

*New Jersey Department of Transportation  
Office of Maritime Resources*

Restoration of an Historical Subaqueous Borrow Pit  
for Management of Navigational Dredged Material  
in Coastal New Jersey

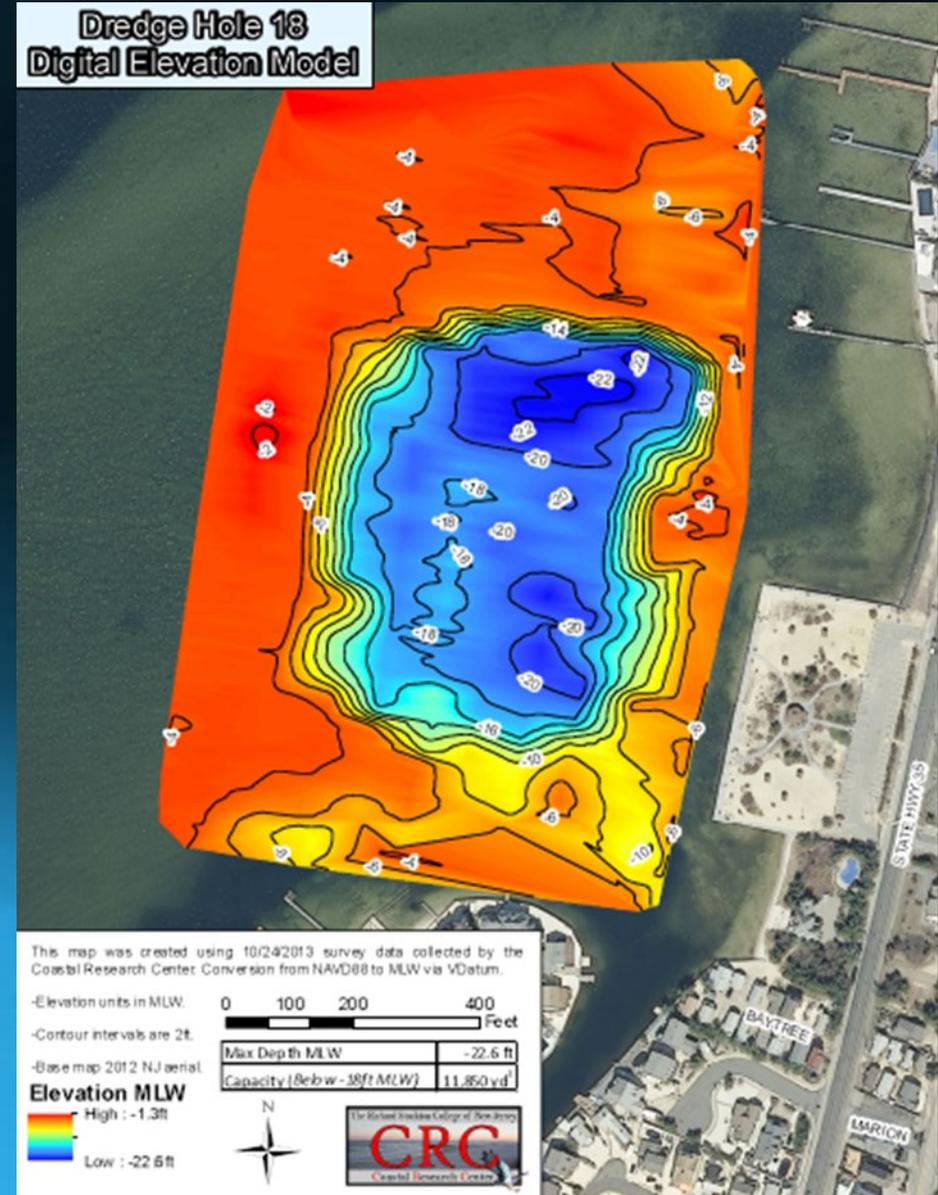
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WEDA – Dredging Expo and Summit, June 2021

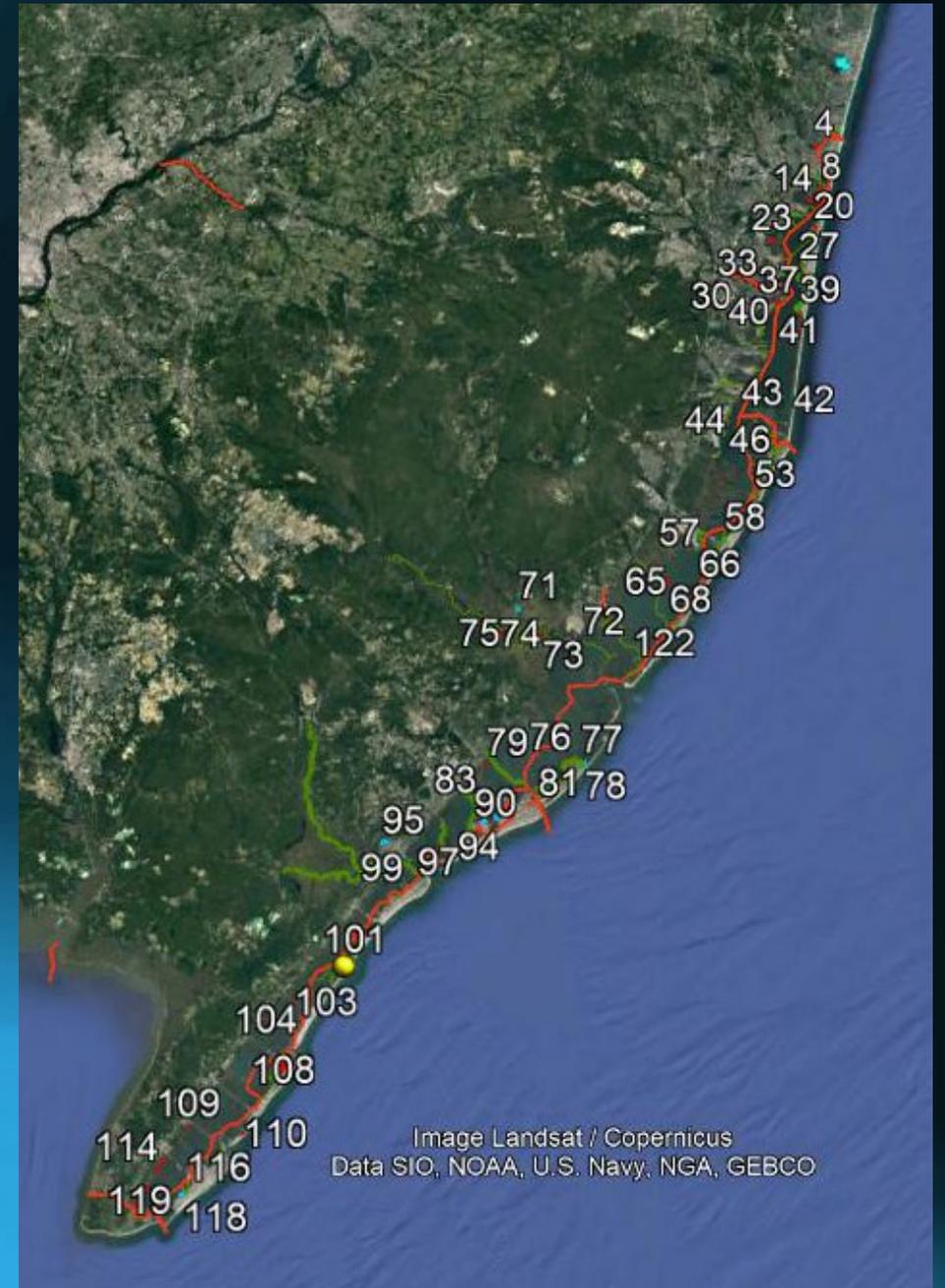
# What are "Dredged Holes"?

- Subaqueous borrow pits or "dredged holes" are deep underwater depressions left over from sand mining operations for fast land development or beach replenishment
- Tend to reduce hydraulic circulation, collect fine grained organic silt and can become hypoxic or anoxic
- Identified by USACE in the mid 1960s as potential placement sites for dredged material from Intracoastal Waterway
- In 2014, OMR hired Stockton University to inventory New Jersey dredged holes and rank them by size, proximity to dredging projects, and current habitat quality



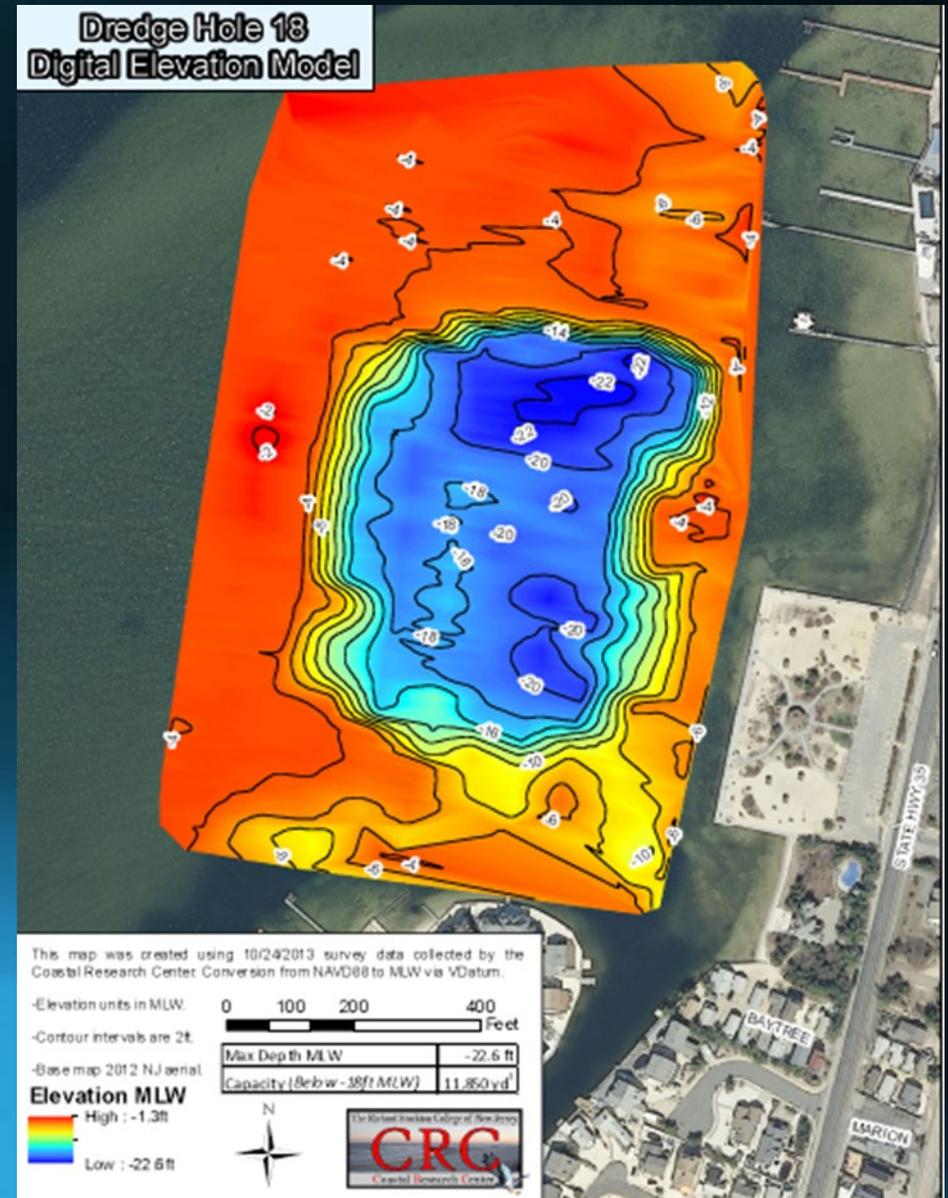
# Site Selection

- 122 subaqueous sites identified
- Sites screened by size, habitat value and proximity to needed dredged material management capacity
- Anoxic or hypoxic conditions all or part of the year, no benthic life, limited fisheries utilization
- Filling will restore shellfish and/or SAV habitat or improve hydraulic circulation
- 5 priority sites selected
- 1.7 MCY of capacity identified, potentially more if filled to surrounding elevation



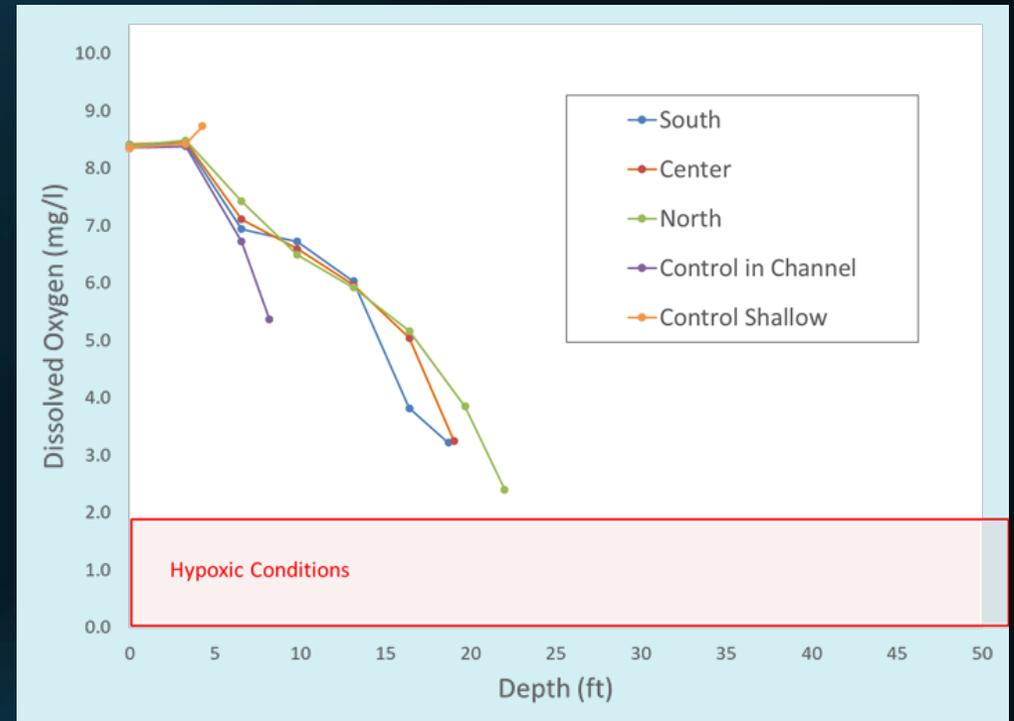
# Dredged Hole 18

- Upper Barnegat Bay, Ocean County, NJ
- Hole dredged in 1962 for beach replenishment after hurricane
- >20 feet deep, nearly vertical sides
- Surrounding elevation <-4' MLW
- Fine silt and clay bottom
- Hypoxic during summer
- Extensive surrounding beds of *Ruppia maritima* (widgeon grass)
- At least 180,000 CY of "air space" to fill to surrounding elevation
- Surrounding material >90% sand



# Preconstruction Monitoring

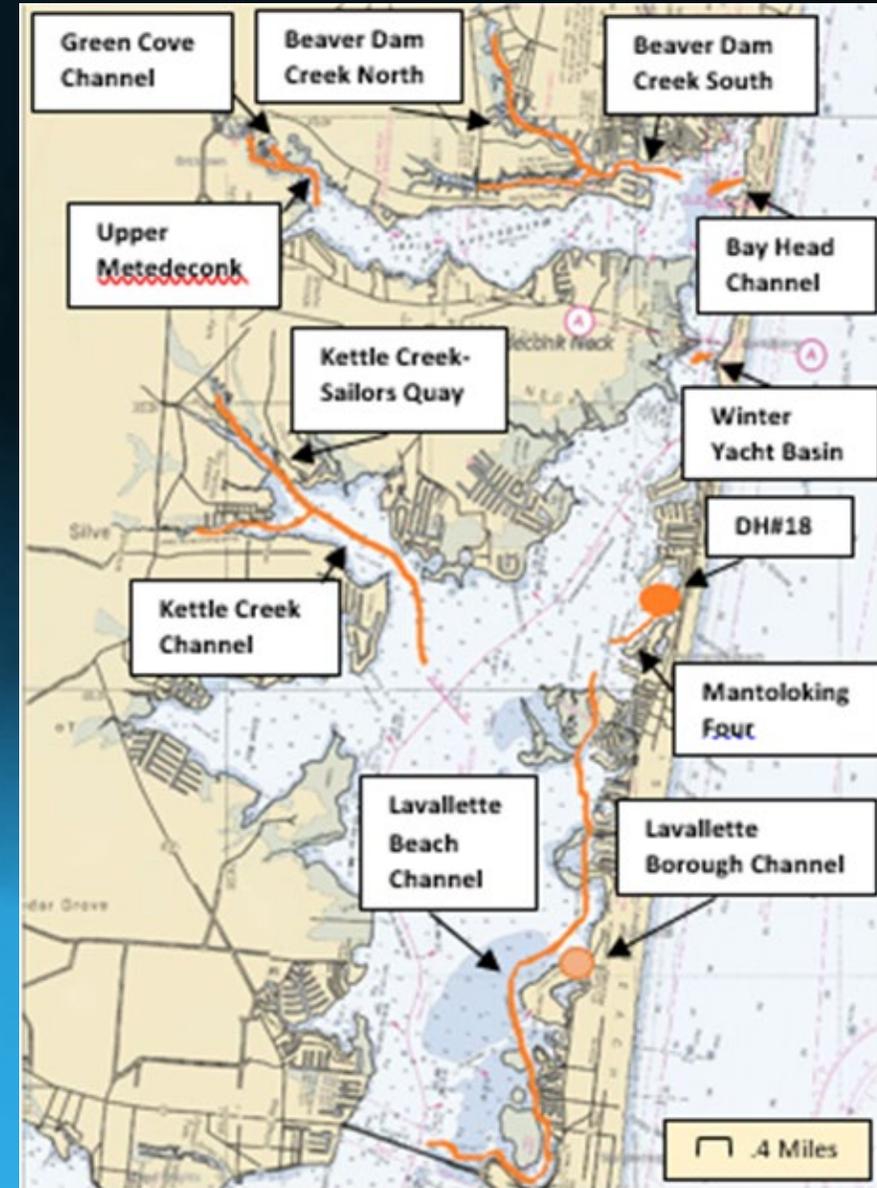
- Submerged Aquatic Vegetation
- Benthic Community Analysis
- Fisheries Utilization
- Water Quality
- Sediment Chemistry
- Alternatives Analysis
- GP24 Restoration Permit



# Upper Barnegat Bay



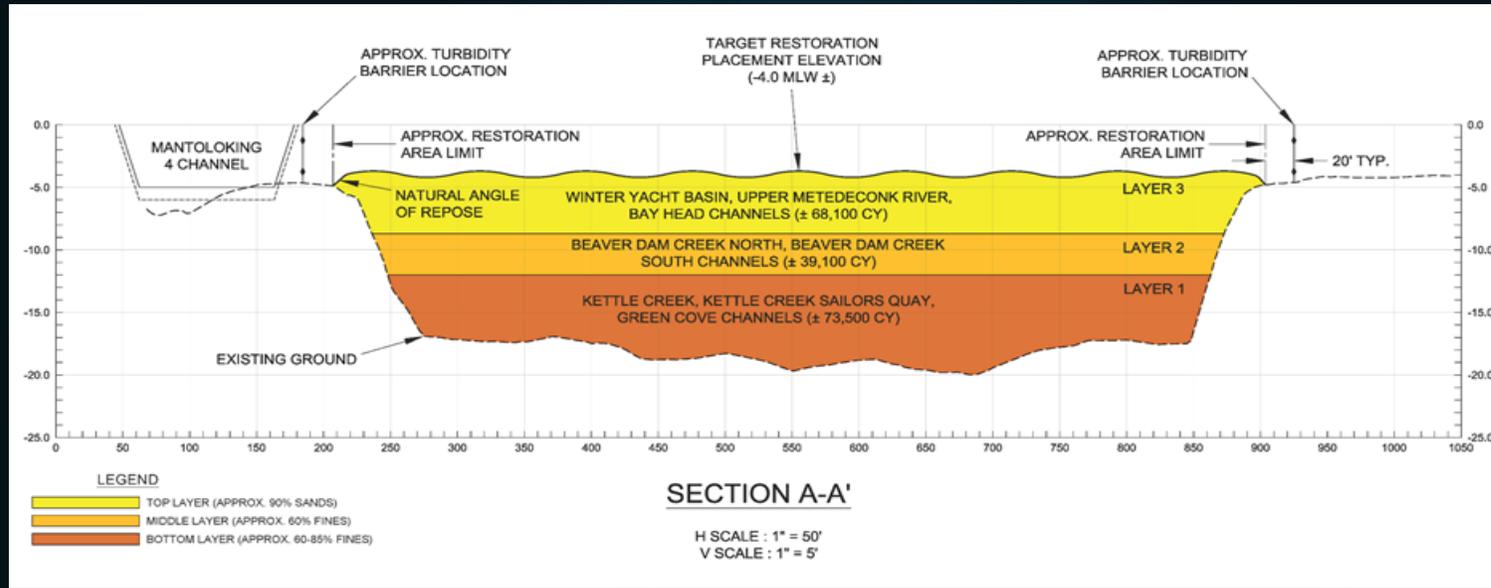
- 10 channels (6 were severely shoaled)
- 1 municipal boat ramp
- 145 water dependent businesses and facilities, including 112 marinas
- 13.25 miles of channel
- 6-7 ft x 100 ft
- 240,000 cyd of mostly clean material
- Lack of disposal options



| Channel                    | Available Volume (CY) |
|----------------------------|-----------------------|
| Green Cove                 | 3120                  |
| Kettle Creek               | 17770                 |
| Kettle Creek Sailor's Quay | 41500                 |
| Mantoloking 4              | 2450                  |
| Beaver Dam Creek North     | 23100                 |
| Beaver Dam Creek South     | 16540                 |
| Winter Yacht Basin         | 1140                  |
| Bay Head                   | 5700                  |
| Upper Metedeconk River     | 58090                 |
| Lavallette Beach Channel   | 80390                 |
| Lavallette Boat Ramp       | 560                   |
| <b>Totals</b>              | <b>250,360</b>        |

| Channel                    | Percent sand | TOC (mg/kg) | Criteria Exceedances  |
|----------------------------|--------------|-------------|---|
| Green Cove                 | 77           | 150,000     | As in bulk sediment   |
| Kettle Creek               | 15           | 75,000      | None  |
| Kettle Creek Sailor's Quay | 48           | 77,100      | As in bulk sediment, Pb in elutriate                                  |
| Mantoloking 4              | 99           | NM          | None  |
| Beaver Dam Creek North     | 58           | 106,270     | As and B(a)pyrene in bulk sediment, Pb, Cu and chlordane in elutriate |
| Beaver Dam Creek South     | 36           | 106,300     | None  |
| Winter Yacht Basin         | 80           | 8,080       | None  |
| Bay Head                   | 91           | 2,935       | None  |
| Upper Metedeconk River     | 89           | 21,160      | None  |
| Lavallette Beach Channel   | 73           | 9,560       | DDT in bulk sediment  |
| Lavallette Boat Ramp       | >95          | NM          | None  |

# Placement Strategy



- Bottom Layer: 70,100 CY contaminated fine grained material from Green Cove, Kettle Creek and Kettle Creek Sailors Quay
- Middle Layer: 33,000 CY clean fine grained material from Beaver Dam Creek North and South
- Top Layer: 105,100 CY clean coarse grained material from Winter Yacht Basin, Upper Metedeconk River, Bay Head, Lavallette Beach and Lavallette Boat Ramp

# *Placement Technique*

- Mechanical Dredging with closed clamshell over two dredging seasons
- Tug and Barge Transport
- Mechanical offloading below surface
- Turbidity barrier surrounding site



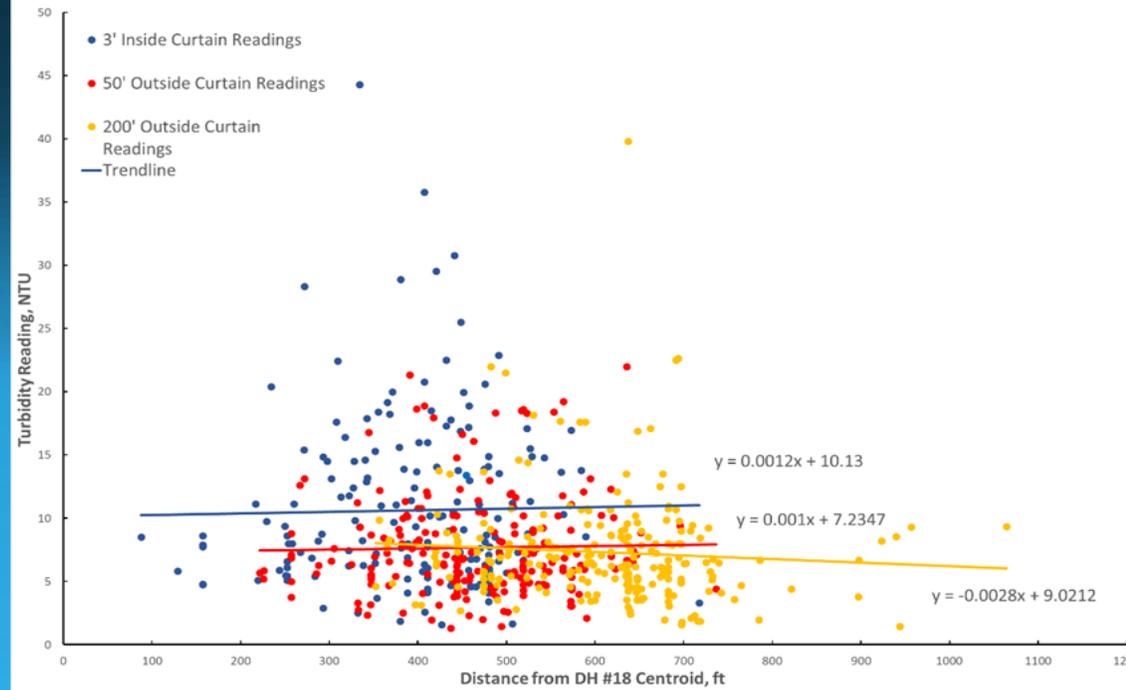
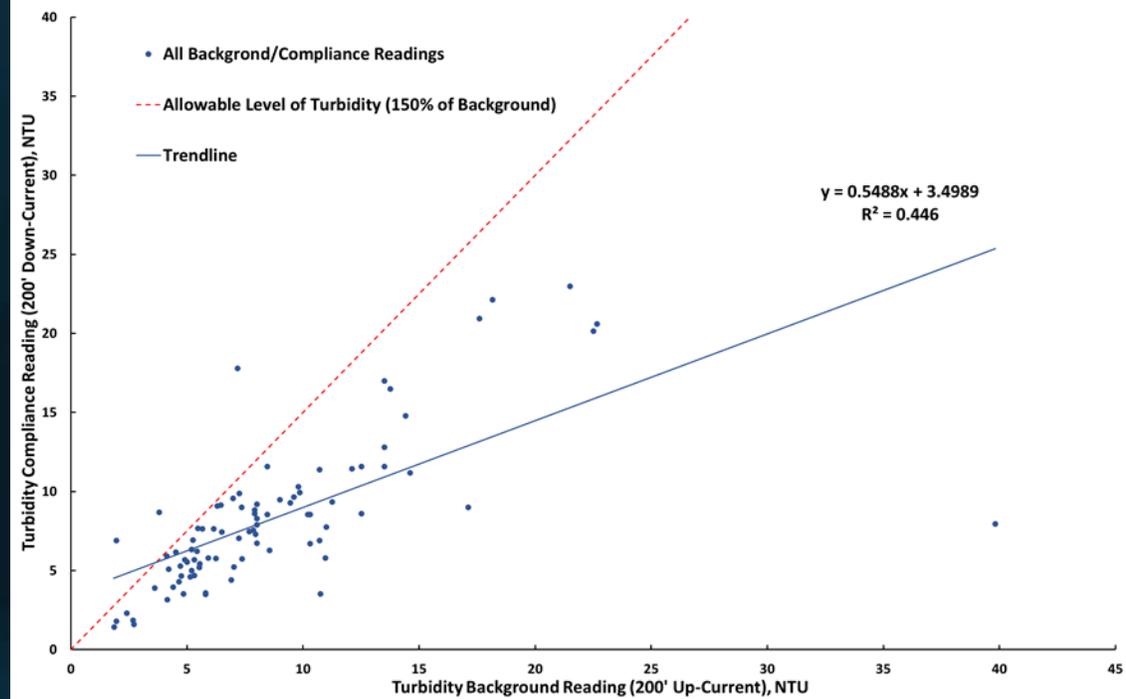
# *Permit Requirements*

- No dredging between December 31 and July 1
- Approved Placement Plan
- Turbidity Monitoring Plan
  - Twice daily
  - Incoming and outgoing tide
  - Downstream could not exceed 1.5 times upstream
- Adaptive Management Plan
  - Confirm readings
  - Slow placement rate
  - Decrease dropping distance
  - Place in “bowl pattern”
  - Cease operations
- Post Construction Monitoring Plan

# Turbidity Compliance

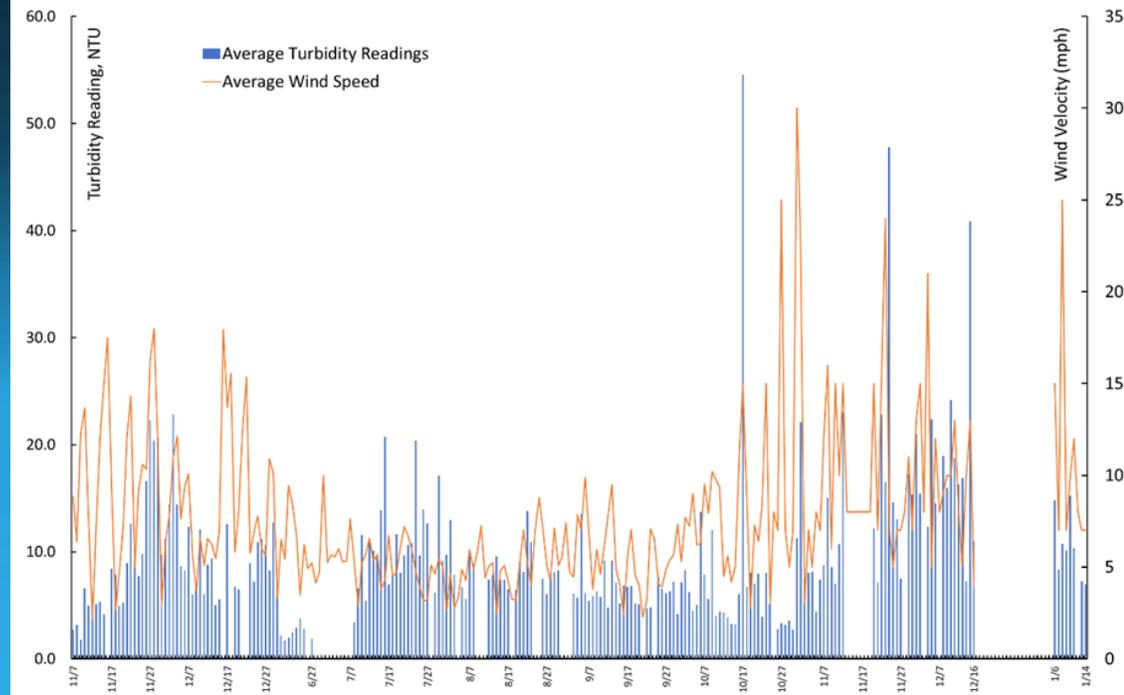
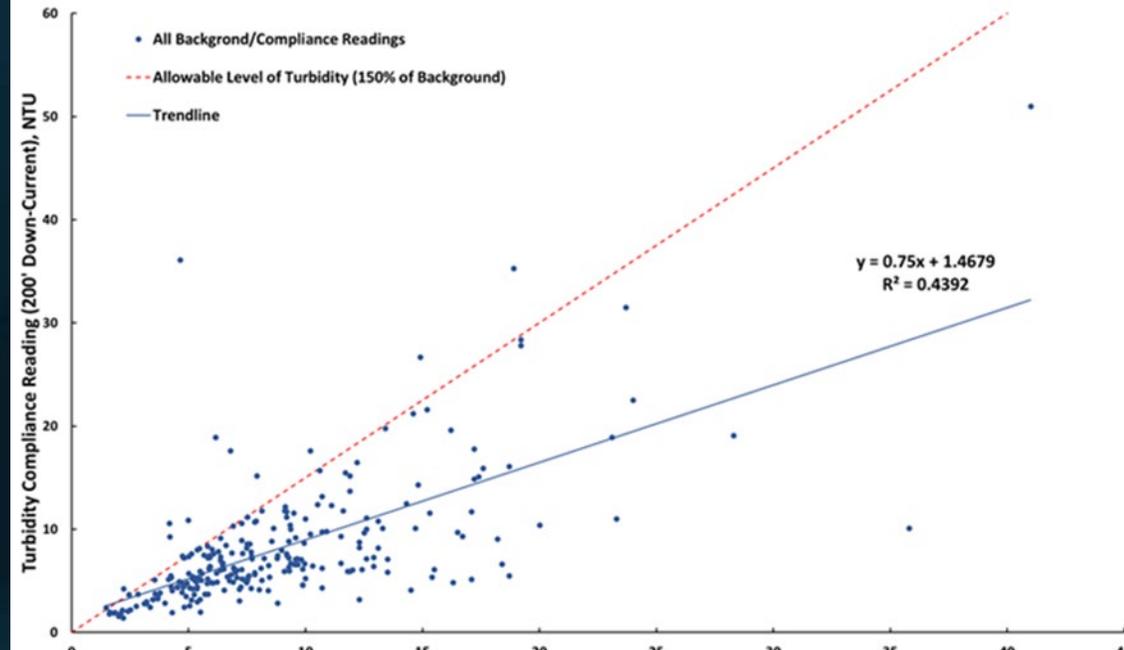
- Typical Background TSS in Barnegat Bay is 3-6 NTU, but regularly exceeded water quality standards
- Turbidity was monitored at several locations up current and down current twice daily
- Permit limit was 1.5 times background
- Turbidity ranged from 1.5 to 40 in Season One
- No correlation with distance from placement
- Turbidity curtain not required in Season Two

WEDA Dredging Summit and Expo 2021



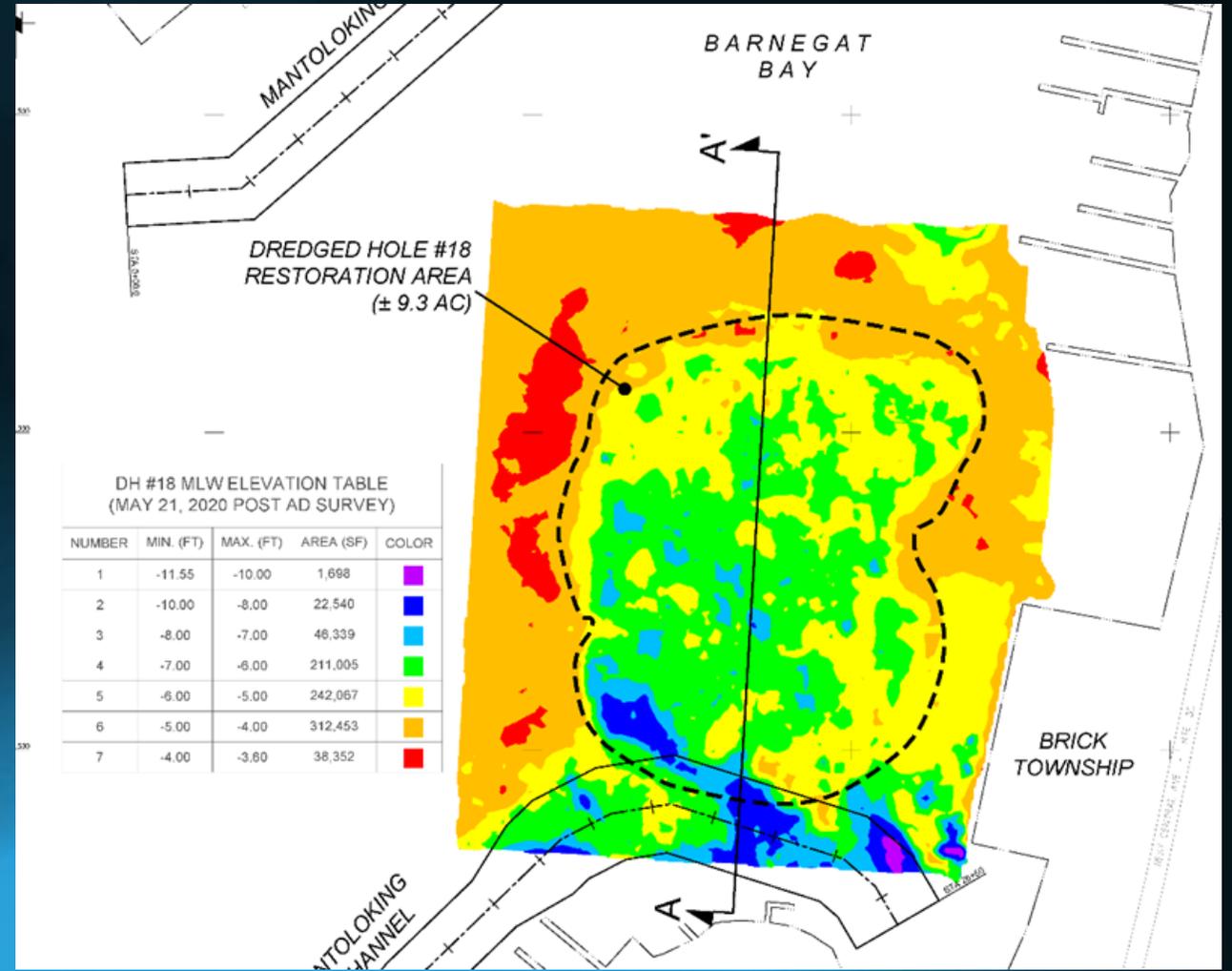
# Turbidity Compliance

- Turbidity ranged from 1.5 to 70 NTU during Season Two
- Turbidity curtain was not deployed
- No correlation with distance from placement activity
- Strong correlation with wind events and equipment movement



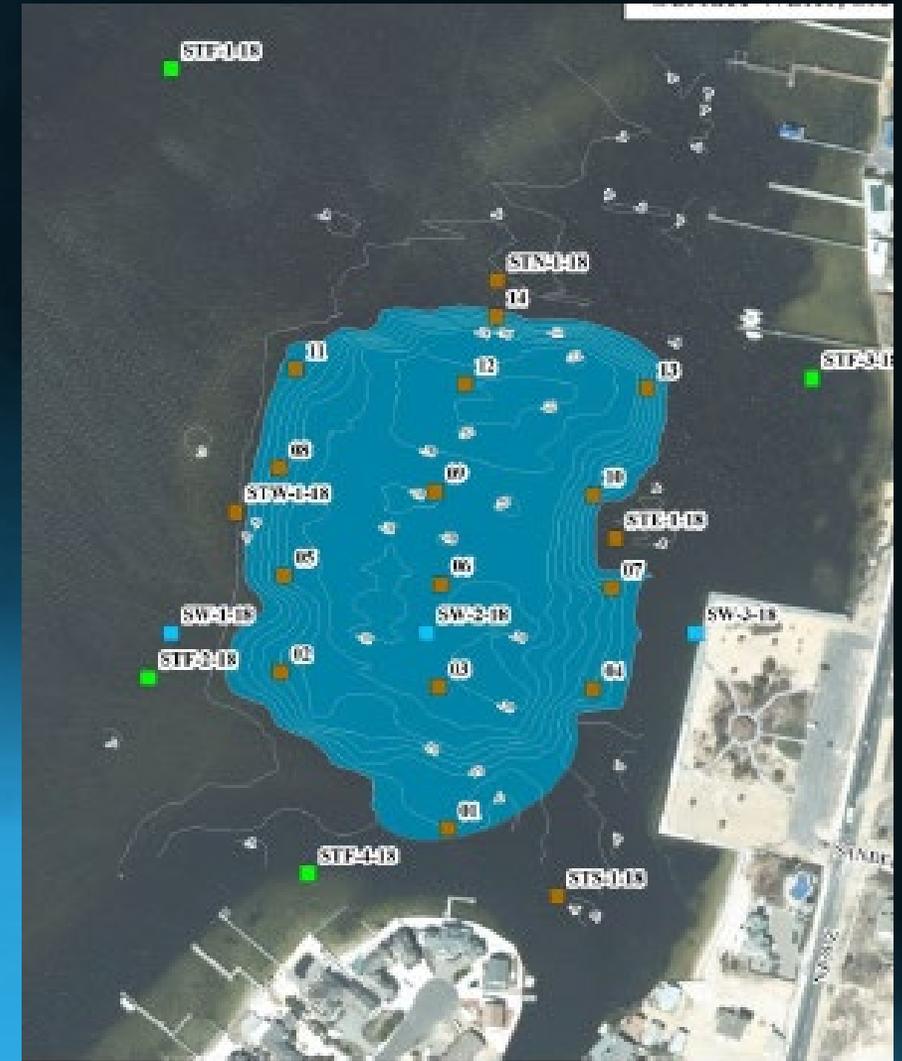
# Final Elevations

- 209,000 CY placed at site
- Sandy material added last
- Elevations ranged from -3 to -8 MLW, with most areas being -5 to -6.



# *Post Placement Monitoring*

- Years 1-4 post construction
- 2020:
  - Cap thickness
  - grain size confirmation
  - Water quality
- 2021/2022/2023:
  - Water quality
  - Cap Integrity
  - Benthic Community Analysis
  - Submerged Aquatic Vegetation Survey



# *Post Construction Monitoring and Adaptive Management*

- Post construction coring revealed cap thickness ranged from 0.1 to 6.3 ft averaging 2.8.
- Grain size of top layer ranged from 76.9-94.0 percent sand, averaging 89.2%
- In late 2020, added another 35,000 CY of sand from Lavallette Beach Channel and Ramp to augment sand
- Water quality parameters were all within range of control sites
- Additional cap monitoring, SAV and benthic community analysis is scheduled for this summer, and the next two summers.

# *By the Numbers*

- Days of dredging: 274 (plus 2020)
- Miles of channel dredged: 13
- Cubic yards placed: 244,106
- Habitat restored: 9.3 acres
- Engineering and permitting cost: \$623,638
- Oversight cost: \$528,818
- Monitoring cost (realized and outyears): \$218,214
- Total project cost: \$18,426,516
- Cost per cubic yard: \$75.49

# Questions?

