

Options for Integrating EWN/NNBF as part of Dredging and Coastal Restoration



Joseph Gailani

U.S. Army Engineer Research
and Development Center (ERDC)
Vicksburg, MS

Dredging Summit and Expo '18
Norfolk, VA
joe.z.gailani@usace.army.mil



®

US Army Corps of Engineers
BUILDING STRONG®



Background

- Regional sediment budgets are out of balance due to anthropogenic activities
 - ▶ Habitat loss
 - ▶ Increase flood risk/risk to human safety
 - ▶ Reduced quality of life
- Regulation addressing placement: CWA Section 404
- Dredged material (DM) is a resource that can be used to support NNBF through EWN solutions
- USACE directed to beneficially use dredged sediment to address sediment deficits
 - ▶ Habitat – wetland, migratory bird resting areas, etc
 - ▶ Berms/reefs – break waves - protect shores/banks
 - ▶ Beach/littoral zone nourishment
 - ▶ Land reclamation
 - ▶ Remediation of contaminated sites



Objectives

- Address mandate to increase DM beneficial use
- Reduce overall costs by simultaneously providing benefits to multiple USACE business line
 - ▶ Navigation
 - ▶ Ecosystem Restoration
 - ▶ Flood Risk Management
- Improve regional sediment management
 - ▶ Maintain sediments in the littoral zone
 - ▶ Identify areas which are losing sediment (wetlands or beach/dune systems, for example)
 - ▶ Develop solutions to address sediment deficits using DM
- Cost-effective and sustainable solutions
- Increase strategic placement (vs. direct placement)
 - ▶ Nearshore berms
 - ▶ Mud motor in the Wadden Sea



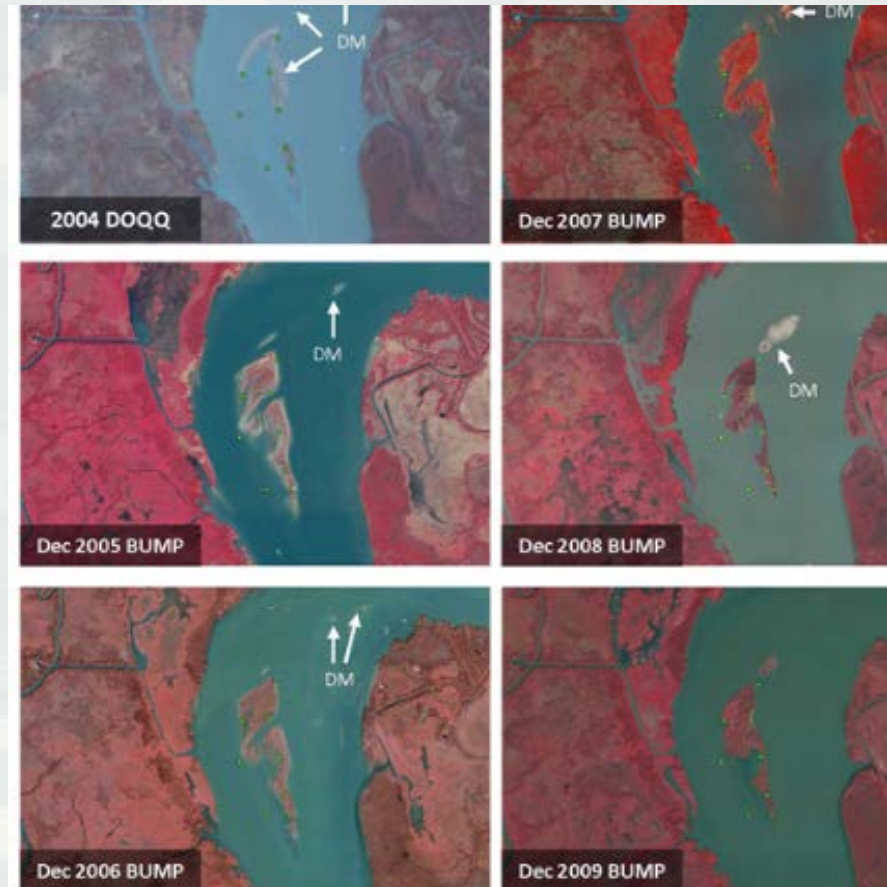
Strategic vs. Direct Placement

- Direct placement of DM is used to construct beaches, wetlands, stable berms, etc.
 - Cost can be high
 - Opportunities may not align with dredge schedules
 - Available dredged sediment may not be compatible
 - Environmental or resource impacts may be high
 - Future site capacity is limited
- Strategic placement is the practice of placing DM at one location with the expectation that hydrodynamic forces will move sediment toward targeted resources
 - Often lower cost than direct placement
 - Permits natural sorting of sediments
 - Slower rates of accumulation permit habitat recovery
 - Site capacity renewed for future dredging projects
 - Sustainable solutions which support RSM
 - Engineer/Design to maximize benefits to NNBF
 - Balance cost/benefits



Strategic Placement

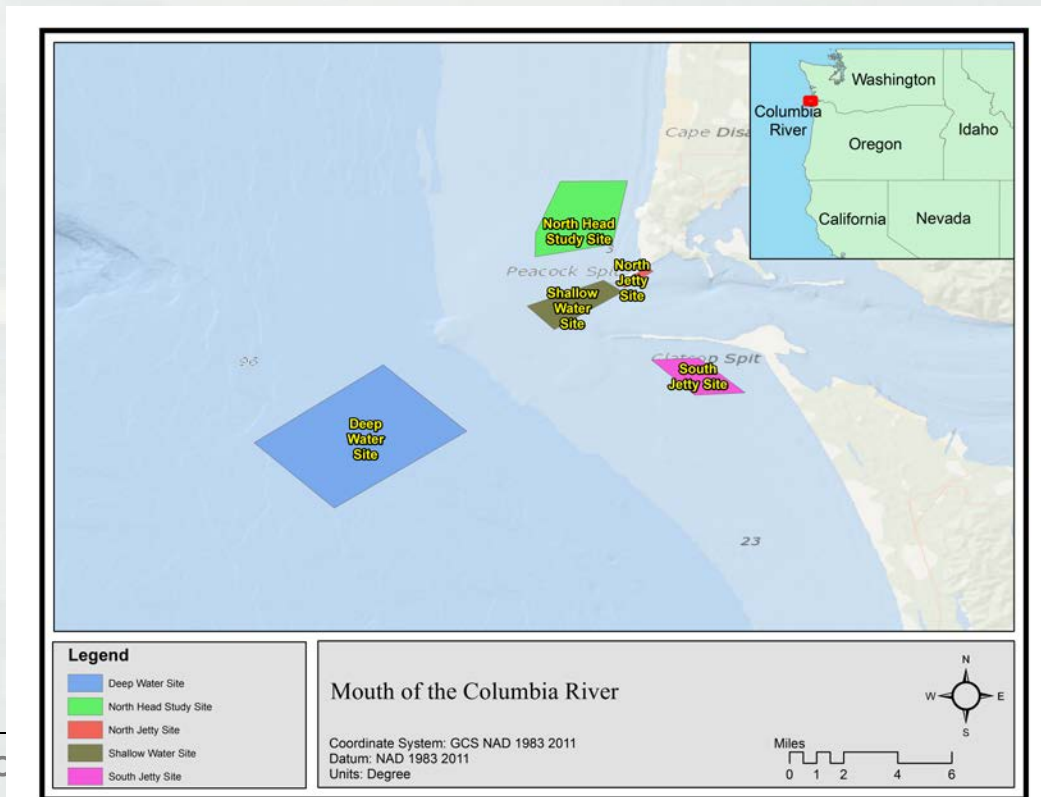
- Reduce overall costs by simultaneously providing benefits to multiple USACE business line
 - ▶ Navigation
 - ▶ Ecosystem Restoration
 - ▶ Flood Risk Management
- Improve regional sediment management
 - ▶ Maintain sediments in the littoral system
 - ▶ Target areas which are losing sediment (wetlands or beach/dune systems, for example)
- Increase strategic placement in USACE



BU maintenance material

Mouth of the Columbia River, OR

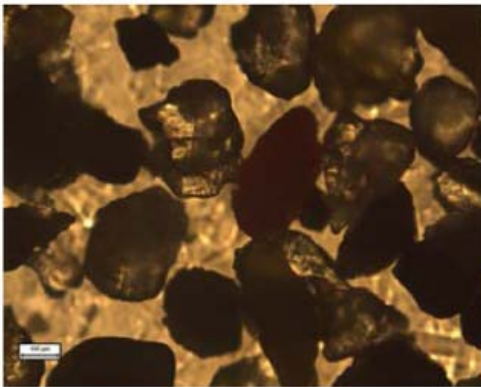
- Strategic Placement not new to USACE
- 6M m³ dredged annually, predominately sand
- Beach nourishment expensive



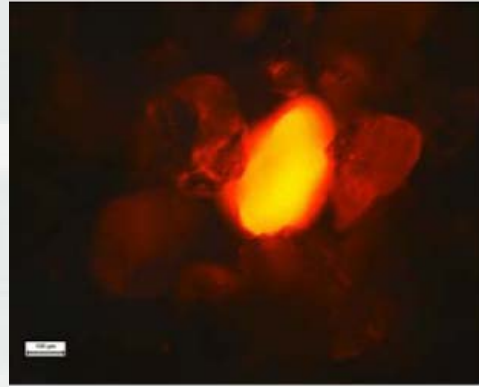
BU maintenance material

Mouth of the Columbia River, OR

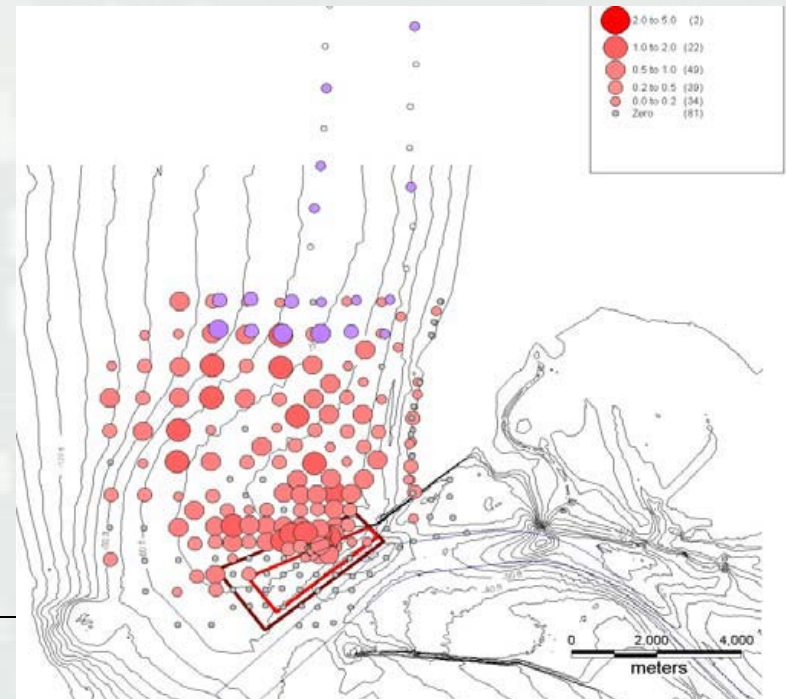
- Placement north and south of the jetties
- Littoral placement is cost-effective and sustainable – how can we optimize?
- Nourishment demonstrated through tracer



Tracer particle in native sand
white light only, no
fluorescence illumination.

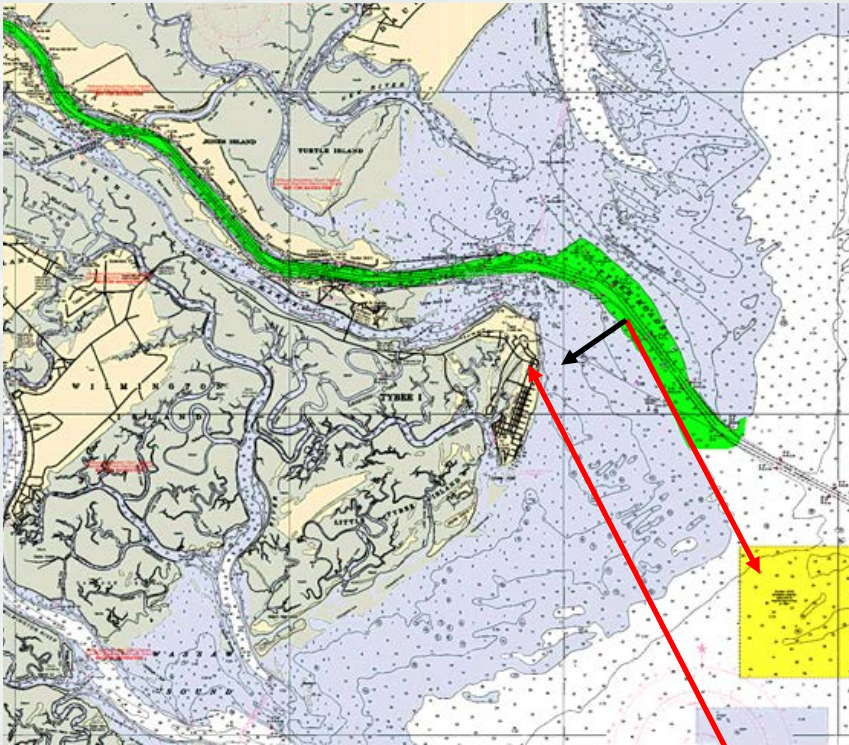


Tracer particle in native sand
No white light, fluorescence
illumination only.



BU of new maintenance material Savannah Entrance Channel, Georgia

- Maintenance material 75-85% sand
- Not acceptable for beach nourishment
- Separate navigation and FRM (beach fill) projects



- Reduce cost by combining projects
- Demonstrate fate of sand and fines at adjacent inlet
- Guidance for placement at Savannah

BU of new maintenance material Savannah Entrance Channel, Georgia



BU maintenance material Green Bay, Wisconsin

- CDF reached capacity
- Open-water placement not permitted
- Objective: use DM to re-construct island chain that has been eroding



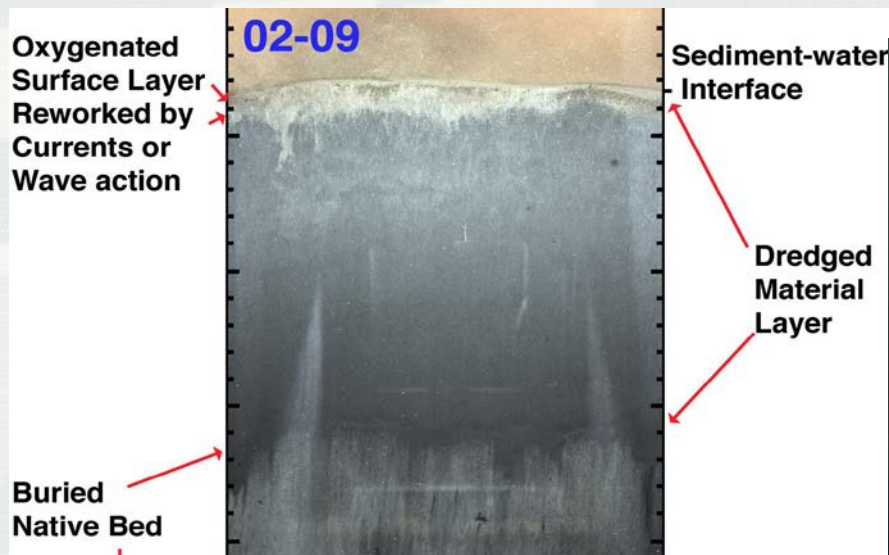
BU maintenance material Green Bay, Wisconsin

- Construct Wave Barrier
- Place dredged material behind barrier
- 20 years life (capacity ~ 2M m³)
- 110 ha of island and wetland habitat



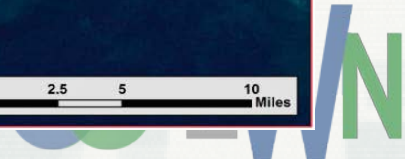
BU maintenance material Mobile Bay, Alabama

- Bay has 6M m³/yr budget deficit
- Budget deficit effects include loss of wetland and shoreline erosion
- 2012 emergency dredging → first in-bay placement in 35 years
- Opportunity to evaluate benefits/risks



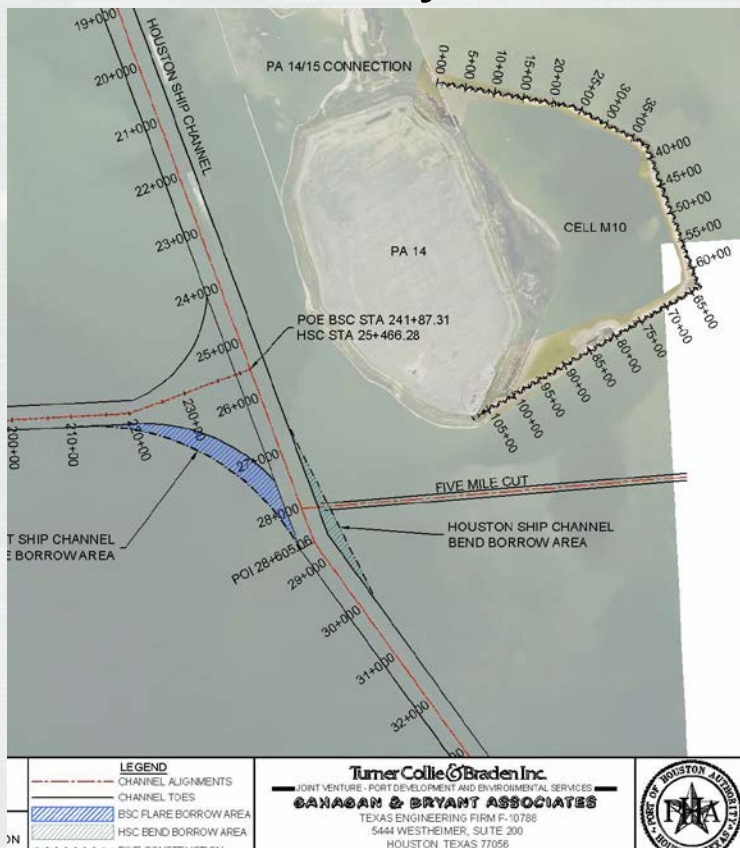
BU maintenance material

Mobile Bay, Alabama



BU of new work material Galveston Bay, Texas

- Channel Deepening → large amount of stiff clay
- Build berm to protect wetland construction site
- How will “dynamic” berm evolve?



- Renourishment as part of sustainable solution for dredged sediment mgmt
- Monitor hydrodynamics and morphology
- Develop guidance and screening level models

BU of new work material Galveston Bay, Texas



BU maintenance material Mississippi River, Missouri

- Upland sites filled
- Alternative:
 - ▶ Side-casting
 - ▶ Dynamic features

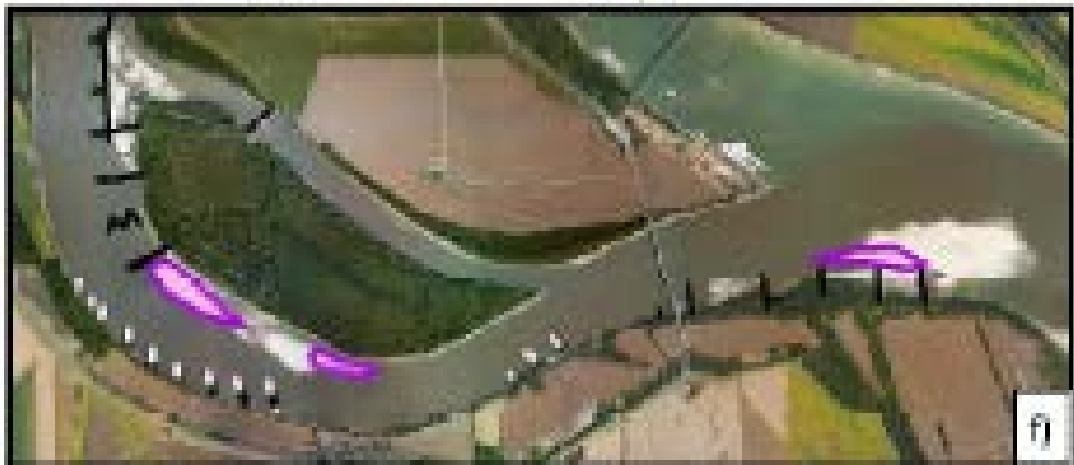


- Create bars and islands to protect riverbanks



- Sustainable solution to DMM: “dynamic” features permit reuse of the placement site
- Added benefit: habitat for fish and birds

BU maintenance material Atchafalaya River, Louisiana



Conclusions

- BU has been practiced by USACE for decades
- Strategic placement offers opportunities to develop sustainable solutions to supplement direct placement efforts
- EWN, strategic placement solutions require improved understanding of dynamics and response of the system
- Strategic placement solutions which support NNBF provide an opportunity to simultaneously support multiple business lines
- This can reduce overall costs for developing regional sediment management solutions

