OPEN WATER SITE MANAGEMENT AND CONTROLS

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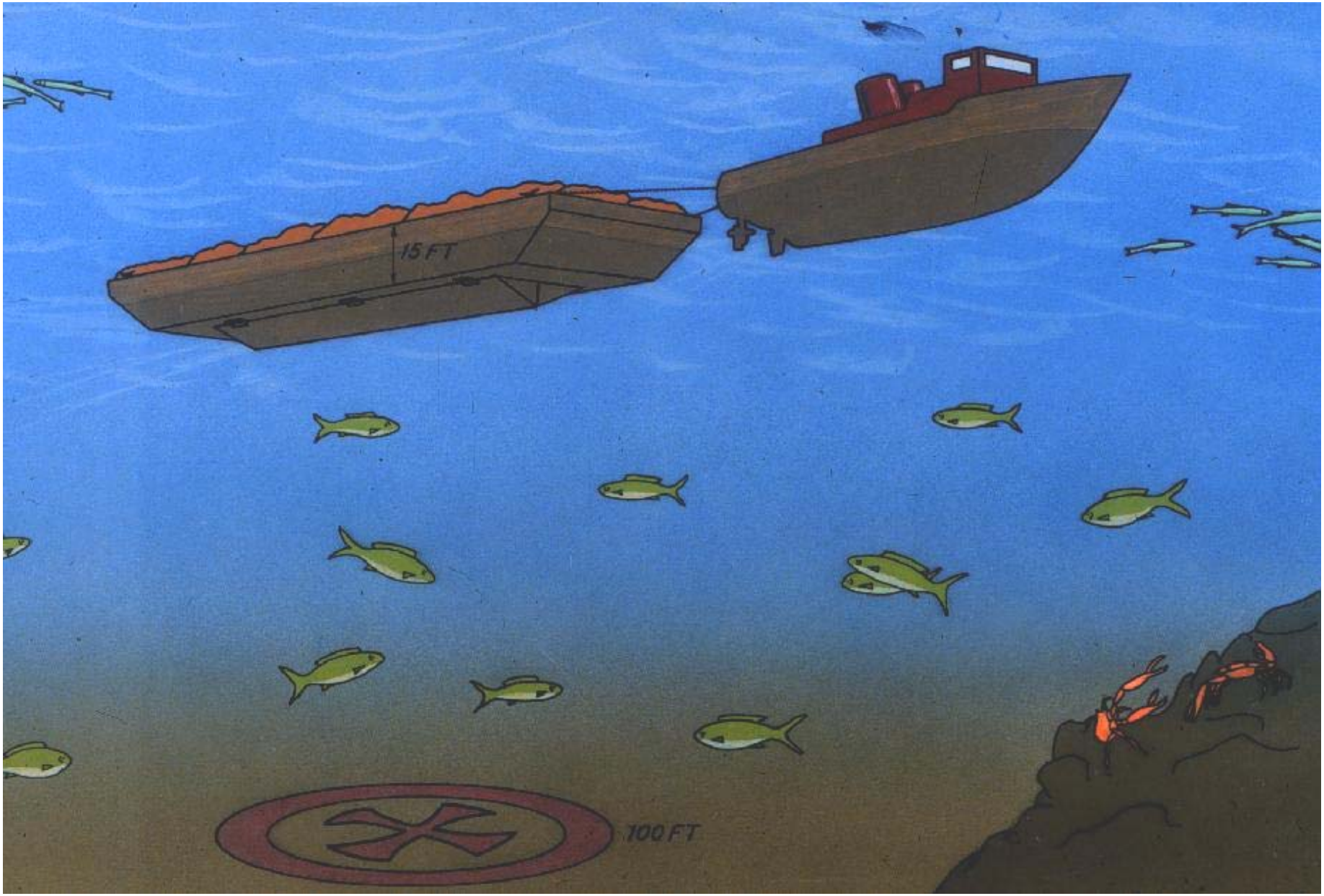
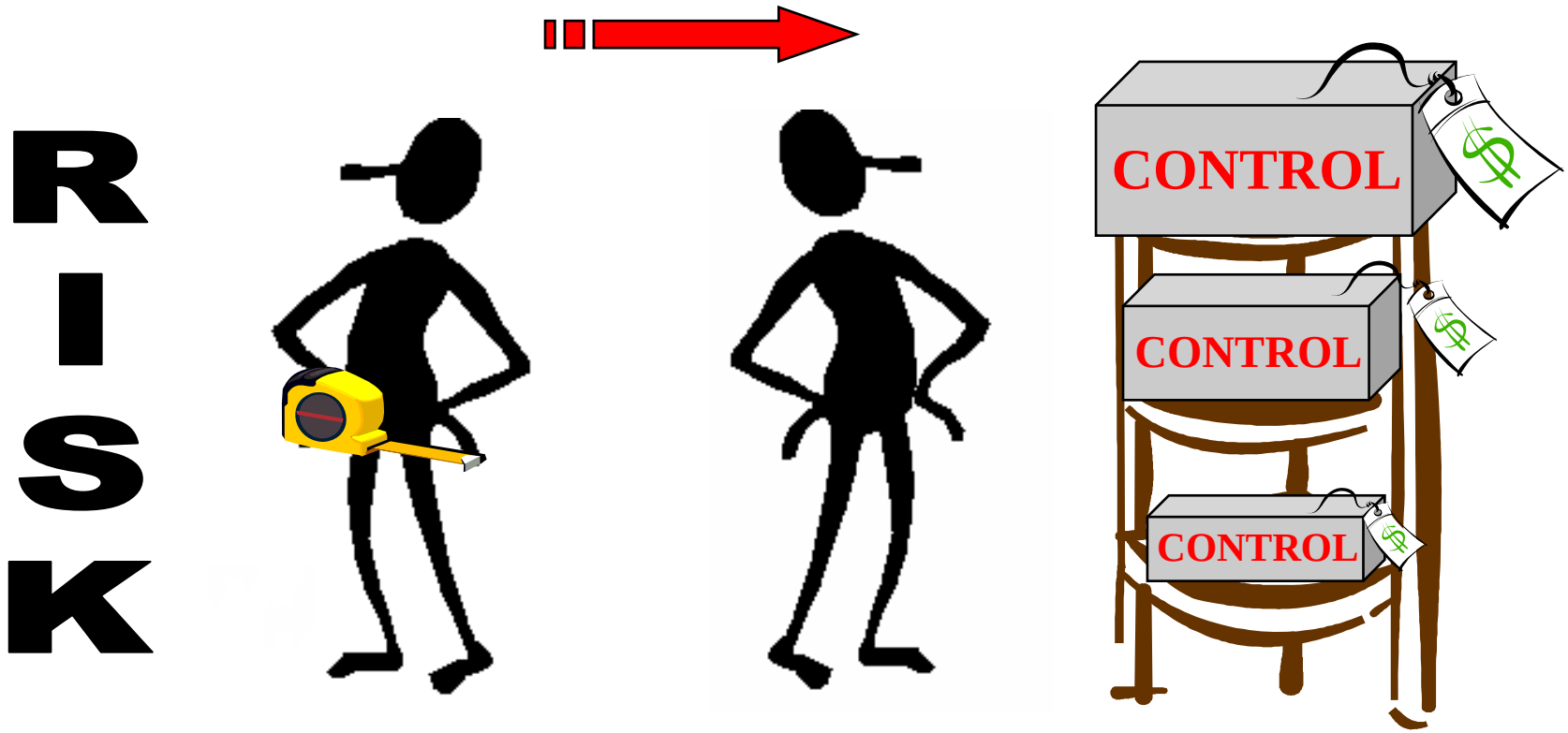

15 FT
100 FT

Risk Management

Risk Assessment

Risk Management



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

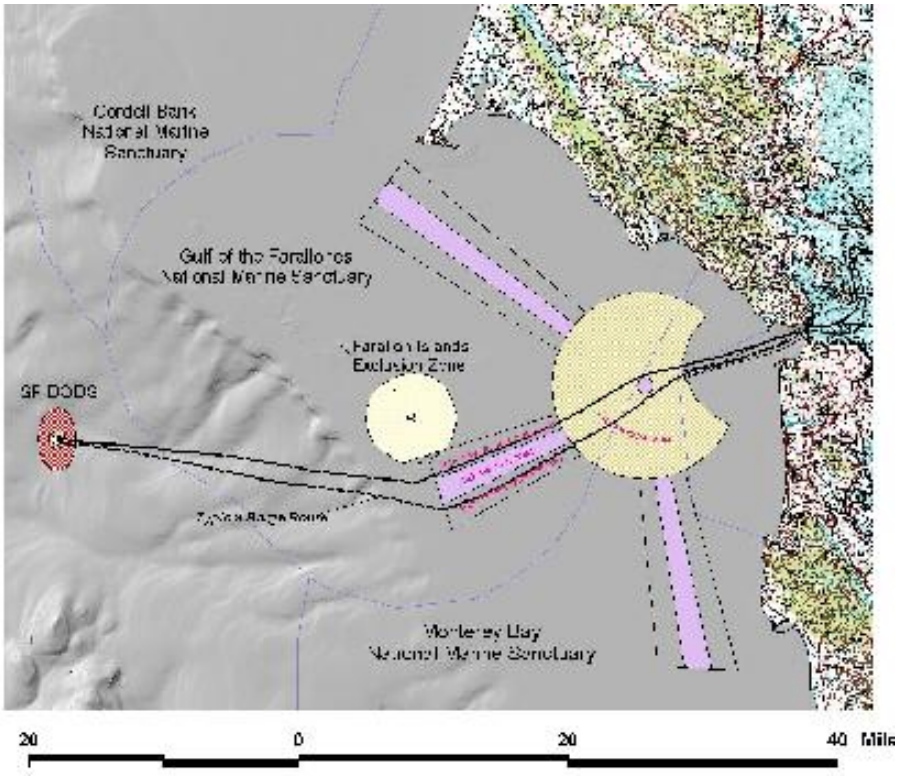
- **Is proposed dredged material suitable for open water placement at the site without special management or controls?**
  - Physical impacts
    - MPRSA sites via site designation
    - CWA sites project specific
  - Contaminant impacts
    - MPRSA via OTM procedures
    - CWA via ITM procedures

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)**



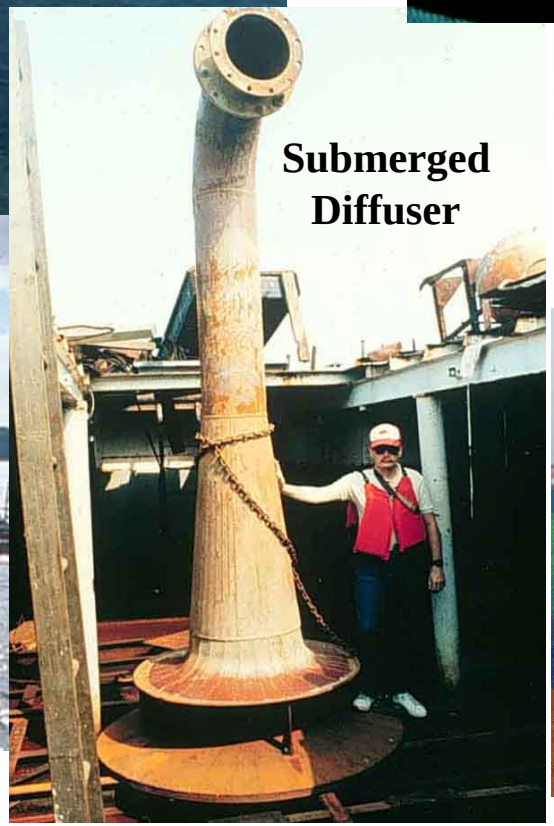
Operational Considerations

- 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

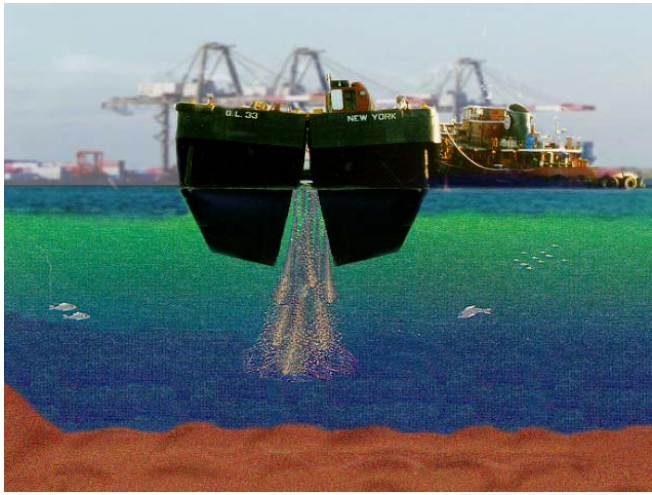
One Tree Island Marina



Submerged Diffuser

See TN at:
http://el.erdc.usace.army.mil/elpubs/pdf/doerr9.pdf

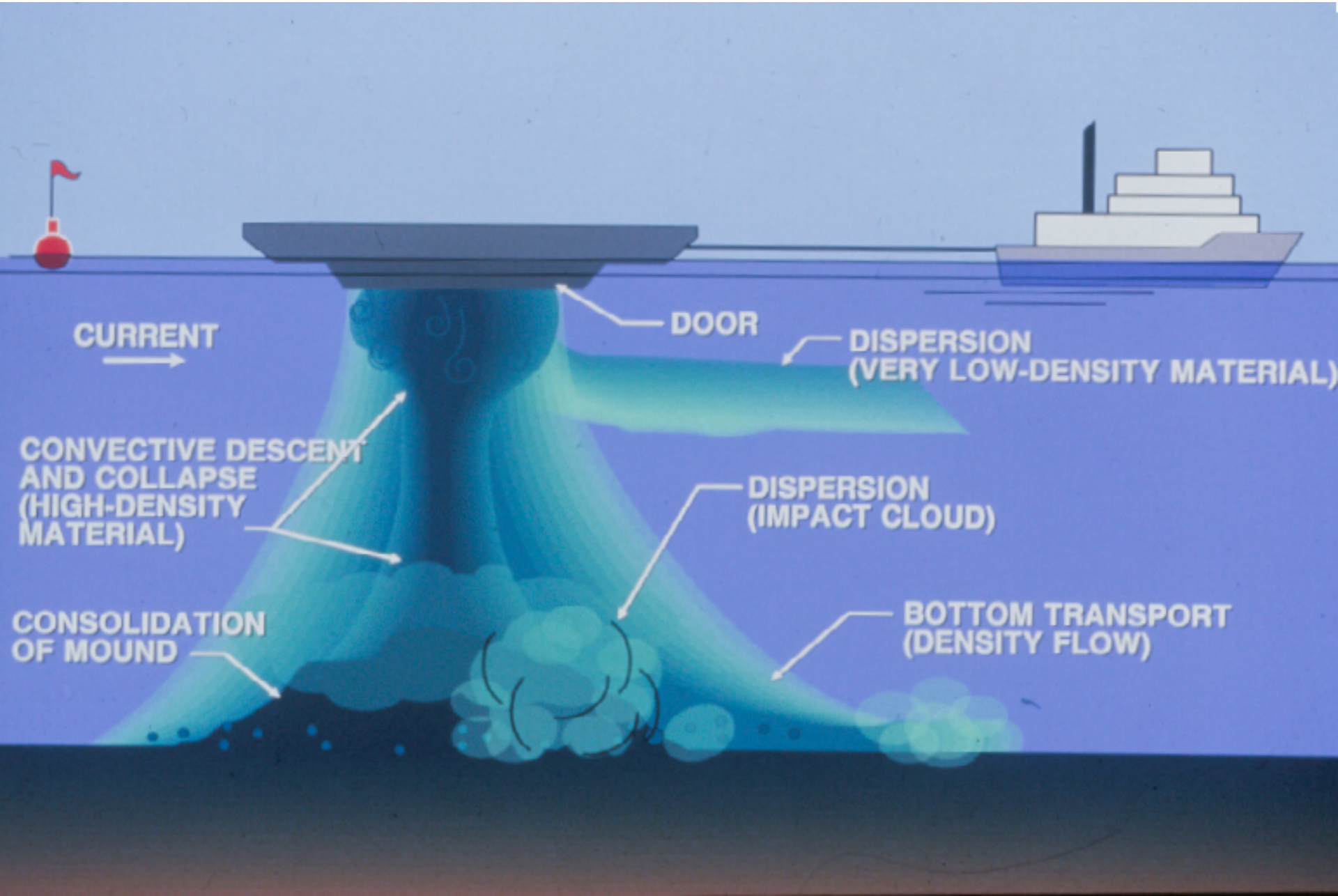
Denny Way CSO



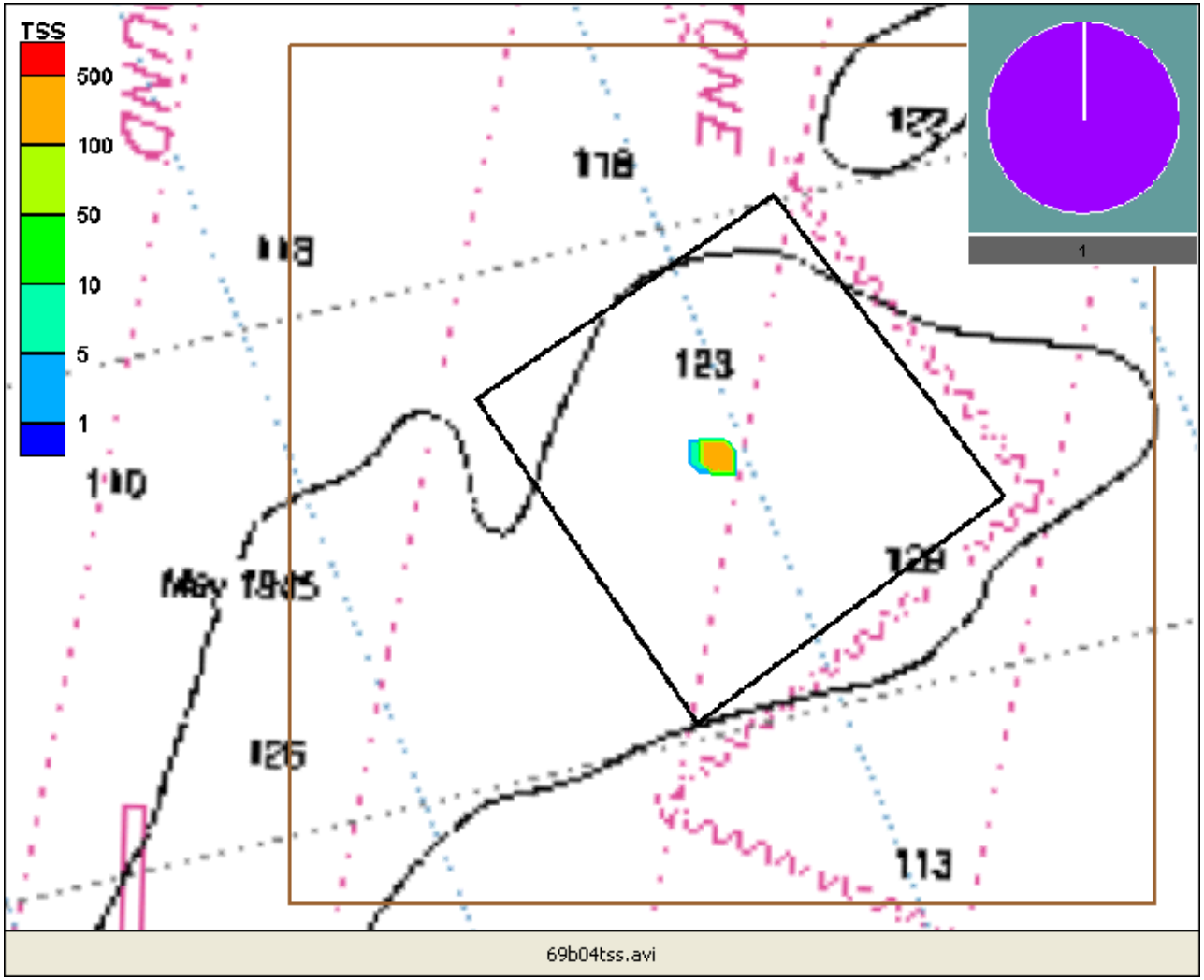
Tools to Evaluate Effectiveness

- **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**

STFATE


CURRENT
DOOR
DISPERSION
(VERY LOW-DENSITY MATERIAL)
CONVECTIVE DESCENT
AND COLLAPSE
(HIGH-DENSITY
MATERIAL)
DISPERSION
(IMPACT CLOUD)
CONSOLIDATION
OF MOUND
BOTTOM TRANSPORT
(DENSITY FLOW)

Site 69b, TSS

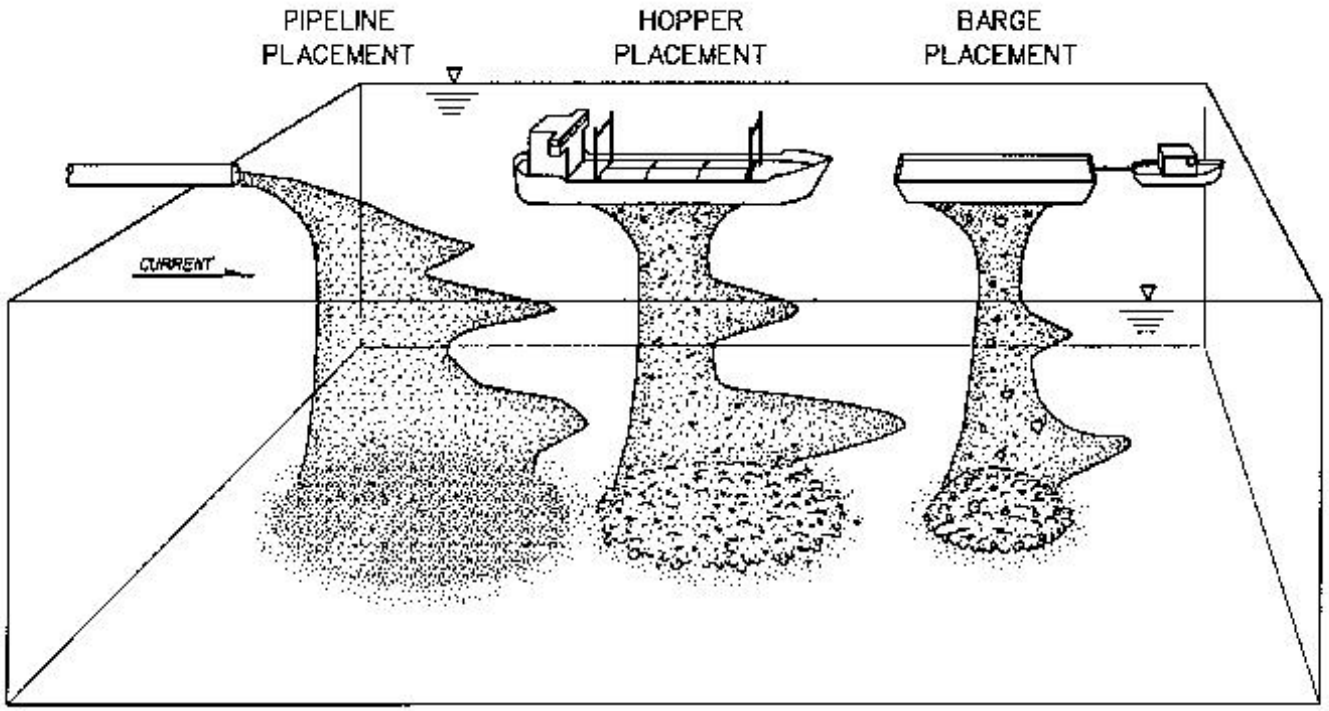


Open Water Control Measures

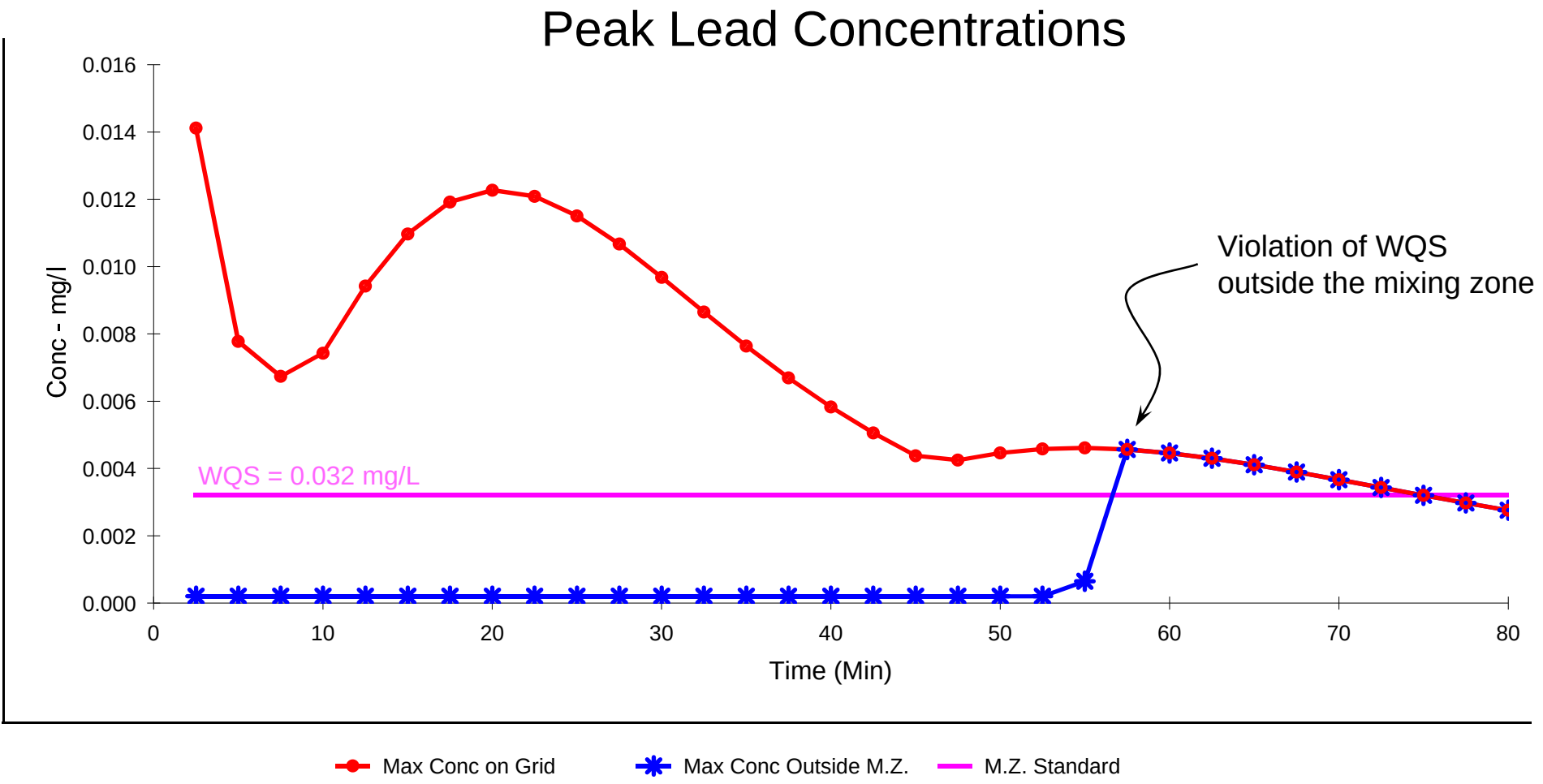
- **Water Column Management**
  - Submerged discharge
  - Silt Curtains
  - Geocontainers
  - Treatment (polymer addition)
  - Reduce discharge rate
  - Promote mixing (dump while under tow)
- **Benthic Management**
  - Treatment (not typically done)
  - Lateral confinement or CAD
  - Capping with cleaner dredged material or armor
  - Geocontainers

Operational Modifications

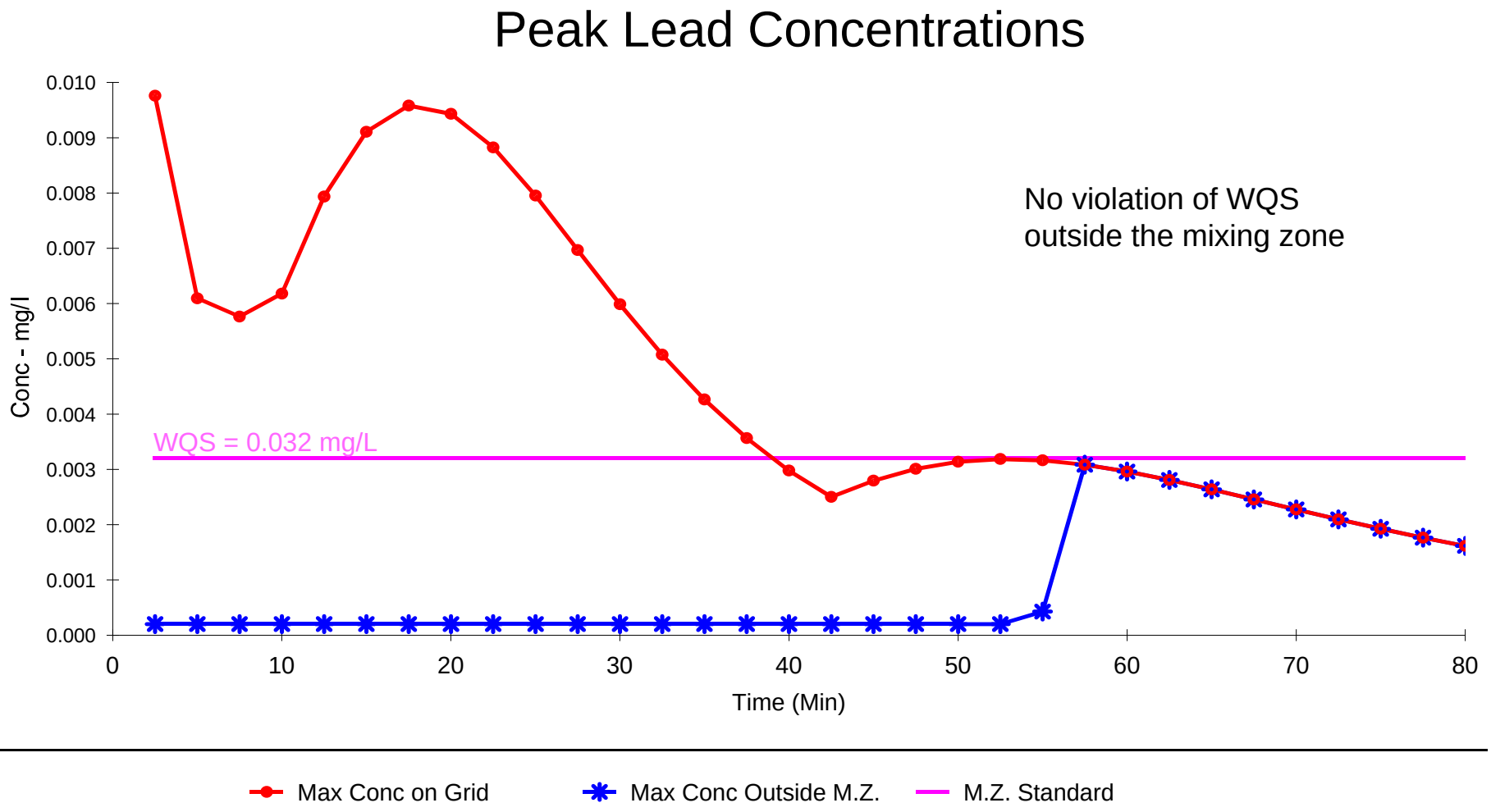
- **Select different equipment type**
- **Select different equipment size**
- **Control placement operation**
  - Location
  - Rate
  - Method



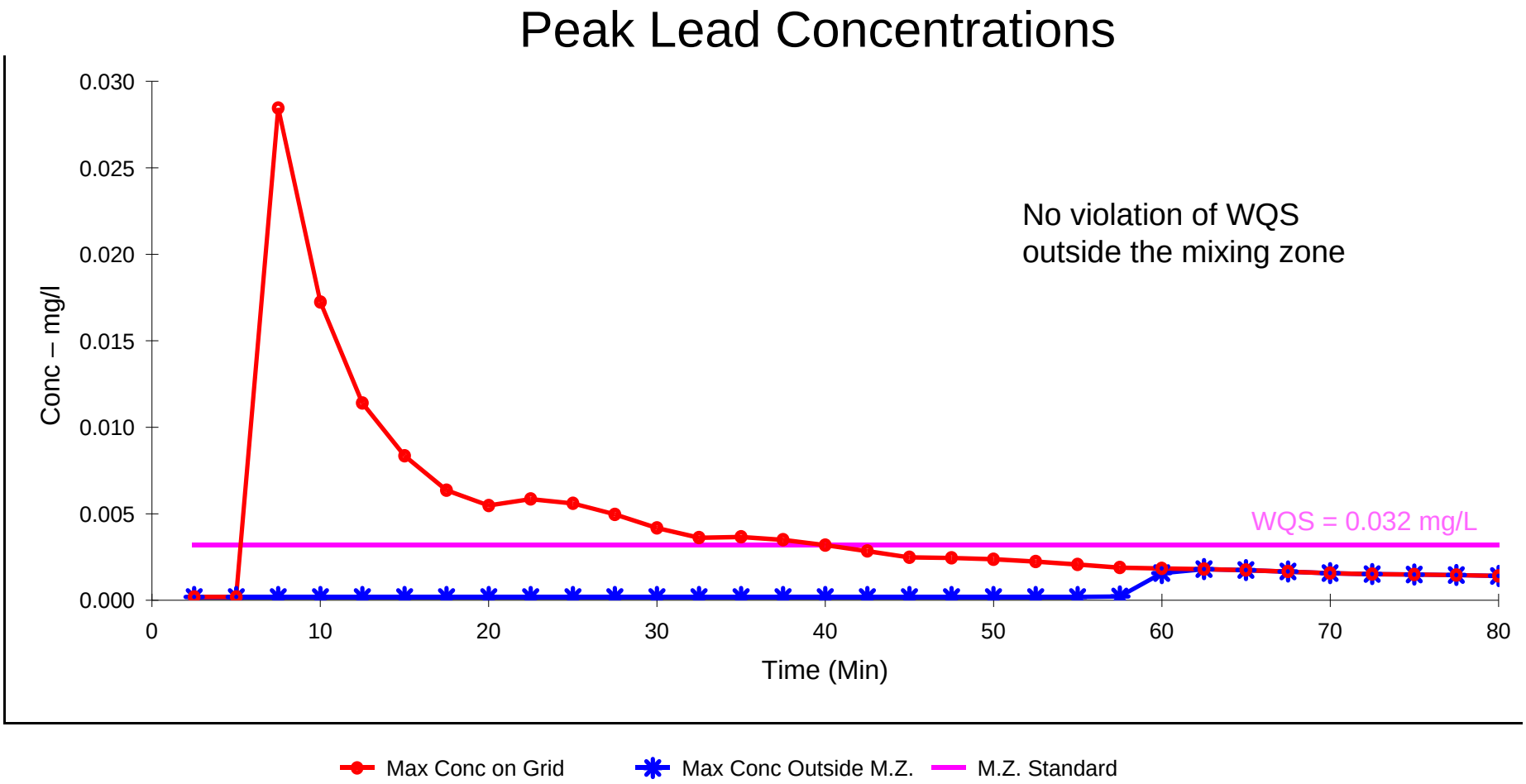
STFATE Evaluation of Alternatives 3000 CY Barge – Single Dump



STFATE Evaluation of Alternatives
1500 CY Barge – Single Dump



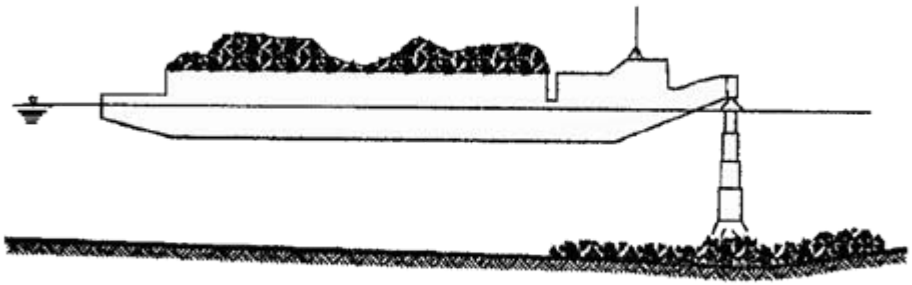
STFATE Evaluation of Alternatives 3000 CY Barge – Spreading



Submerged Discharge

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

Submerged Diffuser



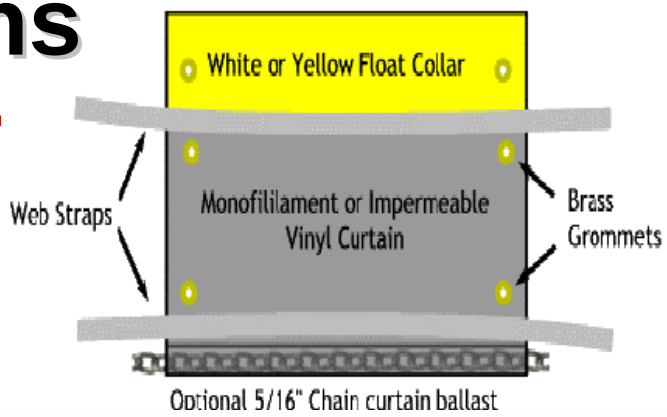
Barge with Tremie

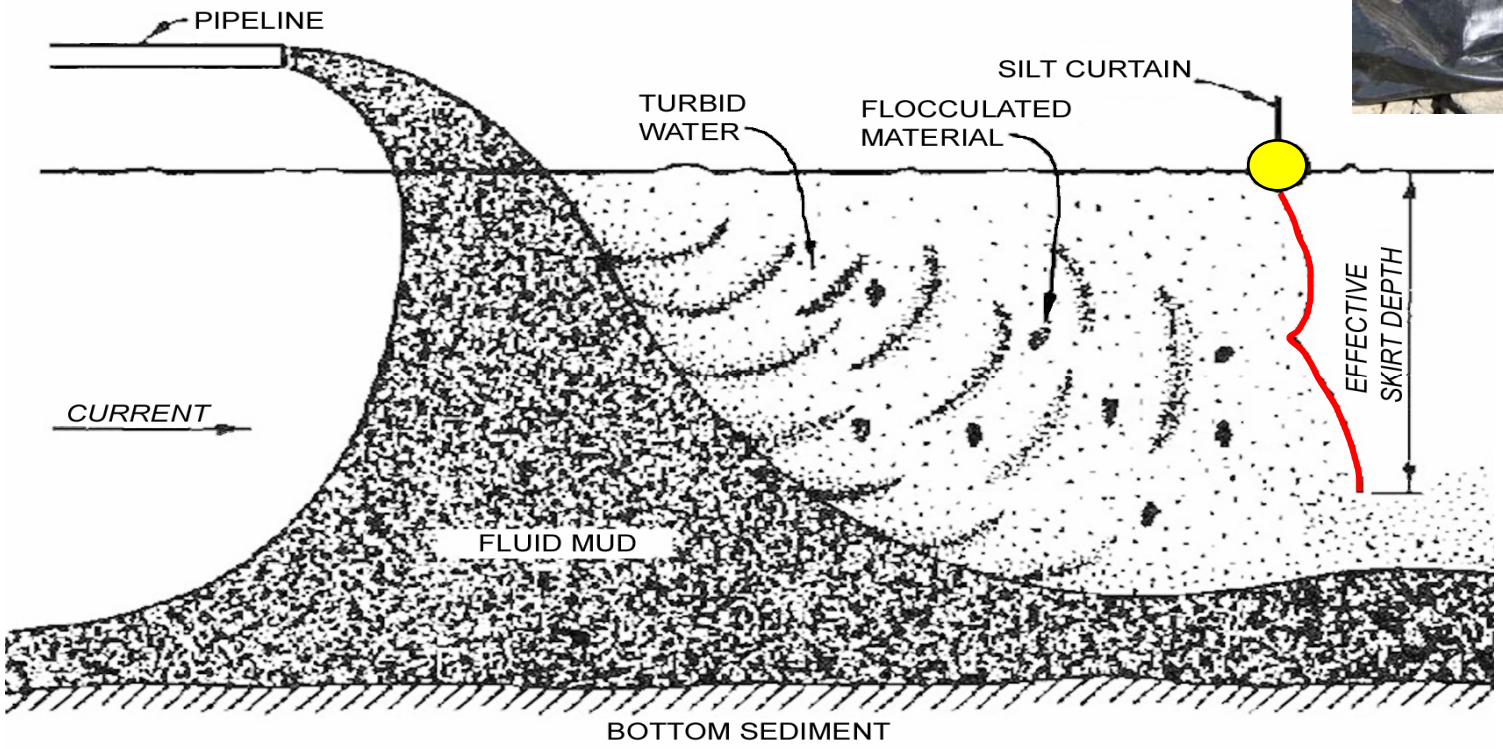
Silt Curtains

- **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

- **http://el.erdc.usace.army.mil/elpubs/pdf/doere21.pdf**

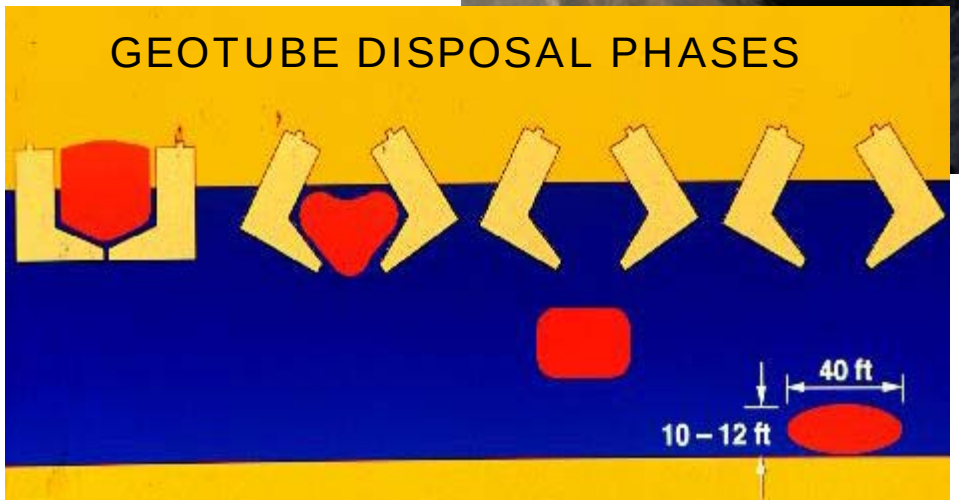
Silt Curtains





Geo-containers

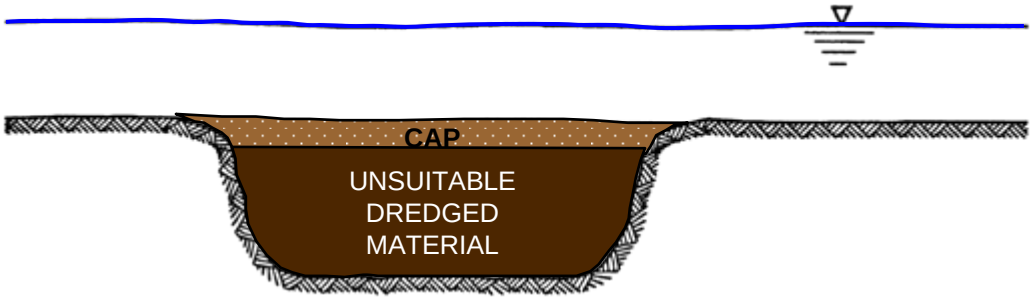
- Geotextiles used for solids containment
- Can reduce water column dispersion
- Can reduce capping requirements
- Engineering design approaches available
- Operational aspects need refinement


GEOTUBE DISPOSAL PHASES
40 ft
10 – 12 ft

CAD/Capping

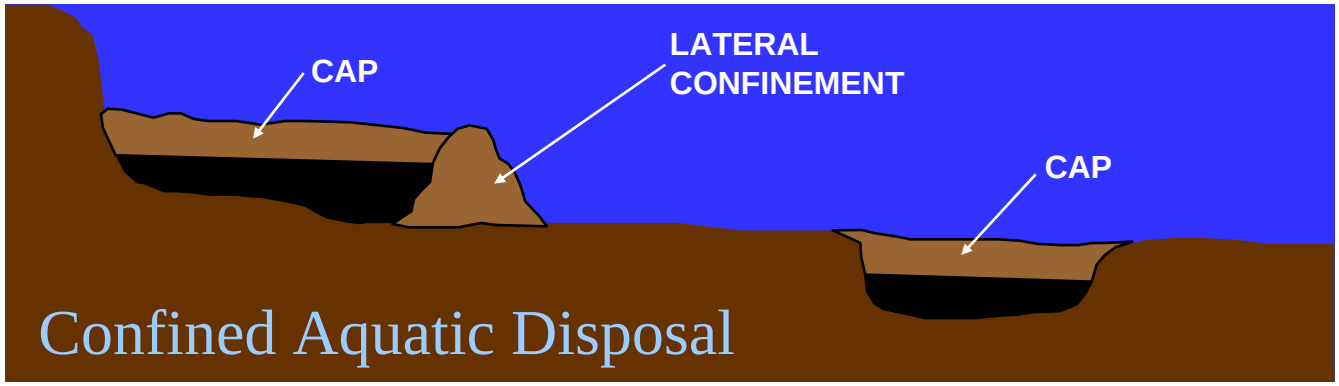
Purpose - Manage risks from contaminated material by:

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

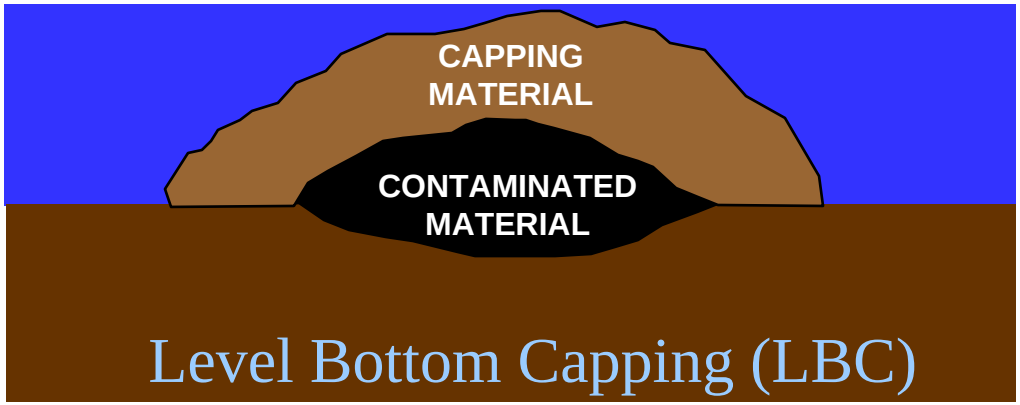


CAD Approaches

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

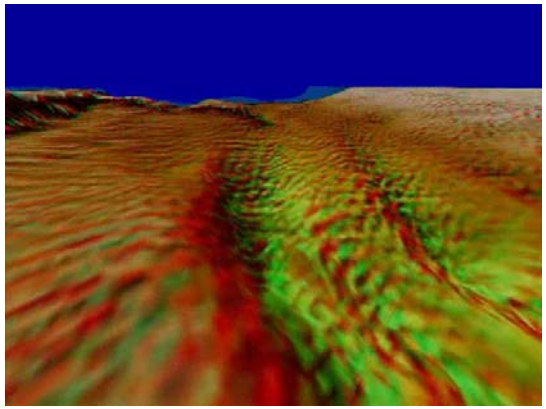


- **Mounds**
- **In Situ Capping**

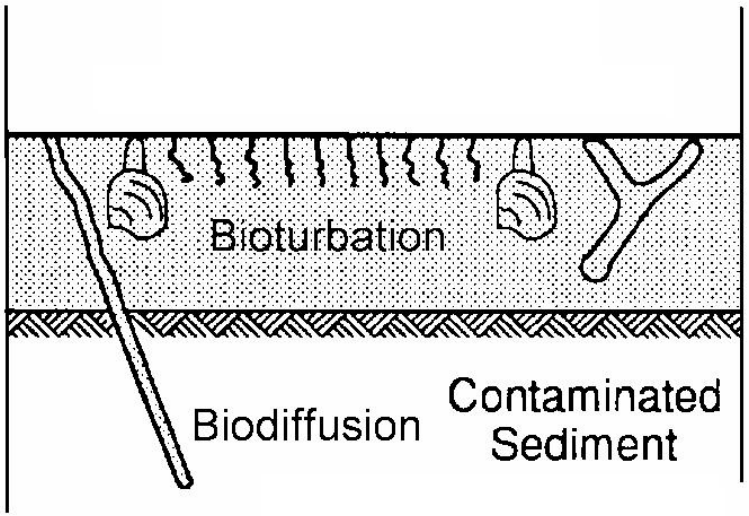


Capping Considerations

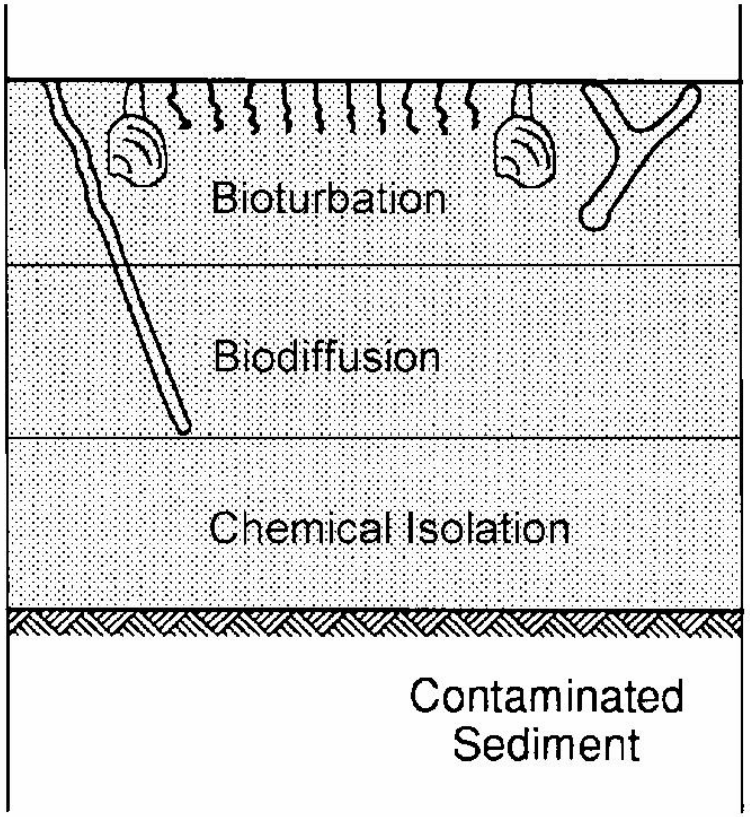
- **Placement and design of constructed cells**
- **Placement techniques for unsuitable material**
  - Controlled, accurate
- **Placement techniques for cap material**
  - Even coverage
  - Avoid displacing unsuitable material
- **Cap design – account for:**
  - Erosion
  - Bioturbation
  - Recolonization
  - Consolidation
  - Contaminant transport
  - Operational factors



Cap Designs



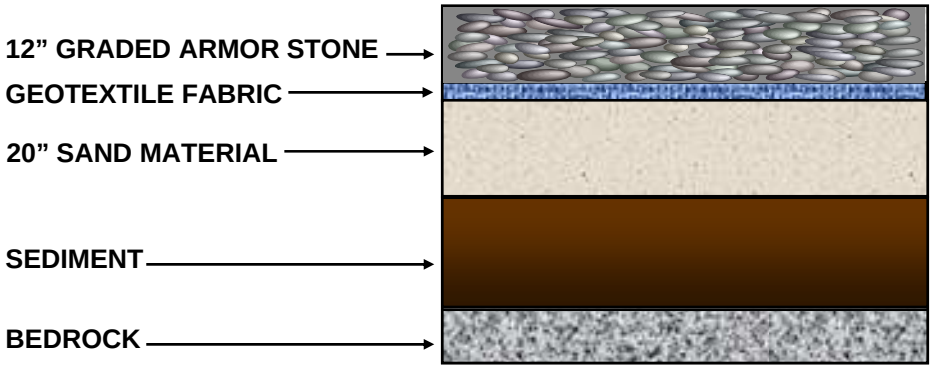
Minimal Isolation Capping



Isolation Capping

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



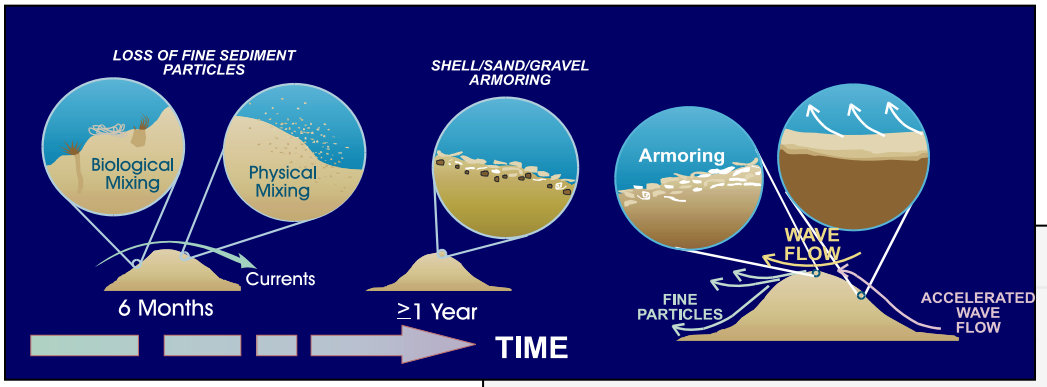
Example Cap Design

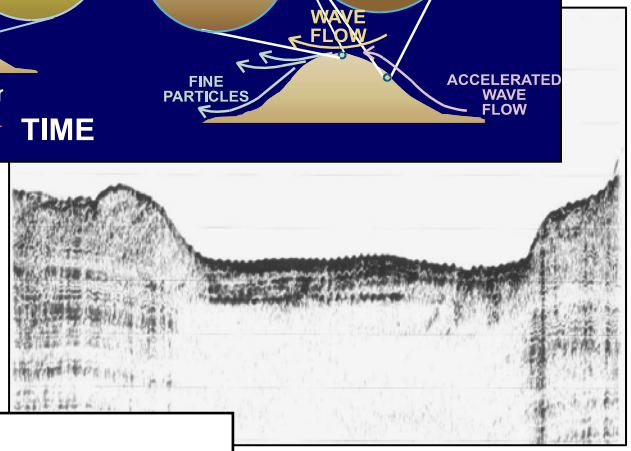
Capping Materials

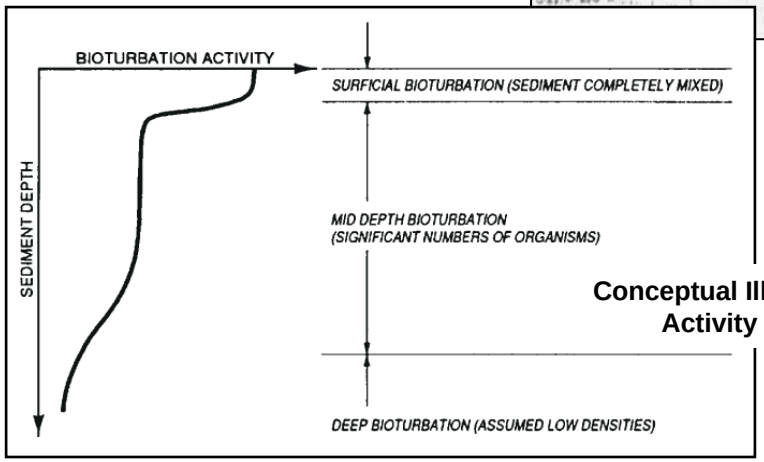
- **Granular Materials**
  - Sediments
  - Soils
  - Quarry run materials
- **Fabrics, Membranes and Specialty Materials**
- **Armor Stone**
- **Amendments**
  - Adsorbents
  - Reactants

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



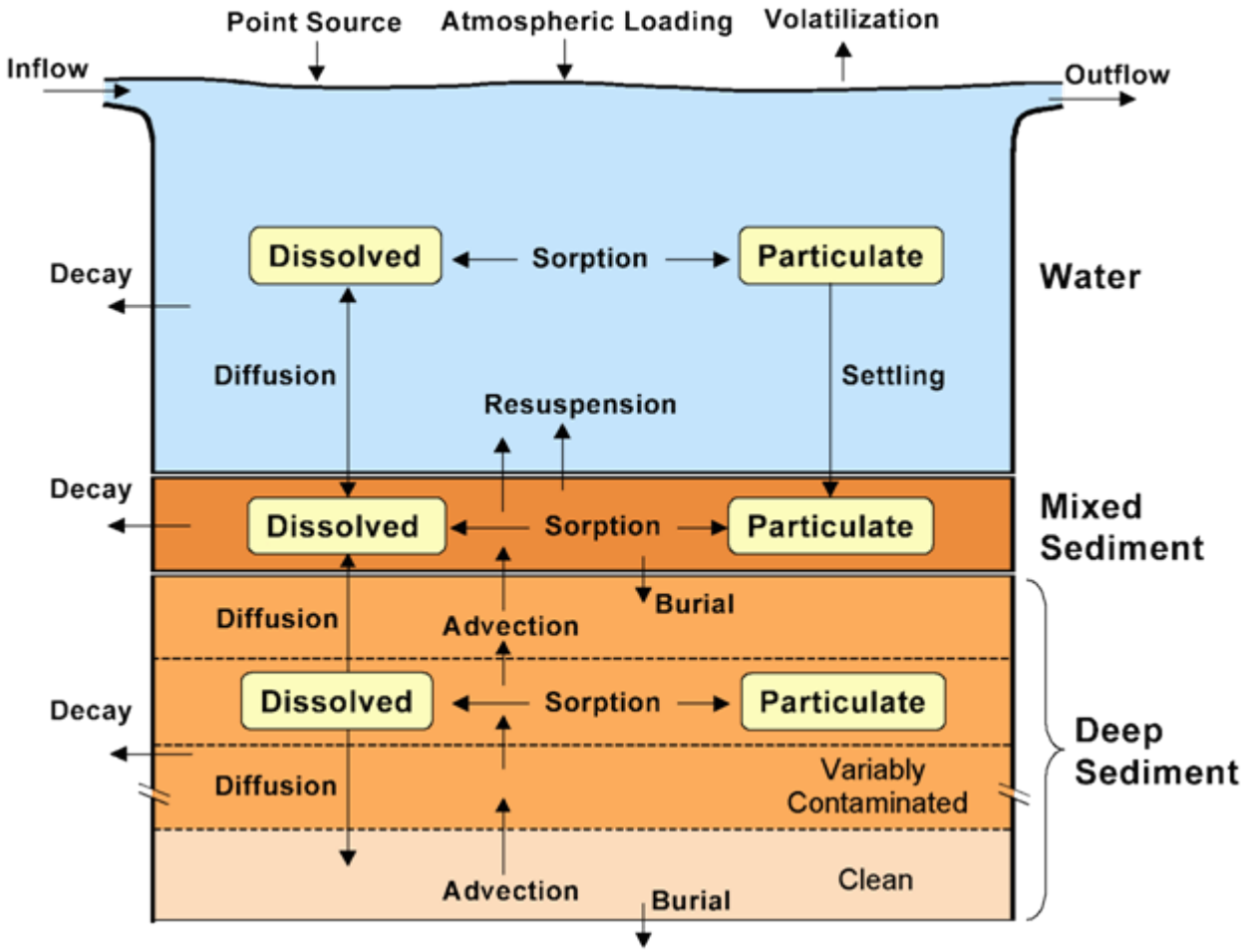




Conceptual Illustration of Bioturbation Activity vs. Sediment Depth

Recovery/Cap Model

- **Long term effectiveness evaluations**



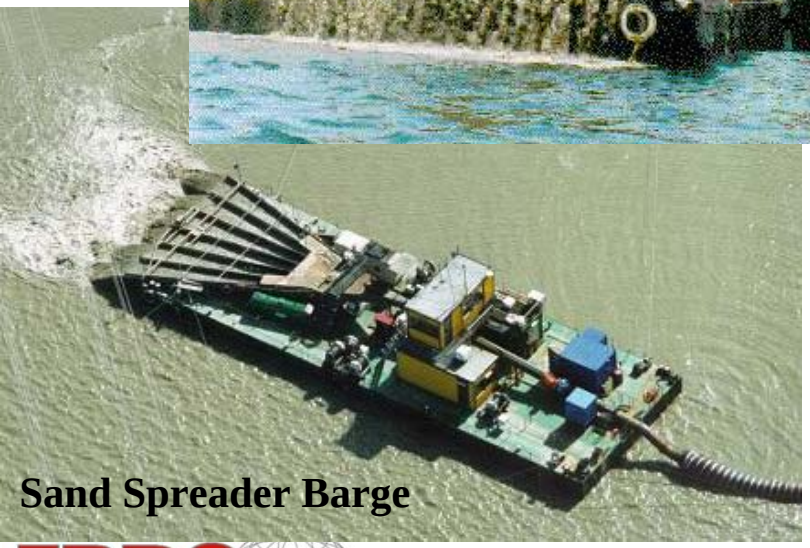
Cap Placement Methods


Baffle Plate on MS River


Eagle Harbor


Eagle Harbor

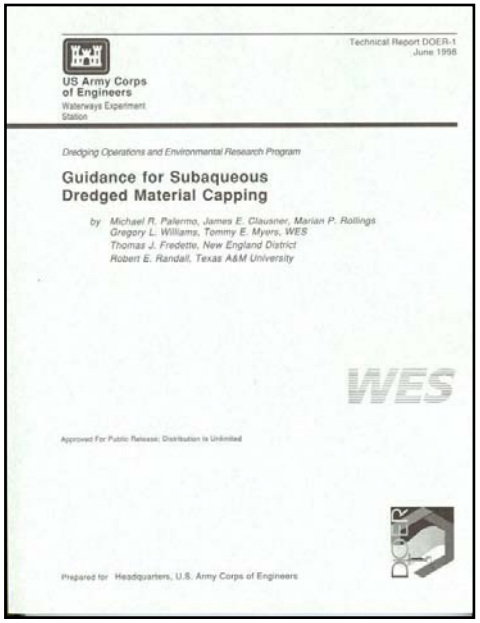

Sprayed slurry system placing sand at Soda Lake, WY

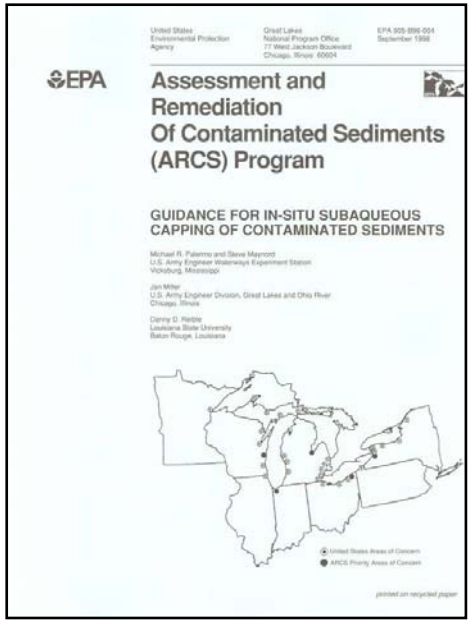

Sand Spreader Barge


Simpson-Kraft Sand Box

Capping Guidance

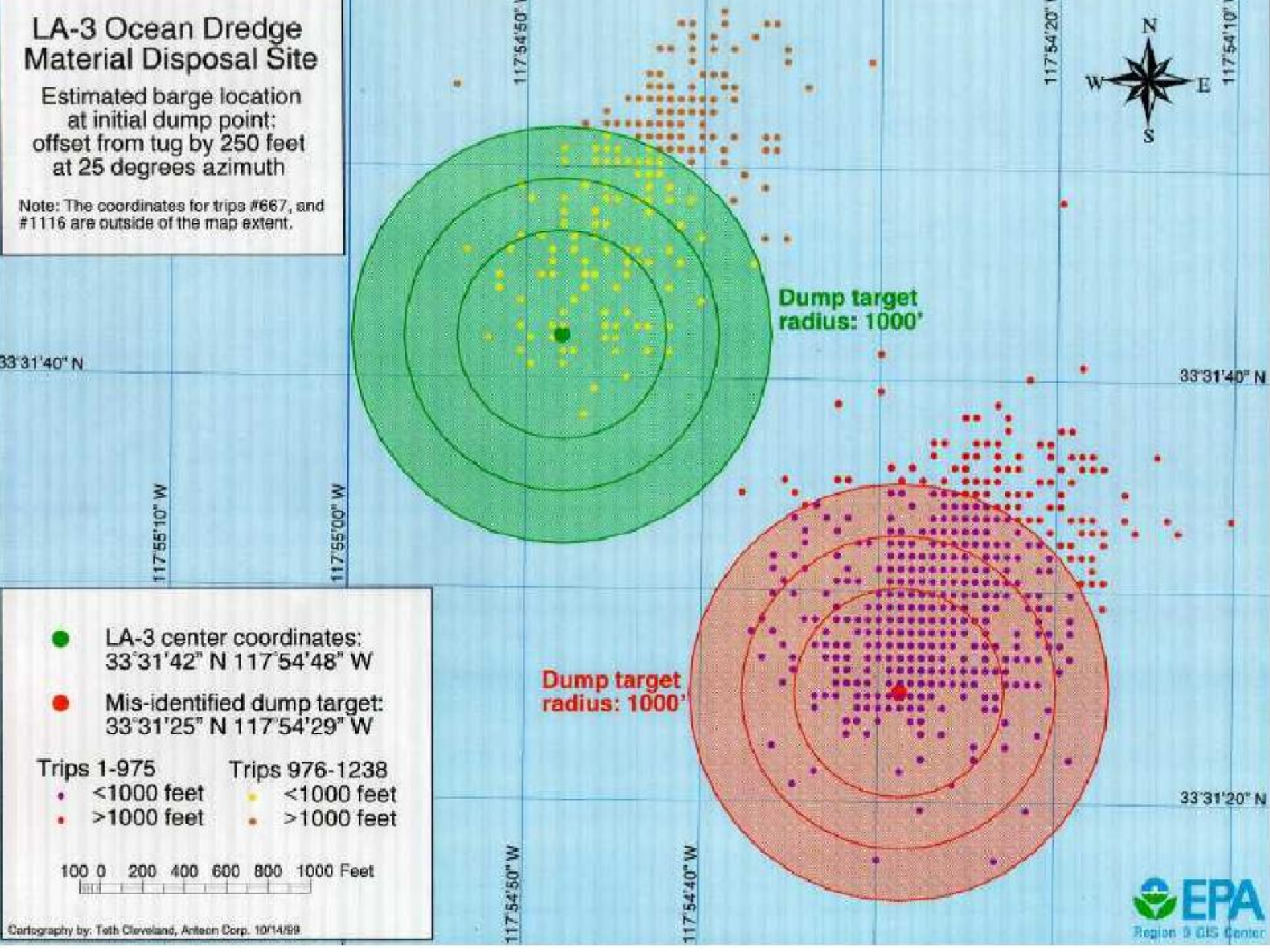
- **USACE guidance for DM capping**
  - http://www.wes.army.mil/el/dots/doer/pdf/trdoer1.pdf
- **EPA (ARCS) guidance for ISC**
  - http://www.epa.gov/glnpo/sediment/iscmain/index.html





Site Management Plans

- Roles and responsibilities
- Management objectives
- Specifics on operations and management
- Inspection and enforcement
- Monitoring requirements

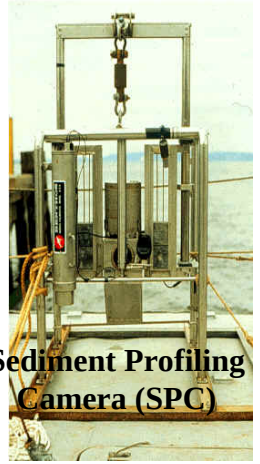

LA-3 Ocean Dredge Material Disposal Site
Estimated barge location at initial dump point: offset from tug by 250 feet at 25 degrees azimuth
Note: The coordinates for trips #667, and #1116 are outside of the map extent.
Dump target radius: 1000'
Dump target radius: 1000'
33°31'40" N
33°31'20" N
117°55'10" W
117°55'00" W
117°54'50" W
117°54'40" W
117°54'20" W
117°54'10" W
N
S
E
W
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
<1000 feet
>1000 feet
Trips 976-1238
<1000 feet
>1000 feet
100 0 200 400 600 800 1000 Feet
Cartography by: Teth Cleveland, Antech Corp. 10/14/99
EPA
Region 9 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

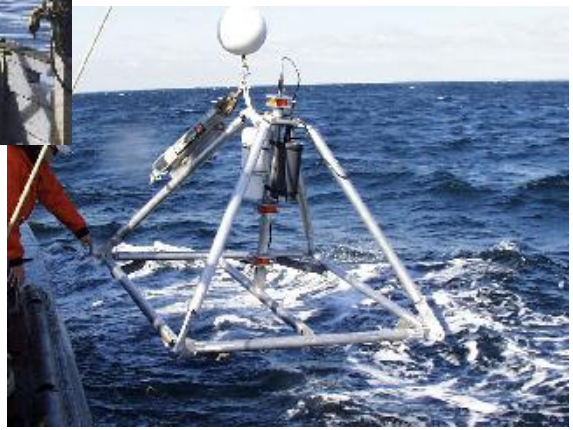
- **Assess findings to establish needs by comparing with performance predictions, considering natural processes**
  - If in agreement or better, adapt monitoring plan to findings
  - If contradicts predictions, determine processes of interest
  - Perform process-based confirmation monitoring
  - Determine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



Sediment Profiling Camera (SPC)

- **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??