

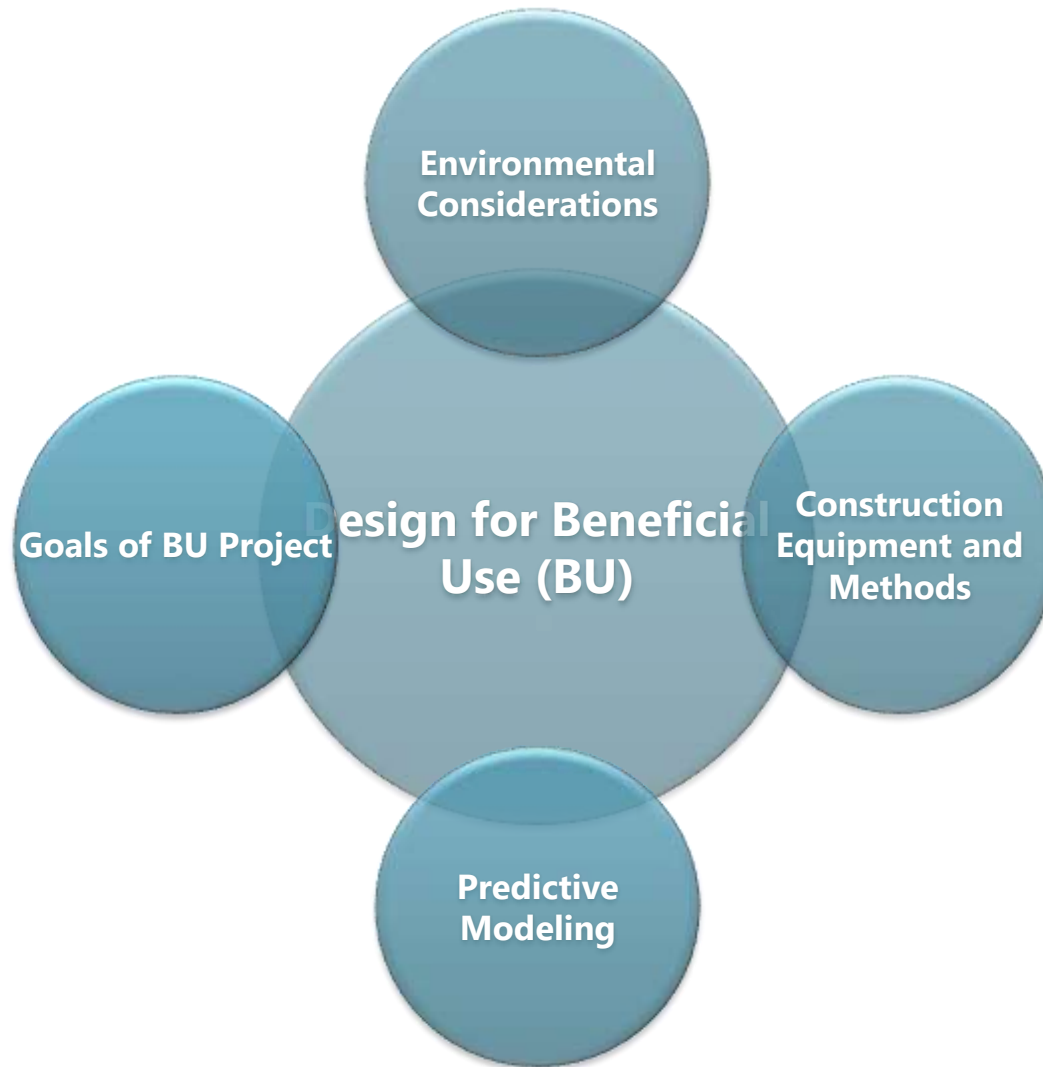


Predictive Modeling and Design Solutions for Beneficial Use of Dredged Material



Presented by Wendell Mears
April 18, 2018

Integrated Approach is Key to Success



Beneficial Use (BU) Opportunities

Beneficial Use Opportunities



Beneficial Use Opportunities (cont.)



Habitat Restoration -
Mitigation

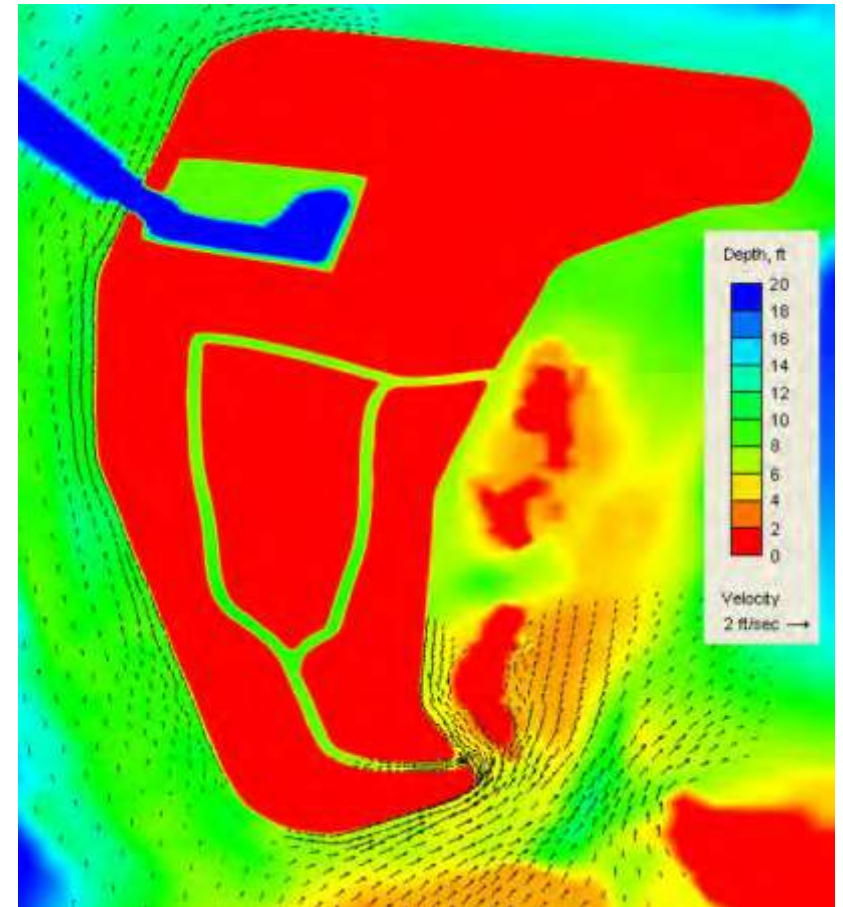
Beach Nourishment



Predictive Modeling for BU Projects

Physical Stability of Placed Sediment

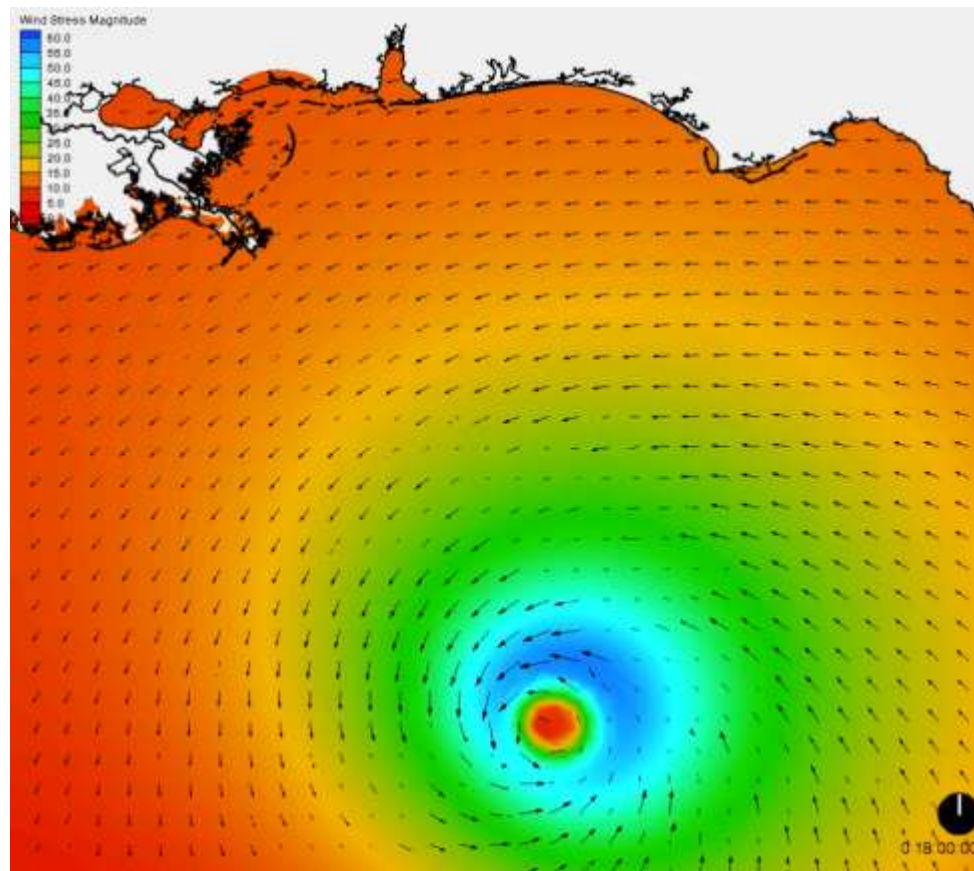
- Objective: Evaluate short- and long-term physical stability of placed material due to hydrodynamic forcing
- Tools: ADCIRC, STWAVE, Delft-3d, SWAN, M2D and others
- Data needs
 - Site conditions
 - Design conditions
 - Sediment characteristics



Maximum Predicted Current Field Around BU Island (M2D Model)

Physical Stability of Placed Sediment

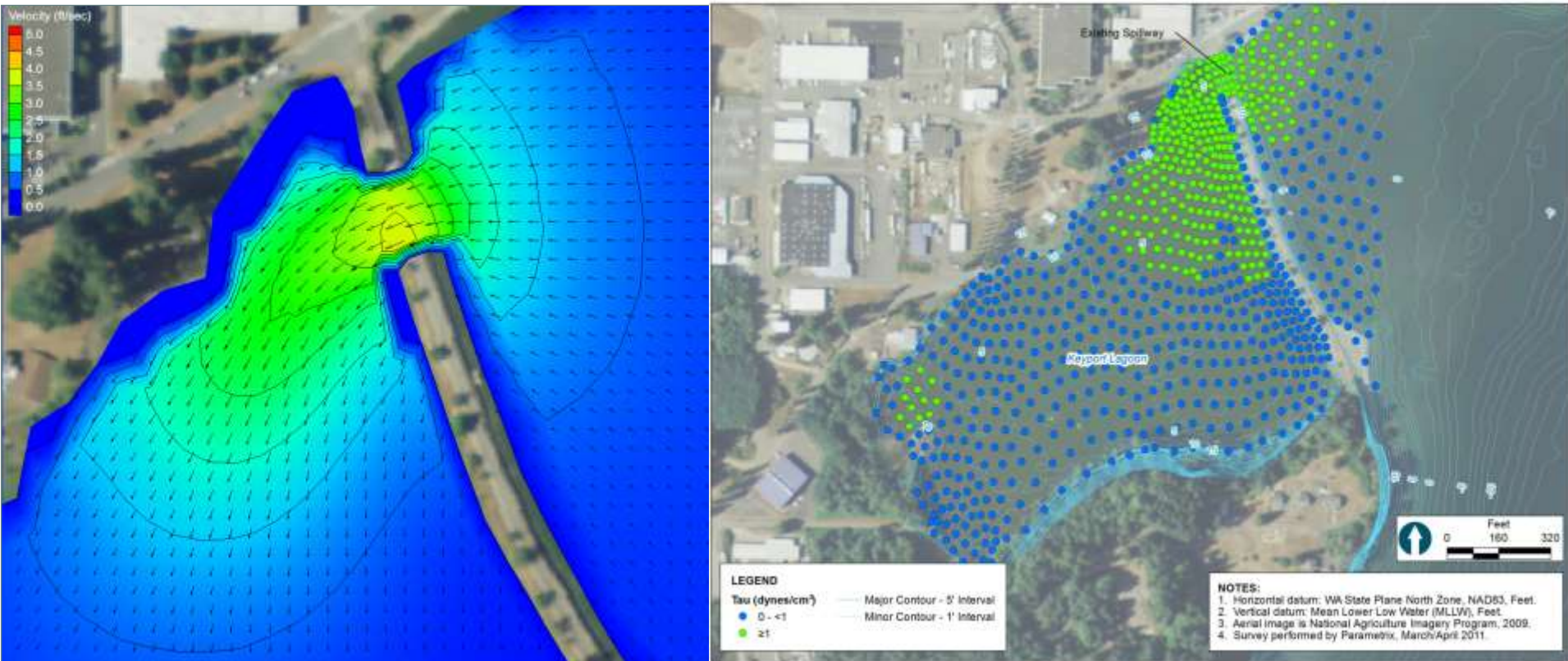
- Tidal currents
- Wind-waves
- Vessel wakes
- Propeller wash
- Riverine currents
- Outfalls/stormdrains
- Storms/hurricanes



Simulation of Hurricane Katrina for Port of Gulfport (wind stress)

Keyport Lagoon, U.S. Navy

Tidal Currents (ADCIRC) and Excess Shear Stress



Hancock County Living Shorelines, Mississippi Sound

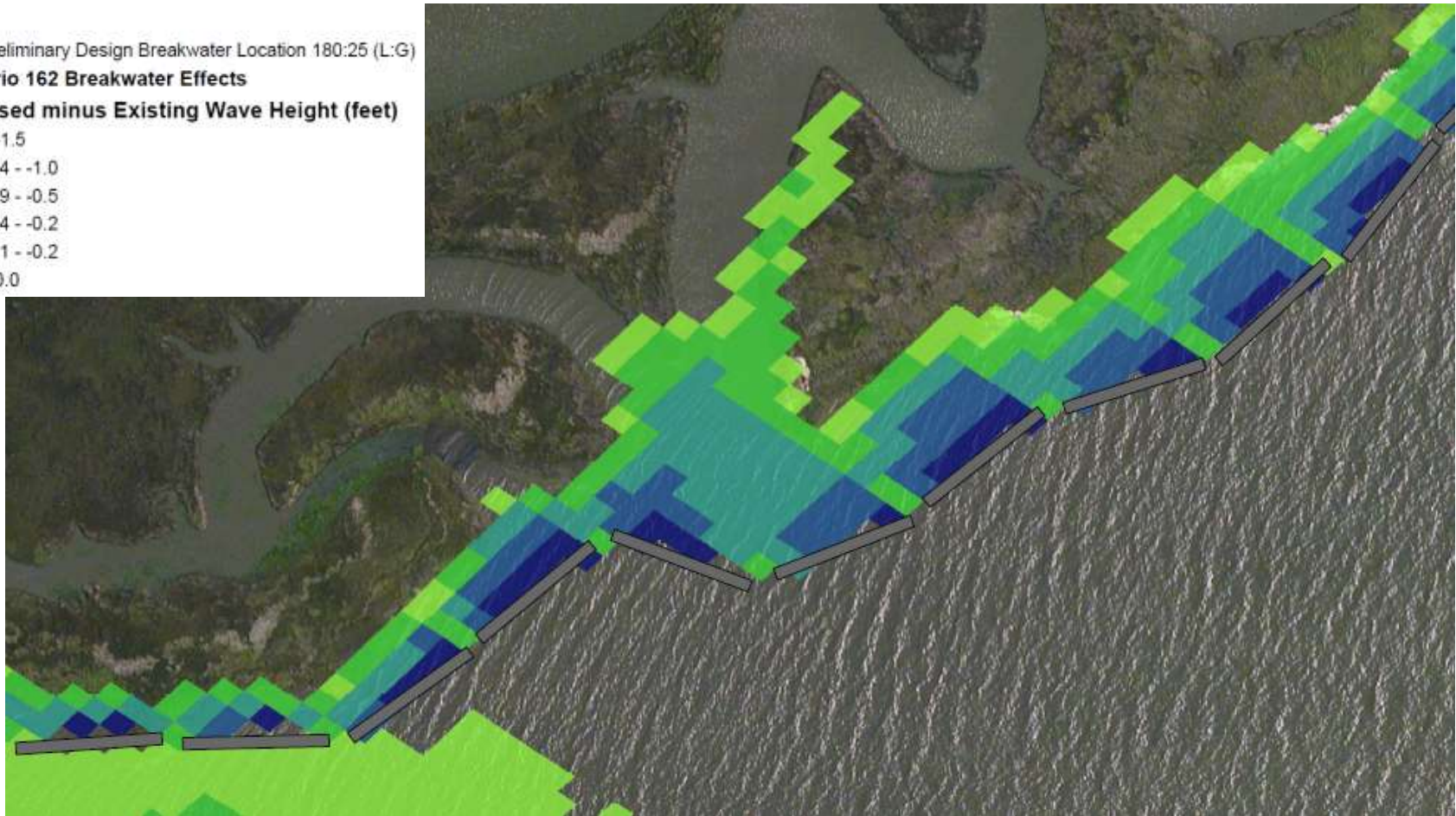
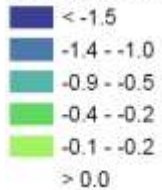
Wave Energy Along Shoreline (Delft 3D Wave)

LEGEND

█ Preliminary Design Breakwater Location 180:25 (L:G)

Scenario 162 Breakwater Effects

Proposed minus Existing Wave Height (feet)



Sustainability (SLR)

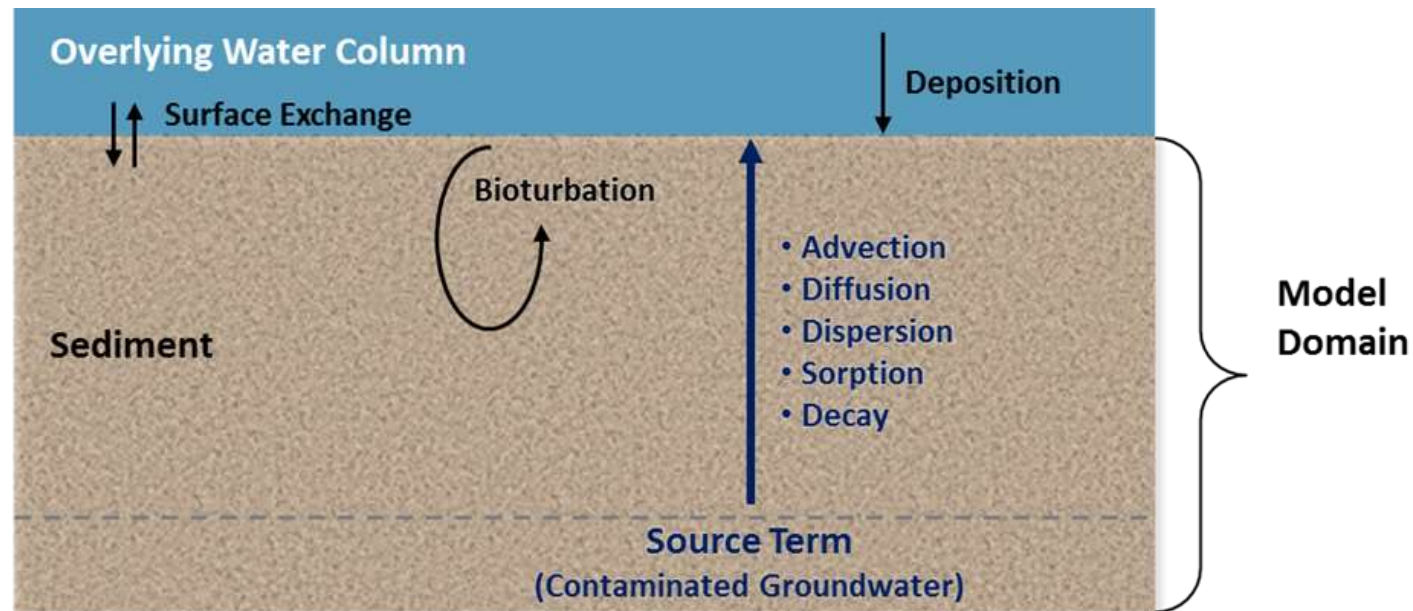
- Objective: Evaluate impacts to project over design life based on predictions of sea level rise
- Tools: Hydrodynamic models and GIS spatial modeling tools
- Data needs
 - Site conditions
 - Design conditions
 - Habitat conditions and characteristics
 - Sea level rise estimates (typically through 2100)



Transformation of Tidal Wetlands in DE

Contaminant Mobility (Benthic)

- Mobility of contaminants through the placed sediments
- Groundwater pathways
- Reible Model (1998 EPA Cap Guidance document)
- AQFATE



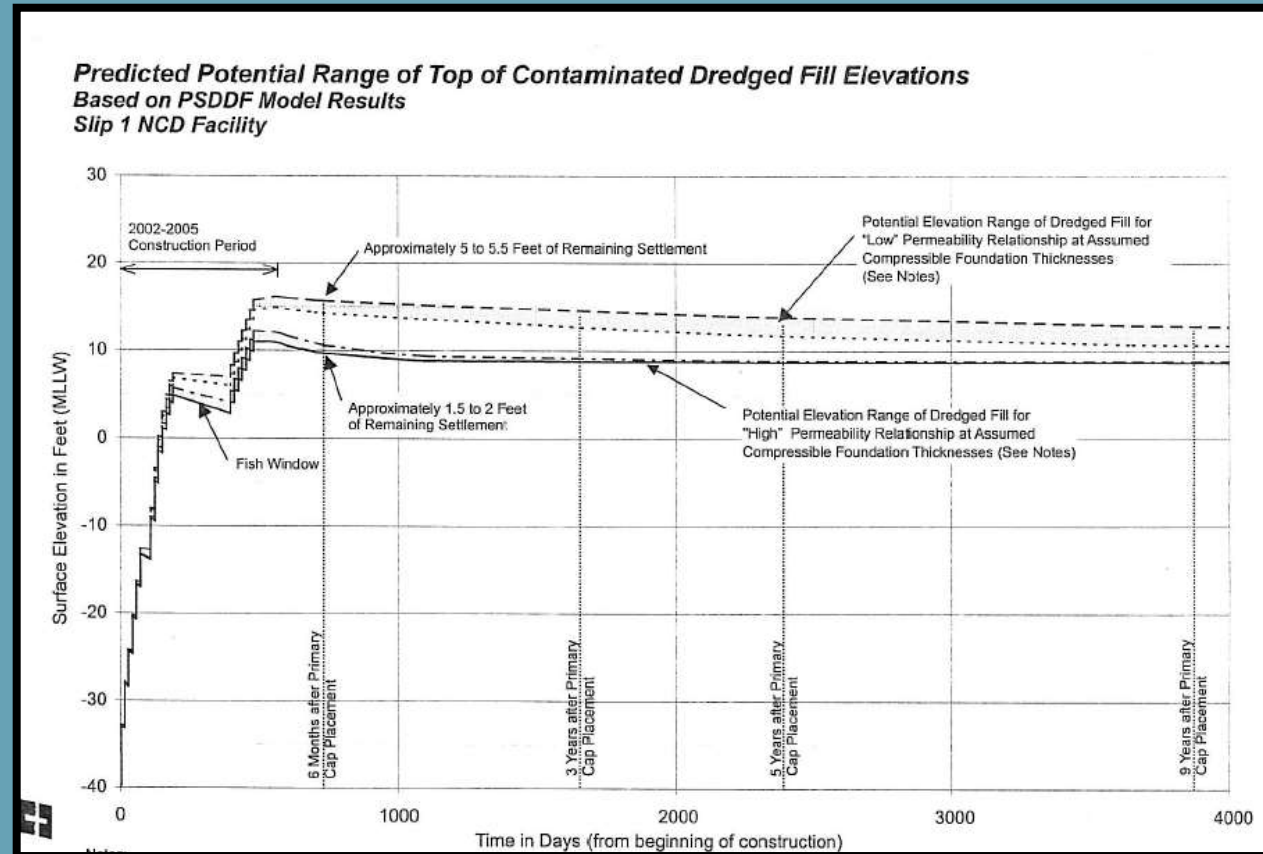
Contaminant Mobility (Suspended)

- Objective: Assess water quality impacts resulting from dredging
 - Turbidity
 - Dissolved contaminants
- Tools: ADDAMS, DREDGE and STFATE modules; EPA Plumes
- Data needs
 - Site conditions
 - Sediment characteristics
 - Dredge characteristics and operations
 - Placement operations



Geotechnical Modeling

- Dredged material bulking and settlement (short-term)
- Foundation consolidation (long-term)
- PSDDF Model
 - Settlement during construction
 - Long-term consolidation



Summary of Predictive Modeling for BU

Beneficial Use Options	Physical Stability	Sustainability	Contaminant Mobility (Benthic)	Contaminant Mobility (suspended)	Geotechnical Considerations
Confined Placement Facility/ Shoreline Development	+++	+	+++	+++	+++
Confined Aquatic Placement	+++	++	+++	+++	+++
Beach Nourishment	+++	+			+
Habitat Restoration/Mitigation	+++	+++			+++
Sediment Remediation Cap	+++		+++	+++	+++

- + Considered
- ++ Important
- +++ Critical for Design

Confined Placement Facilities

CPF Design Considerations



- Containment design
 - Static and seismic stability
 - Contaminant mobility
- Size and capacity
 - Short-term bulking and settlement
 - Long-term consolidation
 - Ponding area to meet water quality criteria
- Pumping distance
 - Water content
- Site final use
 - Habitat
 - Shoreline development
 - Recreation

Confined Aquatic Placement

CAP Design Considerations

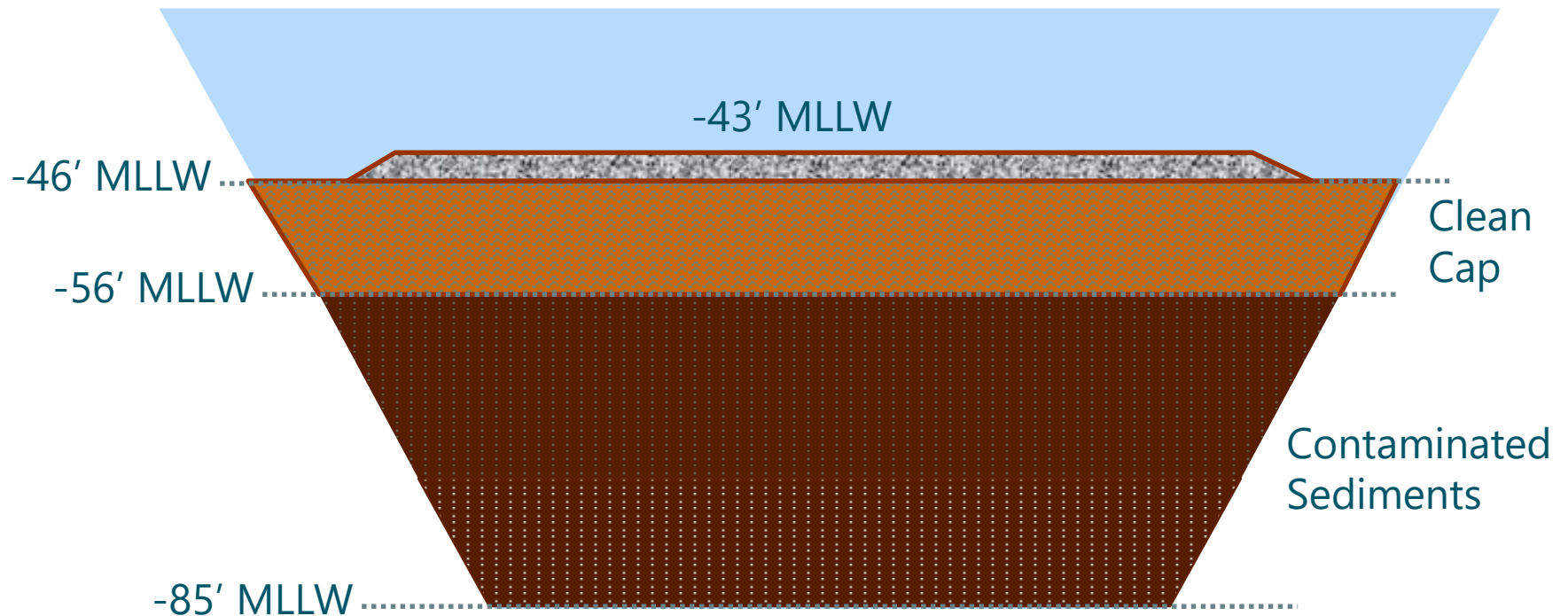


- Submerged or emergent
- Containment design
 - Static and seismic stability
 - Erosion protection
 - Contaminant mobility
- Size and capacity
 - Short-term bulking and settlement
 - Long-term consolidation
- Sustainability
- Pumping distance
 - Water content
- Site final use
 - Typically habitat function
 - Navigation and anchoring restrictions

Port Hueneme Beneficial Use

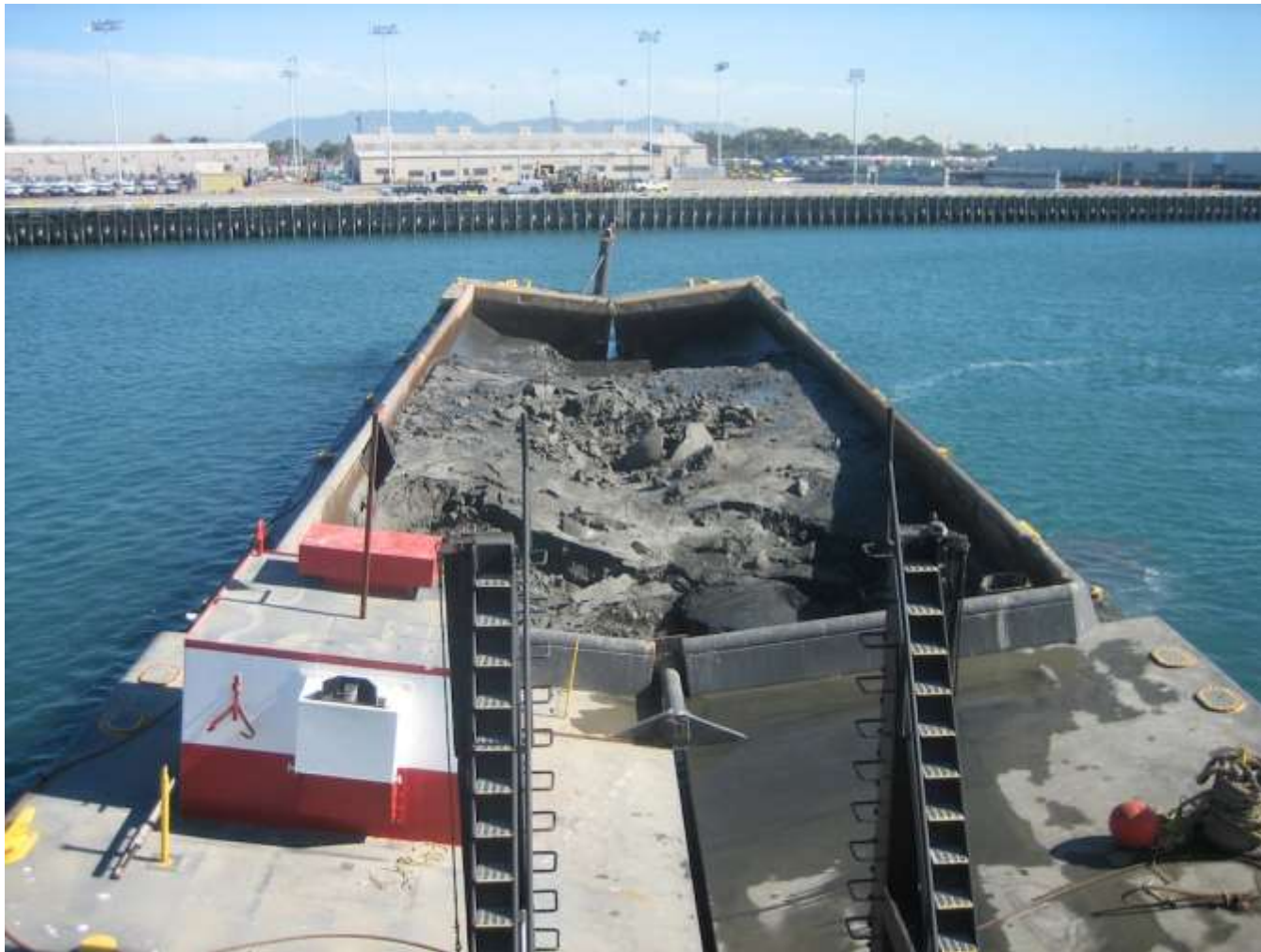


Port Hueneme CAP Cross-Section



Note:
MLLW = mean lower low water

Port Hueneme – Barge Placement



Port Hueneme, USACE, U.S. Navy

Beach Nourishment and Habitat Restoration

Other Beneficial Uses



- Beach nourishment
- Agriculture and products
 - Topsoil
 - Aquaculture
- Berms
 - Stable and feeder
- Habitat restoration
- Land improvement
- Marsh and intertidal habitat

Deer Island Marsh Creation

- Design elements
 - 7- to 8-foot-high dike
 - Easterly wing dike
 - Flash board riser weirs
 - Offset to provide bayou
- Dredged material from Biloxi Lateral Channel
- Approximately 40 acres were filled with 365,000 cy of sediment



Enhancing Existing Marsh

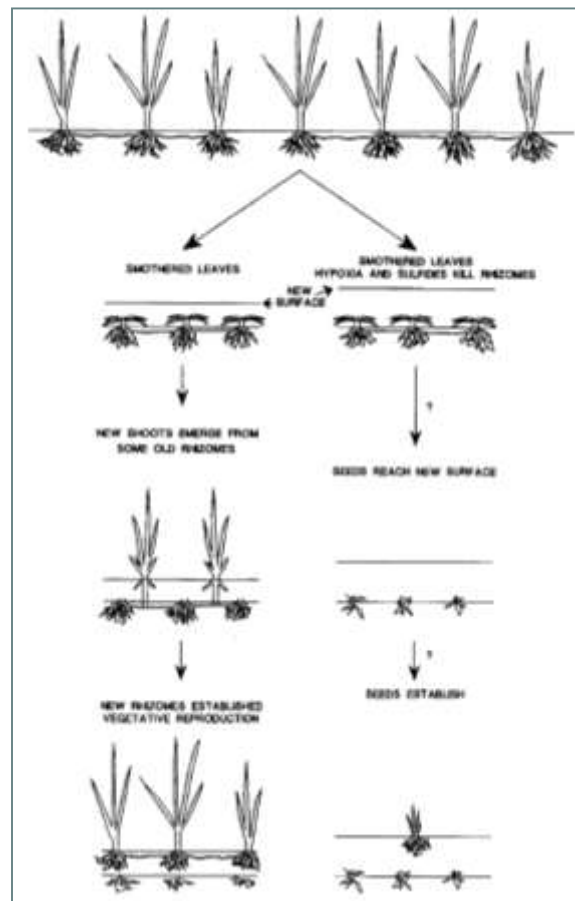


Illustration of conceptual model for marsh recovery after thin-layer placement

Questions?

