

# ENGINEERING WITH NATURE TO SUPPORT SYSTEM RESILIENCE: *EXAMPLES OF INNOVATIVE CHANNEL DREDGING AND PLACEMENT IN COASTAL NEW JERSEY*

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# A “PERSISTENT” APPROACH

## NJ Past, Present & Future

- **Navigation and Nature:** District took action to restore navigation after Sandy, but also looked for opportunities to assist with shoreline & ecosystem recovery and build coastal system resilience with *clean* dredged sediment
- **Technical Expertise:** Use *Regional Sediment Management (RSM)* and *Engineering with Nature (EWN)* concepts to develop short-term (post-Sandy) and long-term dredging strategies
- **Team Approach:** Actions were aided by support from USACE North Atlantic Division and other districts including Galveston, Mobile & Baltimore, ERDC, NJDEP and other partners

***Within State of NJ...Progression from fear and risk aversion to being proactive and driven with willingness to accept risk***



# New Jersey Intracoastal Waterway (NJIWW) Channel Dredging with Innovative Placement



The NJIWW is a 117 mile long federal channel that runs through the NJ Back Bays from Manasquan to Cape May



# MORDECAI ISLAND RESTORATION BEACH HAVEN, NJ CASE STUDY



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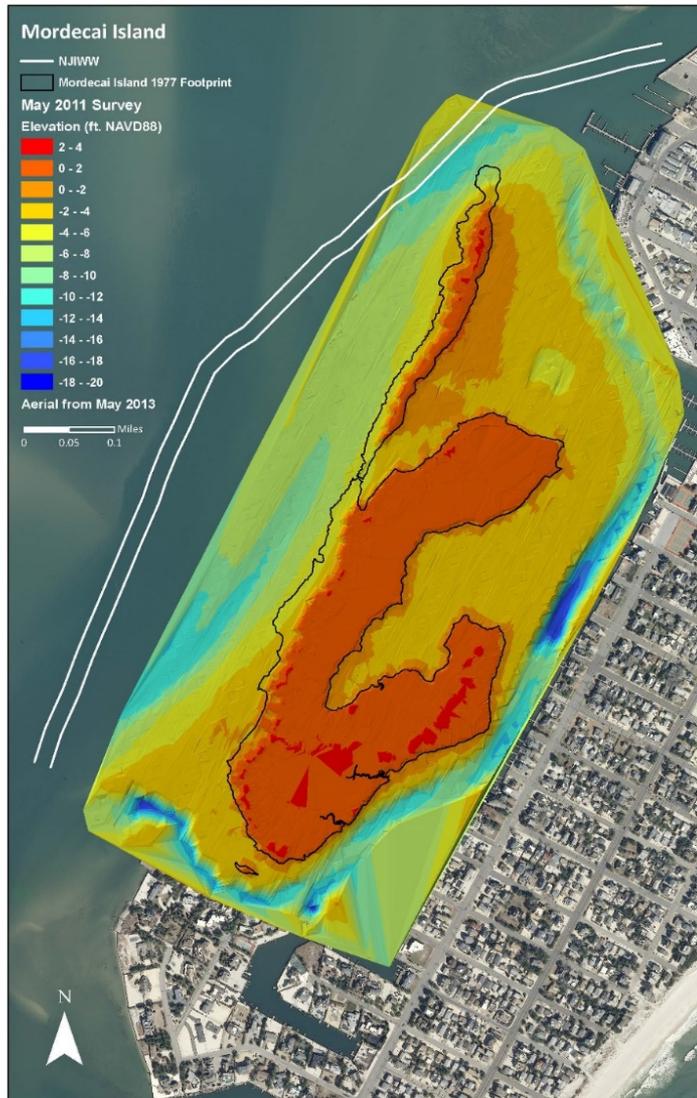
# ACCELERATING PROGRESS WITH AN RSM/EWN SYSTEMS APPROACH: MORDECAI ISLAND NJ



©2010



# MORDECAI ISLAND PLANNING STUDY: ECOSYSTEM RESTORATION CONTINUING AUTHORITIES PROGRAM (CAP)



Continued erosion of Mordecai Island threatens a diversity of natural wildlife habitats including open marsh, salt ponds, exposed mud flats, shrub-dominated areas and shallow water eelgrass beds.

**Previous work and partnerships were and are incredibly valuable!!** Included NMFS & USFWS, Bureau of Coastal Engineering, Mordecai Land Trust, NOAA



# POST-CONSTRUCTION MORDECAI ISLAND



Mordecai Island August 2017



# AVIAN MONITORING AND ADAPTIVE MANAGEMENT: THINKING THROUGH THE PROJECT OBJECTIVES



Raised Habitat in Dec 2017



**Build it and they will  
come....**



# MORDECAI ISLAND CONSTRUCTION: DECEMBER 2017



ps

# MORDECAI ISLAND: CONTINUING TO MONITOR & PARTNER



NOAA NCCOS, USACE, ReClam the Bay,  
Mordecai Land Trust, Rutgers University



# DREDGING MUSEUM EXHIBIT IN THE NETHERLANDS



# **NJIWW Channel Dredging And Placement Demonstration Projects: Ring Island And Avalon NJ**

**Land Owned By New Jersey Division Of Fish & Wildlife (NJDFW)**

**Constructed With Emergency Supplemental Operation & Maintenance  
Funds**

**And**

**A National Fish And Wildlife Foundation Grant TO NJDFW, The Nature  
Conservancy And Green Trust Alliance**

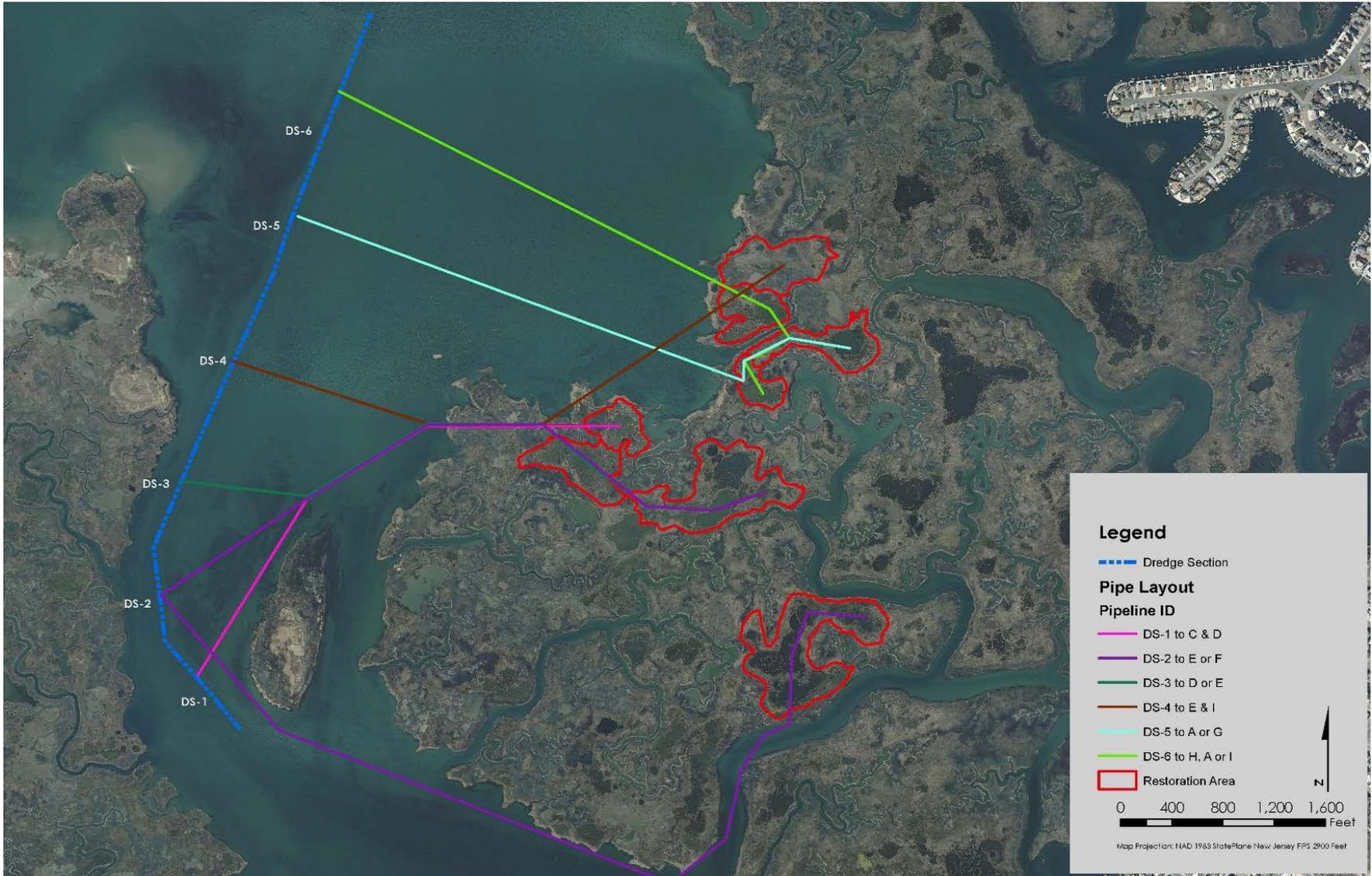
**Contractor: Barnegat Bay Dredging Co.**



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# NJIWW Dredging & Avalon Thin Layer Placement



**Constructed Dec 2014 to Feb 2016**

# NJIWW Avalon Pilot Project: Dredging “The Football Field” And Thin-layer Placement



- Larger project continued from Nov 15 to Feb 2016 (45,000 cy & 35 acres)
- USACE funded dredging, NFWF grant funded placement design, construction oversight
- Costs and lessons learned under development
- Monitoring to continue for several years, NFWF Grant Team & ERDC

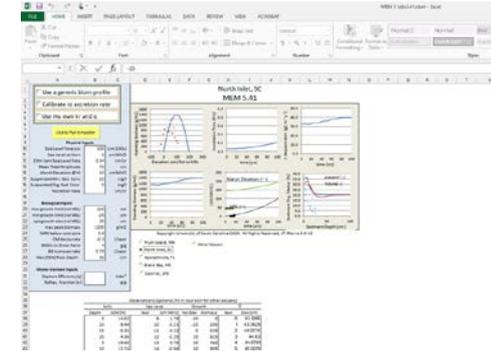
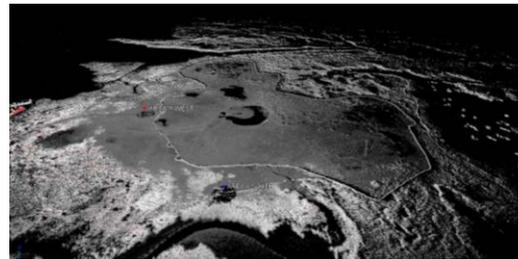




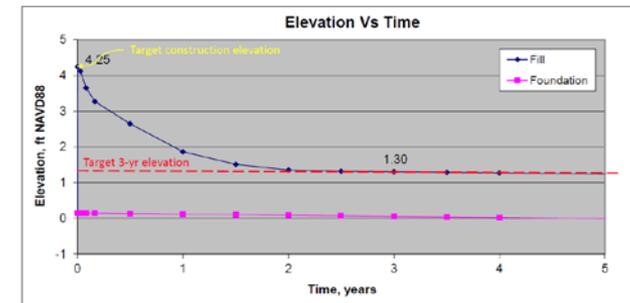
# Guidance for Designing and Constructing of TLP Projects

## Objectives:

- Distill knowledge & information from past current, and developing TLP projects, and evolving pertinent R&D activities
- Synthesize into guidance document designed for use by both USACE and stakeholders to optimize engineering and construction of TLP projects.



Marsh Equilibrium Model (MEM)



PSDDF - Primary Consolidation, Secondary Compression, And Desiccation Of Dredged Fill

# Ring Island, NJ: Black Skimmer Habitat And Thin-layer Placement with NJIWW Sand



- Constructed August 2014
- Placed on land owned by NJDFW instead of Confined Disposal Facility
- Habitat creation
  - Shorebird usage
  - Also used by horseshoe crabs & terrapins
- Small thin layer placement demo with >96% sand, 500 cubic yards
- Raised elevation of habitat in March 2018, Adaptive Management!!

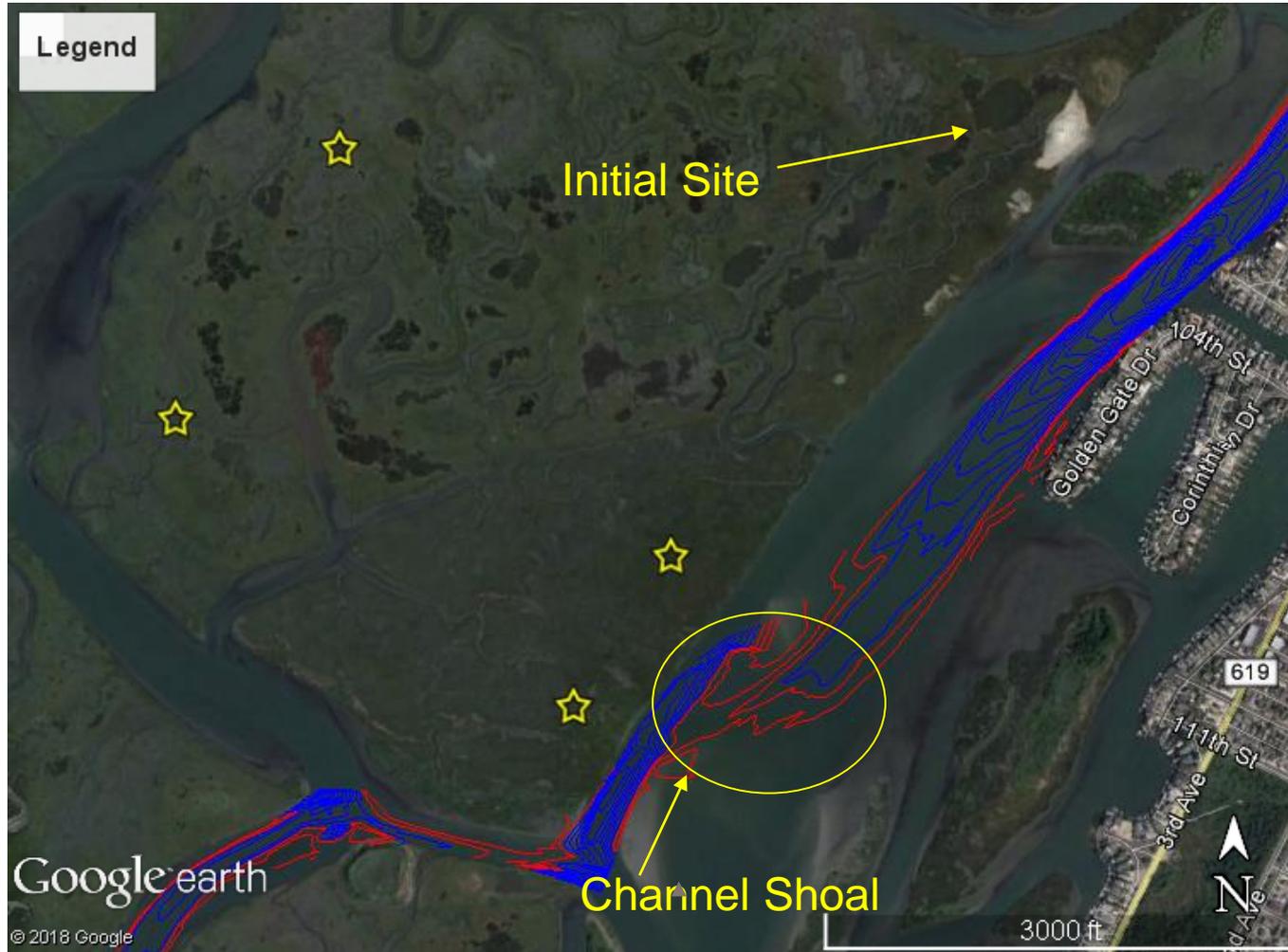
# UPCOMING ACTIONS AND FUTURE OPPORTUNITIES



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# ADAPTIVE MANAGEMENT AND SYSTEMS APPROACH FROM NNBF PILOTS TO SOLUTIONS



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# ADAPTIVE MANAGEMENT AND SYSTEMS APPROACH *FROM NNBF PILOTS TO SOLUTIONS*

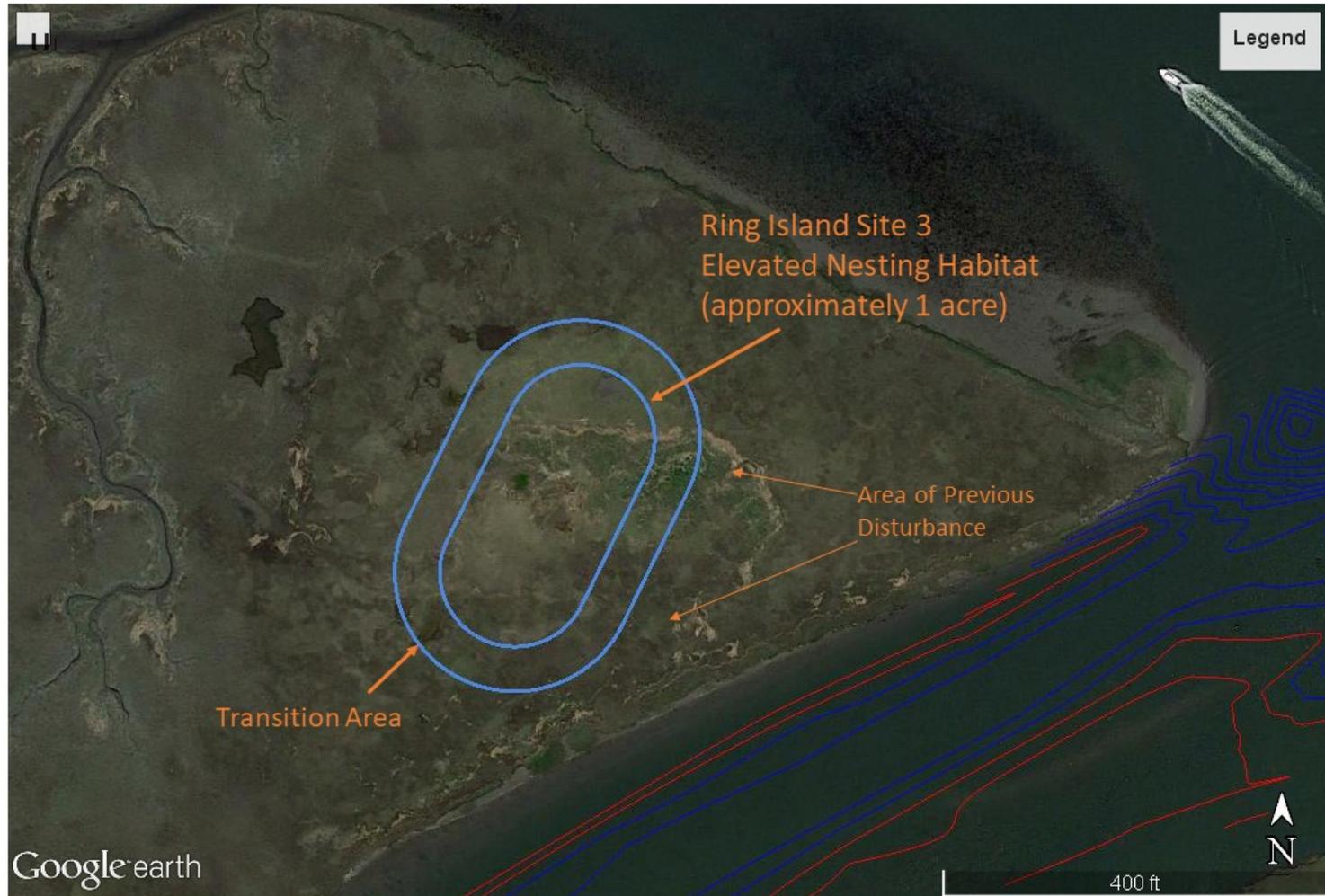


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# ADAPTIVE MANAGEMENT AND SYSTEMS APPROACH

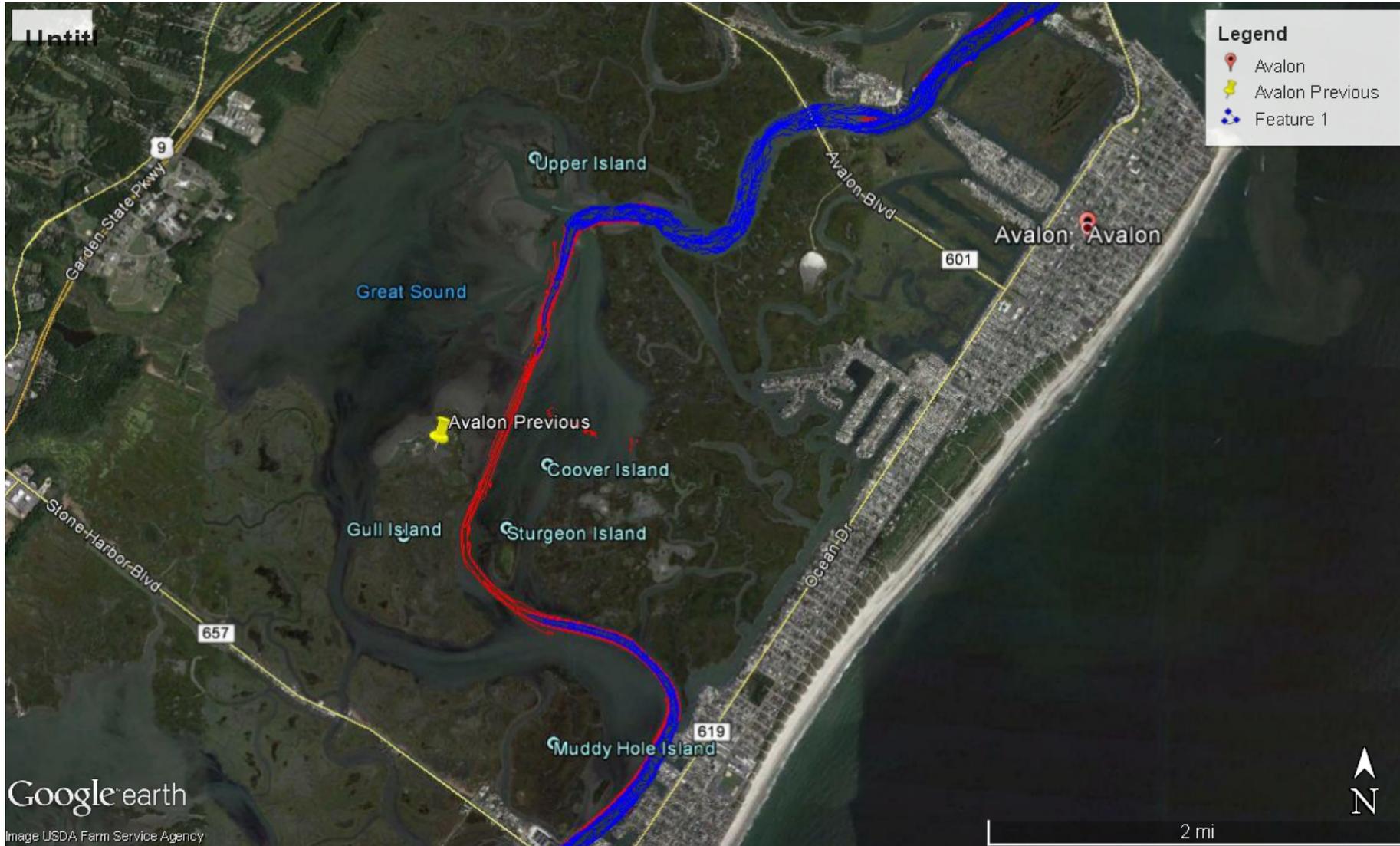
## *RING ISLAND SITE 3, ANTICIPATED DEC 2018*



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# SEVEN MILE ISLAND “LIVING LABORATORY” APPROACH PROVIDING ECOLOGICAL UPLIFT AND ENHANCED RESILIENCE FOR ECOSYSTEMS AND COASTAL COMMUNITIES



# NJIWW Critical Shoals (Markers 386 to 397) Placement Strategy



Possible placement areas for NJIWW  
Markers 386 to 397 west of Avalon/Stone Harbor

- Notes
1. Volumes ~75K CY, mixed sediments
  2. Need clarification on current shellfish areas

# SEVEN MILE ISLAND “LIVING LABORATORY” FOR COASTAL RESILIENCE

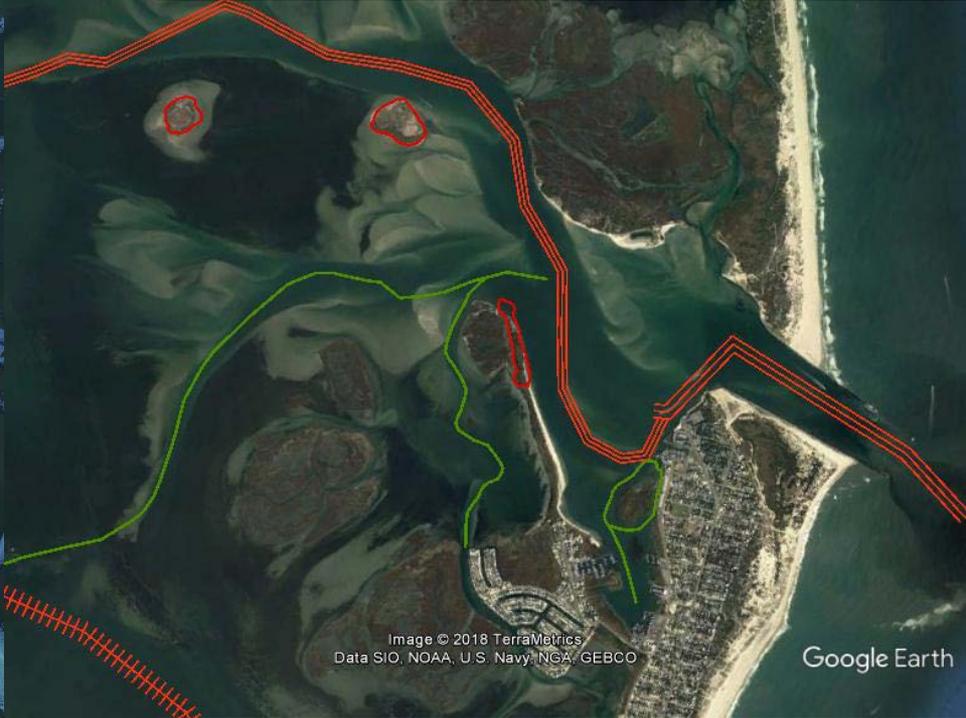
- Scientific Advisory Committee/Living Lab Working Group:  
*Helps with managing risk and brings stakeholders & agencies together*
- Develop project objectives/components/techniques that have role in addressing future system resilience, such as,
  - fine grained sediment transport & strategic placement
  - sea level rise & future trajectories of marsh
  - edge erosion
  - success of previous sites
- Implement Short and Long-term Actions & Strategies
  - Collect pre-project data and establish baseline to add to data set (start now)
  - Do not over-engineer, use nature as the lead and mimic processes
  - Construct (Fall 2019)
  - Implement a monitoring program
  - Adaptive management and lessons learned



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# EWN Opportunities: Barnegat Inlet, NJ



# BARNEGAT INLET AND BAY, NJ ISLAND BUILDING AND OPPORTUNITIES



# ***Future Opportunities***

- Island Creation in coastal NJ and DE
- Strategic Placement for Marsh Restoration and Coastal Resilience
  - Thin layer
  - Edge restoration
  - Using natural processes
- Using the EWN Strategic Plan and RSM Strategies: Working together to inform science-based decisions and projects, opportunities and challenges
- Engineering with Nature Proving Ground Projects that are cost effective and science based

# Sharing Lessons Learned across USACE

## San Francisco District Navigation Synchronization Meeting

March 2018



**Adaptive Management Puts  
Controls on Known Risk,  
*LTC Rayfield, San Fran District*  
September 2018**



# ENGINEERING WITH NATURE PLANTING WORKSHOP IN DELAWARE APRIL 2018 USACE, CENTER FOR INLAND BAYS, DNREC

