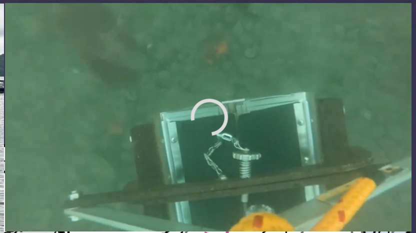
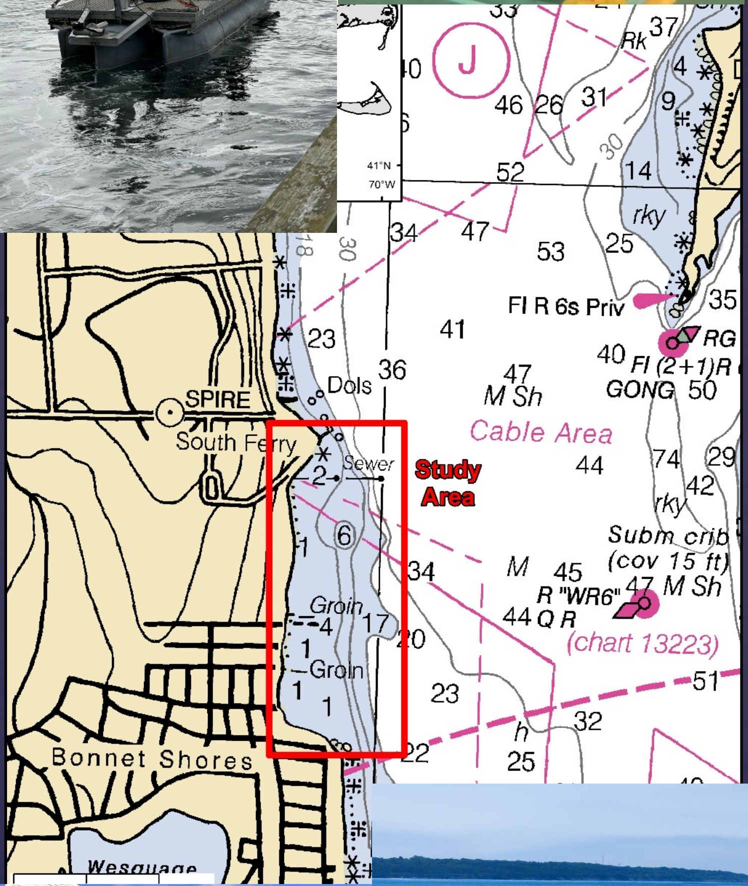




Environmental Characterization and Modeling Studies to Better Understand Coastal Erosion in Little Beach Area of Bonnet Shores, Narragansett, Rhode Island

Presented by: John King

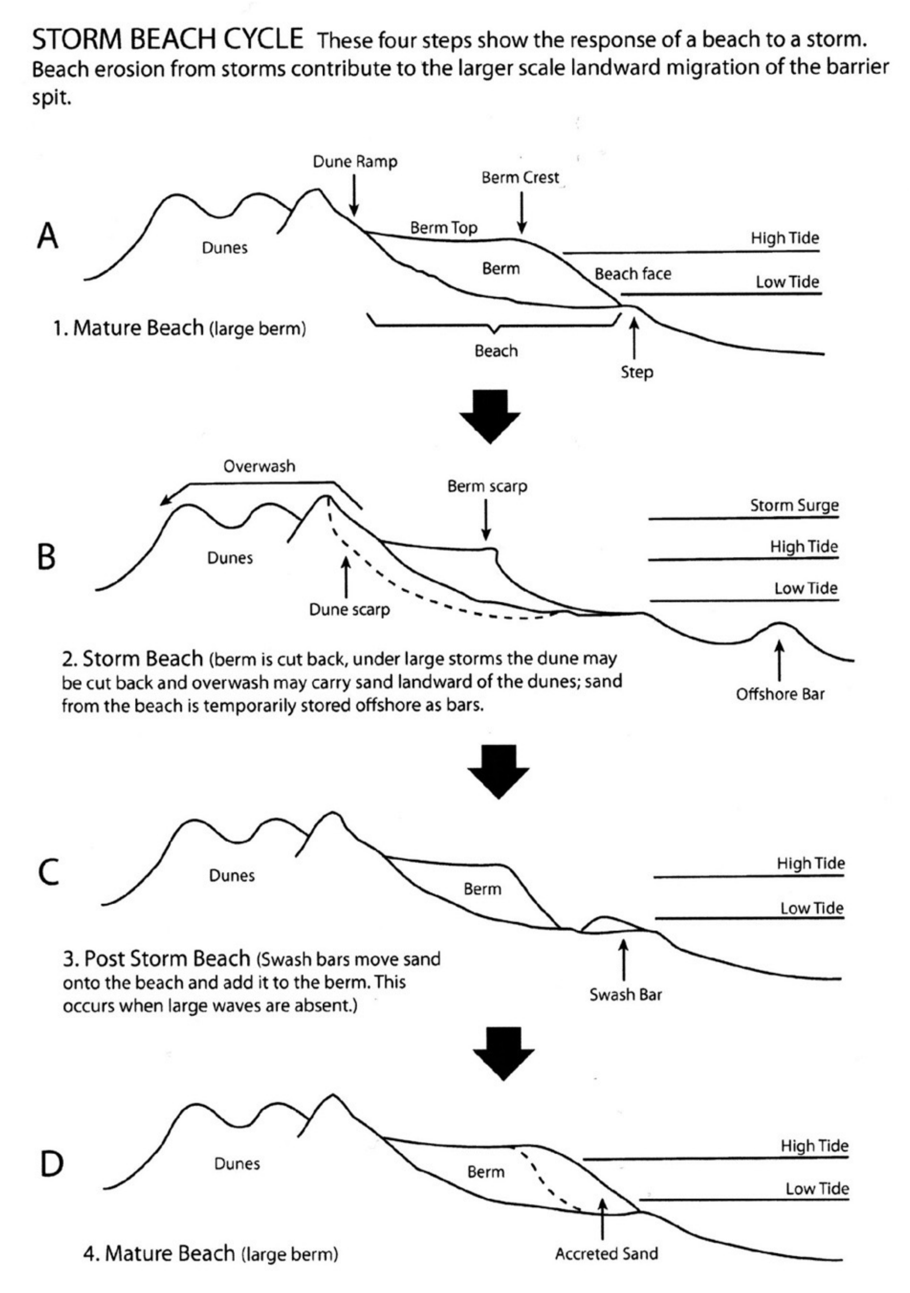
April 15, 2025

Collaborators: Brian Caccioppoli, Bryan Oakley, Reza Hashemi, Arash Rafiee Dehkharghani

THE UNIVERSITY OF RHODE ISLAND GRADUATE SCHOOL OF OCEANOGRAPHY

EASTERN CONNECTICUT STATE UNIVERSITY

Storm Beach Cycle



LiDAR System & Research Vessel

1. Teledyne-Optech ILRIS HD-MC

    Laser scanner

    - Accuracy = 4 mm @ 100 m
    - 10 kHz repetition rate
    - Pt density = 1.3 cm @1000m

2. Applanix POS MV v4

    Orientation (heading/pitch/roll)

    - 0.002 degrees accuracy

3. Trimble R10 – VRS RTK enabled

    Precise positioning

    - 4-5 cm positional accuracy
    - Real time NMEA data stream

LiDAR Elevation at Little Beach

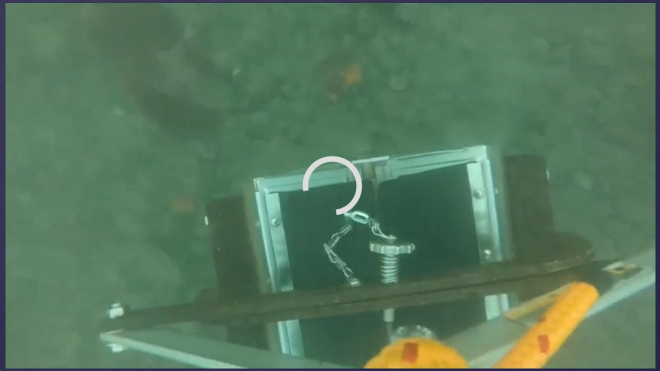
Little Beach Volumes and Change

Table 2.1 LITTLE BEACH VOLUMES	
Date	Volume (cubic meters, NAVD88)
9/9/2020	6,164
10/19/2022	5,781
PERCENT CHANGE	
Date Range	NAVD88
9/9/2022 to 10/19/2022	-6.2%

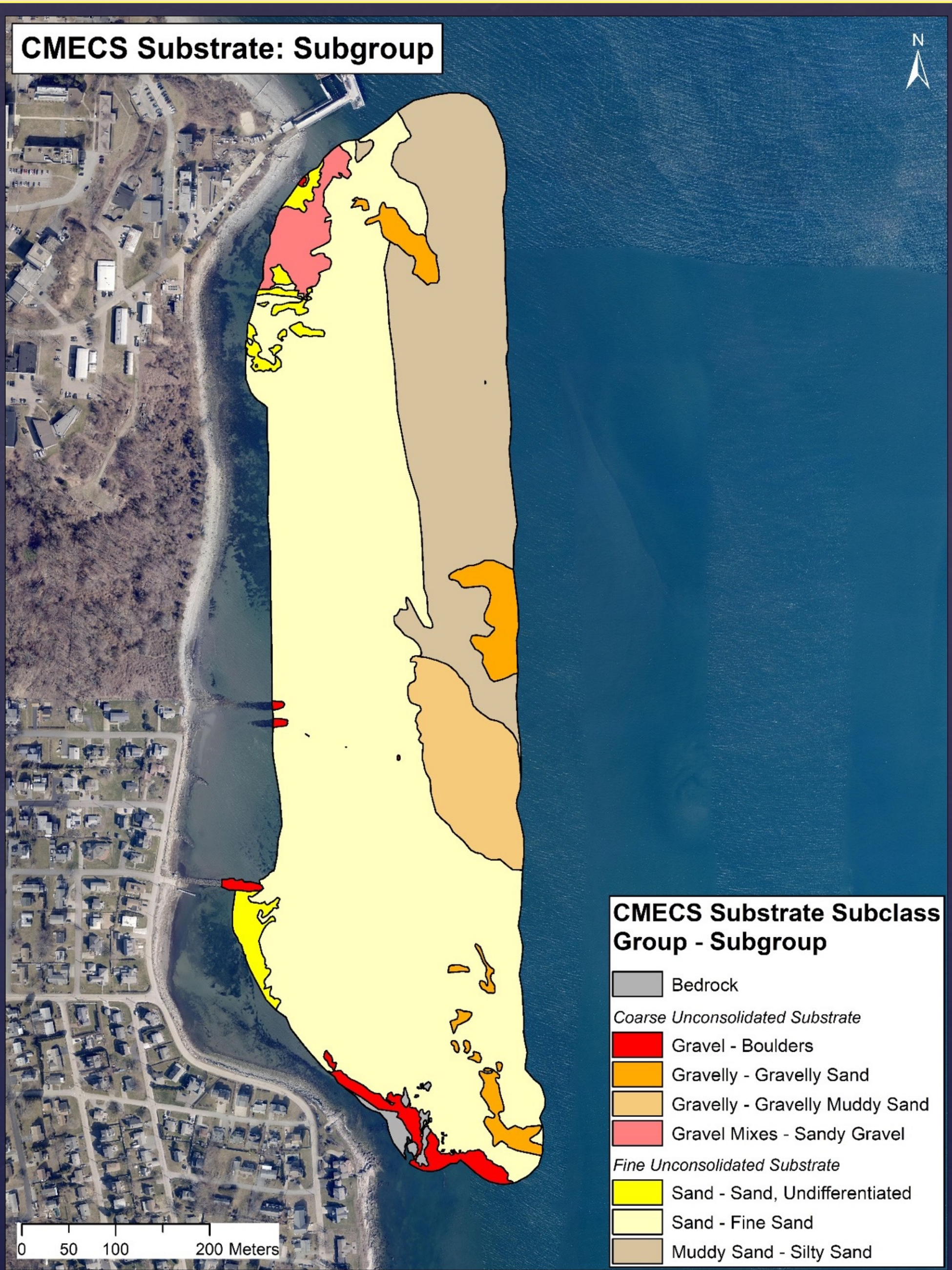
Change in Elevation Between LiDAR Surveys

Little Beach Side-Scan Mosaic

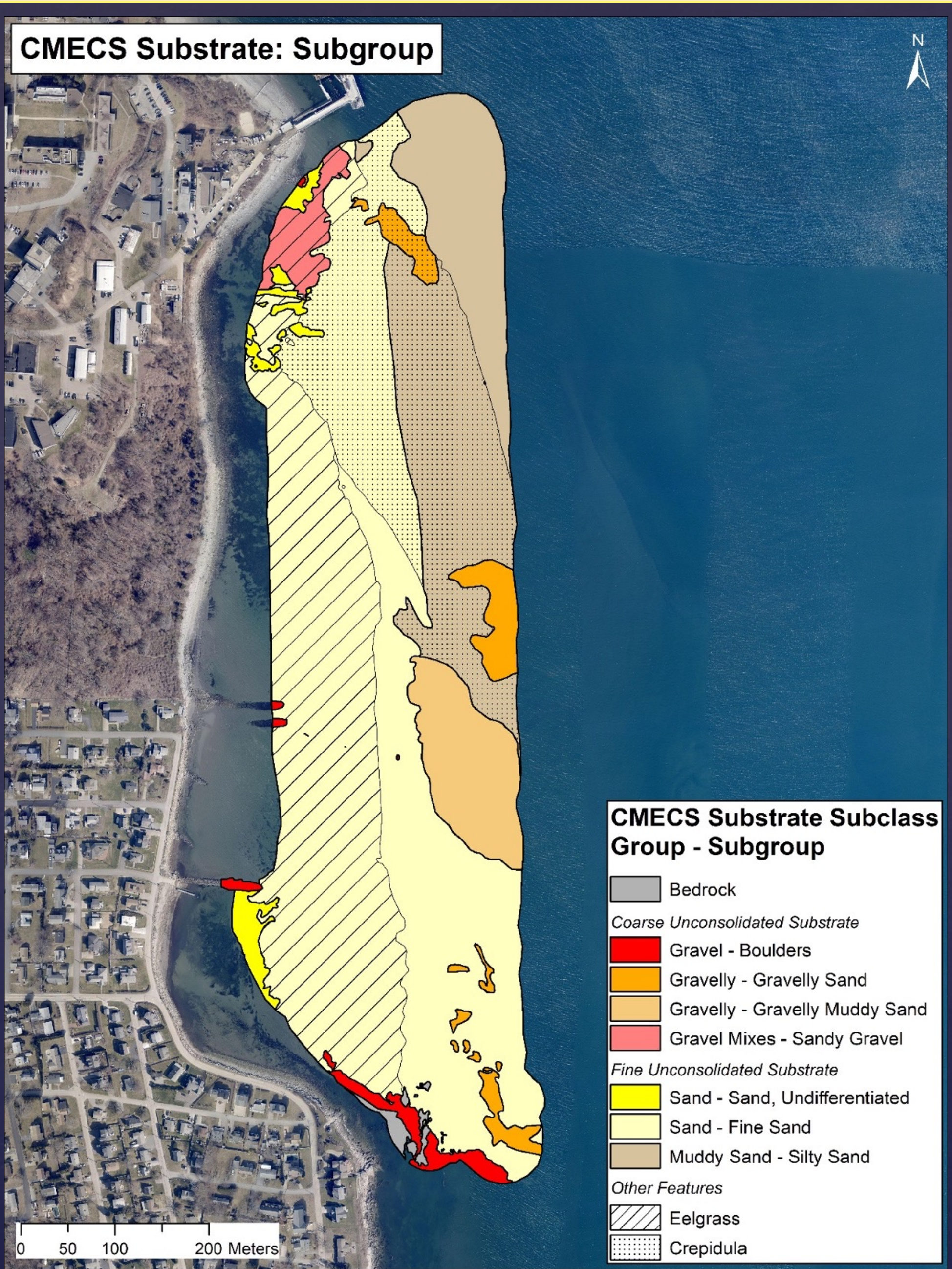
Sediment Grab Sample Locations



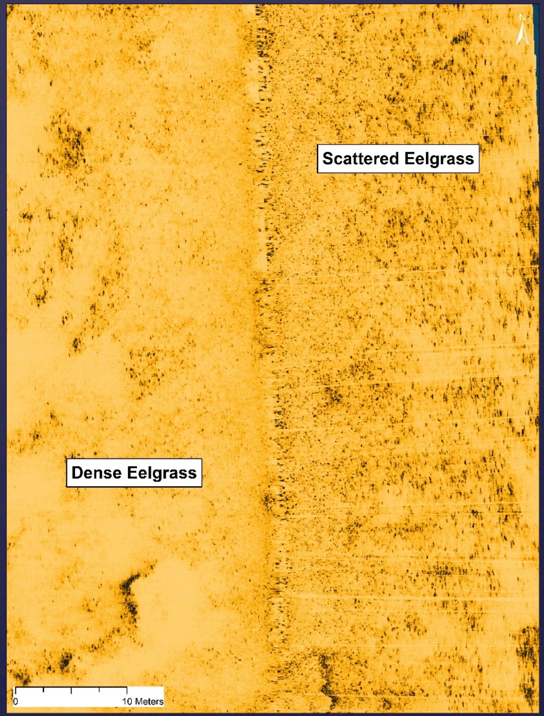
CMECS Substrate Map



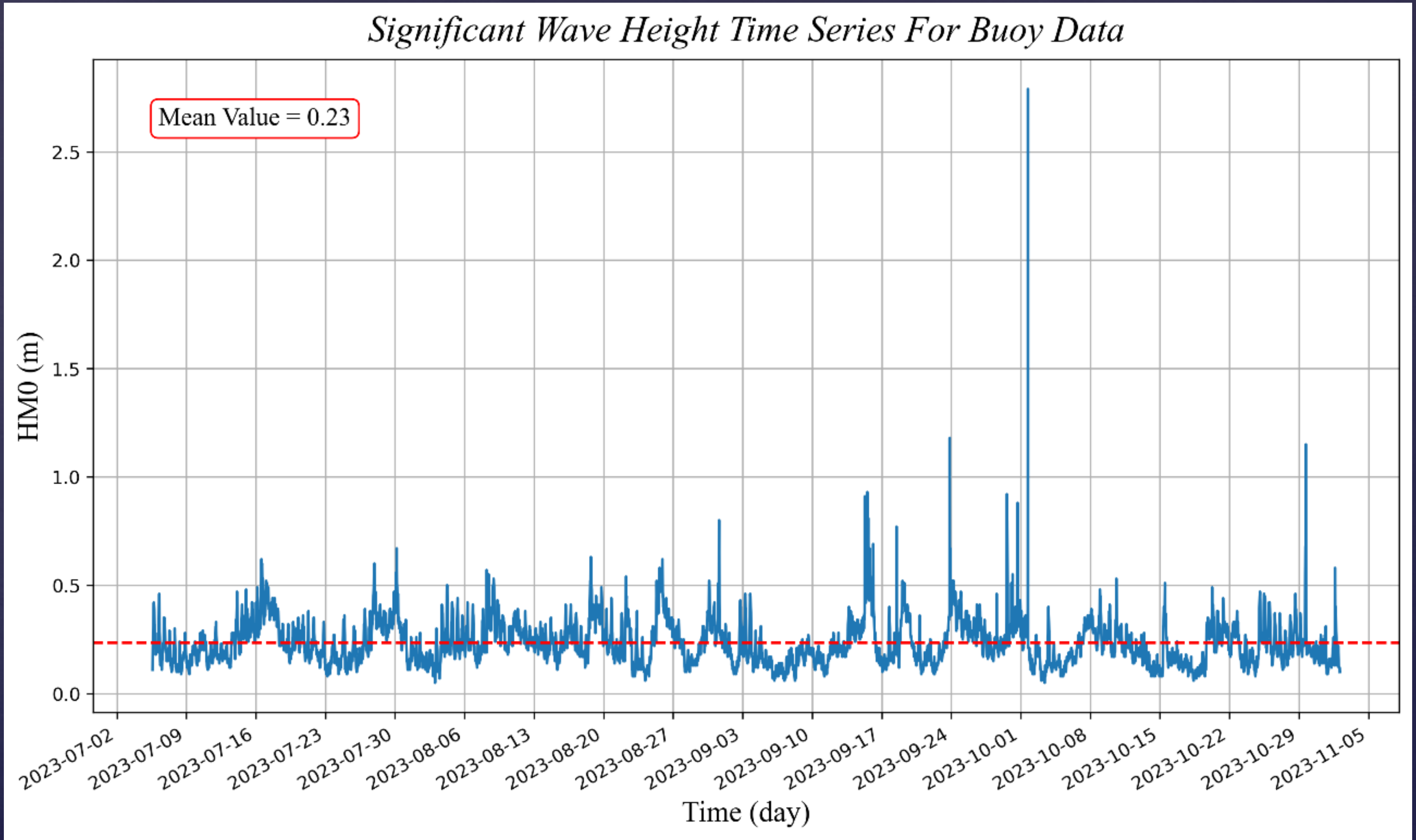
CMECS Substrate Map with *Crepidula fornicata* and Eelgrass



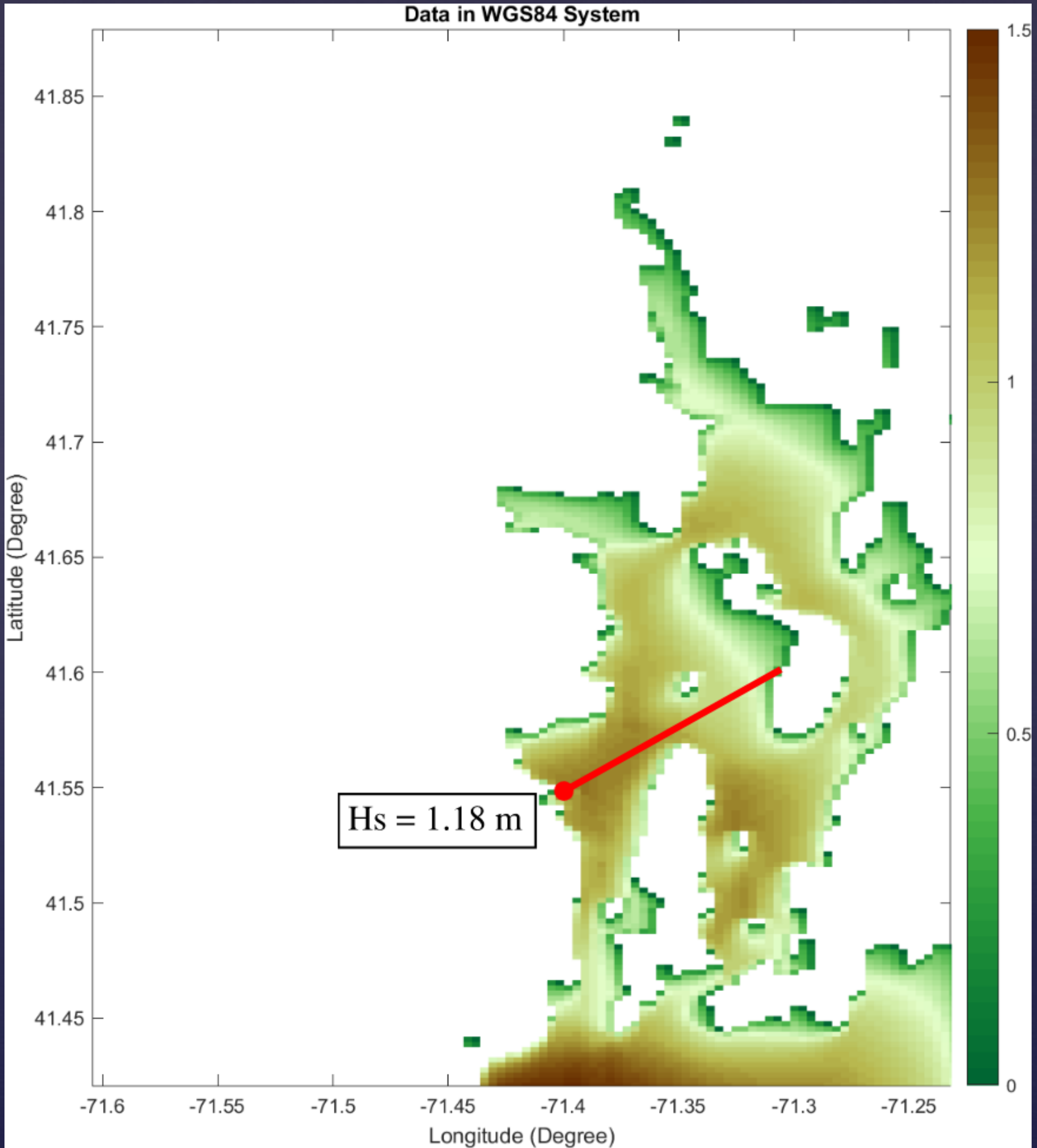
Mapped Extent of Eelgrass Beds, this study and Bradley, 2023 study



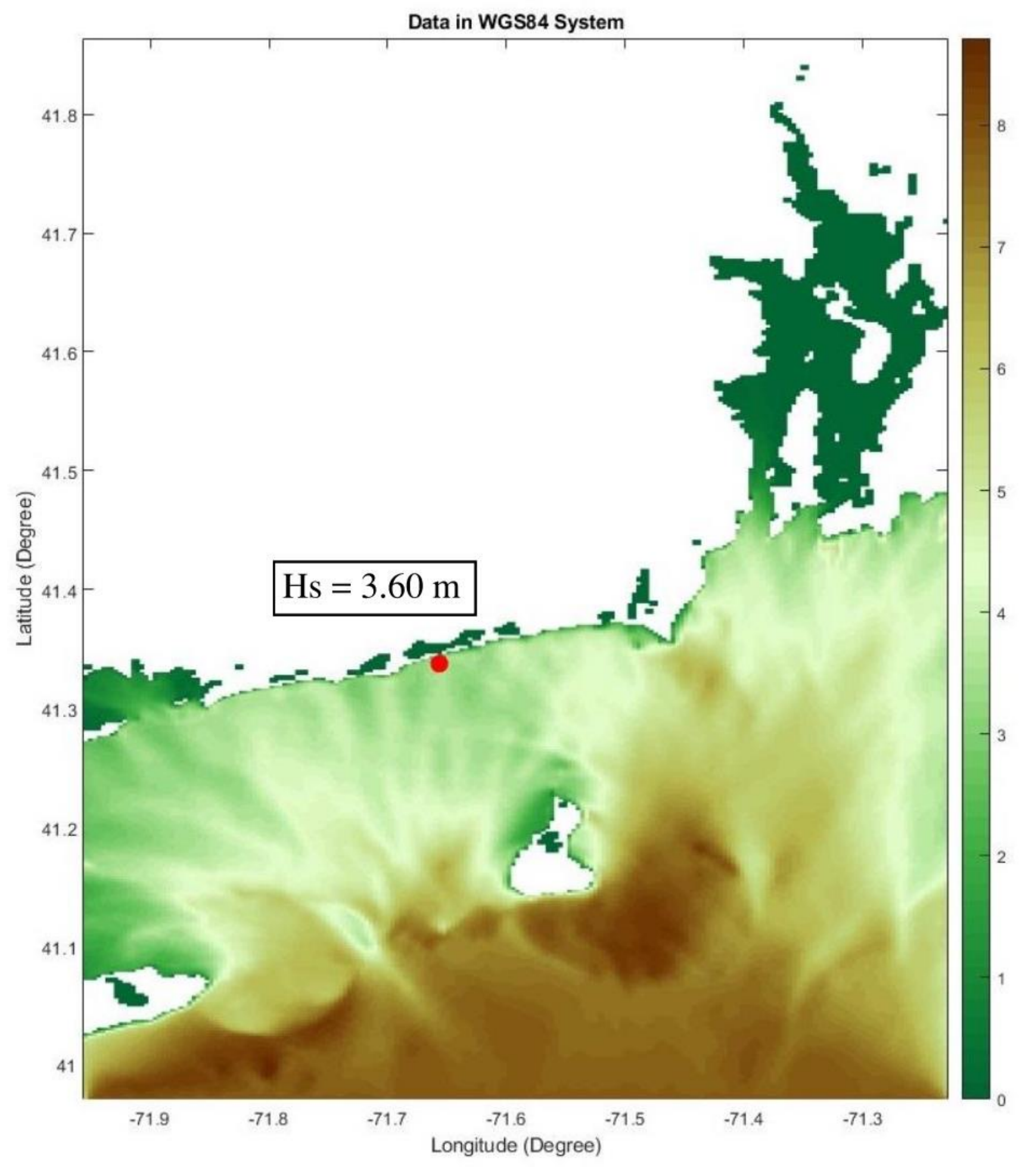
Wave Height Measured at Little Beach



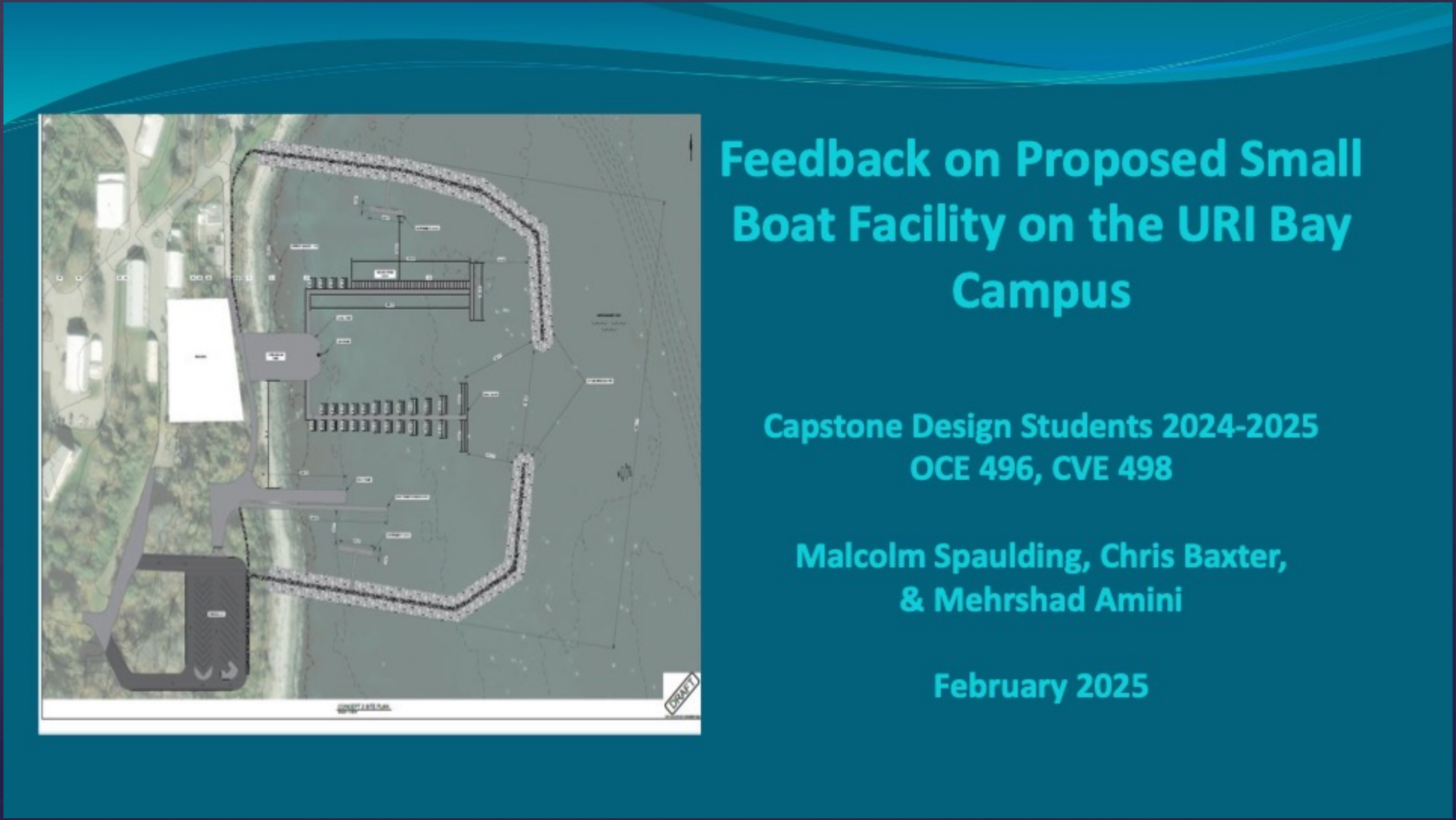
Modeled Wave Height, NE wind at 20 m/s



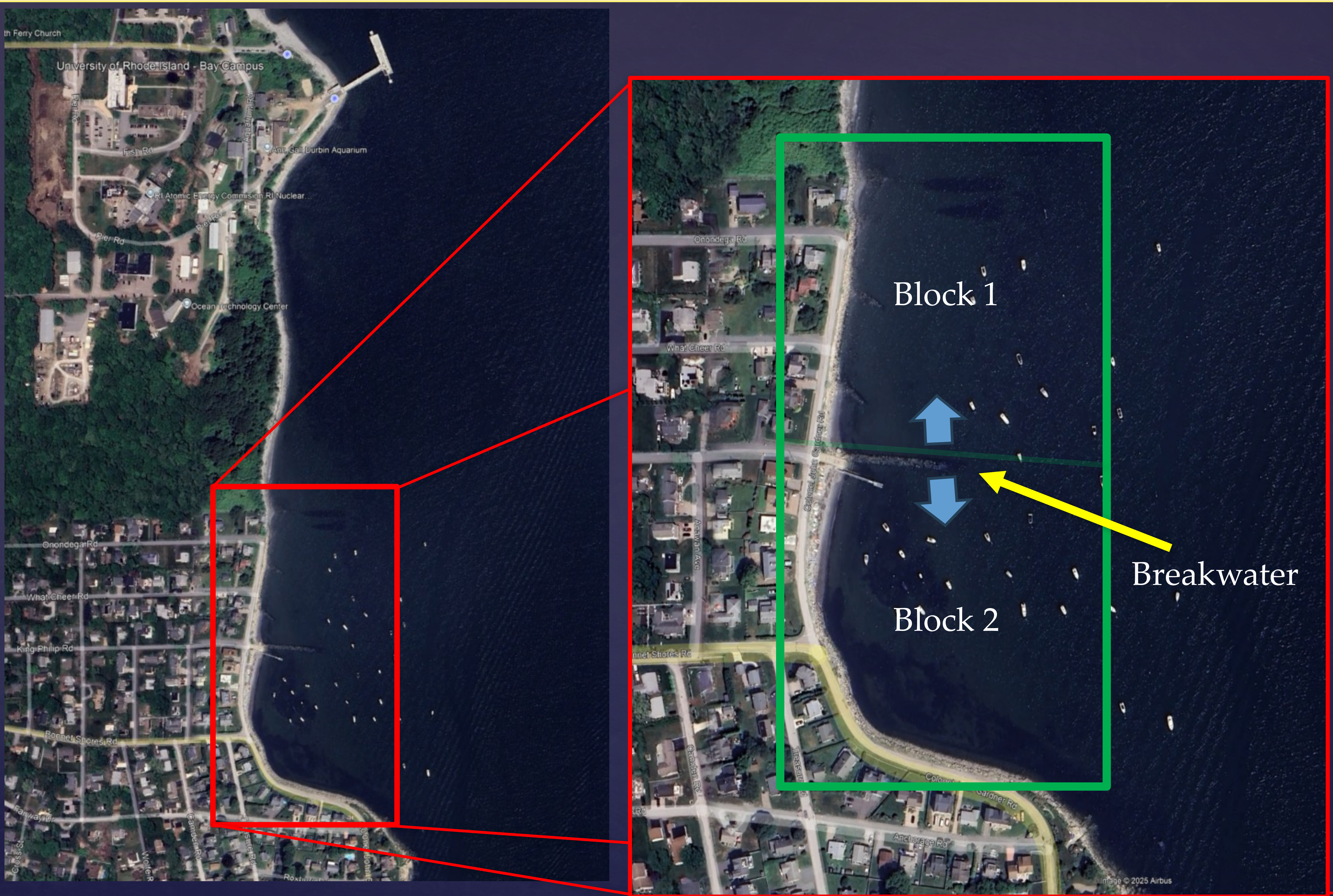
Modeled Wave Height Simulated from Hurricane Irene



Proposed Facility at URI Bay Campus (Conceptualization Only)



Nature–Based Approaches to Reduce Flooding and Erosion



Nature–Based Approaches to Reduce Flooding and Erosion

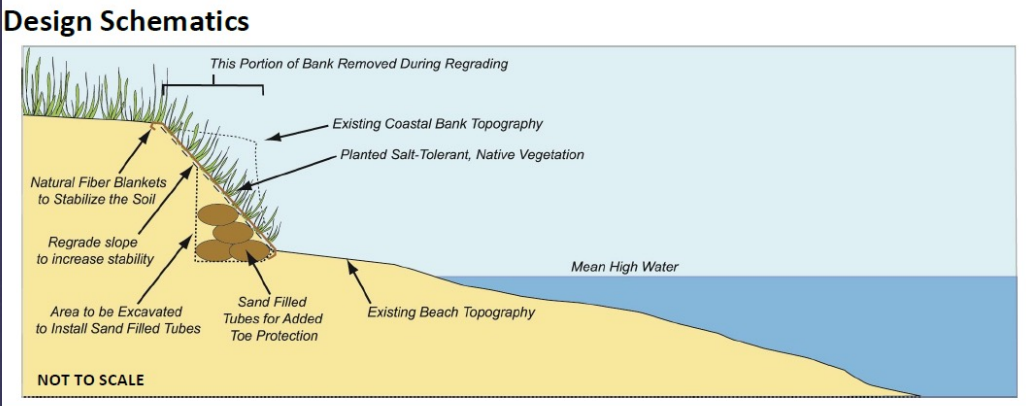
Problem:

- Coastal flooding and shoreline erosion

Potential solutions:

These concepts are inspired by nature-based strategies, often referred to as Living Shorelines. These techniques not only help reduce erosion and flooding, but also preserve natural habitats, improve water quality, and maintain the natural sediment transport dynamics.

1) Restore part of the dunes to reestablish the coastal bank
2) Nourish and reprofile the beach
3) Install living breakwaters



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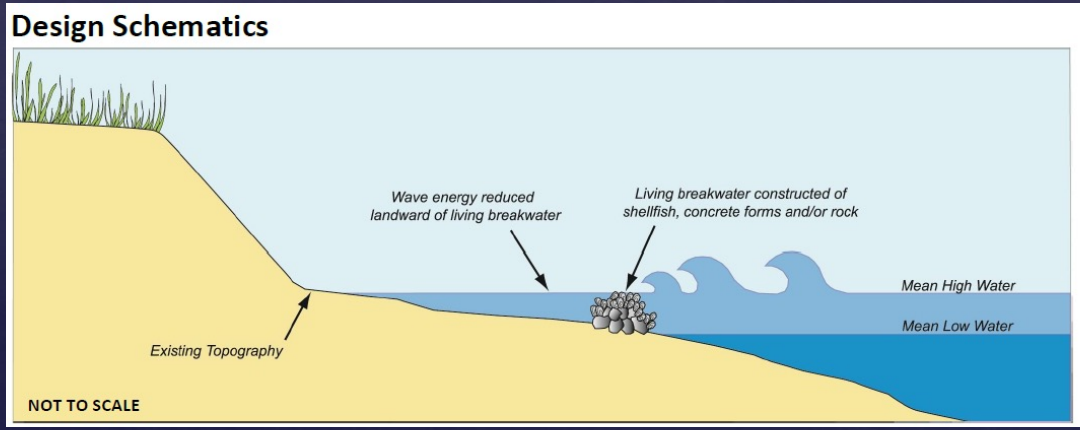

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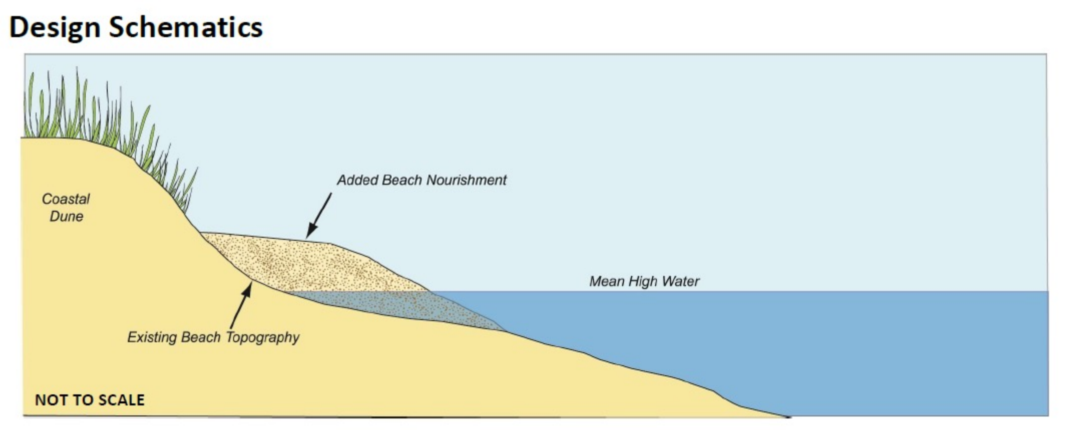
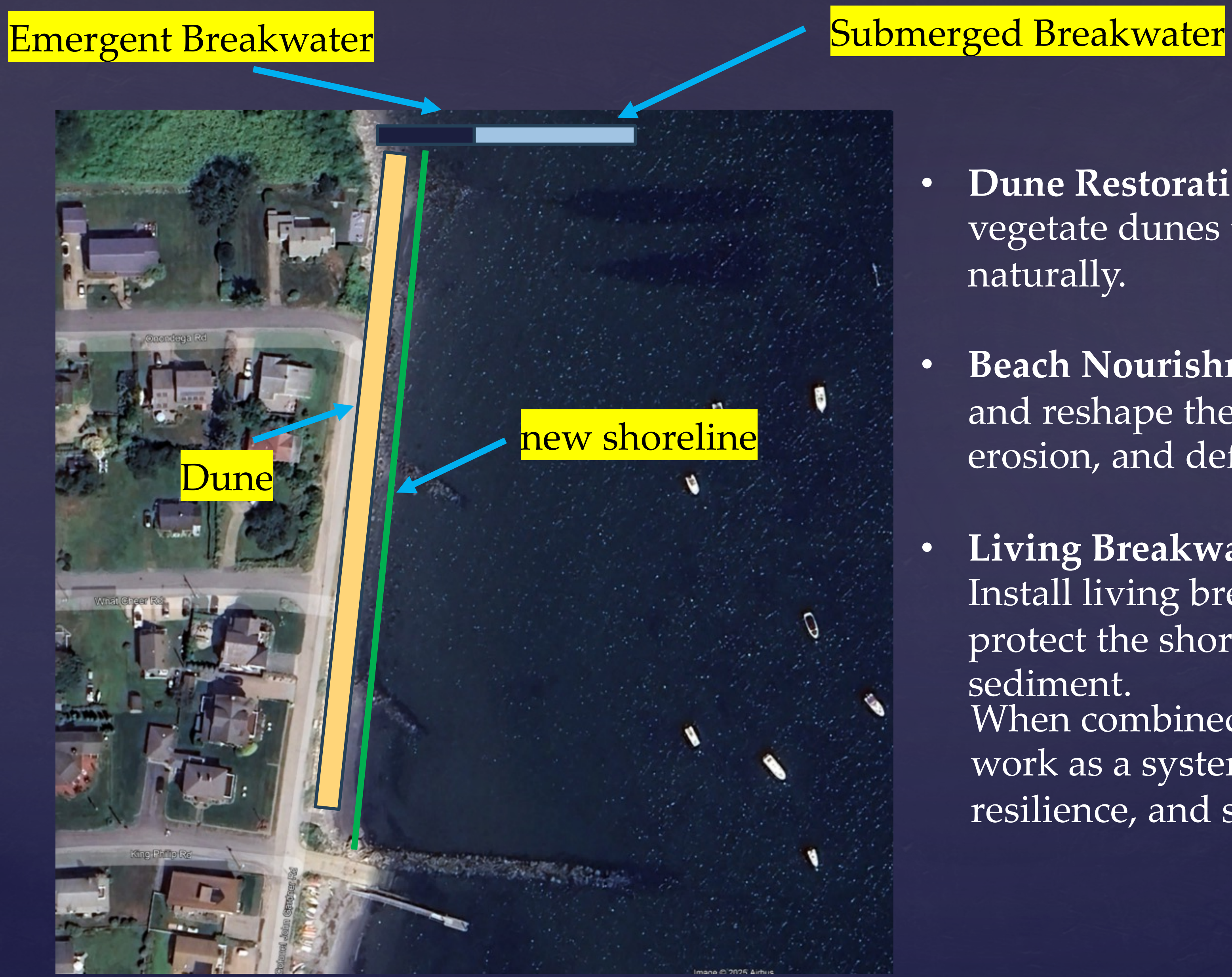


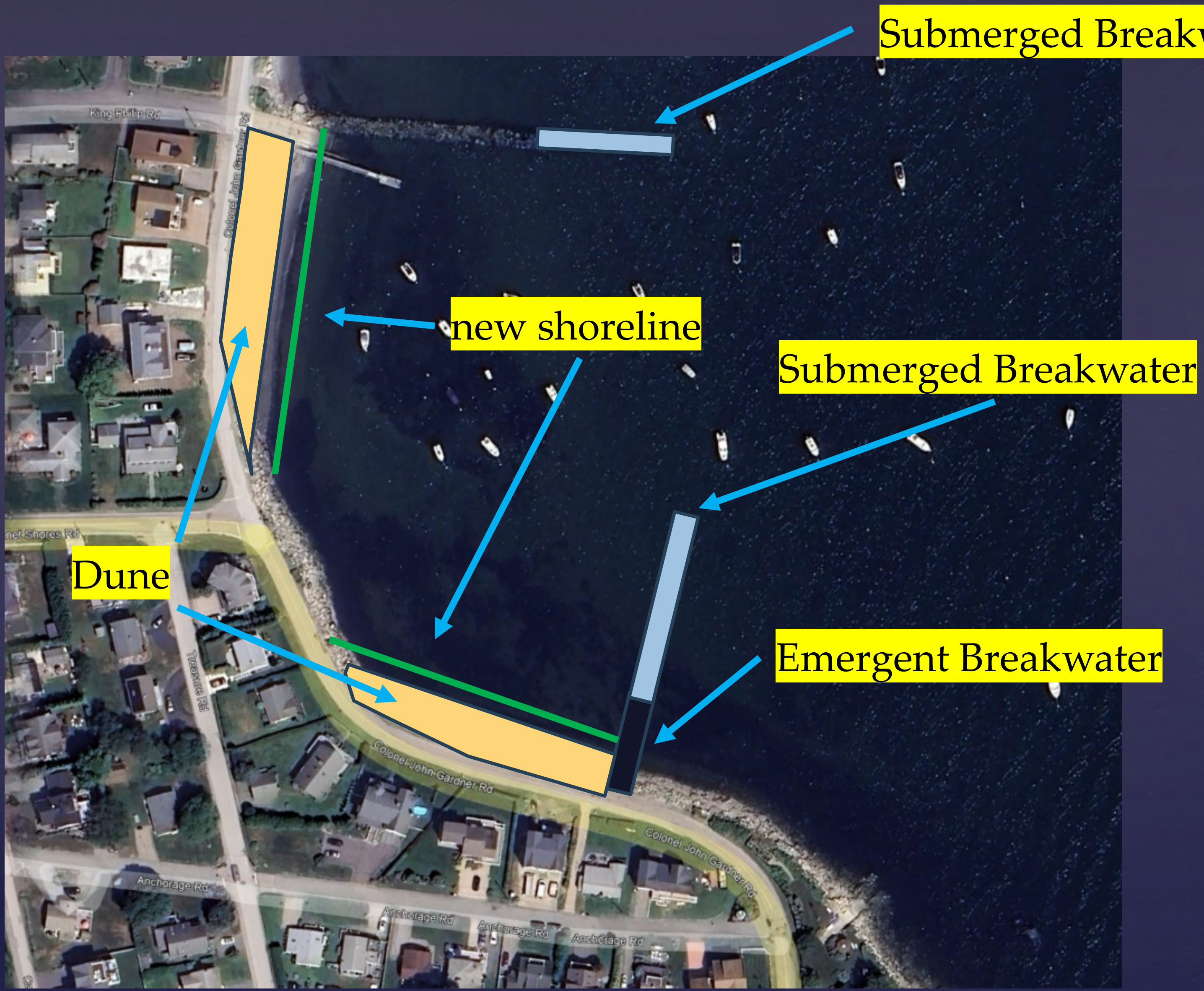
Conceptual Layout: Combined Strategies for Coastal Protection – Block 1



- **Dune Restoration (Dunes Area):** Rebuild and vegetate dunes to buffer wave impact and trap sand naturally.
- **Beach Nourishment (New Shoreline):** Add sand and reshape the beach to rebuild lost shorelines, fix erosion, and defend against future storms.
- **Living Breakwaters (Submerged + Emergent):** Install living breakwaters to reduce wave energy, protect the shoreline, and help retain beach sediment.

When combined, these nature-based strategies work as a system to defend the coast, enhance resilience, and support natural processes.

Conceptual Layout: Combined Strategies for Coastal Protection – Block 2



By combining dune restoration, beach nourishment, and living breakwaters, we propose a sustainable and adaptive approach to managing erosion and flooding at Little Beach.

- These strategies work with nature, not against it.
- They preserve the character of the beach, enhance habitat, and improve storm protection.
- This conceptual plan is scalable and can be tailored to local needs and site-specific challenges.

Let's protect the beach naturally – for today and the future.