

NEW WORK DREDGED MATERIAL BRINGS LIFE TO BOTTOM OF CHARLESTON HARBOR

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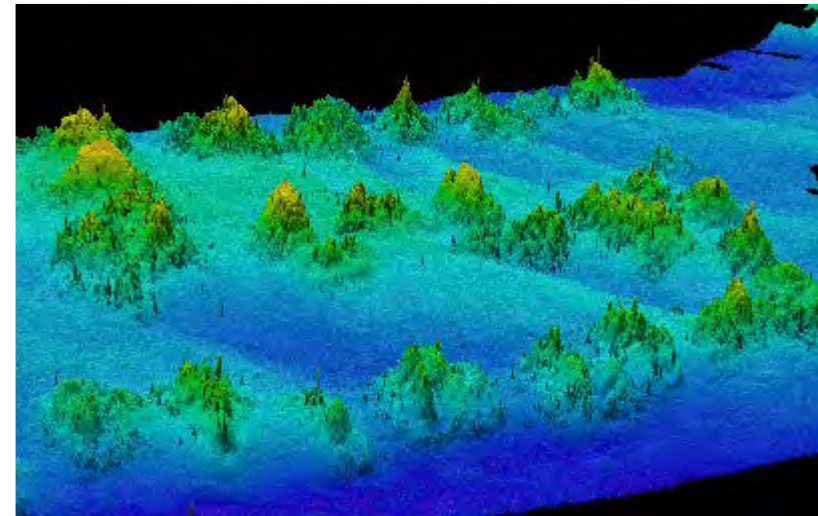
WEDA Eastern Chapter Meeting
18 November 2019

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BACKGROUND

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CHARLESTON HARBOR DEEPENING AND WIDENING (POST 45) PROJECT



Objective

- Improve safety and efficiency of the Charleston Harbor navigation system for deeper drafting containerships

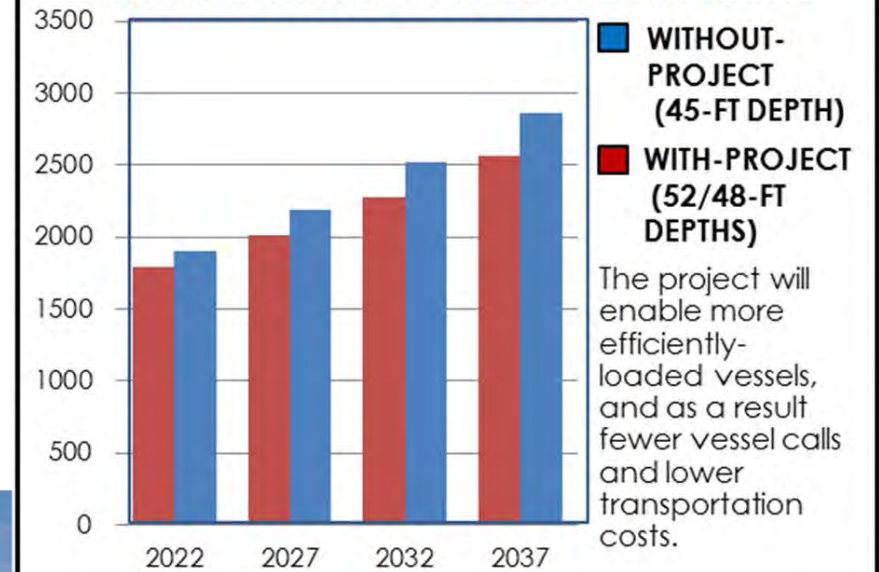
Non-Federal Sponsor

- South Carolina State Ports Authority

Planning Study

- One of first Feasibility Studies completed under USACE SMART Planning (reduced time and cost of study)
- Recommended Plan = Locally Preferred Plan
- ROD signed January 2016
- Construction authorized December 2016, first cost of \$502,693,000

FORECASTED CONTAINER VESSEL FLEET PER YEAR
WITH AND WITHOUT-PROJECT CONDITIONS



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POST 45 PROJECT (CONT.)



Authorized Plan

- Widen channel in select areas
- Deepen Inner Harbor (3 segments)
 - Lower Harbor (segments 1 and 2, from 45' to 52')
 - Upper Harbor (segment 3, from 45' to 48')
- Extend and deepen Entrance Channel
 - Extend 3 miles
 - Deepen from 47' to 54'

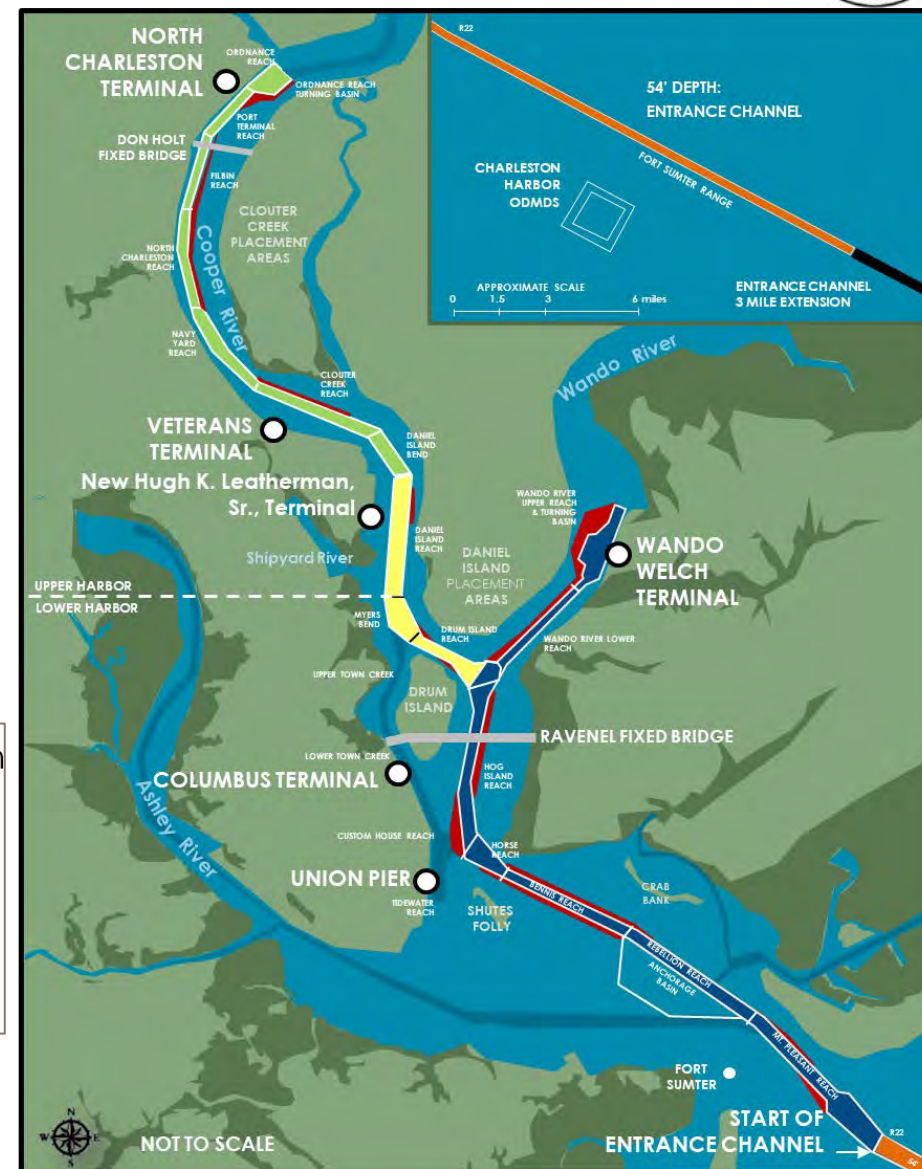
Status of Entrance Channel

- Two contracts awarded to GLDD, Sept and Oct 2017
- Started deepening March 2018
- Duration 40-76 mo. (March 2021)

Status of Lower Harbor

- Contract awarded August 2019 to Norfolk Dredging for Segment 1

- Entrance channel: 54' depth
- Entrance channel 3-mile extension
- Segment 1: 52' depth
- Segment 2: 52' depth
- Segment 3: 48' depth
- Widening in select areas



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ARTIFICIAL REEFS

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HABITAT MITIGATION

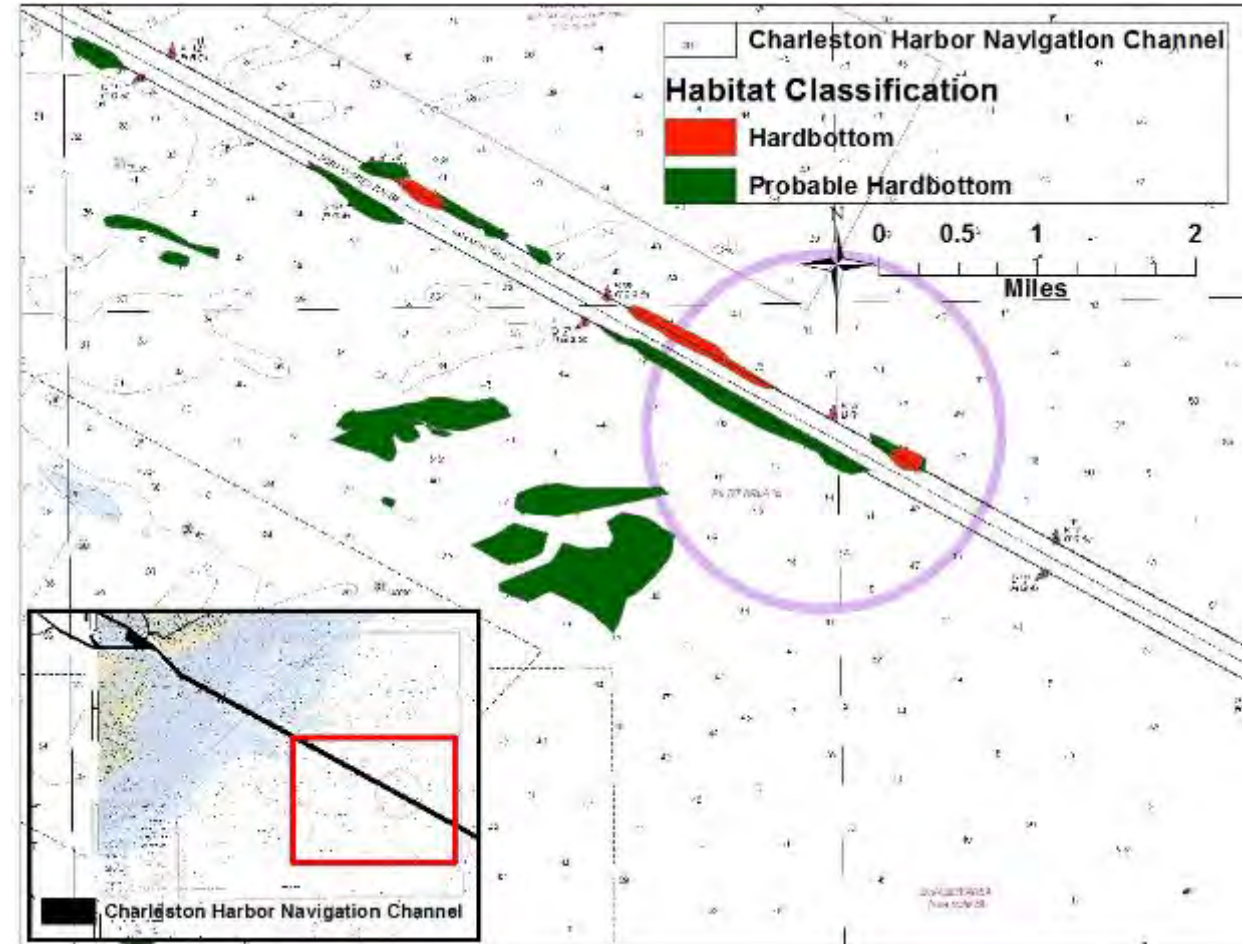


Mitigation Requirement

- FS/EIS revealed ~30 acres of hard bottom habitat impacted by Entrance Channel new work
- Hardbottom = Essential Fish Habitat (EFH) for economically important fisheries in South Carolina

“Mitigation” Reefs

- Create two 33-acre artificial reefs to mitigate for lost habitat (1 required, 1 contingent)
- Artificial reefs = man-made hardbottom habitat
- Provide substrate with vertical relief and rugosity for invertebrates to attach, and attract fish





HABITAT MITIGATION (CONT.)

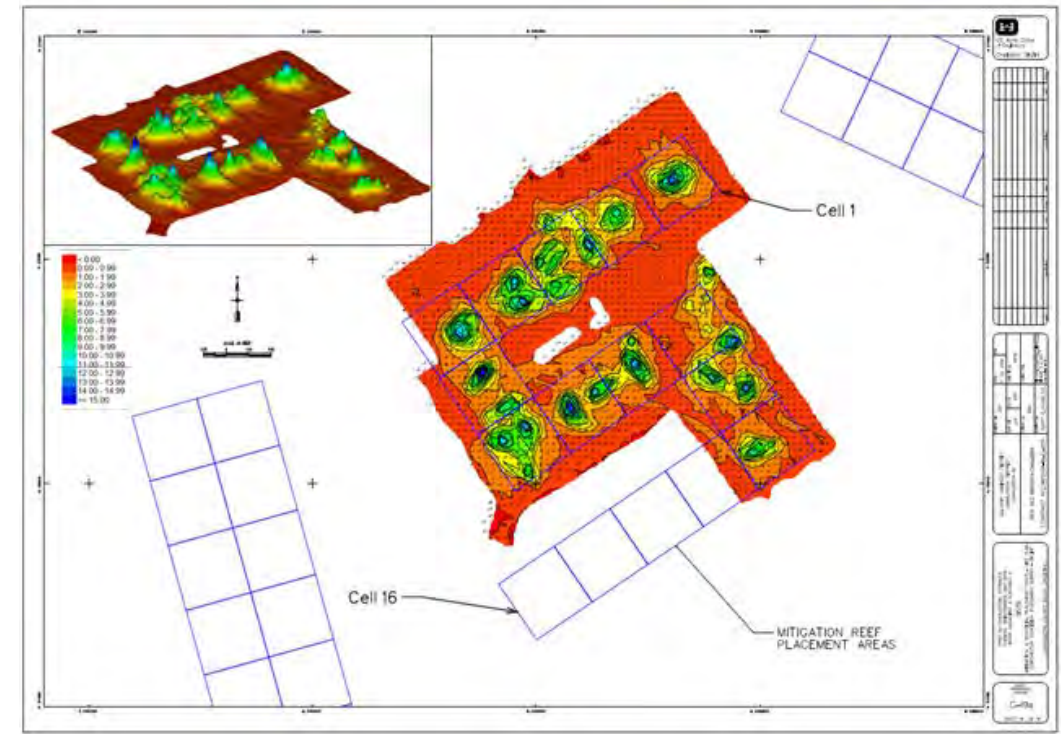


Design Criteria

- Create with limestone rock dredged from Entrance Channel or with quarried rock
- Sixteen 300x300 ft. grid cells to guide placement
- Minimum placement of 10,000 CY per cell
- Minimum peak vertical relief 3.5 ft.
- Unique “S” and “J” design to exploit rugosity and edge diversity

Siting Criteria

- Offset from channel and other navigation features
- Avoid cultural/historic resources and existing hardbottom habitat
- Keep close proximity to existing hardbottom





BENEFICIAL USE OF DREDGED MATERIAL



Beneficial Uses of Dredged Material

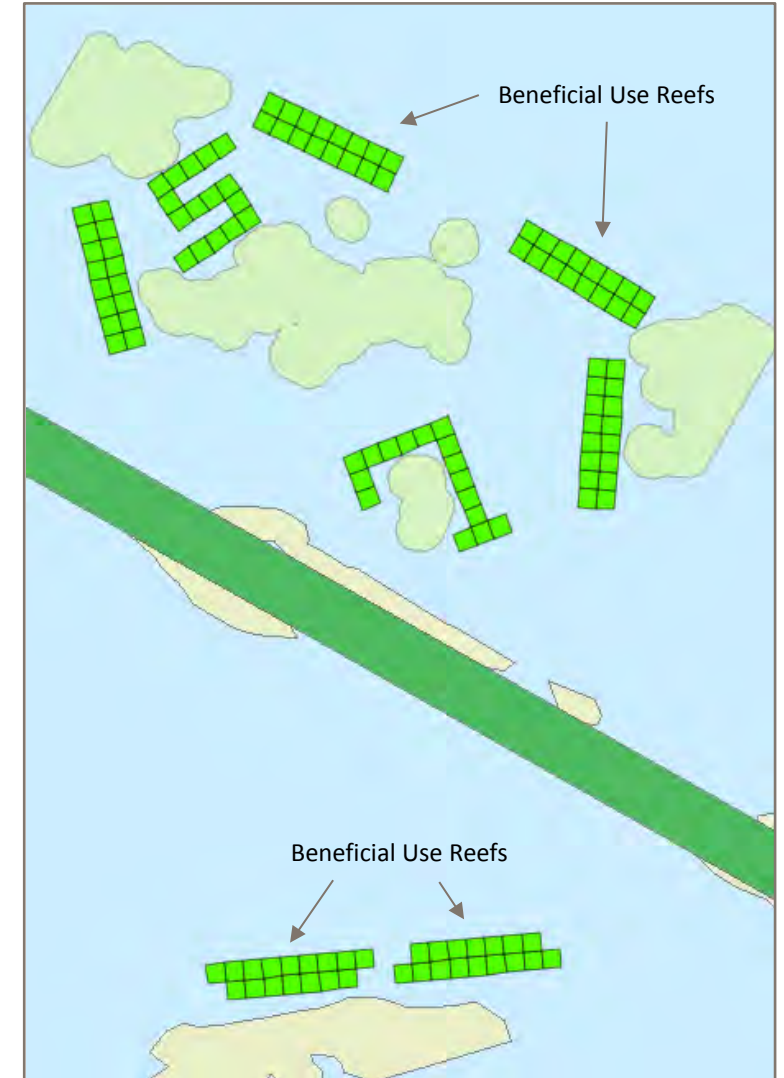
- Identified in FS/EIS, refined during PED; Supplemental EA
- Creation of artificial reefs w/ Entrance Channel material = least-cost disposal mechanism

“Beneficial Use” Reefs

- Create six 33-acre artificial reefs as a beneficial use
- Add 240,000 cy material to an existing artificial reef in state waters

Criteria

- Sixteen 300x300ft grid cells to guide placement
- Maintain mounded, uniform shape
- Minimum placement of 10,000 CY per cell





AGENCY/STAKEHOLDER COORDINATION



Primary

- NOAA Fisheries
- South Carolina Department of Natural Resources (SCDNR) Artificial Reef Program

Others

- Post 45 Interagency Coordination Team (ICT)
 - 12 Federal and state agencies
- Harbor Pilots, Coast Guard



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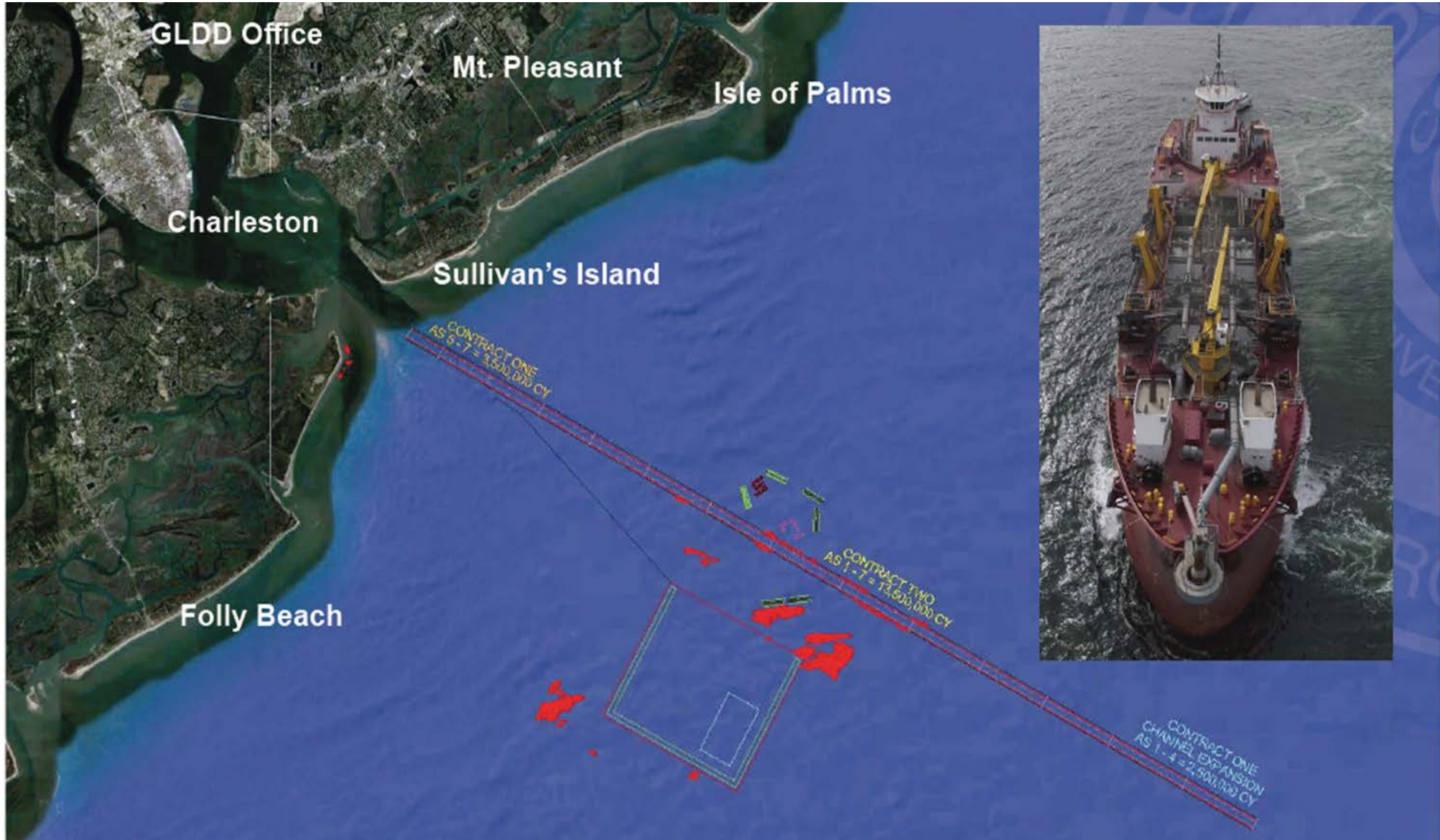


CONSTRUCTION

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ENTRANCE CHANNEL PROJECT AREA



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ENTRANCE CHANNEL DREDGED MATERIAL



Two Primary Types

- Fine to coarse grained sand with shell fragments (55' and above)
- Cemented limestone gravel and moderate-to-weakly cemented silty sand (55' and under)



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DREDGE TYPES



Mechanical/Clam Shell (Bucket Size)

- Dredge 58 (20-50 CY)
- New York (13-24 CY)
 - Used for mitigation reefs

Cutter Suction (Cutter Power)

- Texas (4,000 hp)
- Carolina (3,000 hp)
 - Both used for beneficial use reefs

Trailing Suction Hopper (Capacity)

- Ellis Island (14,800 CY)
- Liberty Island (6,540 CY)
- Terrapin Island (6,400 CY)
- Padre Island (3,600 CY)



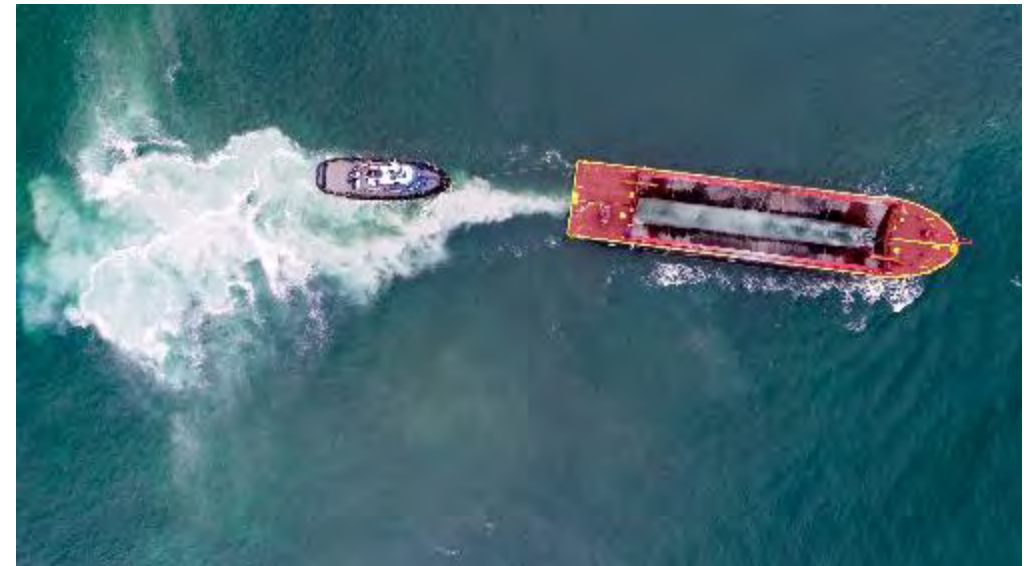
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PRECISE MATERIAL PLACEMENT



- Two tugs employed, tow line and head line
- Each scow 2,500 to 4,400 cy of material
 - That translates to ~200 to 370 over the road dump trucks
 - Each 300' x 300' cell required 10,000 cy minimum (at least 3 scows)
 - A scow is 280' long



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MITIGATION REEF CONSTRUCTION

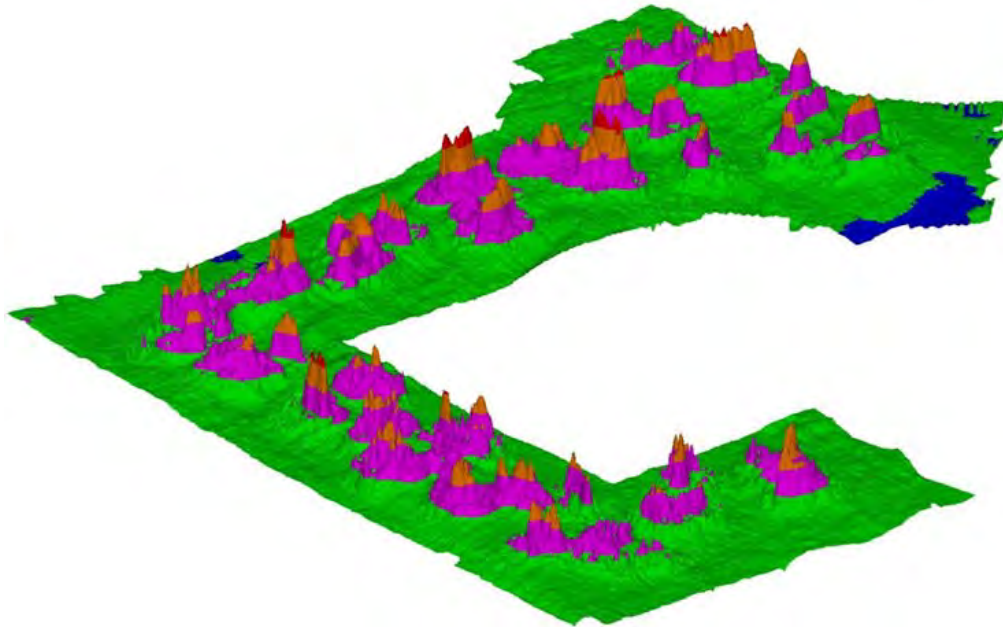


Completed with Dredge New York

- 100 scow loads total
 - Approx. 339,000 CY total

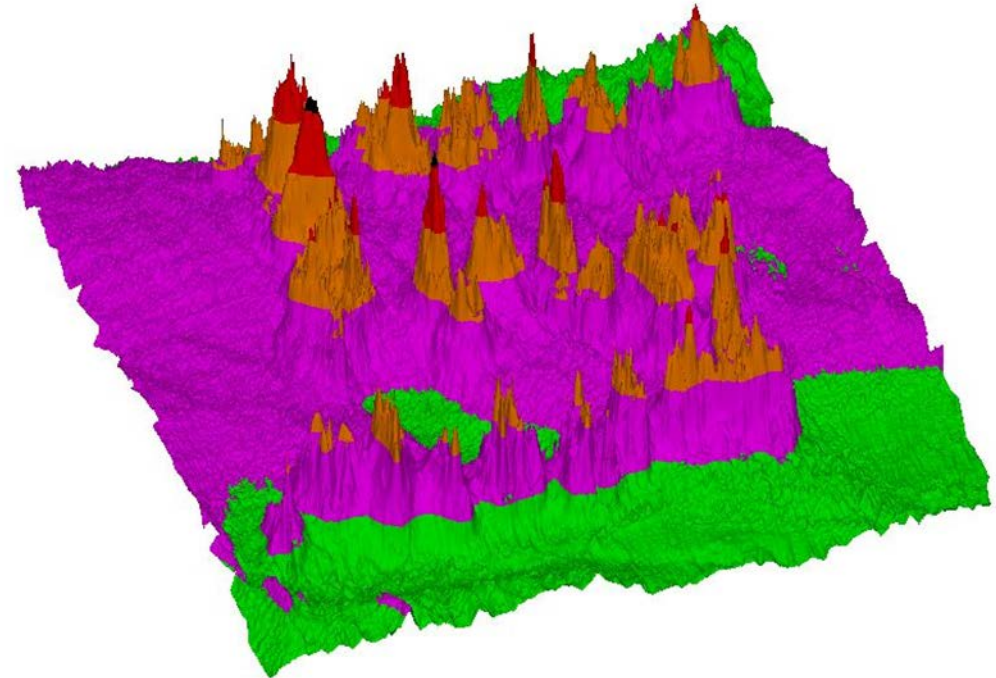
Mitigation Reef “S”

- 49 loads, total volume ~164,000 CY



Mitigation Reef “J”

- 51 loads, total volume ~165,000 CY



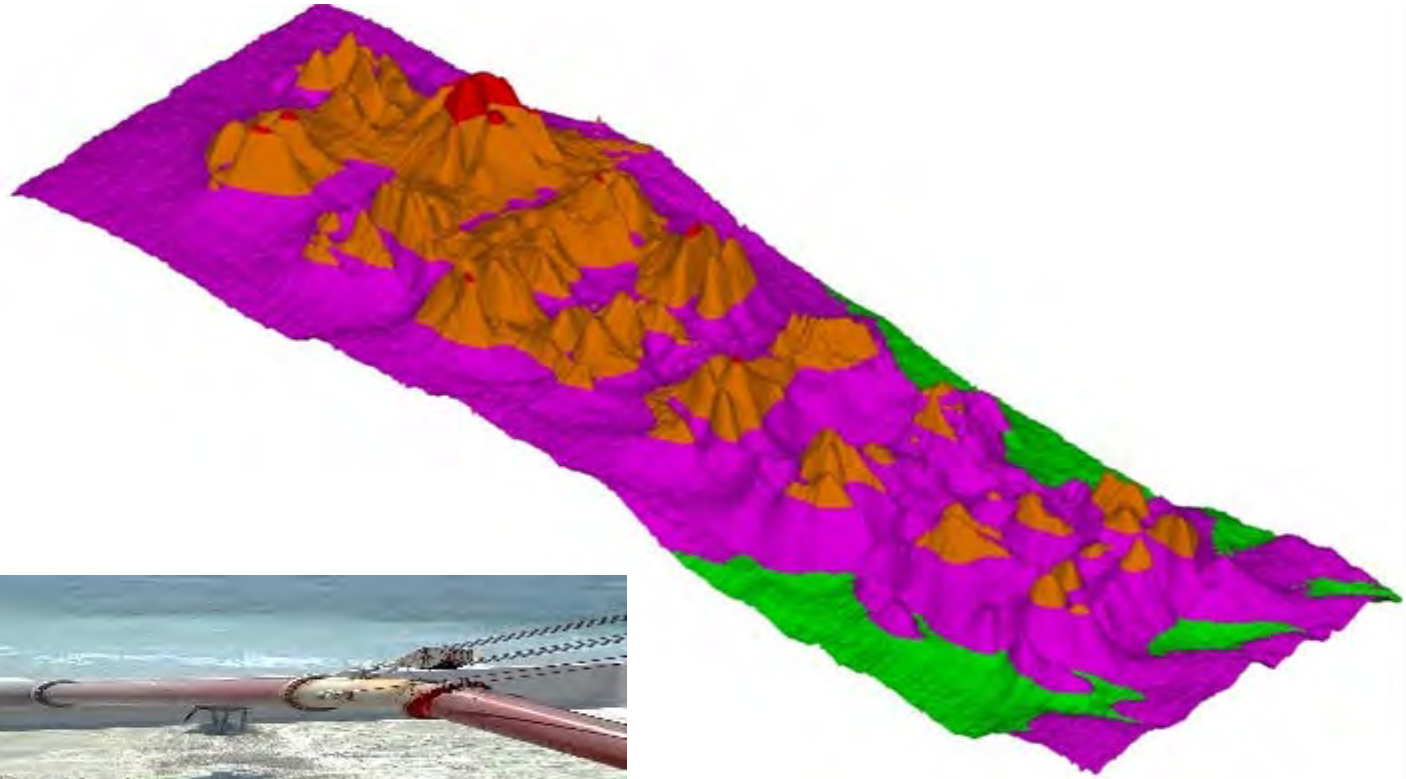


BENEFICIAL USE REEF CONSTRUCTION



Completed two reefs with Cutter Dredges
Texas and Carolina

- 217 scow loads total
 - Approx. 430,000 CY reefs 5 & 6
- Beneficial Use Reef #5
 - 108 loads, total volume ~213,000 CY
- Beneficial Use Reef #6
 - 113 loads, total volume ~217,000 CY



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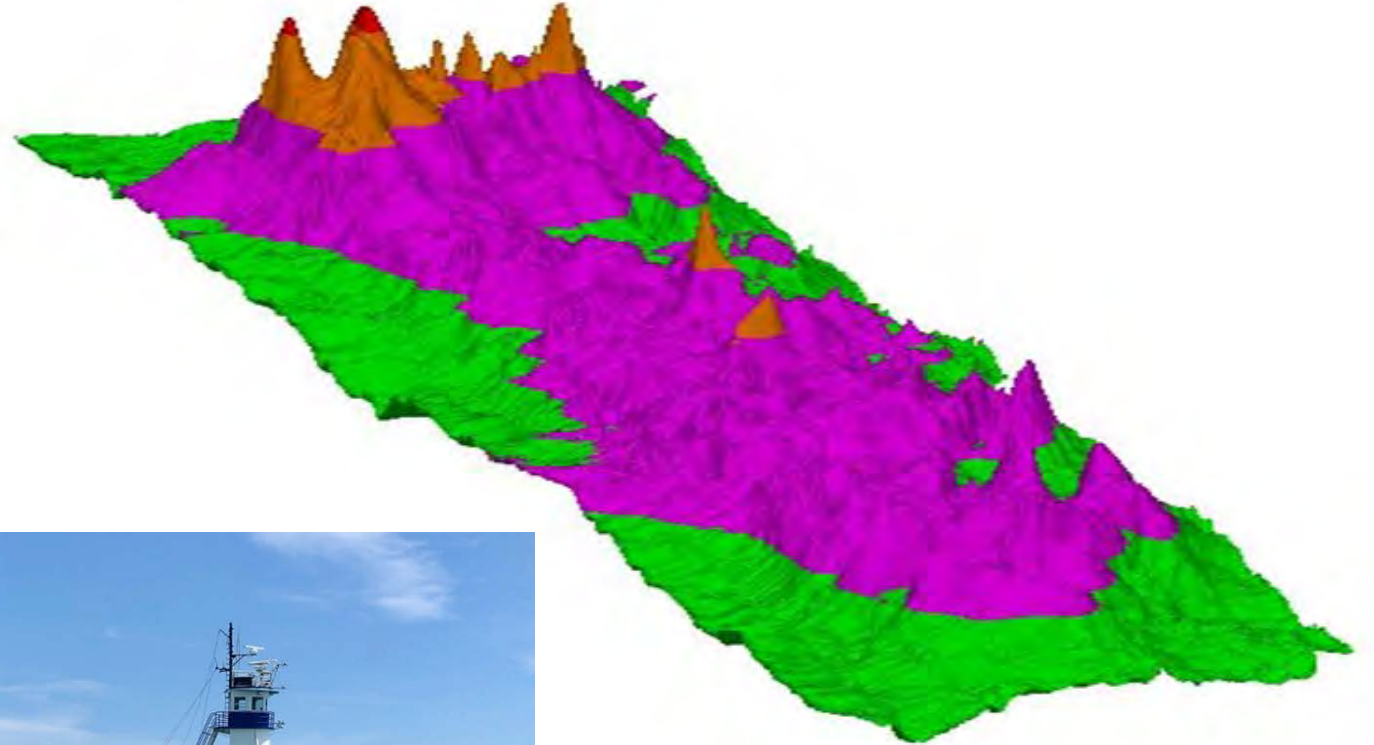


BENEFICIAL USE REEF CONSTRUCTION (CONT.)



Completed two reefs with Cutter Dredge Texas

- 153 scow loads total
 - Approx. 355,000 CY reefs 3 & 4
- Beneficial Use Reef #3
 - 70 loads, total volume ~175,000 CY
- Beneficial Use Reef #4
 - 80 loads, total volume ~180,000 CY



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MONITORING / RESULTS

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PHYSICAL SURVEYS



GLDD As-Built

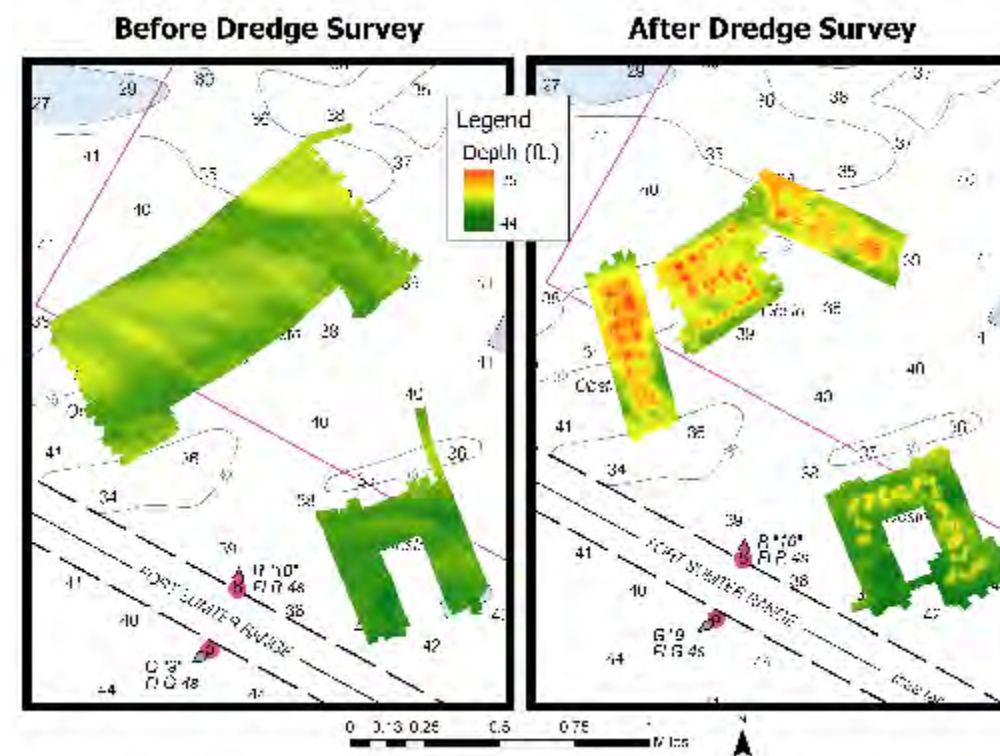
- Post-construction bathymetry
- Verify placement

USACE Before- and After-Dredge Survey

- Required for mitigation reefs, opportunistically for 2 beneficial use reefs
- High frequency multibeam to generate bathymetry, create backscatter mosaic, and calculate rugosity
- Document extent (size) and relief (shape) of constructed reefs (change analysis between before/after survey)

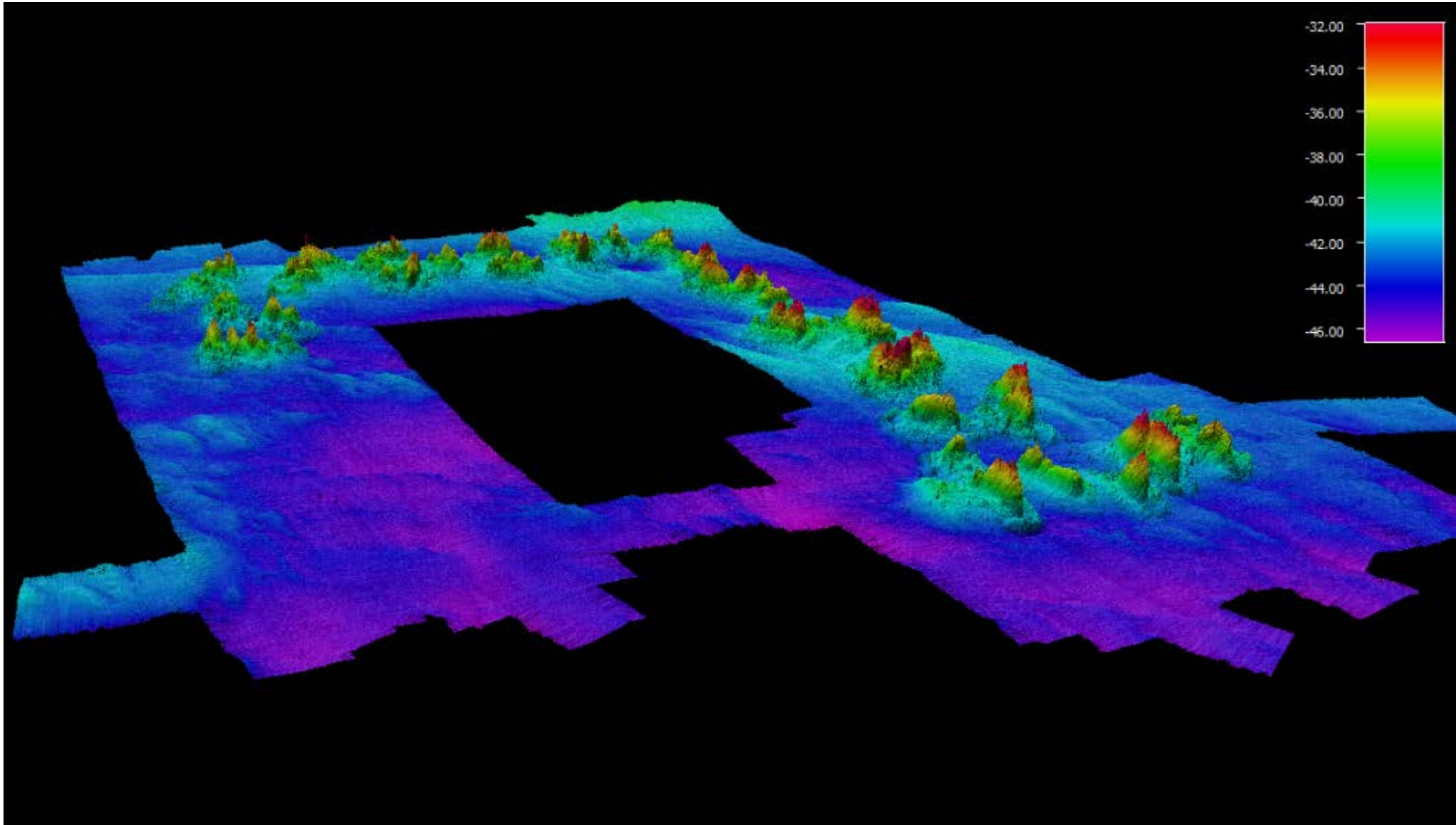
Follow-up Surveys

- Collect high frequency multibeam annually for 4 yrs. following post construction survey
- Monitor settlement and movement of reef over time





PHYSICAL SURVEYS (CONT.)



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BIOLOGICAL MONITORING (MITIGATION REEFS)



Monitoring Plan

- Evaluate habitat mitigation success
- Tapped NOAA Fisheries and SCDNR Artificial Reef Program expertise
- Compare to hardbottom community at channel impact area
- Monitor colonization by benthic (bottom-dwelling) organisms
 - % cover of sessile (non-moving) invertebrates
 - Size, abundance, diversity of sessile invertebrates
- Monitor succession/use by higher levels
 - Abundance and diversity of fish
- Sample annually, 4 yrs. post-construction (3.5 yr. anticipated recovery)

Contingency

- Monitor longer if success criteria not met
- Monitor beneficial use reefs





BIOLOGICAL MONITORING (CONT.)



Monitoring Study for Mitigation Reefs

- Existing SCDNR Cooperative Agreement
- Six transects per reef (12 total)
- Underwater diver surveys (GoPro video and observations for 13 key fish sp. from impact site)
- Baited camera, centrally deployed for 1 hr. to monitor fish missed by diver surveys
- Summer and winter sampling to understand intra-season variability
- Acoustic receivers to document occurrence of tagged finfish and sharks in area
- Select tagging of black sea bass to understand potential for resident population establishment

Focal Fish Species

<u>Scientific Name</u>	<u>Common Name</u>	<u>Managed?</u>
<i>Centropristis striata</i>	Black Sea Bass	yes
<i>Archosargus probatocephalus</i>	Sheepshead	yes
<i>Mycteroperca microlepis</i>	Gag Grouper	yes
<i>Paralichthys lethostigma</i>	Southern Flounder	yes
<i>Lagodon rhomboides</i>	Pinfish	no
<i>Decapterus sp.</i>	Scad	no
<i>Diplodus holbrookii</i>	Spottail Pinfish	no
<i>Halichoeres bivittatus</i>	Slippery Dick	no
<i>Opsanus tau</i>	Oyster Toadfish	no
<i>Pareques umbrosus</i>	Cubbyu	no
<i>Serranus subligarius</i>	Belted Sandfish	no
<i>Urophycis cirrata</i>	Southern Hake	no
<i>Ogcocephalus radiatus</i>	Batfish	no



(VERY) EARLY RESULTS



MR-02-06;
15 May 2019

Juvenile red snapper

Black sea bass

MR-02-13;
15 May 2019

Stingray

Cobia

MR-02-13;
15 May 2019

Black sea bass

Tunicates

Sea whip



NEXT STEPS



Complete Construction of Beneficial Use Reefs #1 and #2

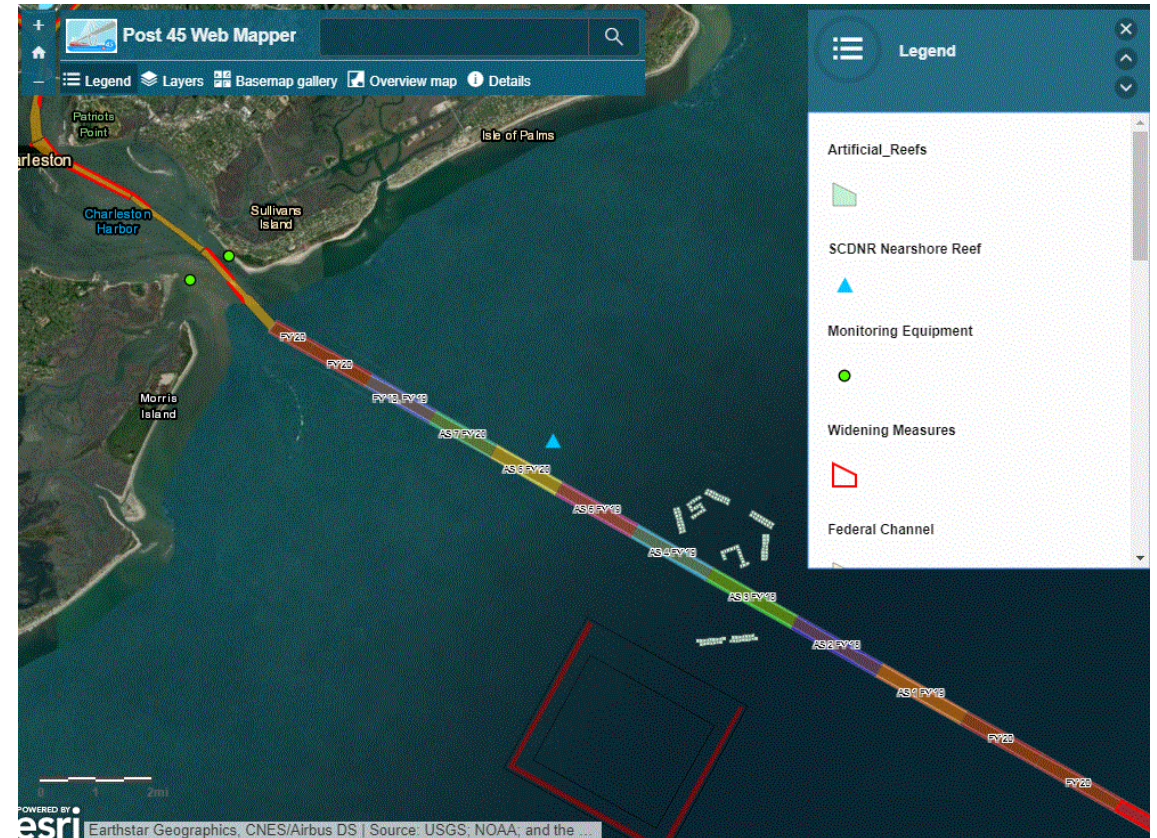
- Summer 2020

Monitoring

- Continue surveying and monitoring of mitigation reefs for 3 more years
- Analyze data and determine if met mitigation requirement

Outreach

- Website/Web Mapper updates
- Regular ICT updates
- News articles



<http://www.sac.usace.army.mil/Missions/Civil-Works/Charleston-Harbor-Post-45/>



QUESTIONS?

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