LIVING BREAKWATERS & TOTTENVILLE SHORELINE PROTECTION PROJECT ELEMENTS

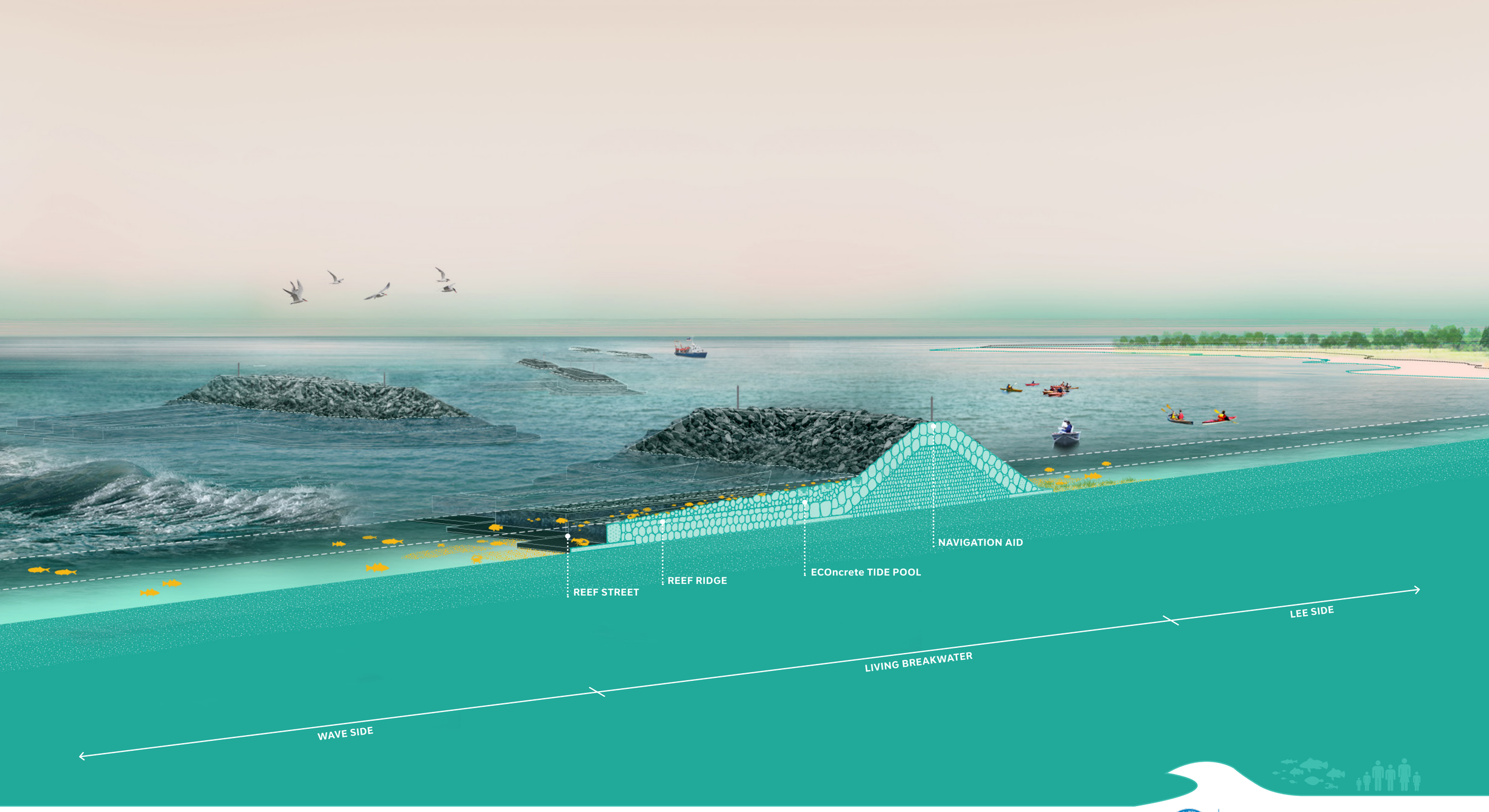
Governor's Office of Storm Recovery

SCAPE TEAM

LIVING BREAKWATERS & TOTTENVILLE SHORELINE PROTECTION PROJECT

Governor's Office of Storm Recovery

SCAPE TEAM



LIVING BREAKWATERS AT 60% DESIGN

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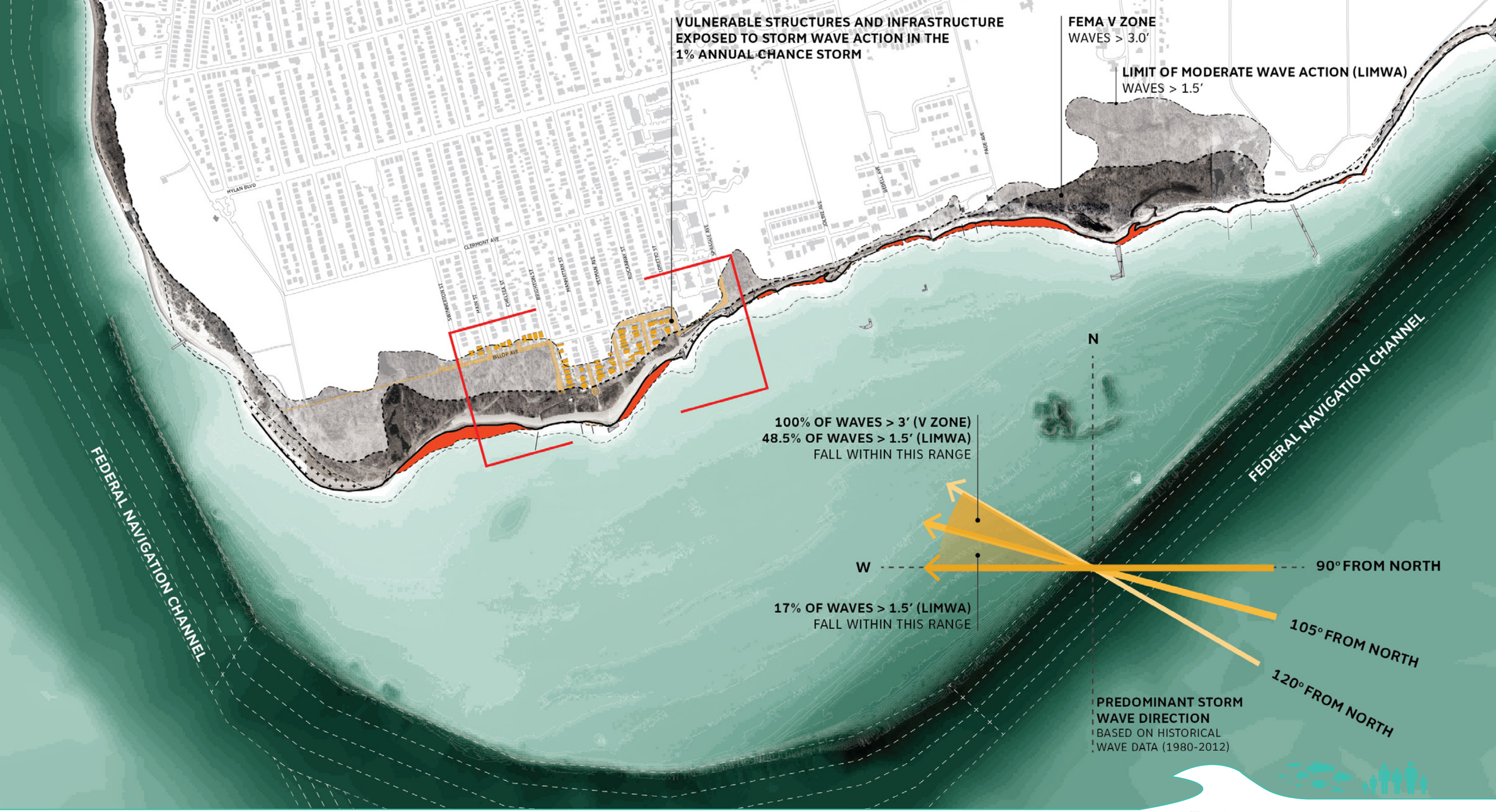

COASTAL RISK

EXISTING SHORELINE STRUCTURES
STRUCTURES WITHIN RISK ZONES
HISTORIC SHORELINE ACCRETION
HISTORIC SHORELINE EROSION
1978 MHW LINE
2015 MHW LINE
CURRENT MLW LINE
VE ZONE LINE
LiMWA LINE

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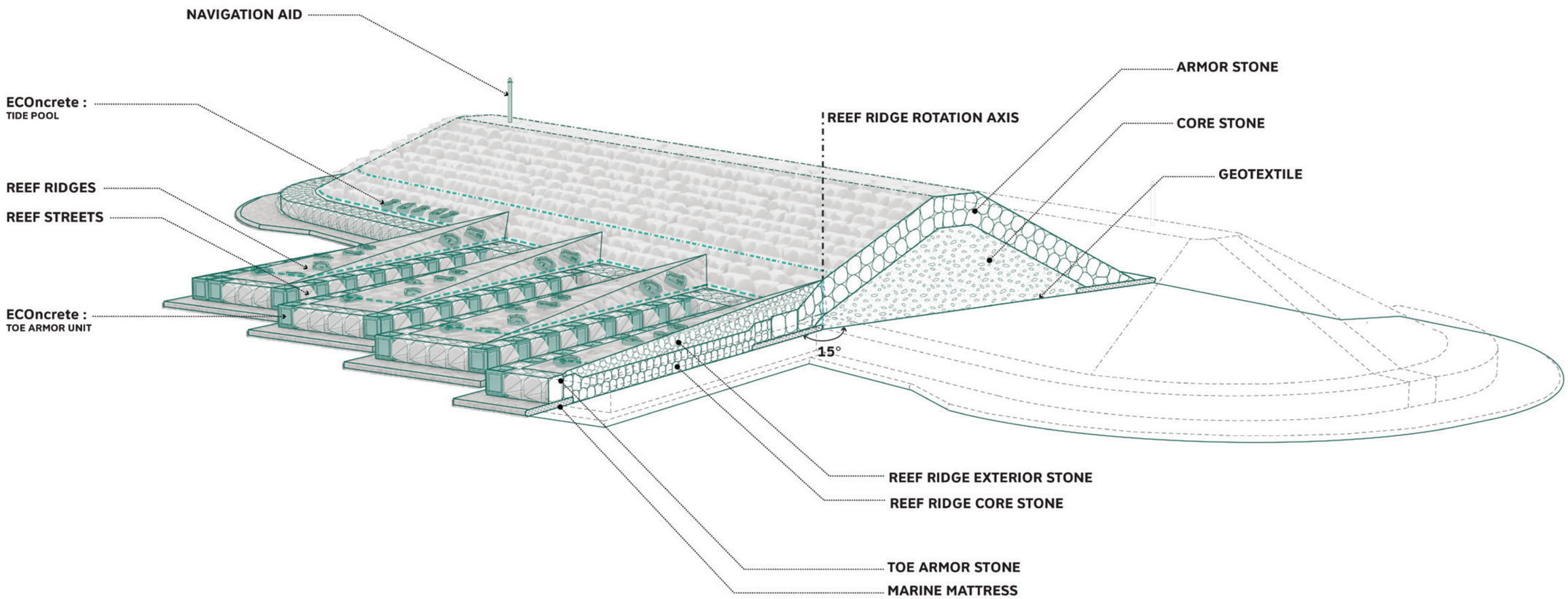

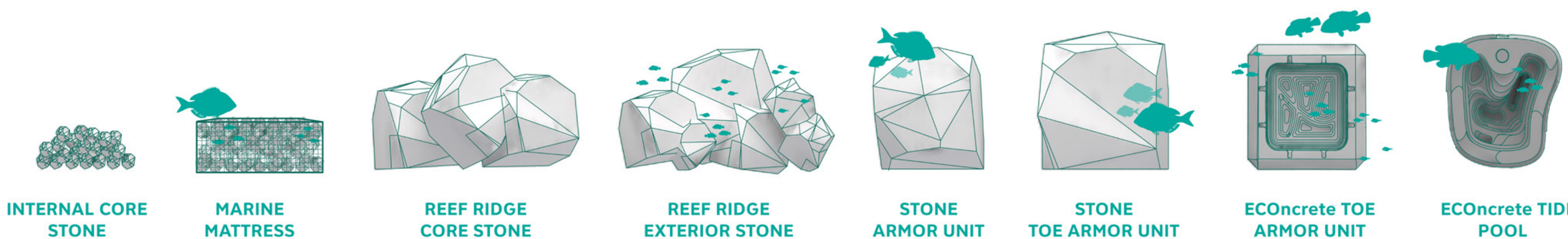

ANATOMY OF A LIVING BREAKWATER

Governor's Office of Storm Recovery

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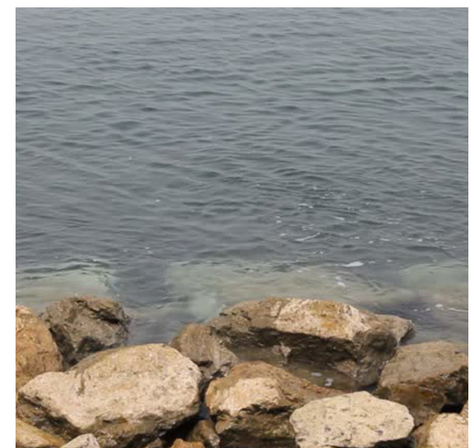
GEOTEXTILE

REEF RIDGE EXTERIOR STONE

STANDARD ARMOR STONE



TOE ARMOR STONE

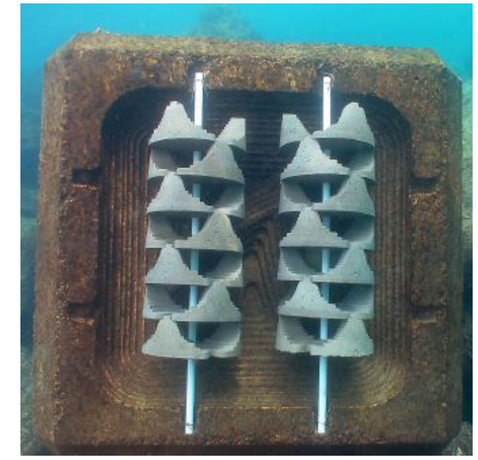
CORE STONE

MARINE MATTRESS

REEF RIDGE CORE STONE

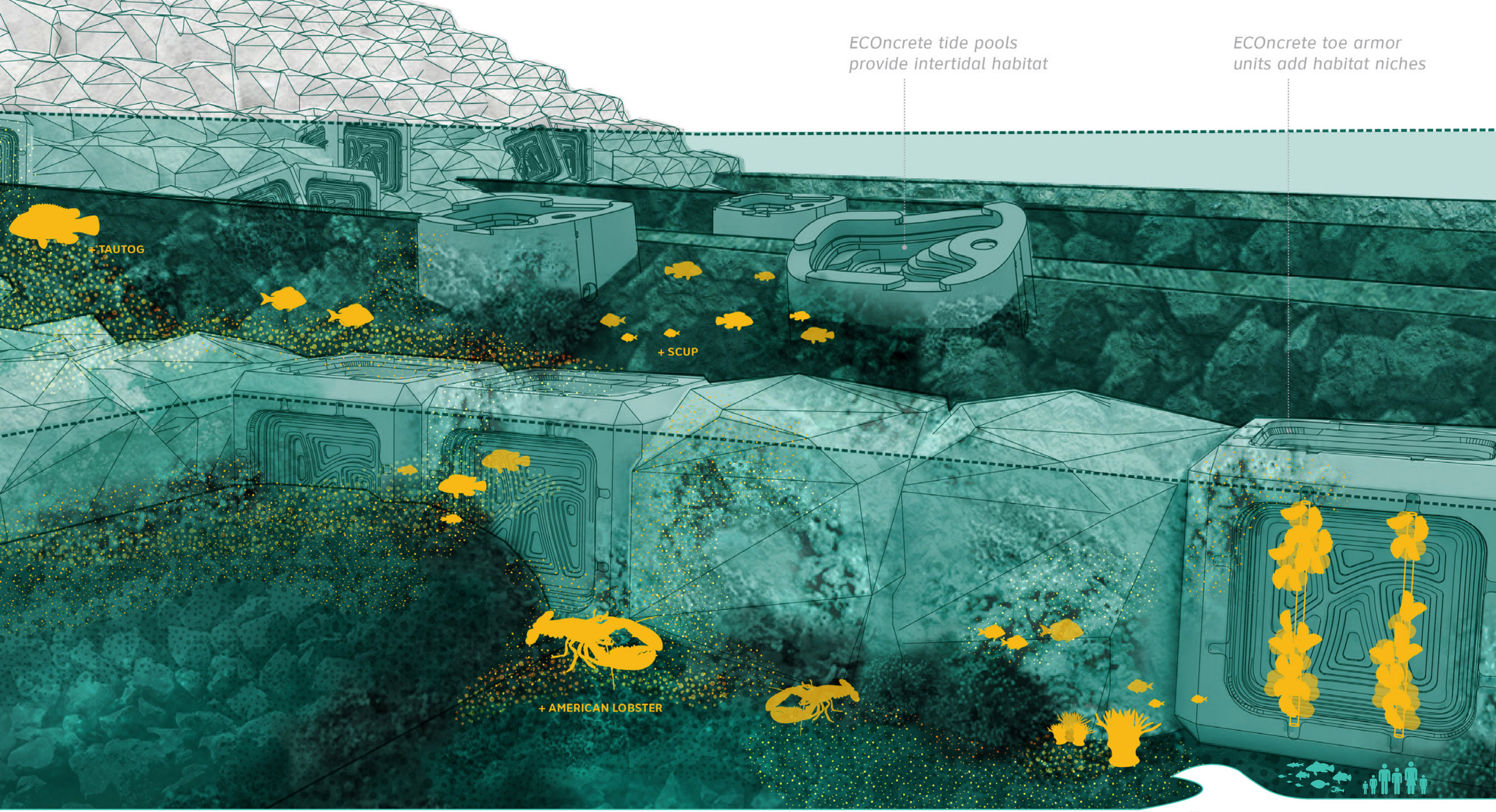
ECOncrete TOE ARMOR UNIT

ECOncrete TIDE POOL



ECOncrete INSERTS

ANTICIPATED CONSTRUCTION MATERIALS



LIVING BREAKWATER HABITAT

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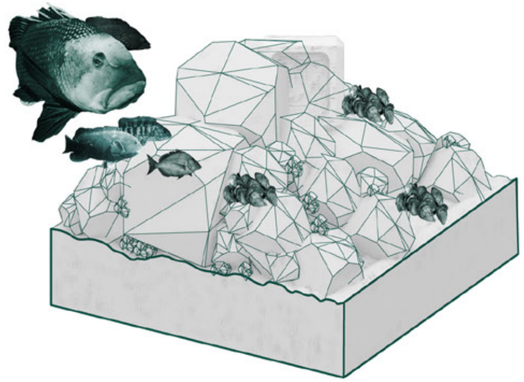
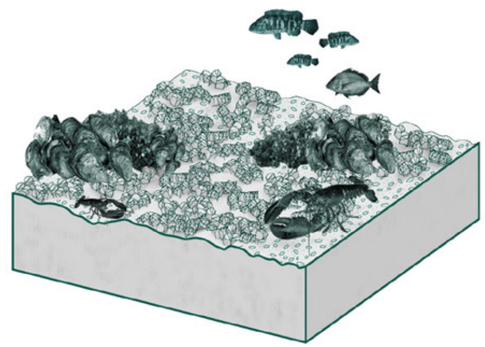


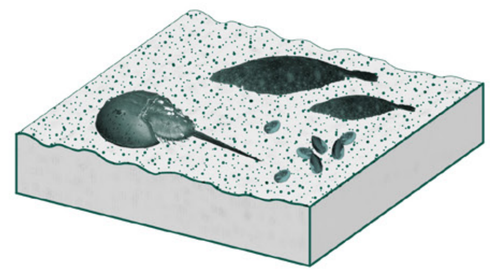
HARD BOTTOM OR HARD/ROCKY

Ranging from small cobbles to boulders that include the breakwater structures and existing rock piles. Habitats occur in emergent, intertidal, and subtidal conditions.



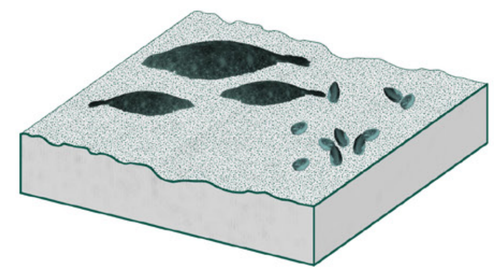
LARGE GRAIN

Substrate includes gravel, pebbles, and shells. Existing gravel and cobble conditions on site as well as shell halo generated by the breakwater over time are aligned with this habitat type. Habitats occur in intertidal and subtidal locations.



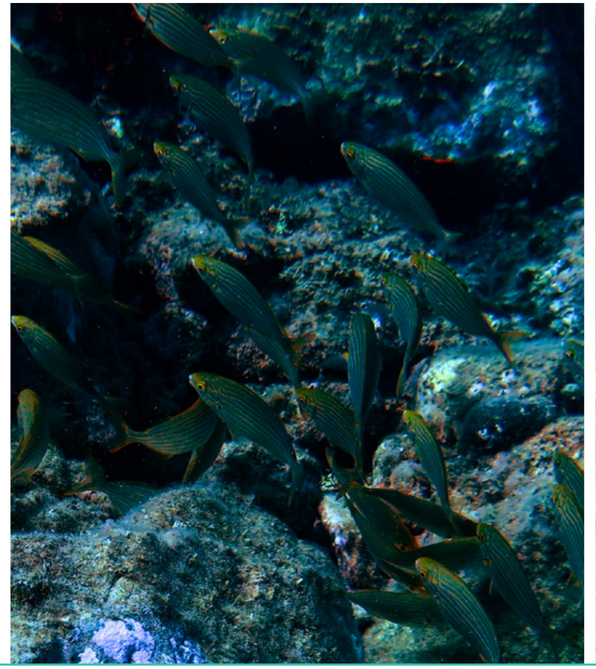
SMALL GRAIN

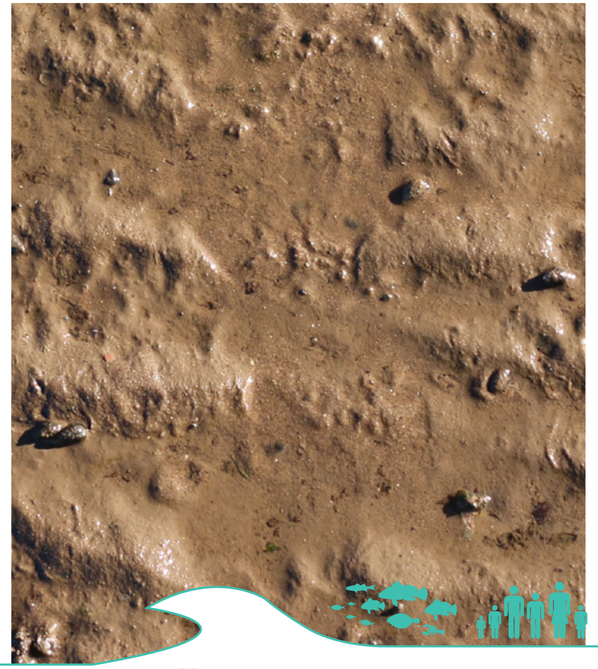
Substrate includes fine to coarse grain. This constitutes the vast majority of the habitat currently found in the project area. Breakwaters will promote the accumulation of sediment along the shoreline, reducing erosion, and yielding wider beaches. Beach fill will also enhance on-shore small grain habitats.



FINE GRAIN

Substrate includes silt and clay cohesive material. This habitat type is observed near the project area, but not observed in the area of breakwater construction. Fine grain habitats are not anticipated to be generated by breakwater interactions with their surroundings.

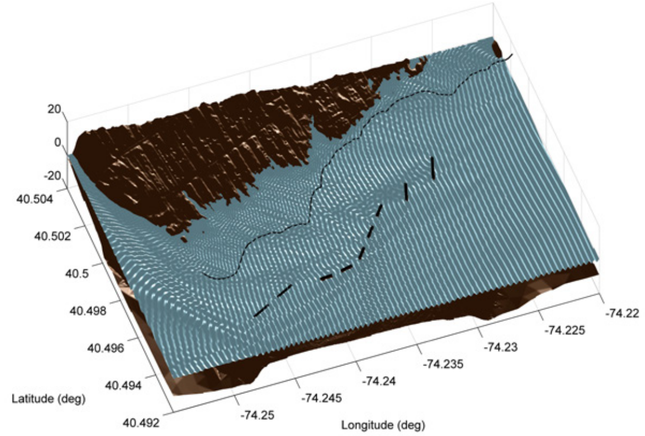




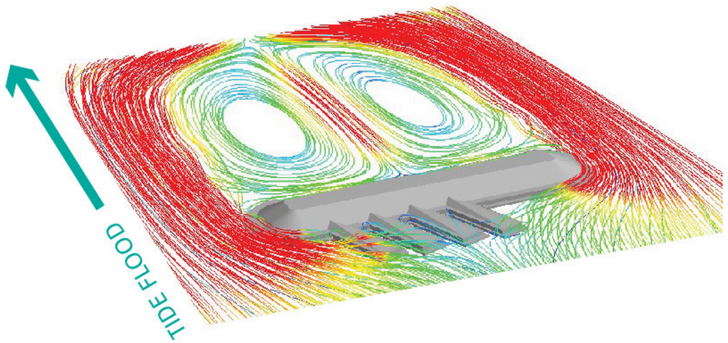
RARITAN BAY REPRESENTATIVE HABITAT

GENESIS - Shoreline Change

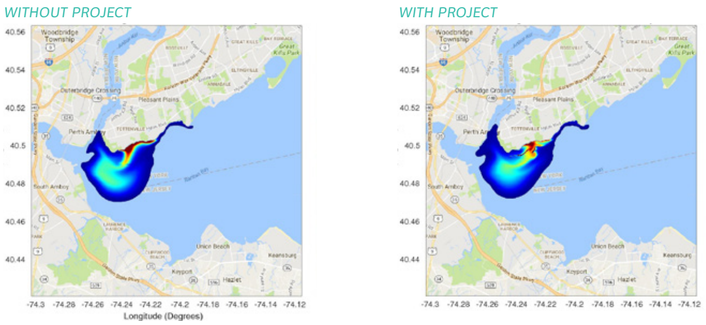
REF DIF - Wave Attenuation



FLOW 3D - Simulated Currents & Flows

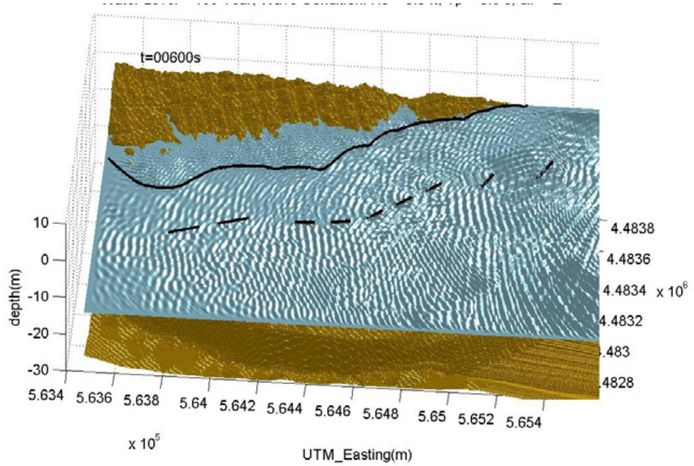


DELFT 3D - Water Circulation

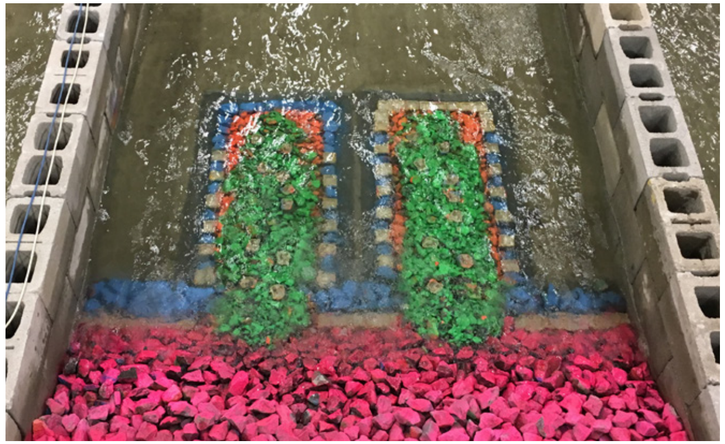


Percent Remaining Tracer Concentration - 2 days

FUNWAVE - Wave Attenuation



PHYSICAL MODEL - Testing for Structural Stability



MODELING METHODS

BED STRESS - SCOUR + TRANSPORT ASSESSMENT

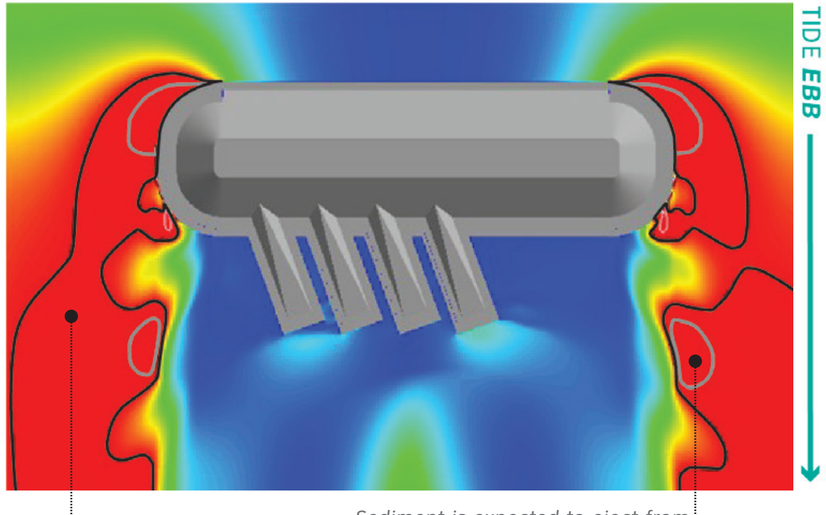
The sediment mobility is assessed with the Shield's parameter, which balances the strength of the flow pushing on the sediment against the sediment size and weight.

Shield's Parameter

0.000 0.018 0.036

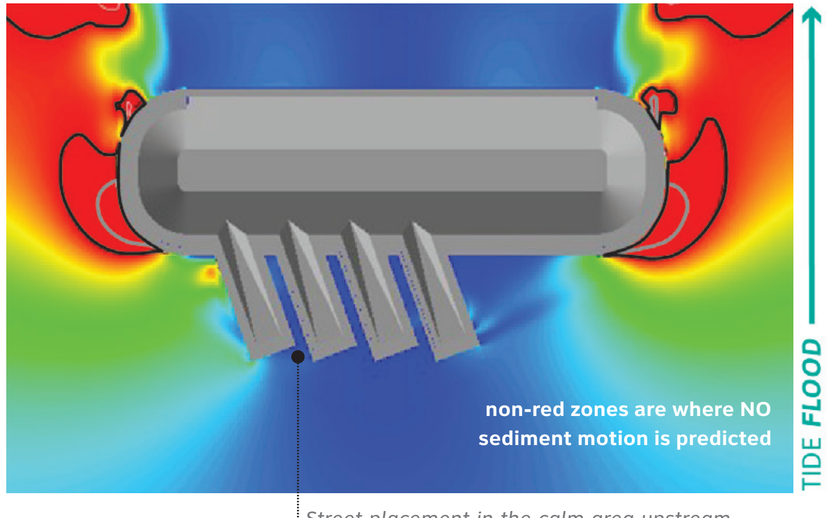
Initiation of bedload transport

Significant bedload transport



Sediment is expected to eject from the sea floor into suspension

Sediment is expected to be in motion along the sea floor



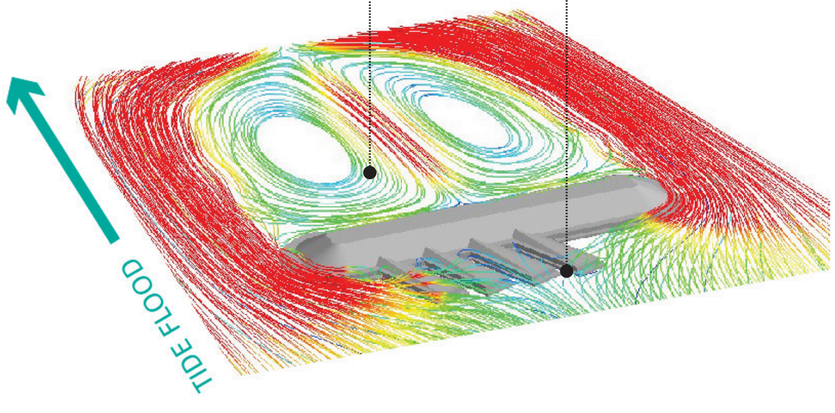
Street placement in the calm area upstream protects against local scouring

FLOW AROUND STRUCTURE

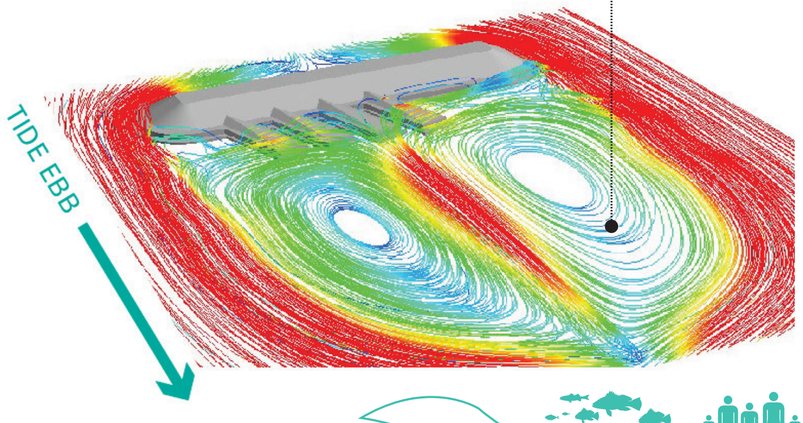
In both scenarios, flow accelerates as it passes around the segment ends - creating a zone of low flow into which the reef ridges and streets are located.

A symmetric, counter-rotating circulation zone forms in the lee

A small portion of the flow penetrates into the reef streets



A water circulation pattern pushes flow into the center reef streets and over the exterior reef streets - promoting exchange



Flow Velocity (ft/sec)

0.000 0.375 0.750

MODELING FOR WATER CIRCULATION & SEDIMENT MOVEMENT

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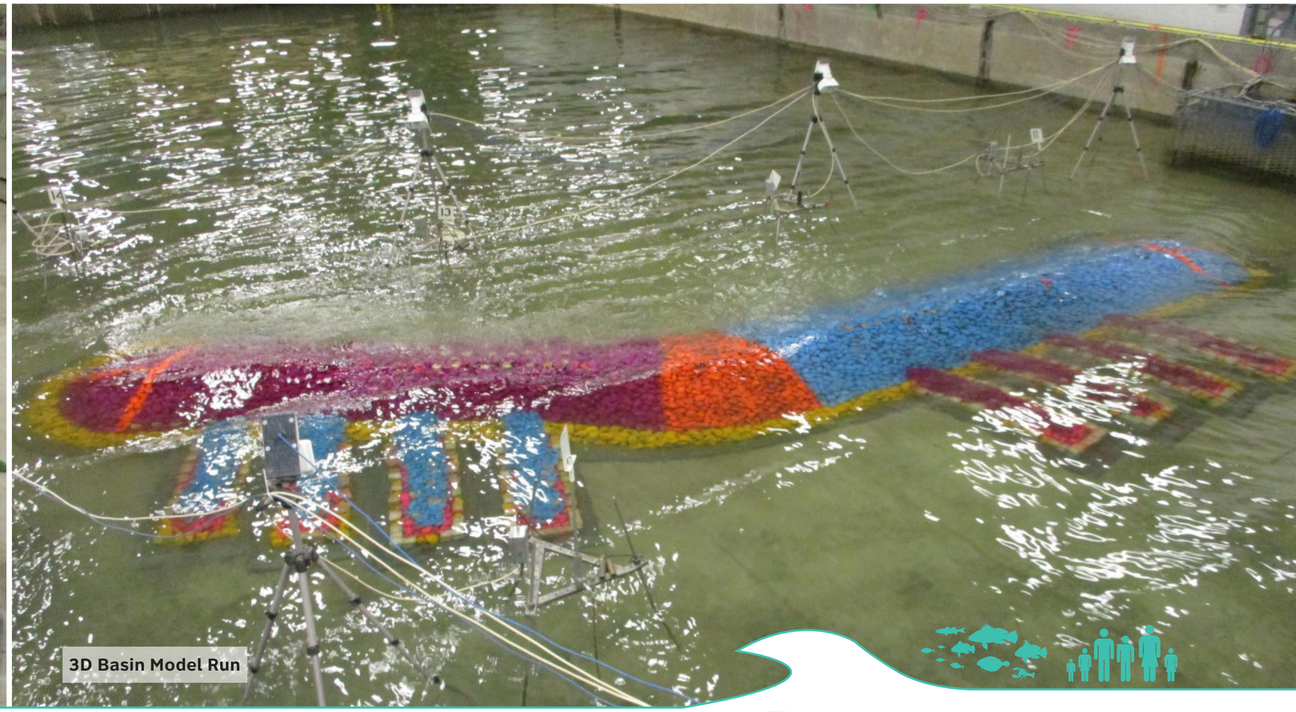
Type A Breakwater Segment

Segment Section Model Run

3D Basin Model Construction



3D Basin Model Run

PHYSICAL MODELING

Governor's Office of Storm Recovery

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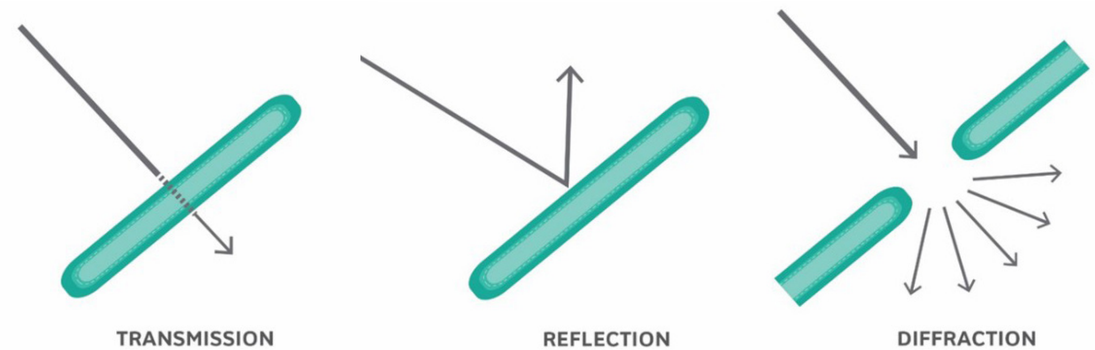
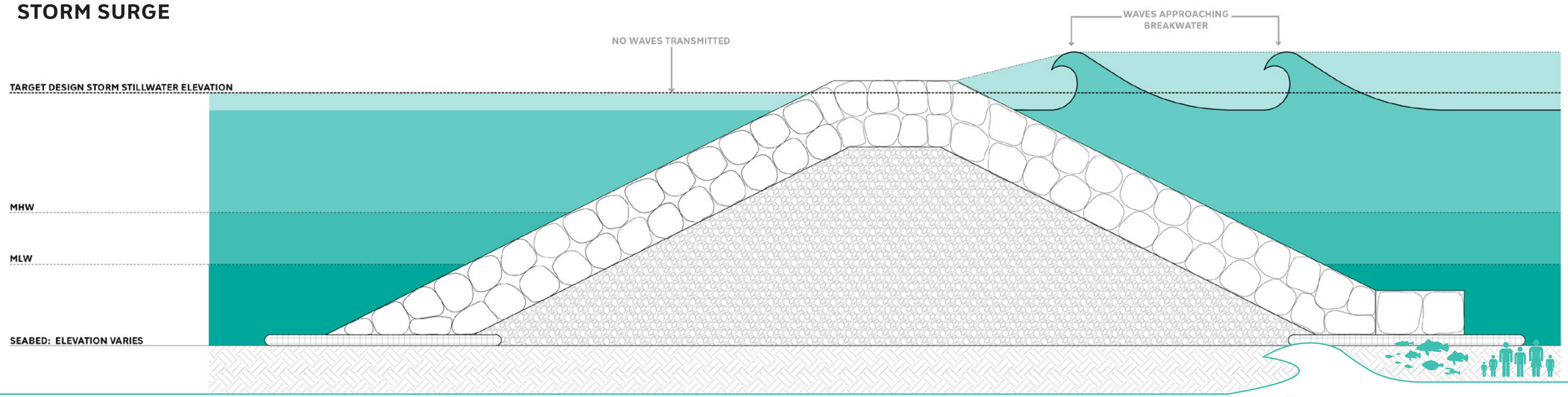


STORM SURGE



STORM WAVE ATTENUATION

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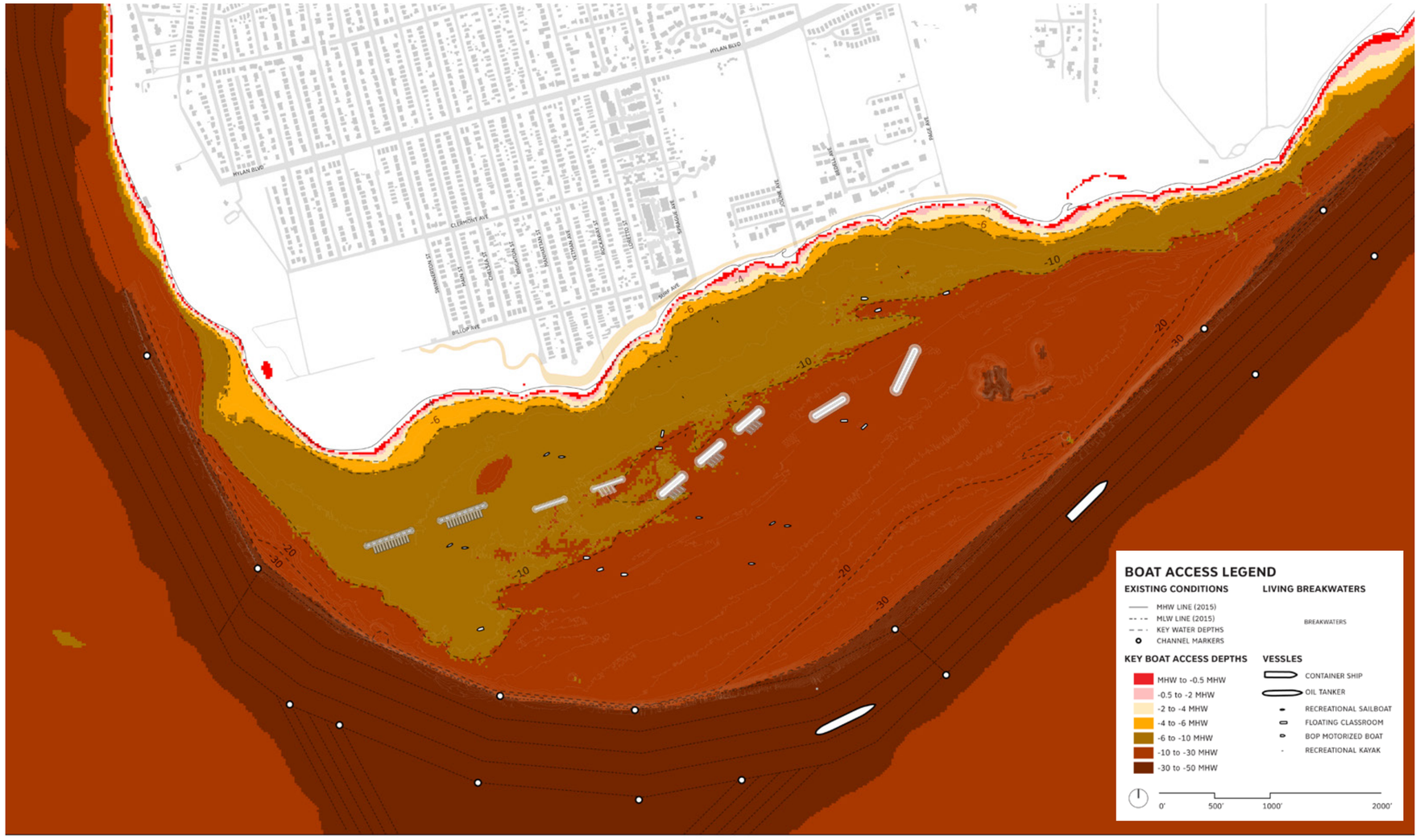

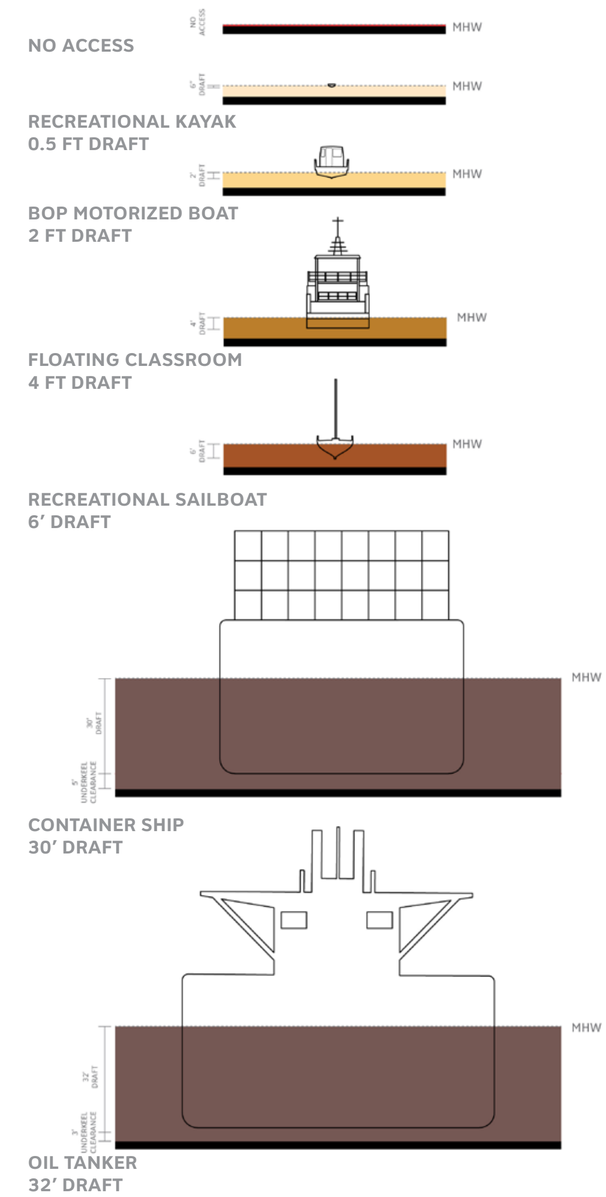

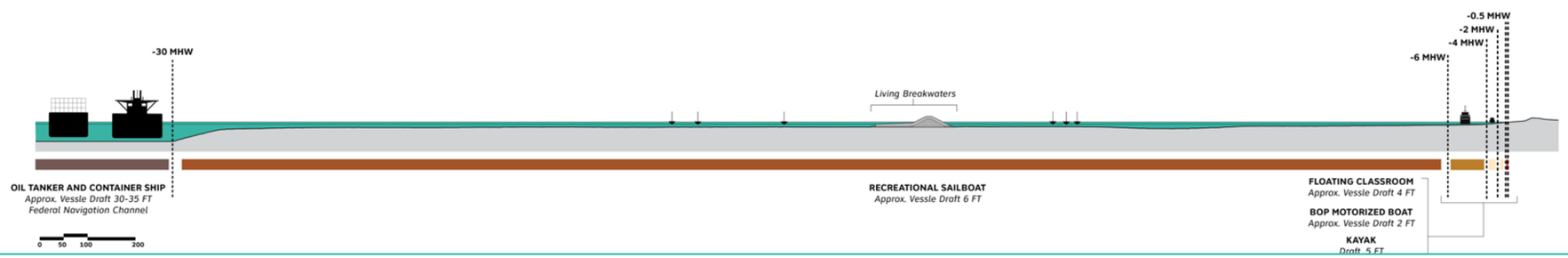

PROJECT SITE VESSEL DRAFTS AT MHW

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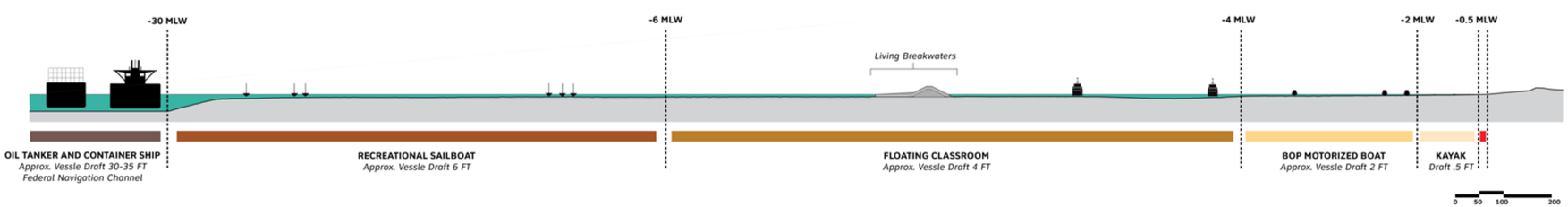

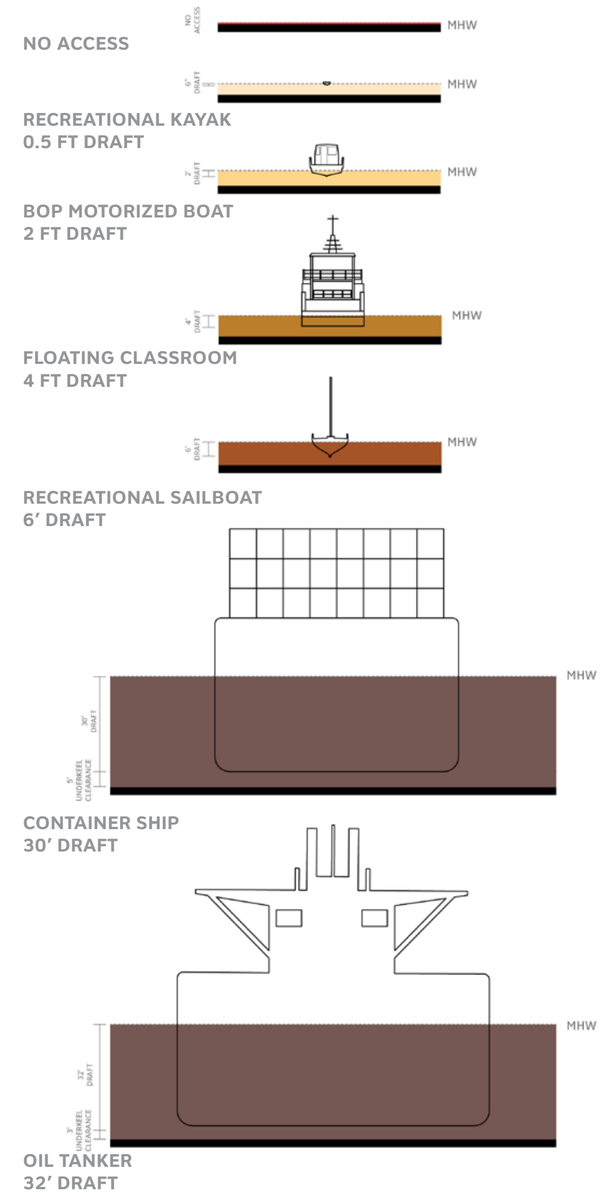

PROJECT SITE VESSEL DRAFTS AT MLW

Governor's Office of Storm Recovery

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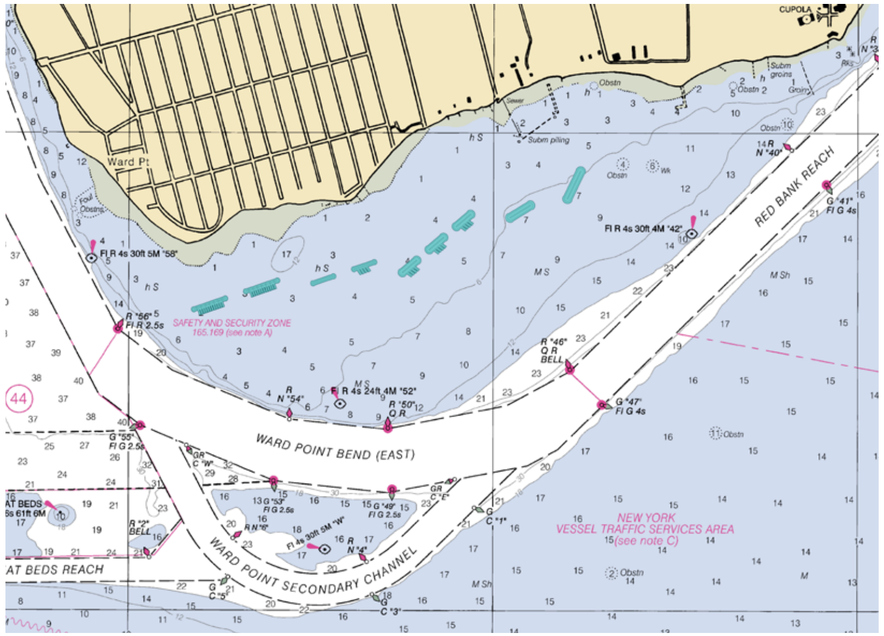
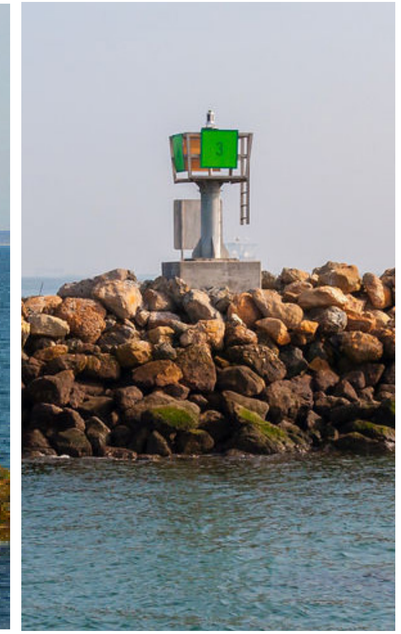


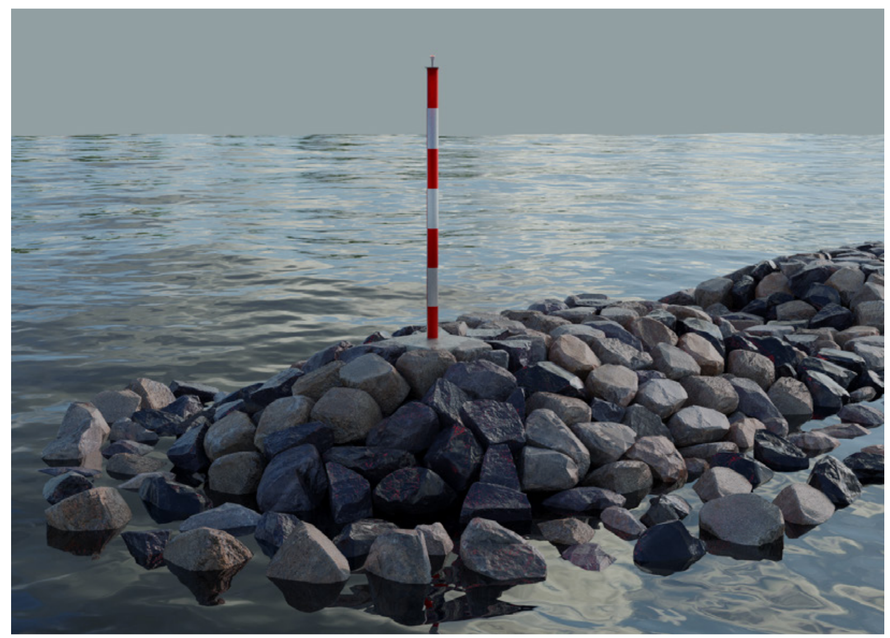
Existing Project Vicinity Navigation Aids

Provencetown Harbor Breakwater, Massachusetts



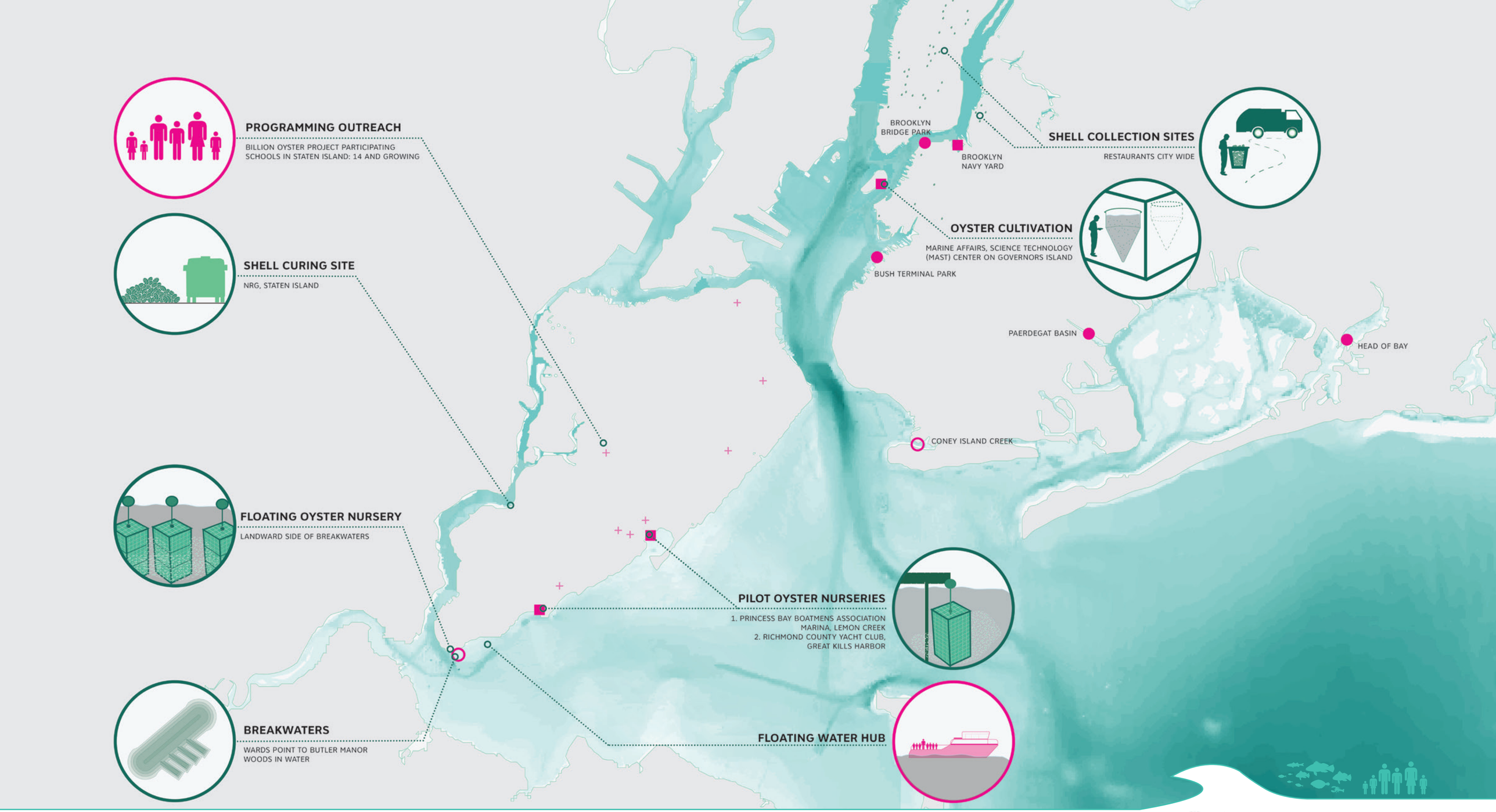
Long Beach Breakwater, California

Living Breakwater Type A Navigation Aid Visualization



NAVIGATION AIDS

- The current navigation aid design is based upon an assumed Class "B" designation. The US Coast Guard shall prescribe the structures' classification and navigation aid requirements as part of processing an application for permit per CFR Title 33, Chapter I, Subchapter C, Part 67.
- autonomous solar powered lights - One power source per light
- Expected to flash once per 4 seconds, 360 degree lens, both sides of a breakwater, white light. Light shall be visible from any angle of approach.
- Per 33 CFR Part 67 requirements, the light shall be displayed not less than 20 feet above mean high water.
- Per 33 CFR Part 67 requirements, the light shall be of sufficient candlepower as to be visible as a distance of at least 3 nautical miles 90% of the nights of the year.



OYSTER RESTORATION AND EDUCATIONAL PROJECT ELEMENTS

BILLION OYSTER PROJECT PILOT REEF PROJECTS: Permitted Proposed

BILLION OYSTER PROJECT NURSERIES: Permitted

BILLION OYSTER PROJECT SI SCHOOLS: +

OYSTER SHELL COLLECTION SITE: •

Governor's Office of Storm Recovery

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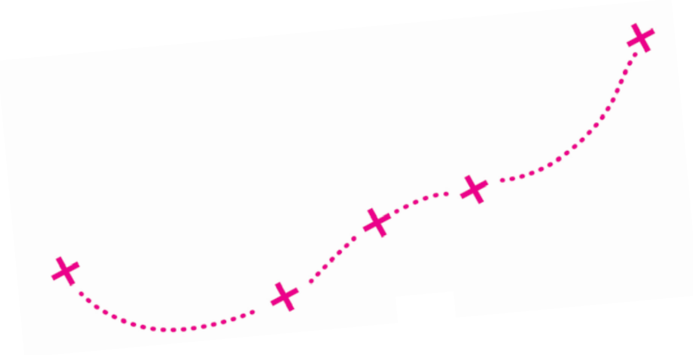
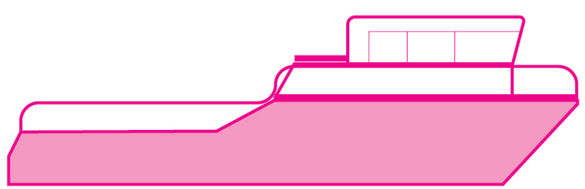
ON-SHORE FEATURES TO SUPPORT:



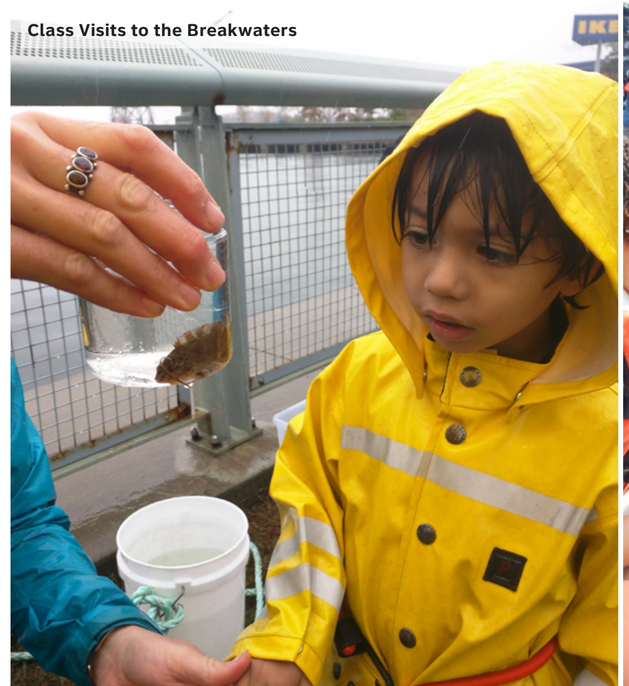


FLOATING HUB TO FACILITATE:

Guided Class Visits

Neighborhood Events and Activities

Monitoring and Education



Class Visits to the Breakwaters

Oyster Restoration and Monitoring

Workforce Development

POTENTIAL SHORELINE MONITORING ACTIVITIES

Governor's Office of Storm Recovery

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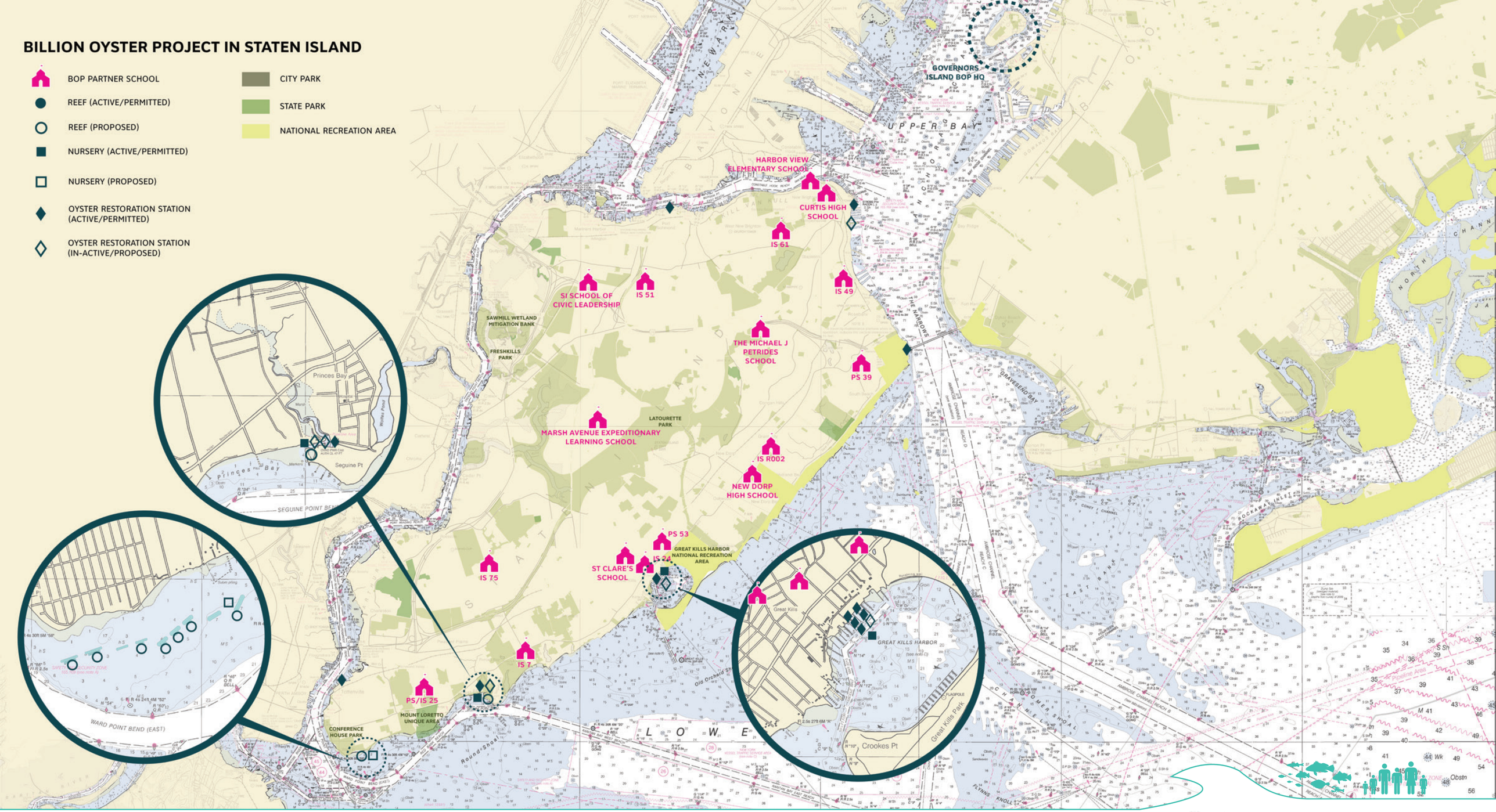
FLOATING HUB ACTIVITIES

- Workforce development training:
  - Training Crew
  - Preventive maintenance
  - Docking
- Community outreach and educational programming:
  - Community Outreach
  - Community Events
- Scientific Monitoring and maintenance :
  - Scuba diving
  - Scientific research
  - Monitoring

BILLION OYSTER PROJECT IN STATEN ISLAND

- BOP PARTNER SCHOOL
- REEF (ACTIVE/PERMITTED)
- REEF (PROPOSED)
- NURSERY (ACTIVE/PERMITTED)
- NURSERY (PROPOSED)
- OYSTER RESTORATION STATION (ACTIVE/PERMITTED)
- OYSTER RESTORATION STATION (IN-ACTIVE/PROPOSED)
- CITY PARK
- STATE PARK
- NATIONAL RECREATION AREA



BILLION OYSTER PROJECT - STATEN ISLAND PROGRAMS AND INSTALLATIONS

Governor's Office of Storm Recovery

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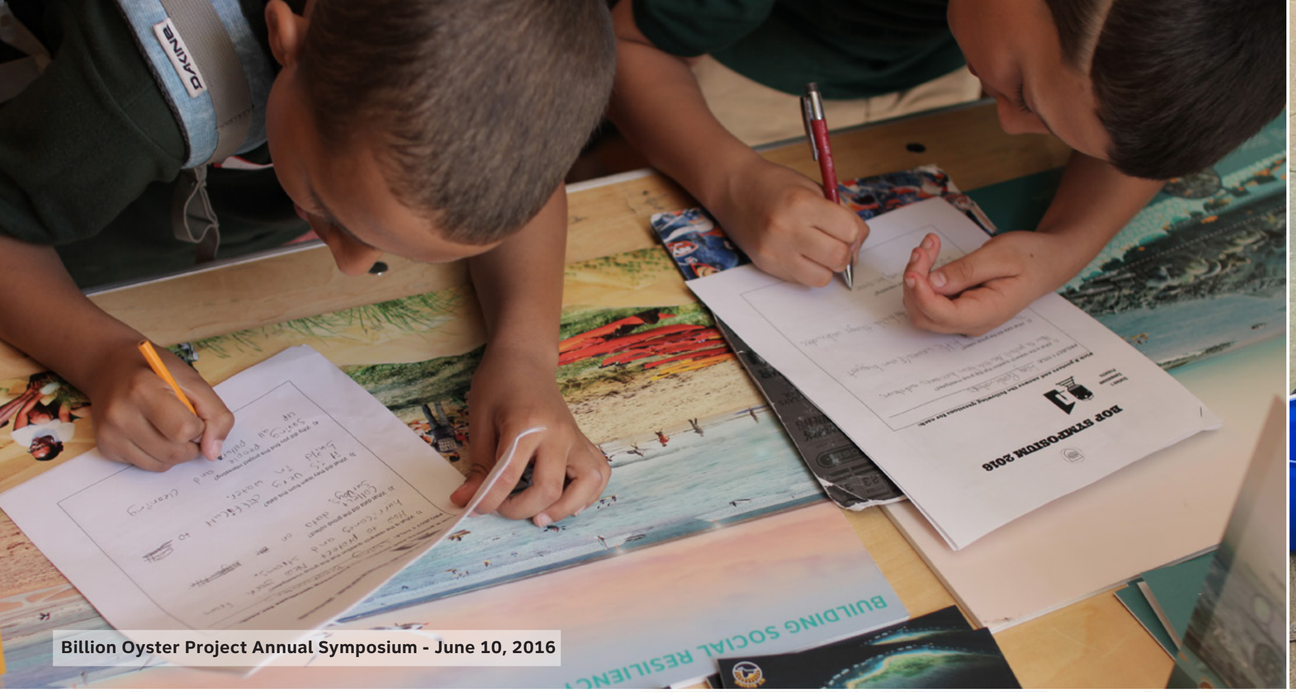
CAC Meeting #5 - September 29, 2017 - PS 6, Tottenville

Open House- January 25, 2017 - PS 6, Tottenville

CAC Meeting #2: Workshop - November 15, 2018

Open House - January 25, 2017 - PS 6, Tottenville

CAC MEETINGS



Billion Oyster Project Annual Symposium - June 10, 2016

Clean Ocean Action Staten Island Student Summit - October 25, 2017

Staten Island Children Museum - September 24, 2016

Submerge Festival, Hudson River Park - September 16, 2017

TABLING AT OTHER EVENTS

CAC Site Walk - November 15, 2015

CAC Shorewalk - April 29, 2016

CAC Beach Clean Up - May 16, 2016

100 Resilient Cities Shorewalk - July 17, 2017

SHOREWALKS AND CLEAN UPS

Earth Day - St. Clare School

Species and habitat ID with SCAPE

Seining with BOP

Shoreline monitoring with SCAPE

EARTH DAY 2018 AT CONFERENCE HOUSE PARK (APRIL 18 & 20, 2018)

Governor's Office of Storm Recovery

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