Titusville Causeway Multi-Trophic Shoreline Stabilization and Resiliency Action Project

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Brevard County
Space Coast Florida
Nature | Beaches | Space
the official website for Brevard County Government

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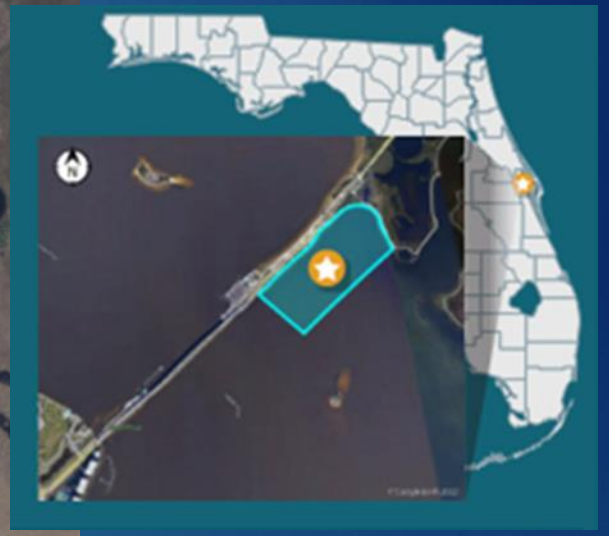
DRMP


MERRITT ISLAND
NATIONAL WILDLIFE REFUGEE



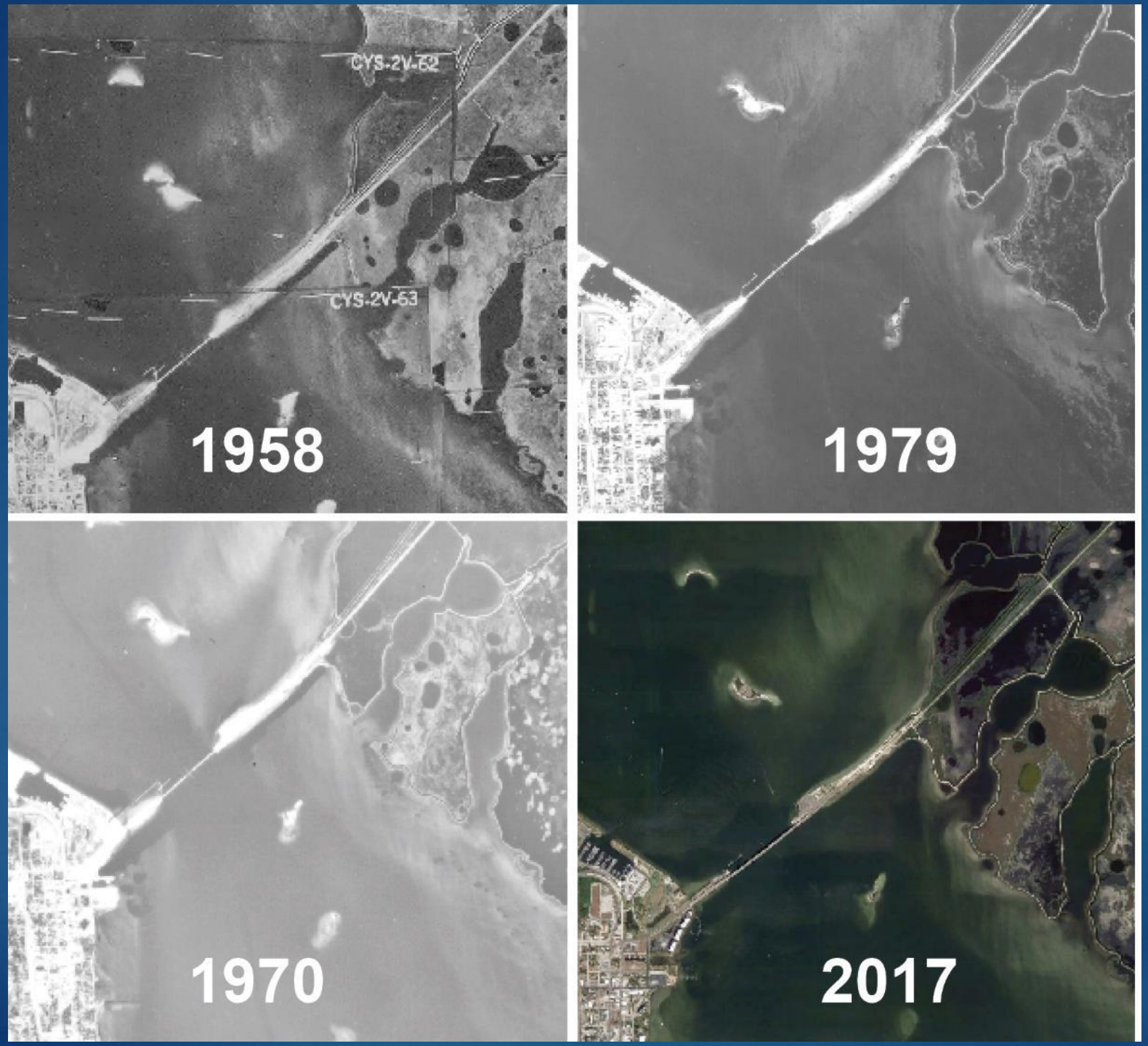
About the Titusville Causeway

- Located in Brevard County
- Built in the 1940s
- Connects City of Titusville the Merritt Island National Wildlife Refuge (MINWR) and Kennedy Space Center (KSC)

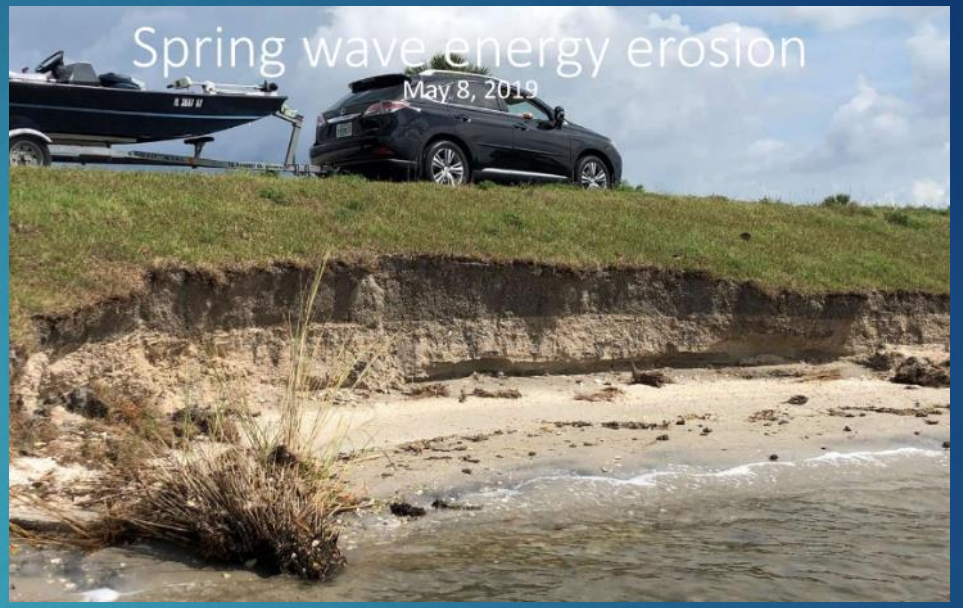
About the Titusville Causeway

- Critical habit for many plant and wildlife species
- Home to one of the State's largest spawning sites for horseshoe crabs
- Extensively used for public recreation
  - Waterfront access
  - Bike/Hike trail to MINWR
  - Popular viewing spot for KSC launches

Historical Imagery and Timeline



Causeway erosion and shoreline degradation



Existing concrete riprap along the shoreline

Time For Restoration

- Critical infrastructure protection storm surge and wave driven wind energy
- Recreational use of the sandy beach and shallow water environment along the Causeway
- Living Shoreline restoration and coastal resiliency
- Remove armored shoreline
  - Habitat restoration to benefit fish and wildlife
  - Seagrass restoration in shallow water habitat

Why is this project important relevant to the coastal community?

- Critical infrastructure protection of shorelines.
- Failing seawalls, riprap armored shorelines, and eroded shorelines.
- Sea level rise and storm surge resiliency
- Bridging ecological functions and recreational access into infrastructure projects

Design, Planning and Engineering Funding

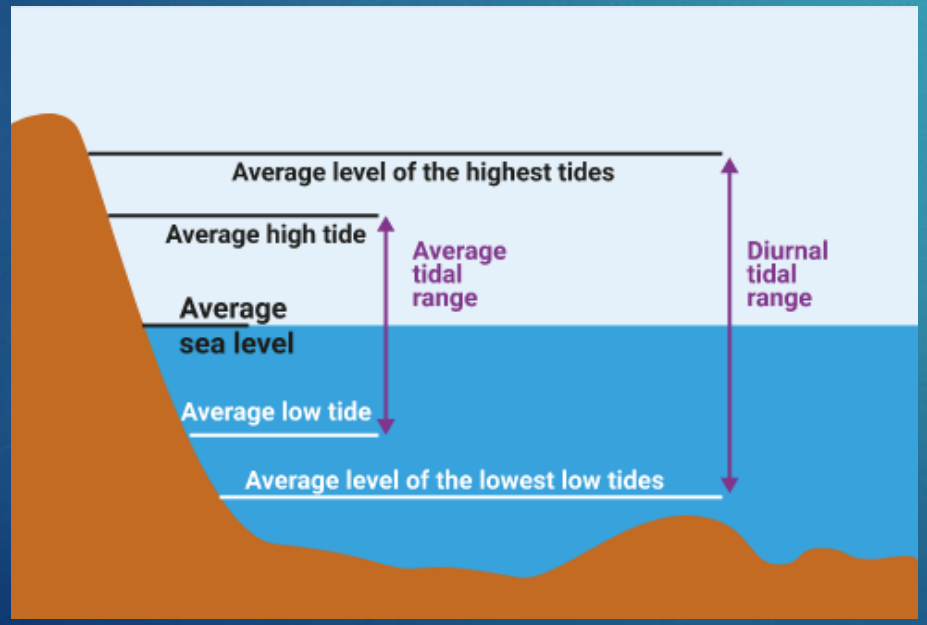
Public Meeting – June 2021

Over $4 Million in Project Funding

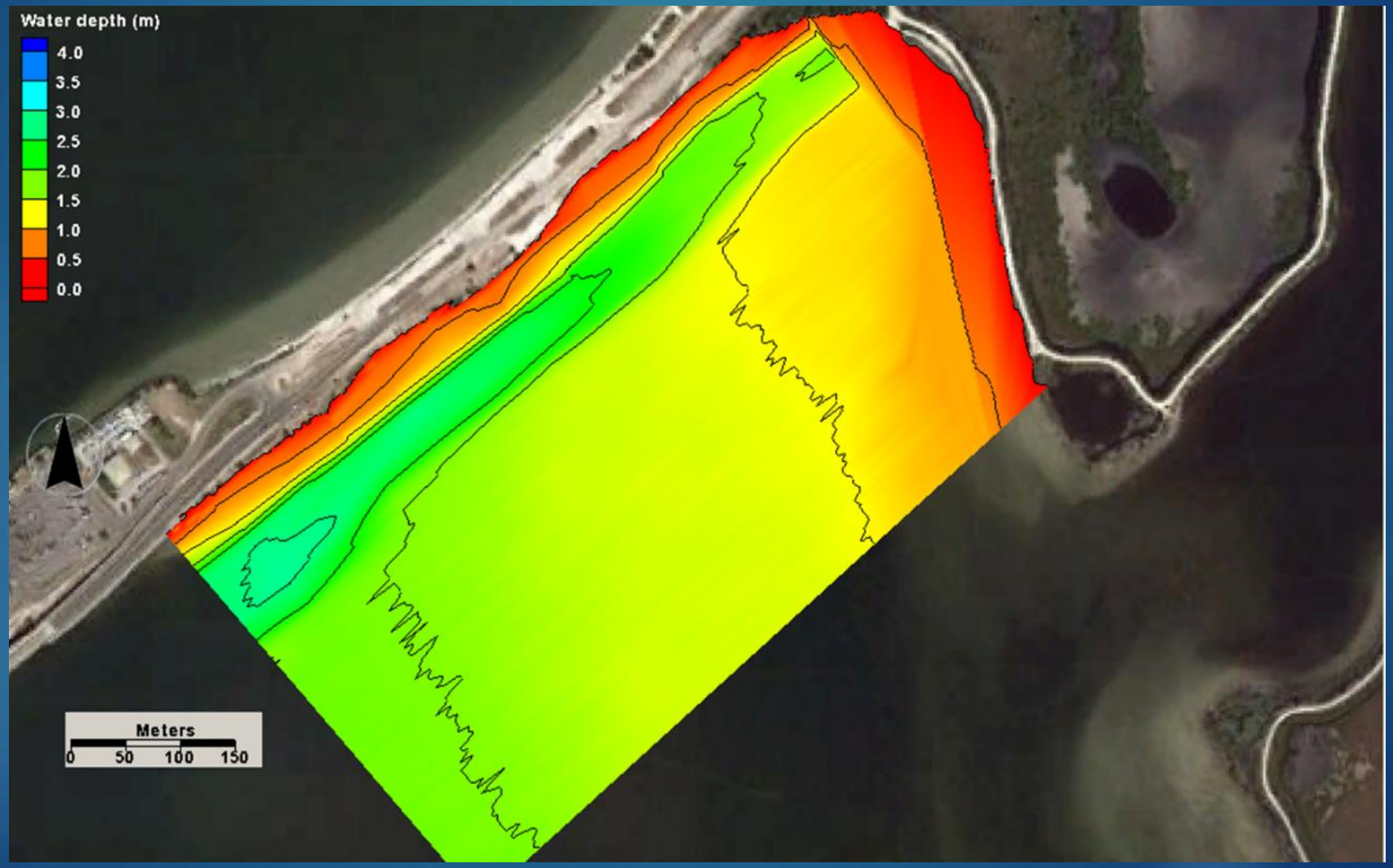
Additional Funding:
Fish and Wildlife Foundation (seagrass) = $500K
Florida Resilient Coastline Program Grant = $94K
FPL Contribution = $25K
FIND Fill Material Donation = $70k

Wave Modeling

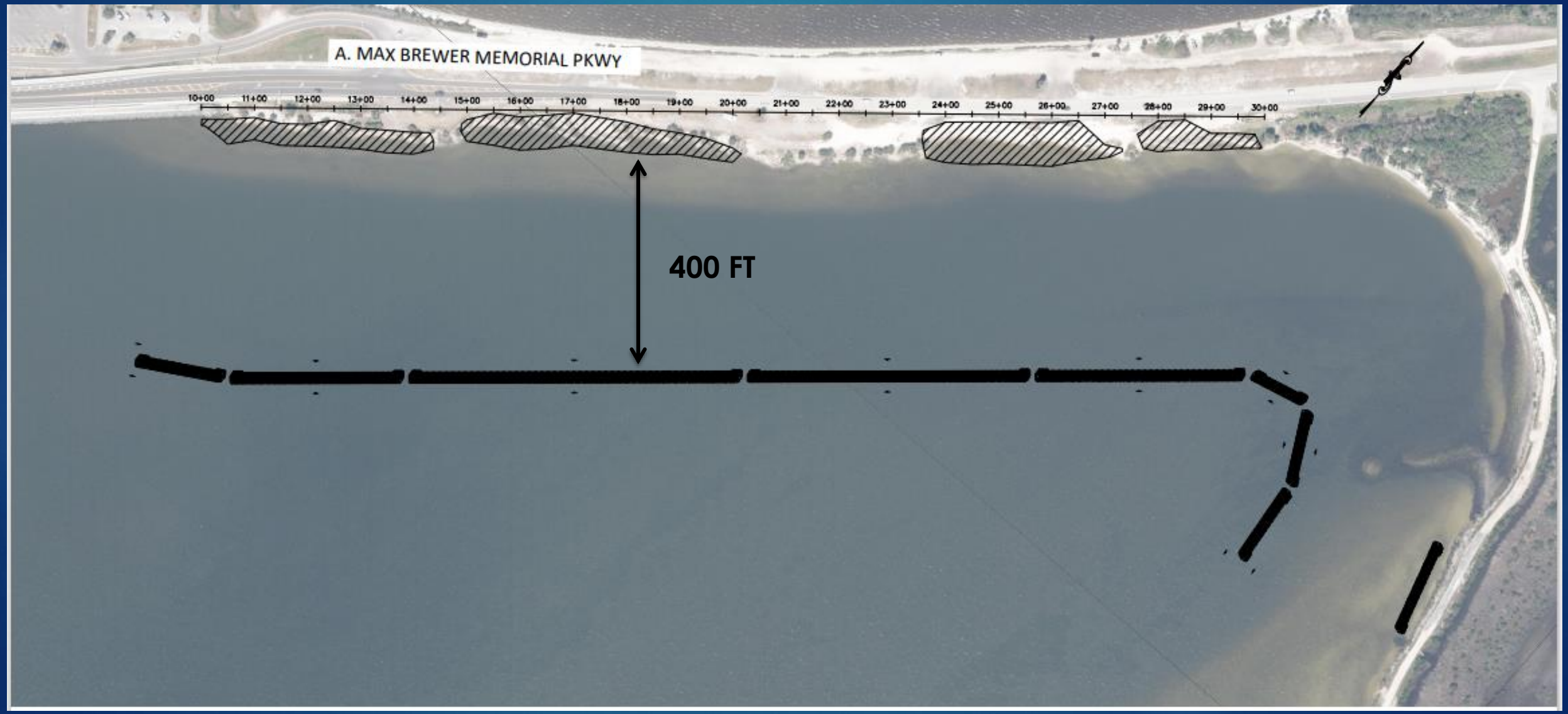
- Wind Direction
- Wind Speed
- Fetch (distance over water)
- Sea Level (IRL)



Current bathymetry within the project area



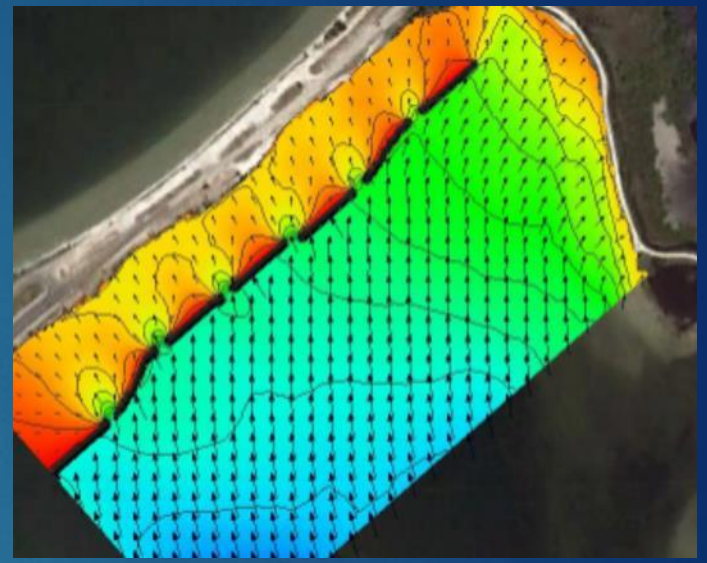
WAD layout and sand re-nourishment

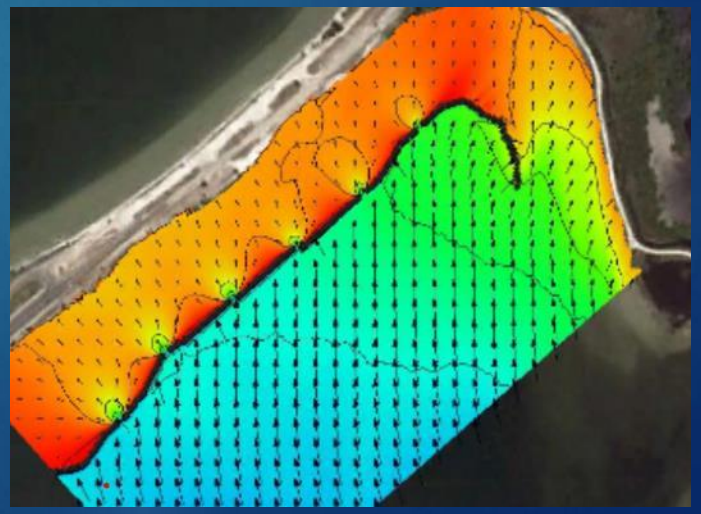


Wave Modeling

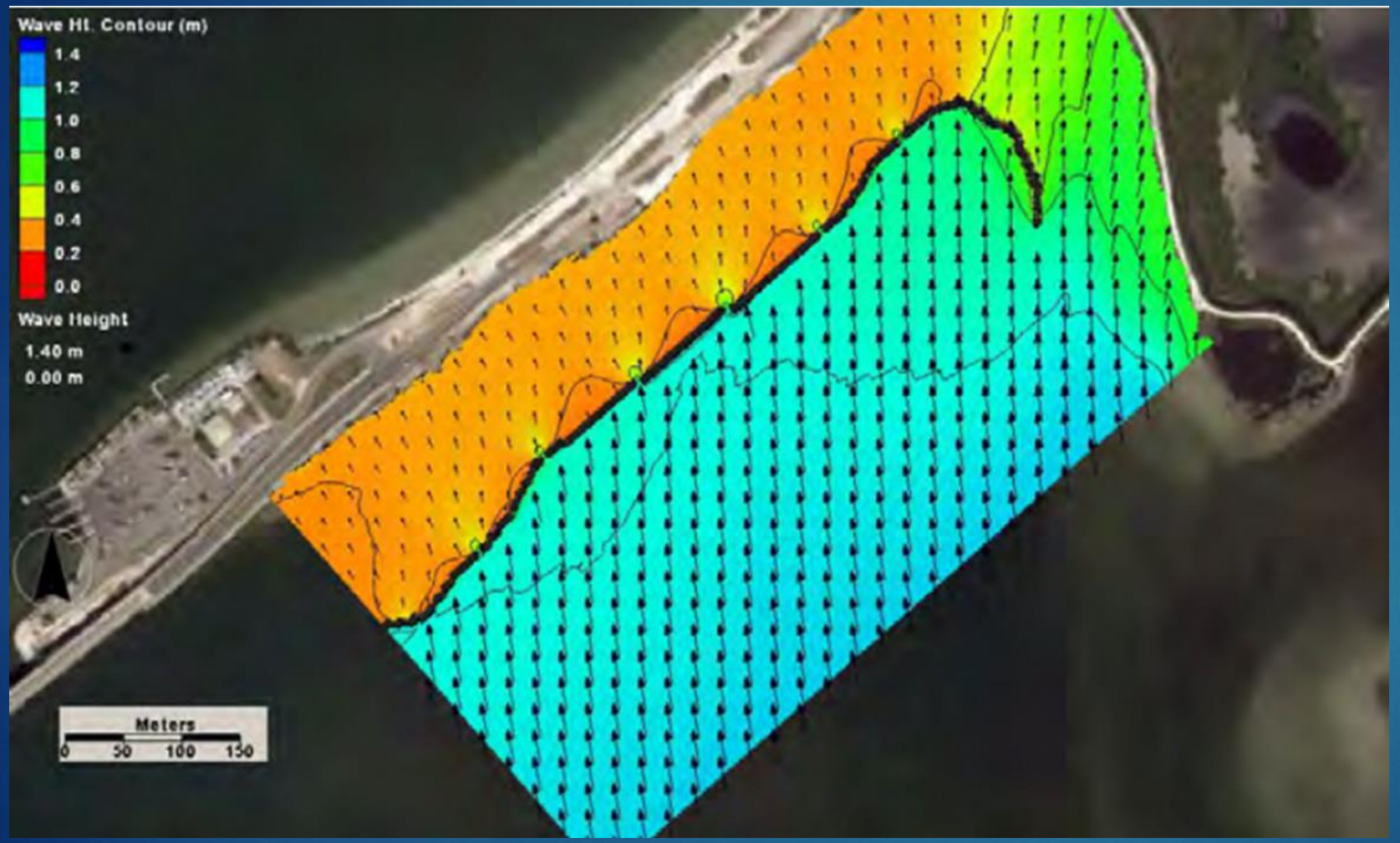
Table I: Summary of WADs array design. Note that Alt. 5 and 6 are 12 m further seaward and include a curved section to protect the eastern shoreline.

	Alt. 1	Alt. 2	Alt. 3	Alt. 4	Alt. 5*	Alt. 6*	No WADs
Extension in meters above mean sea level	0.6 m	0.6 m	0.6	0.8 m	0.6 m	0.8 m	
Gaps between WAD arrays	9 m	15 m	Overlap-ping gaps	12 m	9 m	6 m	
Other pertinent category	double rows	double rows	double rows	double rows	double rows	double rows	
WADs array performance: average nearshore wave height. % in bracket represent wave-energy reduction as compared to the existing condition.							
Mean tide level	0.25 m (61%)	0.30 m (44%)	0.15 m (86%)	0.25 m (61%)	0.20 m (75%)	0.15 m (85%)	0.40
Spring tide level	0.35 m (75%)	0.40 m (67%)	0.20 m (92%)	0.35 m (75%)	0.30 m (82%)	0.20 m (92%)	0.70 m
Spring tide + 0.5 m surge	0.5 m (75%)	0.55 m (70%)	0.45 m (80%)	0.40 m (84%)	0.40 m (84%)	0.25 m (94%)	1.0 m
Spring tide + 1 m surge	0.7 m (66%)	0.75 m (61%)	0.65 m (71%)	0.60 m (75%)	0.65 m (71%)	0.50 m (83%)	1.2 m
Efficacy of design 1-10 scale	5 (69%)	3 (60%)	8 (82%)	6 (74%)	7 (78%)	9 (89%)	





Wave Modeling



Model

- USACE Coatal Modeling System (CMS-Wave)
- Developed by Ping Wang, Ph.D University of South Florida

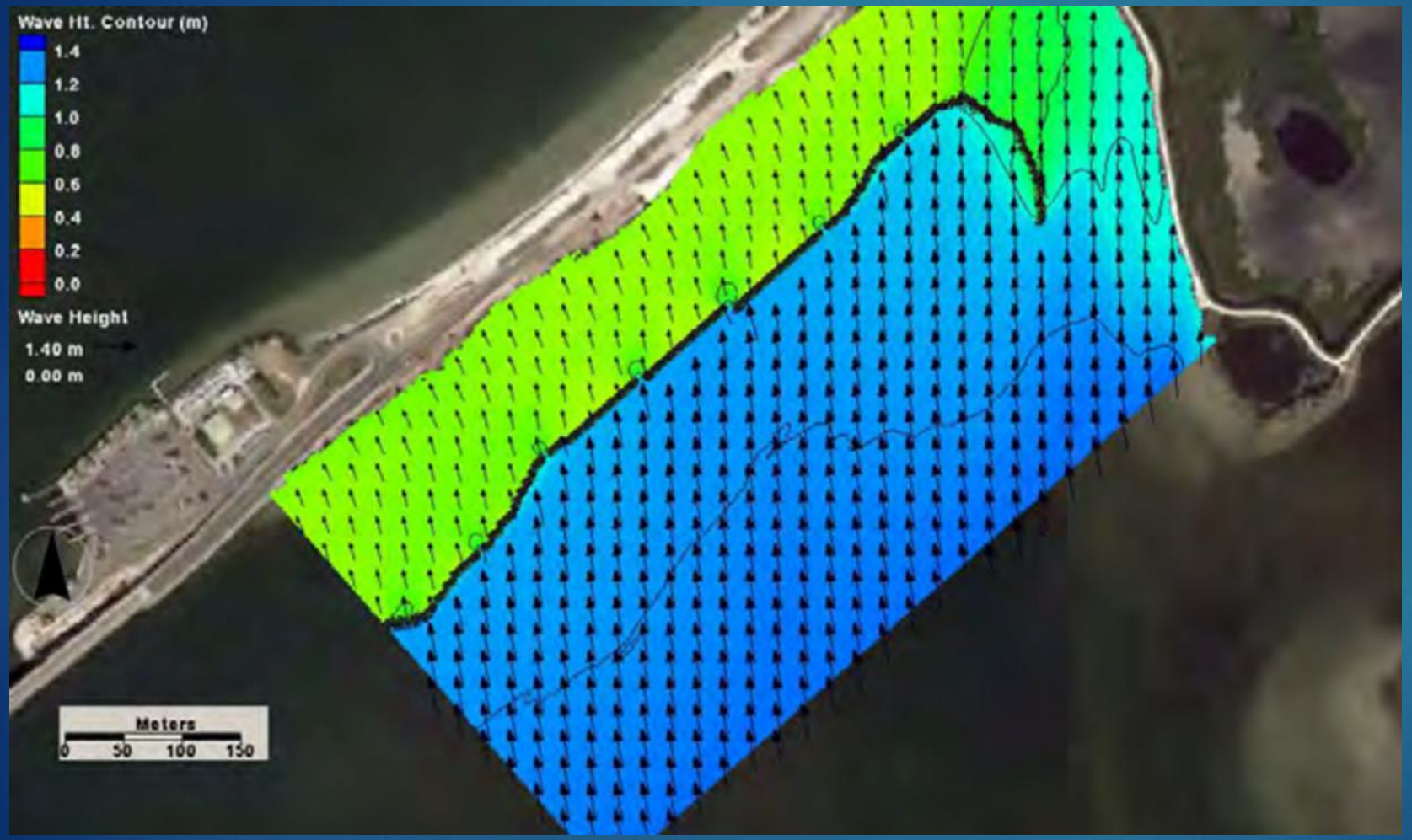
Design Scenario

- Wind = 40 MPH wind from SSE
- Storm surge = 1.5 ft storm surge
- Wave height = 3-4 ft

Wave Attenuation

Waves reduced by 2.3 ft

Wave Modeling



Model

- USACE Coatal Modeling System (CMS-Wave)
- Developed by Ping Wang, Ph.D University of South Florida

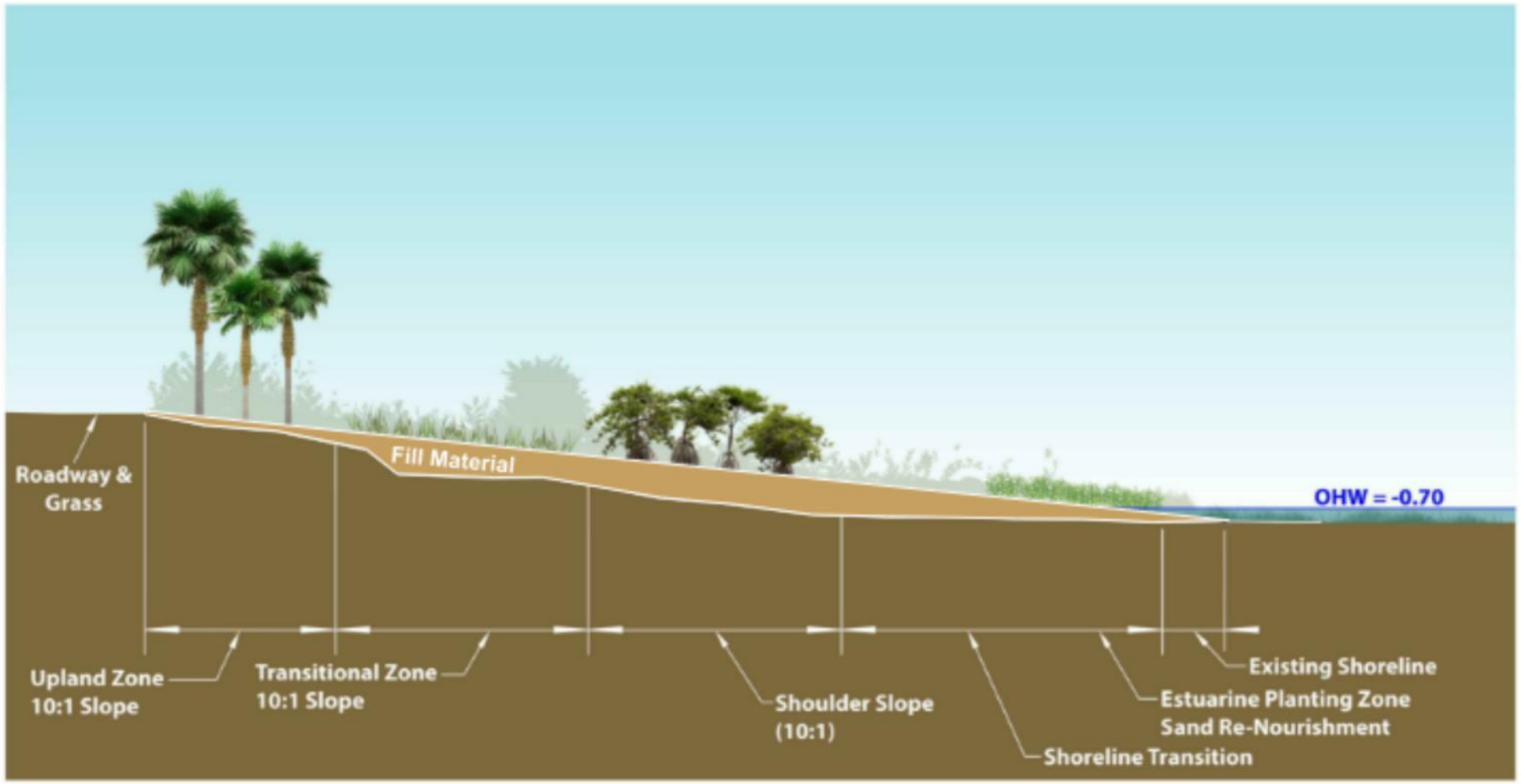
Design Scenario

- Wind = 75 MPH wind from SSE
- Storm surge = 3 ft storm surge
- Wave height = >4 ft

Wave Attenuation

Waves reduced by 2 ft

Shoreline Stabilization



SHORELINE STABILIZATION PLANTING ZONE

2,000 ft Shoreline Stabilization Planting Plan

Common Name	Scientific Name	Quantity	Spacing	Zone
White Mangrove	*Laguncularia racemosa*	140	10 ft on center	Estuarine
Red Mangrove	*Rhizophora mangle*	140	10 ft on center	Estuarine
Silver Buttonwood	*Conocarpus erectus*	140	10 ft on center	Estuarine
Saltgrass	*Distichlis spicata*	1500	3 ft on center	Estuarine
Perennial Glasswort	*Salicornia perennis*	1500	3 ft on center	Estuarine
Saltmeadow Cordgrass	*Spartina patens*	1500	3 ft on center	Estuarine
Sea Oxeye	*Borrichia frutescens*	1100	3 ft on center	Transitional
Seaside Goldenrod	*Solidago sempervirens*	1100	3 ft on center	Transitional
Seashore Paspalum	*Paspalum vaginatum*	1100	3 ft on center	Transitional
Sea Purslane	*Sesuvium portulacastrum*	1100	3 ft on center	Transitional
Smooth Cordgrass	*Spartina alterniflora*	1100	3 ft on center	Transitional
Seagrape	*Coccoloba uvifera*	800	5 ft on center	Transitional
Cabbage Palm	*Sabal palmetto*	75	20 ft on center	Upland
Gumbo Limbo	*Bursera simaruba*	75	20 ft on center	Upland
Railroad Vine	*Ipomea pes-caprae*	220	10 ft on center	Upland
Sea Oats	*Uniola paniculata*	220	10 ft on center	Upland
Muhly Grass	*Muhlenbergia spp.*	2500	5 ft on center	Upland
Smooth Cordgrass	*Spartina alterniflora*	2500	3 ft on center	Upland

Notes:

Plant spacing provided only to demonstrate sufficient quantities throughout the habitats. Plant installation shall be in a manner to mimic natural vegetative communities with plant species in clusters, not linear rows. Plant species should be alternated in groups, to provide greater long-term survival for each species type. Coordination efforts with Brevard County Natural Resources Management Department is required prior to plant installation.

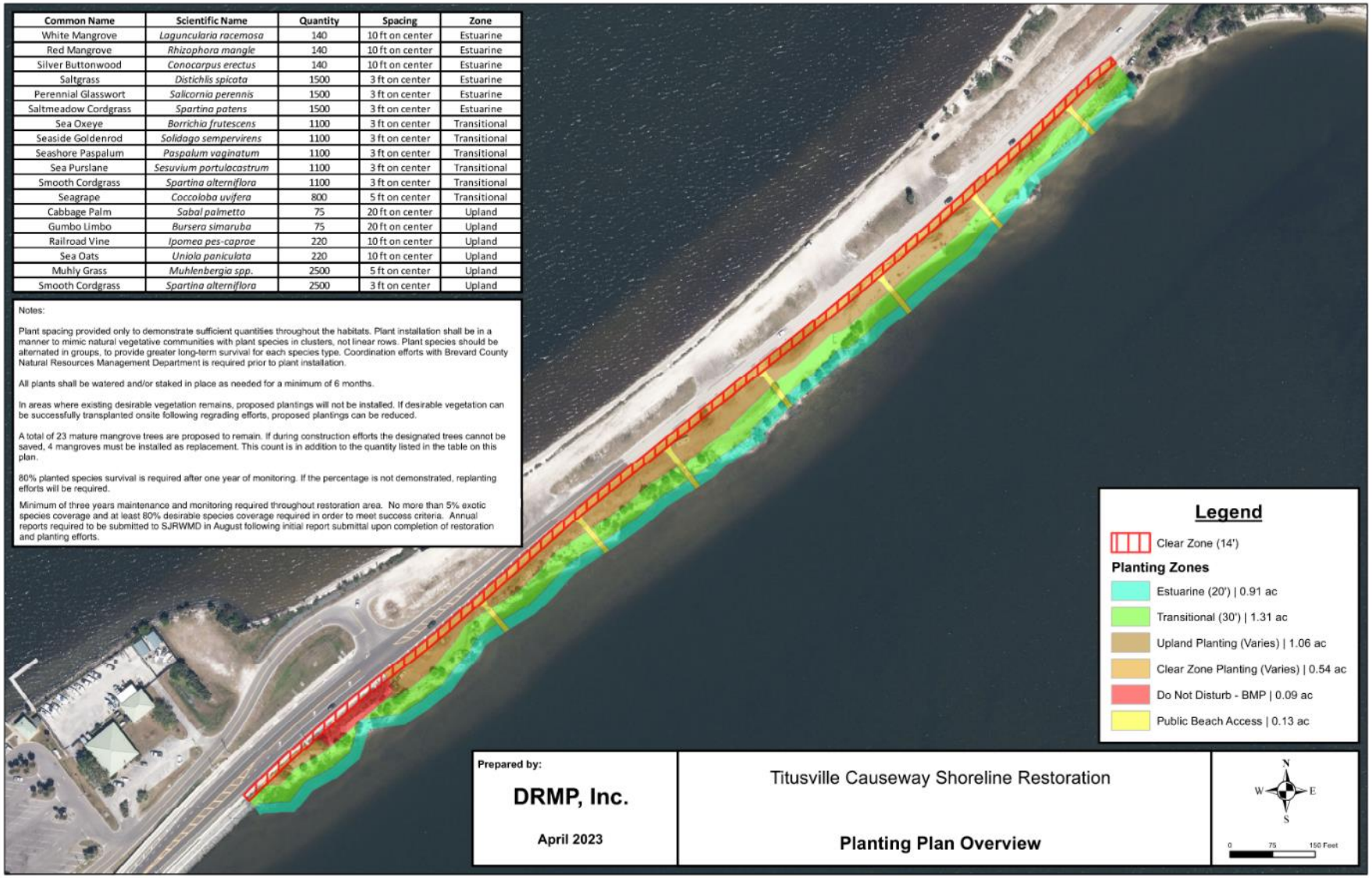
All plants shall be watered and/or staked in place as needed for a minimum of 6 months.

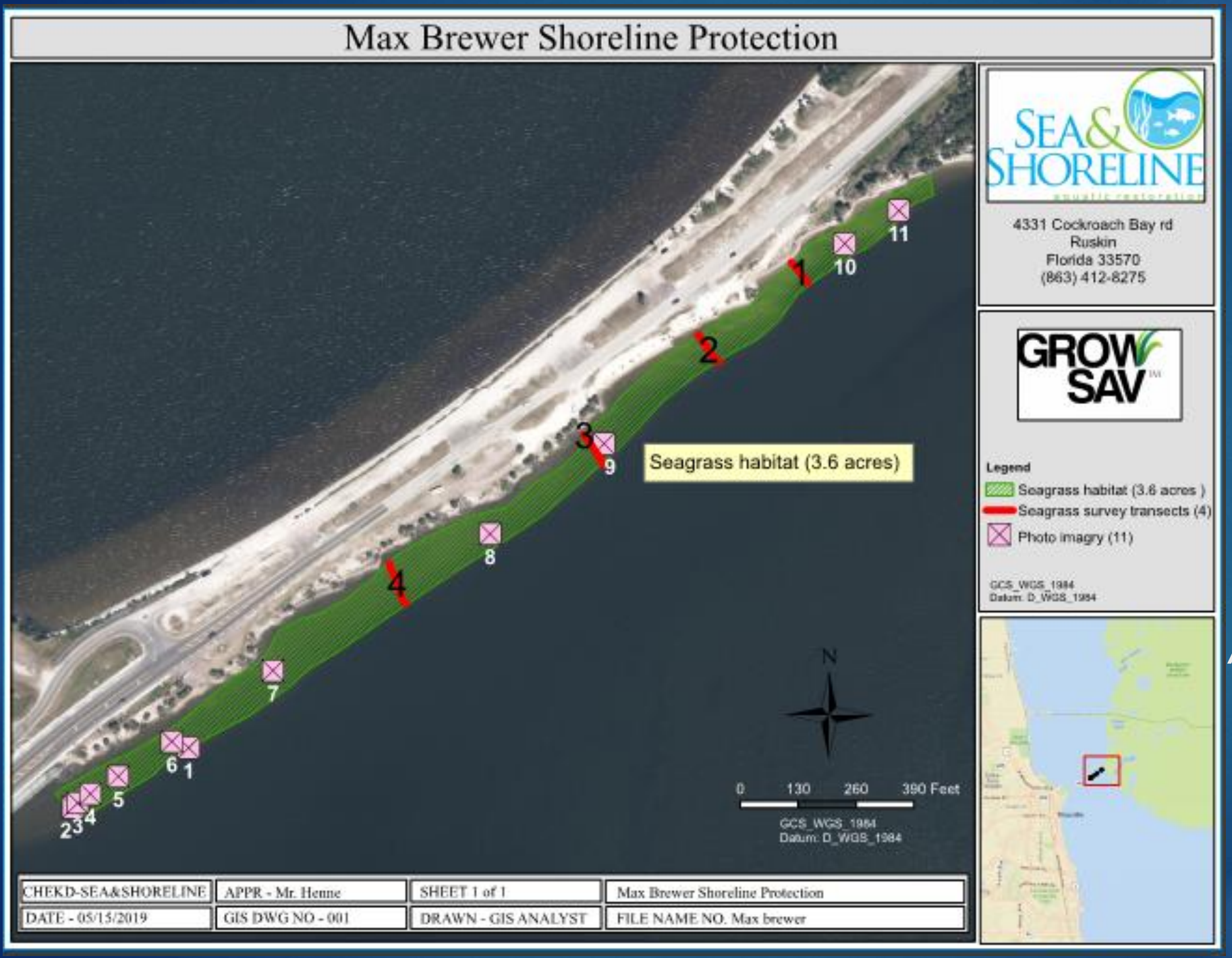
In areas where existing desirable vegetation remains, proposed plantings will not be installed. If desirable vegetation can be successfully transplanted onsite following regrading efforts, proposed plantings can be reduced.

A total of 23 mature mangrove trees are proposed to remain. If during construction efforts the designated trees cannot be saved, 4 mangroves must be installed as replacement. This count is in addition to the quantity listed in the table on this plan.

80% planted species survival is required after one year of monitoring. If the percentage is not demonstrated, replanting efforts will be required.

Minimum of three years maintenance and monitoring required throughout restoration area. No more than 5% exotic species coverage and at least 80% desirable species coverage required in order to meet success criteria. Annual reports required to be submitted to SJRWMD in August following initial report submittal upon completion of restoration and planting efforts.





Seagrass Survey performed on May 2019

Updated June 2020

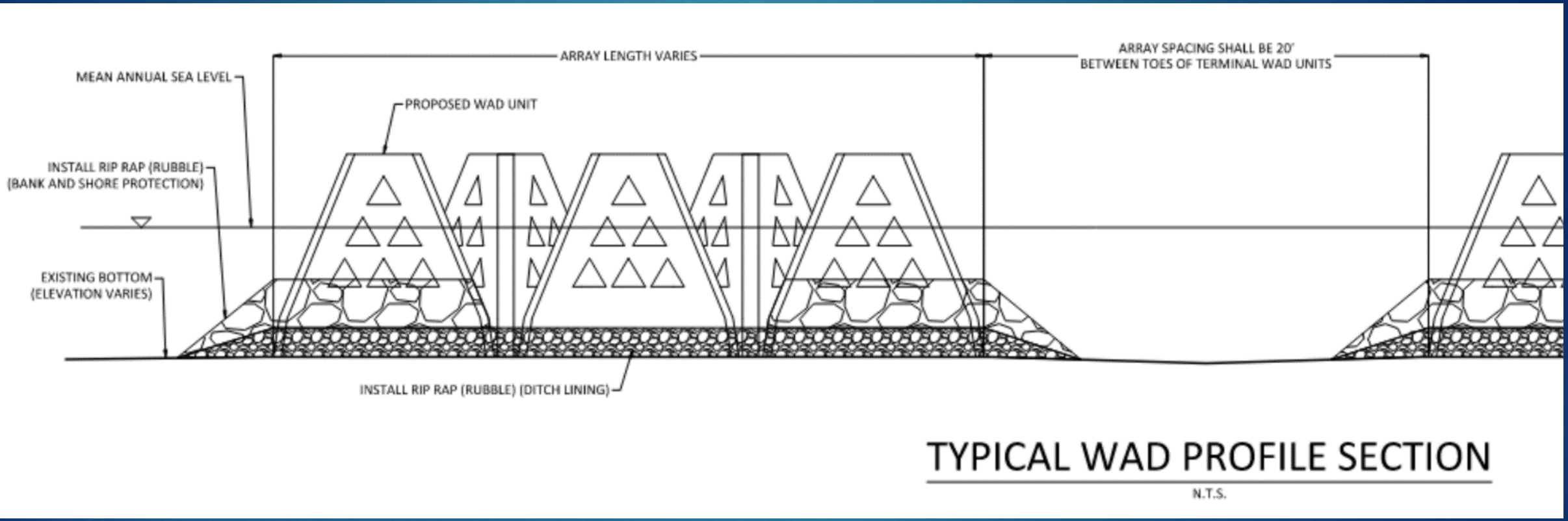
Aquatic Resource Survey 2021

Seagrass Meadow Restoration Plan

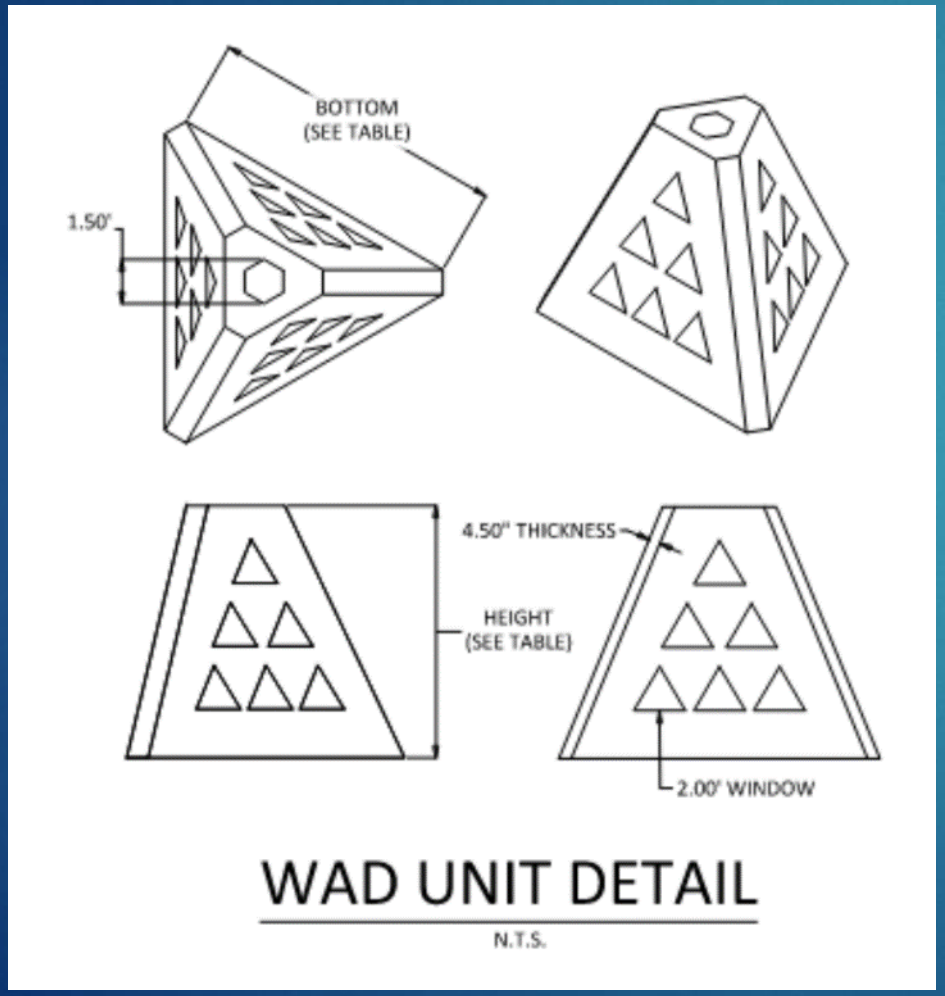
- Benthic, Seagrass and Shoreline Survey
- Wave Modeling
- Design Plans and Specifications
- Sovereign Submerged Lands SSL Easement
- Shoreline Planting Plan & UMAMs
- Seagrass Meadow Restoration Plan
- Flow Monitoring and Sediment Transport

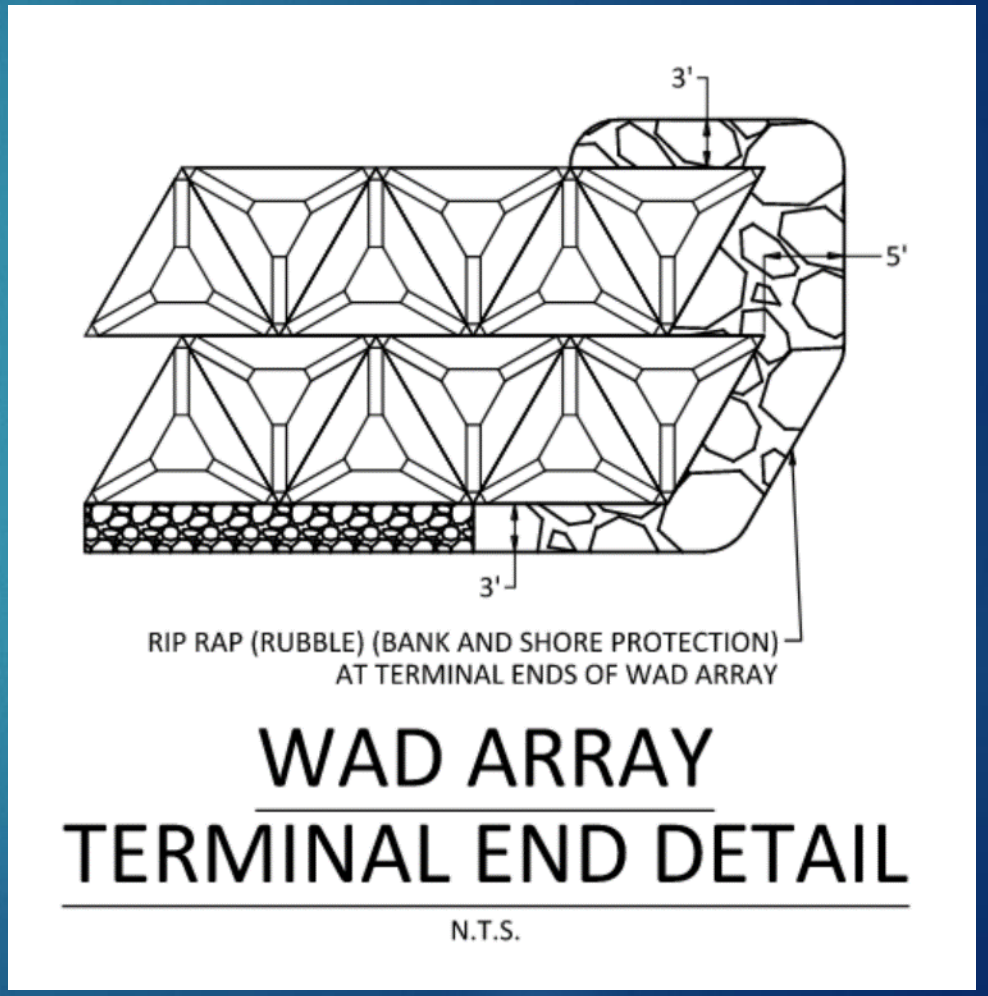
- St. Johns River Water Management District
- US Army Corps of Engineers
- Florida Department of Environmental Protection
- Florida Department of Transportation

Project Details



Project Details





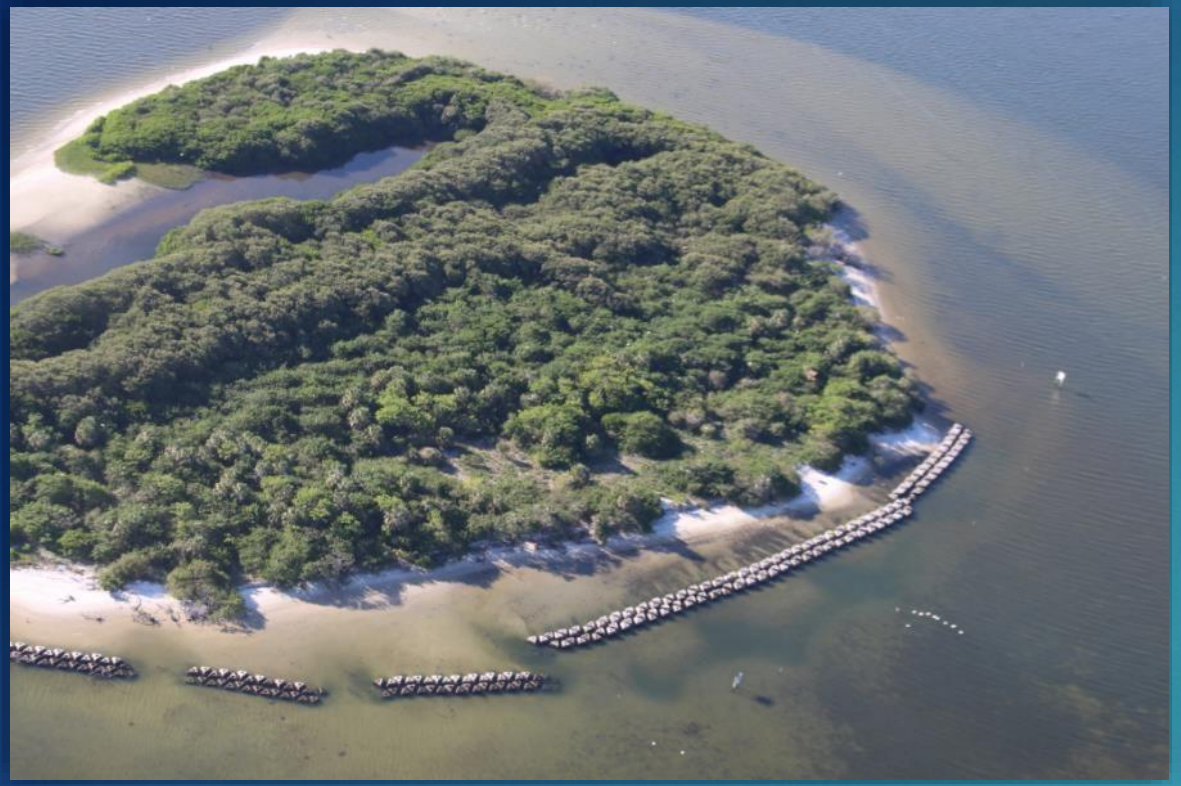
What are Wave Attenuation Devices (WAD's)?

E.G. Simmons Park
Hillsborough County, FL

Shoreline Protection

Breakwater arrays (WAD's) provide a multi-functional approach to shoreline restoration and ecological functions.

Sunken Island



WAD arrays as breakwater reefs

WAD's quickly transition into reef habitat as structure for fish and marine wildlife.

Future Shoreline- Representative Cross Section

SPECIAL THANKS TO OUR PROJECT PARTNERS

FDOT

St. Johns River Water Management District

Space Coast FLORIDA

Brevard County Tourist Development Council

NASA

Atlantic Florida Inland Navigation District Intracoastal

Florida Department of Environmental Protection

Office of Resilience and Coastal Protection

Fish & Wildlife Foundation of Florida

Any Questions?