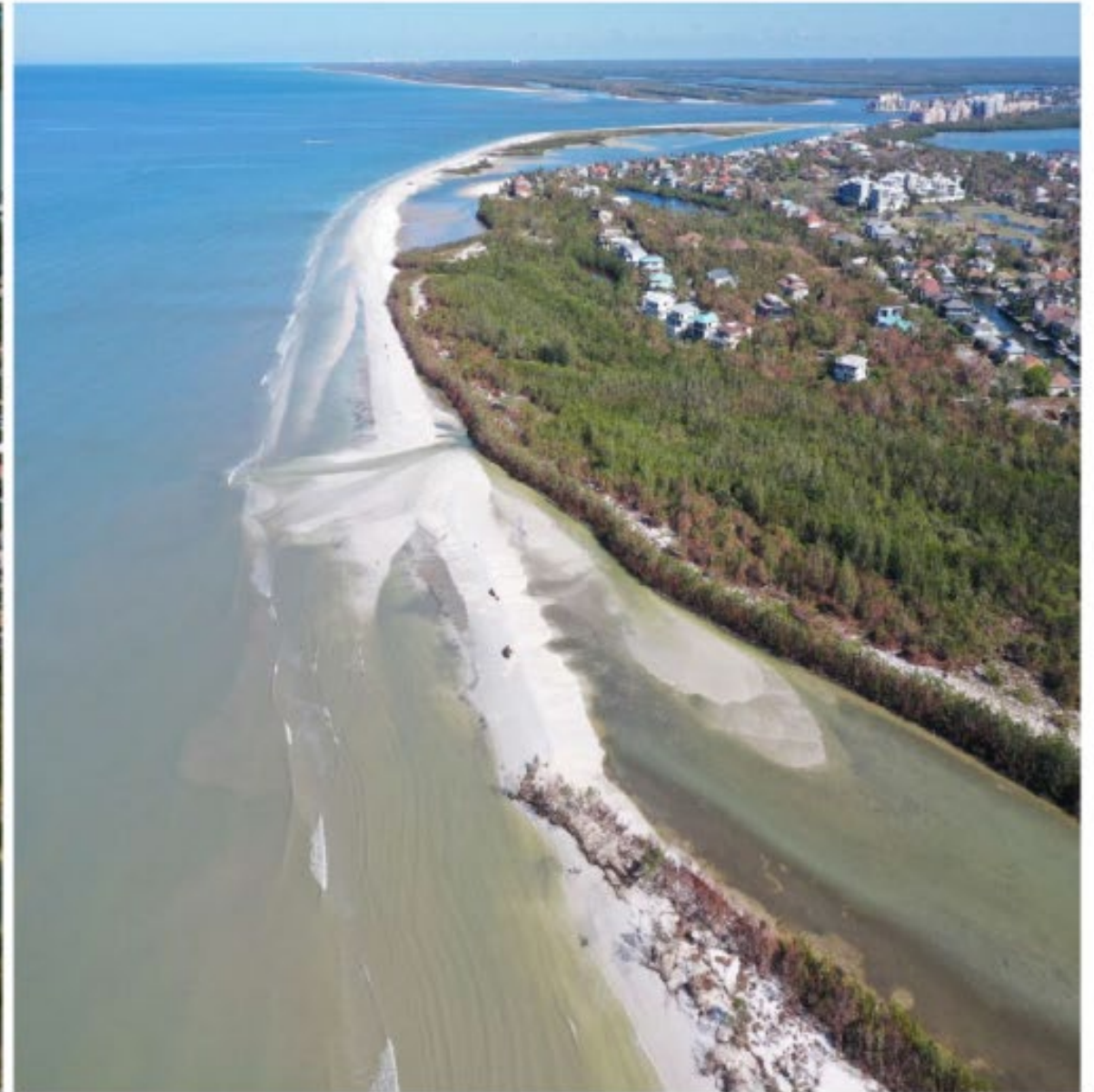
HUMISTON & MOORE ENGINEERS <small>COASTAL ENGINEERING DESIGN AND PERMITTING</small>	CLAM PASS MAINTENANCE PROJECT SITE PLAN - PROJECT STATIONS			5679 STRAND COURT NAPLES, FL 34110 FAX: (239) 594-2025 PHONE: (239) 594-2021 www.humistonandmoore.com
	FOR: PELICAN BAY SERVICES DIVISION			
	DATE: 10/19/23	FILE: PLAN	SCALE: SHOWN	
	JOB: 23-065	DATUM: NAVD88	SHEET: 5	

Tigertail Lagoon / Sand Dollar Island
Ecosystem Restoration



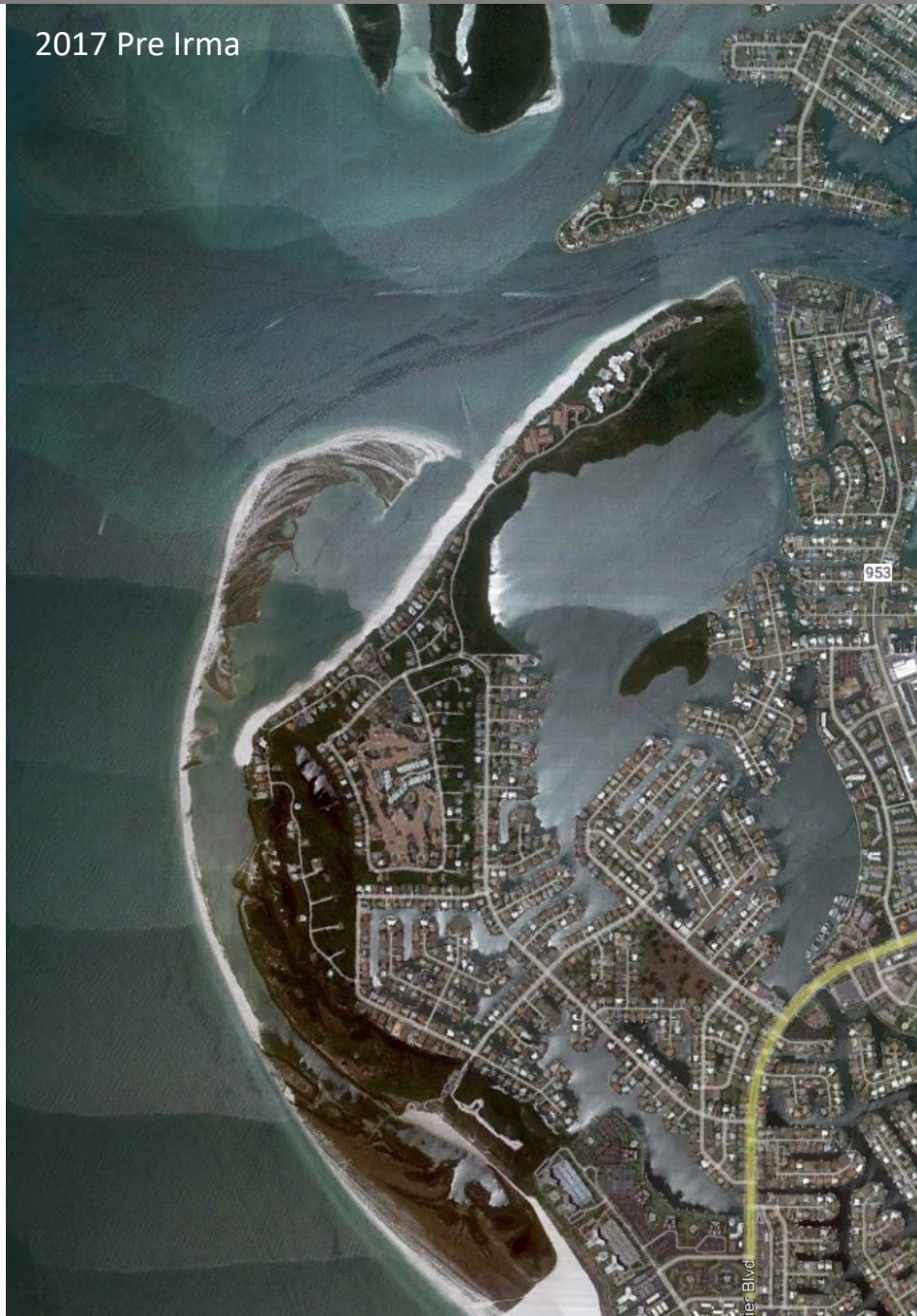


2017 conditions



2022 conditions

2017 Pre Irma



2022 Post Ian



~ 15 acres growth

-20 acres wetland loss

~ 400 ft Shoreline retreat

Water quality issues

□ Main Elements

- **Natural/ nature-based resiliency system**
 - **Multitier coastal storm risk management**
 - Sand Spit
 - Tidal Lagoon
 - Mangrove shoreline
- **Lagoon Flow Channel**
 - Restore tidal exchange
 - Improve water quality
 - Maintain and promote SAV
 - Inlet closures/ opening
- **Renewable sand source**
 - Sand trap
 - Maintain inlet open
 - Cyclic use of sand
 - Incremental adaptation



Schematic of nature-based restoration elements

Sand Dollar Island

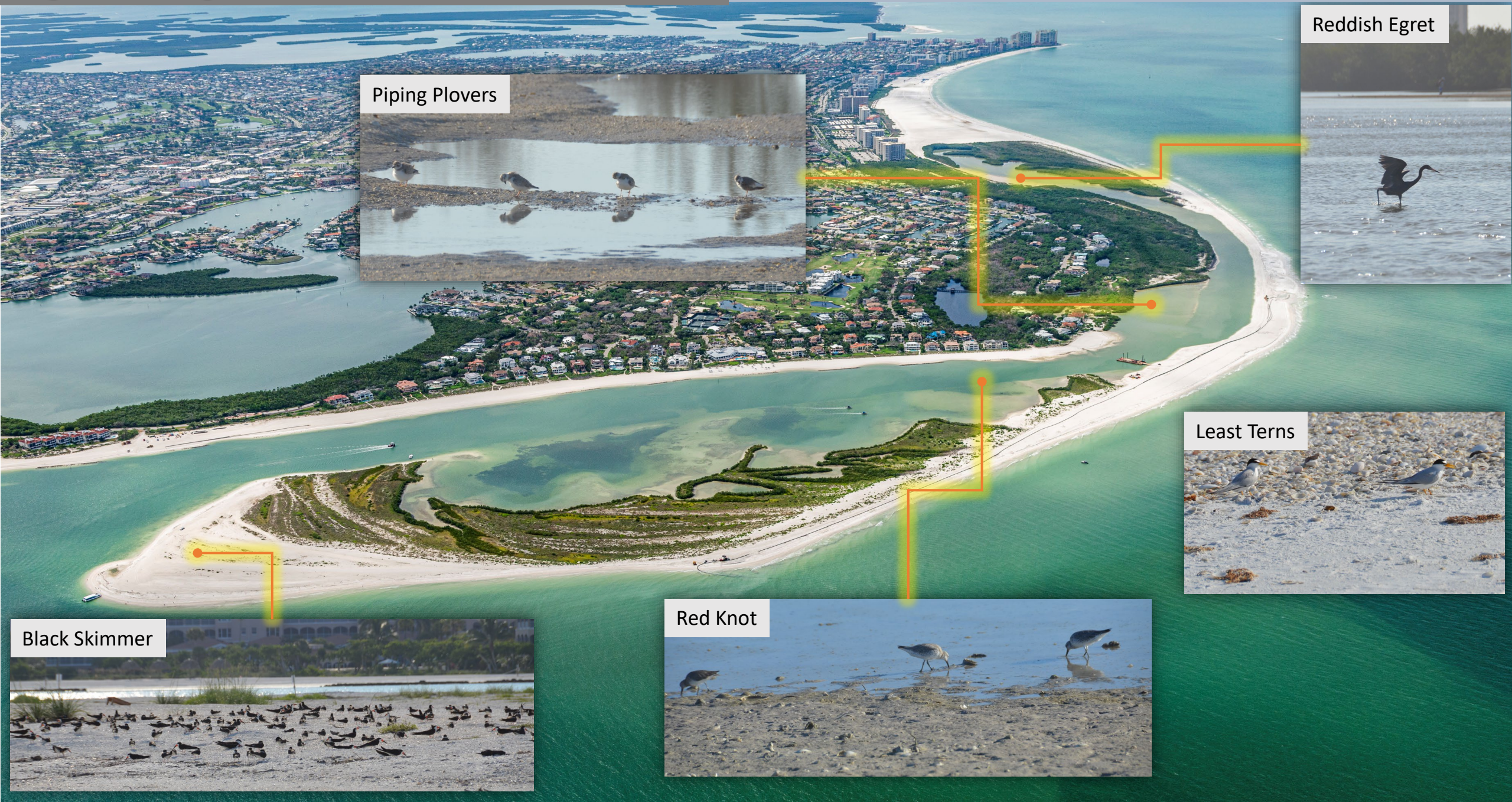
Preconstruction, Post Hurricane Ian- October 2022



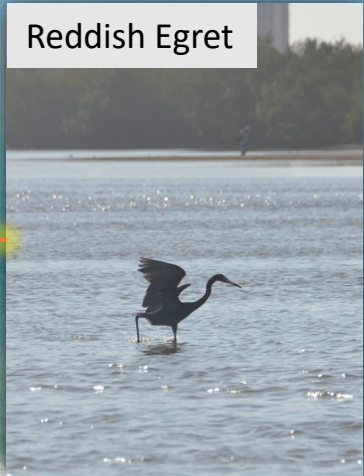


Tigertial Lagoon/ Sand Dollar Island

Environmental Resources - Bird Habitat



Piping Plovers



Reddish Egret



Least Terns



Red Knot



Black Skimmer





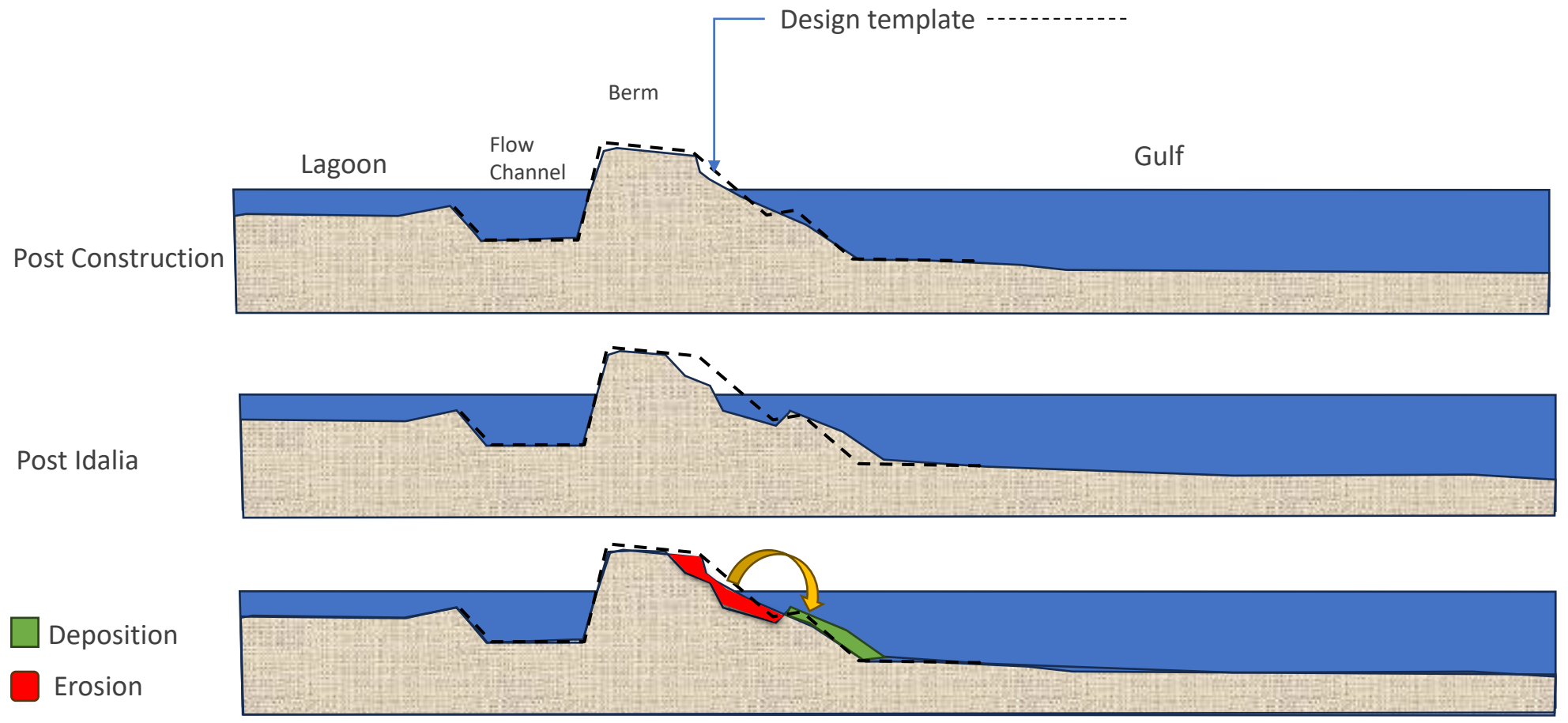
Sand Dollar Island

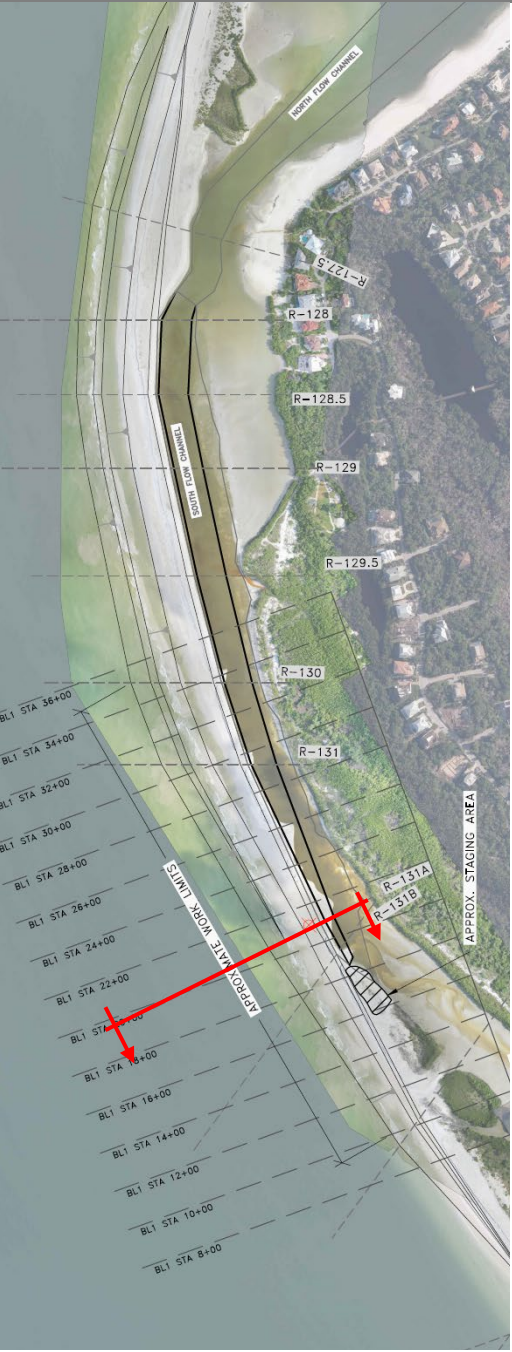
Emergency repair –Sep 29



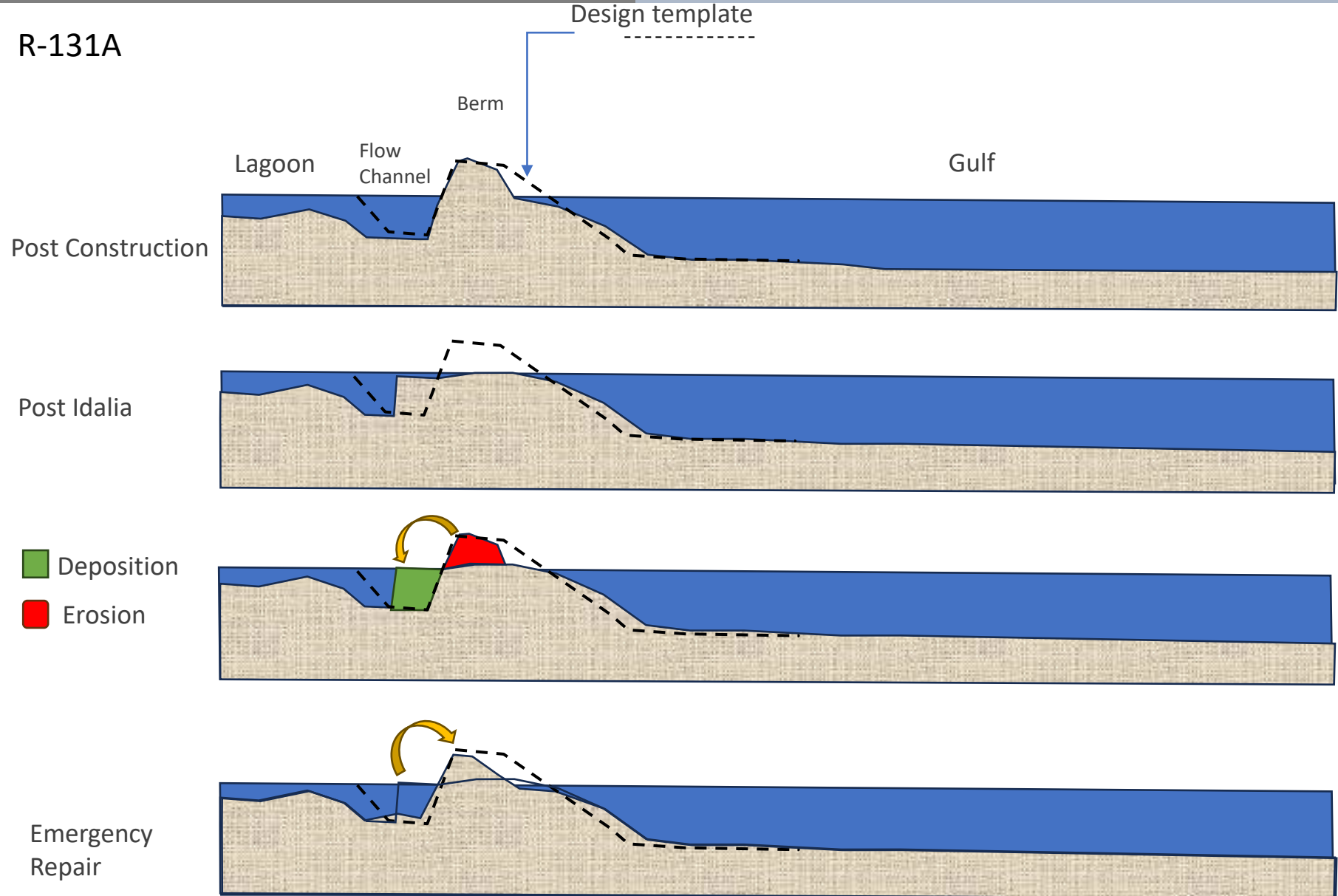


R-128





R-131A



Tigertail Lagoon/ Sand Dollar Island
Aerial views
December 8, 2023



- Operational Monitoring and Maintenance Plan
 - **Compliance items**
 1. Monitoring of environmental resources and bird habitat
 2. Tilling, escarpment and vegetation management
 - **Maintenance**
 1. Recycling of sand from northern spit sand trap and lagoon over-wash to gulf-side of Sand Dollar Island
 2. Emergency repairs post major storms (**Event driven**)
 - **Future Resiliency Considerations**
 1. Disposal of future dredging on Sand Dollar Island
 2. Adaptive management based on monitoring and stakeholders' feedback





Natural and Nature Based Features(NNBF)

Working with Nature *one project at a time*

- *Incrementally working with nature towards **sustainable** and adaptive management programs*

Considerations

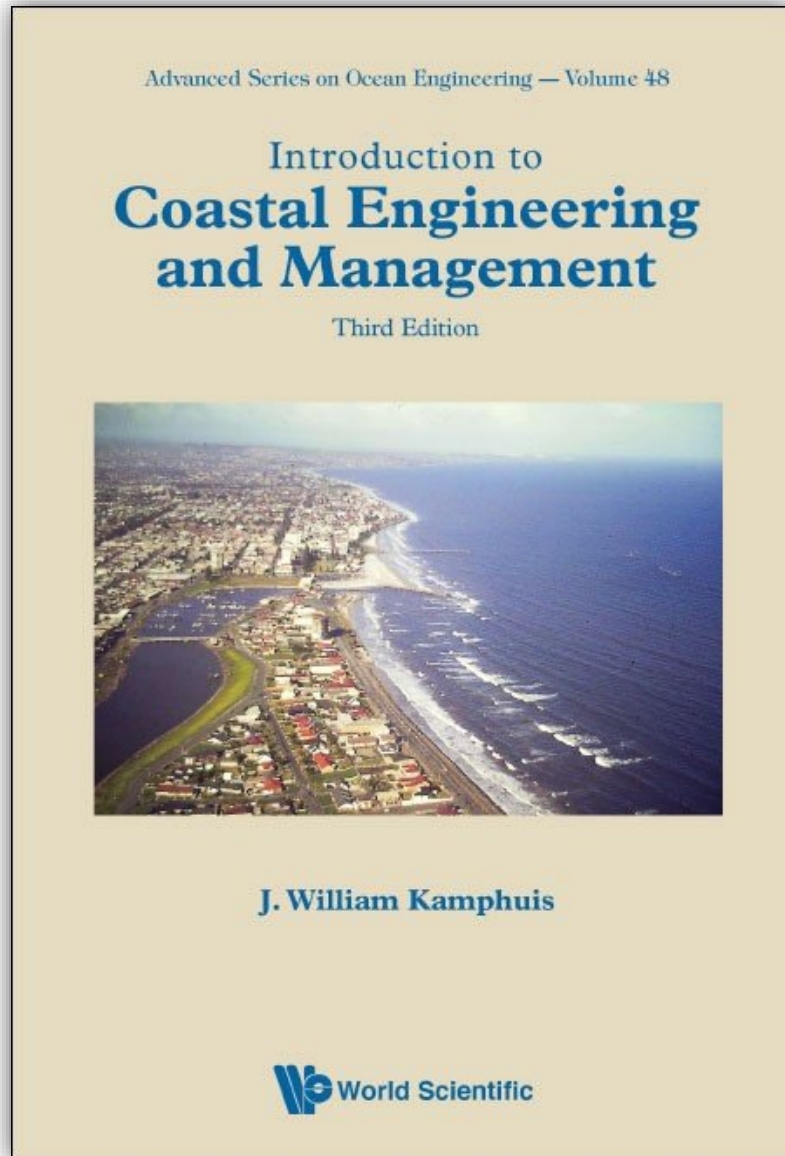
□ **Natural Dynamics**

- *Storms frequency and intensity*
- *Design of Morphologic features*
- *NNBFs adaptability*

□ **NNBF management**

- *Environmental resources*
- *Maintenance and management*
- *Costs and Funding*
- *Public perception*

We are where we are because of those who mentored us along our journey.



J William Kamphuis
1938-2023

(Queen's University, Canada)

“What can I say? This book is really not about facts and formulas. It is about learning and understanding.its stated purpose is to bridge the gap between an eager student who knows nothing about coastal engineering and management, and the available literature.”

Bill Kamphuis, June 2000