OPEN WATER PLACEMENT AND CAPPING
- SITE MANAGEMENT AND CONTROLS

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Implemented controls should be commensurate with potential risk…
Open Water Placement
Risk Management Considerations

• Material Suitability
• Site Characterization
• Site Designation/ Selection
• Operational Considerations
• Design Evaluations
• Control Measures/ Management Actions
• Site Management Plan
• Monitoring
Material Suitability

• Is proposed dredged material suitable for open water placement at the site without special management or controls?
  - Contaminant impacts
    - MPRSA via OTM procedures
    - CWA via ITM procedures
  - Physical impacts
    - MPRSA sites via site designation
    - CWA sites project specific
Site Characterization

- Bathymetry
- Water depth/ stratification
- Current/ wave conditions
- On-site biological resources
- Proximity to sensitive resources
Site Designation/Selection

- **Ocean Site Designation (MPRSA)**
  - Formal Designation Process
  - EPA Designated General Use (Section 102)
  - USACE Designated Specific Projects (Section 103)
  - Final and Interim Designations

- **Site Selection in US Waters (CWA)**
Operational Considerations

- Equipment and placement techniques
- Time, rate, location, and methods of placement
- Quantity and frequency of materials placed
- Navigation and positioning
- Site controls, e.g. Buoys
- Coordinating site use among permit holders
- Monitoring
Placement Methods

Hopper, NY Mud Dump

Denny Way CSO

Submerged Diffuser

One Tree Island Marina

Tools to Evaluate Effectiveness

- **Water Column Dispersion**
  - STFATE or CDFATE or others

- **Placement technique, location, and rate**
  - Mound Development ~ MDFATE / MPFATE

- **Long-Term Stability and Site Capacity**
  - Consolidation ~ PSDDF
  - Erosion/ Consolidation ~ LTFATE

- **Far Field Transport ~ TABS, ICM, PTM**
Site 69b, TSS
Open Water Control Measures

• Water Column Management
  ➢ Submerged discharge
  ➢ Silt Curtains
  ➢ Geocontainers
  ➢ Treatment (polymer addition)
  ➢ Reduce discharge rate
  ➢ Promote mixing (dump while under tow)

• Benthic Management
  ➢ Treatment (not typically done)
  ➢ Lateral confinement or CAD
  ➢ Capping with cleaner dredged material or armor
  ➢ Geocontainers
Operational Modifications

• Select different equipment type
• Select different equipment size
• Control placement operation
  - Location
  - Rate
  - Method
STFATE Evaluation of Alternatives
3000 CY Barge – Single Dump

Peak Lead Concentrations

Violation of WQS outside the mixing zone

WQS = 0.032 mg/L
STFATE Evaluation of Alternatives
1500 CY Barge – Single Dump

Peak Lead Concentrations

No violation of WQS outside the mixing zone

WQS = 0.032 mg/L
STFATE Evaluation of Alternatives
3000 CY Barge – Spreading

Peak Lead Concentrations

No violation of WQS outside the mixing zone

WQS = 0.032 mg/L

Max Conc on Grid
Max Conc Outside M.Z.
M.Z. Standard

Dredged Material Assessment and Management Seminar
24-26 May 2011, Jacksonville, FL
Submerged Discharge

- Can reduce water column dispersion
- Can improve accuracy of placement
- Pipeline configurations
- Diffuser design available
- Tremie technology

Barge with Tremie

Submerged Diffuser
Silt Curtains

• **Purpose**
  - To control SS/turbidity in the water column (mainly at dredging site)

• **Advantages**
  - Can be used to protect sensitive environments
  - Can allow particles to settle out of the upper water column
  - Commercially available

• **Limitations**
  - Strong currents
    - (> 1 knot/1.5 fps)
  - High winds
  - Debris/Ice
  - Excessive wave heights
  - Fluctuating water levels
  - Must allow traffic in/out
    - Bubble curtains

Silt Curtains

White or Yellow Float Collar

Monofilament or Impermeable Vinyl Curtain

Brass Grommets

Optional 5/16" Chain curtain ballast

Silt Curtain

Float

PIPELINE

TURBID WATER

FLOCCULATED MATERIAL

SILT CURTAIN

CURRENT

FLUID MUD

BOTTOM SEDIMENT

EFFECTIVE SKIRT DEPTH

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Geo-containers

- Geotextiles used for solids containment
- Can reduce water column dispersion
- Can reduce capping requirements
- Engineering design approaches available
- Operational aspects need refinement
Purpose - Manage risks from contaminated material by:

- **Physical isolation of contaminants**
- **Reduction of contaminant flux**
- **Physical stabilization**
  - Limiting losses during placement
  - Reducing mobilization and erosion
CAD Approaches

- **Existing Pits/Fills or Excavated Pits** – (most stable)
- **Lateral Confinement**

![Confined Aquatic Disposal](image1)

- **Mounds**
- **In Situ Capping**

![Level Bottom Capping (LBC)](image2)
Capping Considerations

• Placement and design of constructed cells

• Placement techniques for unsuitable material
  ➢ Controlled, accurate

• Placement techniques for cap material
  ➢ Even coverage
  ➢ Avoid displacing unsuitable material

• Cap design – account for:
  ➢ Erosion
  ➢ Bioturbation
  ➢ Recolonization
  ➢ Consolidation
  ➢ Contaminant transport
  ➢ Operational factors
Cap Design Specifications

• Cap thickness designed to prevent breach from:
  - Props
  - Anchors
  - Fishing trawlers/nets
  - Storm waves
  - Flood currents

• Materials
  - Erosion control – armor, cohesive
  - Contaminant control
  - Habitat

Example Cap Design

12” GRADED ARMOR STONE
GEOTEXTILE FABRIC
20” SAND MATERIAL
SEDIMENT
BEDROCK
Capping Materials

- Granular Materials
  - Sediments
  - Soils
  - Quarry run materials

- Fabrics, Membranes and Specialty Materials

- Armor Stone

- Amendments
  - Adsorbents
  - Reactants
Cap Processes

- **Physical**
  - Erosion and armoring
  - Deposition
  - Consolidation
  - Mixing and disruption

- **Chemical**
  - Diffusion
  - Advection/Convection
  - Biotic Degradation
  - Abiotic Degradation
  - Adsorption/Retardation
  - Volatilization/Stripping by Gas Transport

- **Biological**
  - Recolonization
  - Bioturbation

Conceptual Illustration of Bioturbation Activity vs. Sediment Depth
Recovery/Cap Model

- Long term effectiveness evaluations
Cap Placement Methods

Eagle Harbor

Baffle Plate on MS River

Sprayed slurry system placing sand at Soda Lake, WY

Simpson-Kraft Sand Box

Sand Spreader Barge
Capping Guidance

- **USACE guidance for DM capping**

- **EPA (ARCS) guidance for ISC**
  - [http://www.epa.gov/glnpo/sediment/iscmain/index.html](http://www.epa.gov/glnpo/sediment/iscmain/index.html)

References and Other Resources
Site Management Plans

- Roles and responsibilities
- Management objectives
- Specifics on operations and management
- Inspection and enforcement
- Monitoring requirements
LA-3 Ocean Dredge Material Disposal Site

Estimated barge location at initial dump point:
offset from tug by 250 feet
at 25 degrees azimuth

Note: The coordinates for trips #667, and #1116 are outside of the map extent.

LA-3 center coordinates:
33°31'42" N 117°54'48" W

Mis-identified dump target:
33°31'25" N 117°54'29" W

Trips 1-975  Trips 976-1238
- <1000 feet  - <1000 feet
- >1000 feet  - >1000 feet

100  200  400  600  800  1000 Feet

Cartography by: Tally Cleveland, Ahlton Corp. 10/14/29

EPA
Region 3 GIS Center
Open Water Site Monitoring

- **Need for Monitoring**
  - Evaluate effectiveness of management
  - Evaluate environmental impacts
  - Recommend modifications

- **Monitoring Plan**
  - Clear objectives
  - Testable hypotheses
  - Methods and equipment

- **Management Actions**

- **Silent Inspector**
  - Location
  - Volume
Maintenance and Rehabilitation

• Assess findings to establish needs by comparing with performance predictions, considering natural processes
  ➢ If in agreement or better, adapt monitoring plan to findings
  ➢ If contradicts predictions, determine processes of interest
  ➢ Perform process-based confirmation monitoring
  ➢ Determine maintenance and rehabilitation needs

• Maintenance: Restores performance in response to extreme events

• Rehabilitation: Upgrades performance to achieve long-term performance goals
Open Water Monitoring Tools
Summary

• Site selection / characterization
• Material suitability
• Planning the disposal operation
  ➢ Models available
• Site controls
• Site management plan
• Monitoring
Questions??