Management and Control Measures

(Tab K)

Norman R. Francingues, MSEE
frasang@canufly.net

Training Objectives

• To become familiar with a variety of management and control measures.
• Identify differences between engineered and operational controls for environmental dredging projects.
Control Measures

• Engineered Containment for
  – Resuspension
  – Residuals
  – Volatiles
  – Noise
• Operational Controls

Resuspension Principles

• 3 R’s – Resuspension, Release, Residual
• All dredges resuspend some sediment
• Operations must be properly managed
• Resuspension generally not a problem for navigation
• Resuspension is a serious concern for remedial dredging
Resuspension Concerns

- Navigation
  - Seasonal restrictions (windows)
  - Physical effects of turbidity and burial
- Remedial
  - Chemical releases
  - Residual contamination

The actual dredging process may result in a limited impact on the water column.
- Support activities around the project may have a greater impact on the water quality.
- Ambient and local disturbances may have a similar or greater impact than the dredging operation.
Process & Potential Effects

- Resuspension Processes
  - Equipment specific
  - Sediment specific
  - Operator specific
  - Site specific (hydrodynamics, etc)

- Resuspension Effects
  - Physical (turbidity, contaminant migration, residual)
  - Chemical (WQS)
  - Biological (toxicity)

Engineered Containment

- Structural Barriers
  - Coffer dams
  - Removable Dams (Portadam, Geotubes)
  - Sheet piles

- Nonstructural Barriers
  - Silt Curtains
  - Silt Screens
  - Oil booms
  - Pneumatic (Bubble) Curtains
Coffer Dam

Temporary Dam/Rerouting
Portable Water Filled Dam

Sheetpiles
Sub-division of the Dredging Site by Contaminant Concentration

3,081 Feet of Sheetpile Enclosed the Dredge Area

Primary/Secondary Containment

Sheet Pile

Silt Curtain

Bubble Curtain
Pneumatic Barrier
St. Lawrence River

Silt Curtains

4/21/2005
Environmental Dredging Workshop
Seattle, Washington 2005
Terminology

• What are silt or turbidity curtains/screens/barriers/gunderbooms?
  – Term used to describe devices deployed in water to control suspended solids or turbidity resulting from dredging and construction operations.
  – Used to protect water quality and sensitive aquatic habitat from dredging and construction operations.

USACE Technical Note

• TN covers the following items:
  – Reviews the basic types of silt and turbidity curtains
  – Emphasizes the state of the practice and circumstances under which silt curtains function best
  – Presents a checklist to aid the designer or reviewer of silt curtains
  – Updates and supplements earlier corps guidance (JBF scientific corporation (1977 and 1978) on use of silt curtains.
Early Curtains

- **Florida’s “Pervious Diaper”** – 12 oz. untreated canvas supported by Styrofoam lobster trap floats and driven poles
  - Plugged quickly by marine growth, sank, and rapidly disintegrated
- **Later models** – 16-mil vinyl plastic and 10-mil Visqueen
  - Torn and penetrated by sharks and turtles

Industry’s Response

- Replace skirt material with various thicknesses of polymeric films and reinforced with embedded woven fabric
- Flotation and ballast were “heat-sealed” into material to become integral member of commercial silt curtains
- Pole and timber supports yielded to conventional anchor-buoy systems
- Spin-offs from oil boom technology but better construction
Types of Curtains

- Floating and hanging
- Solid diversion baffle
- Permeable or filter
- Standing frame sinkable hanging, combinations
- Based on water or current (e.g., slack, medium, fast, rough, tidal, etc.)

Typical Floating
Delivery/Assembly

Deploy From Barge

4/21/2005  Environmental Dredging Workshop
Seattle, Washington 2005  (Continued)
Assemble/Deploy
From Land

Processes Affecting Curtains
Effectiveness Depends on:

- Nature of the operation (i.e., navigation or environmental dredging)
- Quantity and type of material in suspension within or upstream of the curtain (including debris, oils and chemicals)
- Characteristics, construction, and condition of the curtain as well as the area and configuration of the barrier enclosure (e.g., partial or full depth containment either solid or permeable)

Effectiveness Depends on:

- Method of deployment
- Hydrodynamic conditions
  - strong currents [>1 knot or 1.5 fps]
  - high winds [especially with long fetch areas]
  - fluctuating water levels [i.e., tidal events]
  - excessive wave height, including ship wakes
  - drifting debris and ice
- Site Conditions
  - water depth, slopes, debris
Specialty Booms

Particulate Control System™ Curtains used in:
- Harbor Development
- Dredging
- Sediments and
- Construction Debris

Specialty Booms

ANGLOR FLE
BOOM FLOA
FABRIC
SUSPENDED
PARTICLES
BUOY
POLY LINES
CURRENT FLOW
ANCHOR CHAIN
ANCHORS
CURTAIN SHIRTS

4/21/2005
Environmental Dredging Workshop
Seattle, Washington 2005
Lessons Learned

• Very few silt curtains applications are alike.
• Each one has unique features that require a site-specific application and adaptation.
• For all practical purposes the cost-effective, limiting deployment value of 1 to 1-1/2 knot current velocity appears to be an industry standard with exceptions on a case-by-case basis.

Lessons Learned

• Effectiveness is influenced by
  – Quantity and type of suspended solids
  – Mooring method
  – Characteristics of the curtain
• Deployment should
  – Remain in place until the dredging is completed
  – Allow for traffic in and out
  – Allow relocation as dredge moves to new site
Lessons Learned

• BMP’s should cover the following topics:
  – planning considerations (site specific project conditions)
  – design or performance criteria
  – construction specifications (curtains and other materials)
  – installation or deployment, removal, decontamination, and maintenance
  – monitoring of silt curtain performance

Silt Curtain
Bottom Line

• Silt curtains are not a one solution fits all type of best management practice.
• Highly specialized, temporary-use device.
• Selected only after careful evaluation of the intended function.
• Designed based on a detailed knowledge of the site where it will be used.
Residuals

Grasse River

Control Measures for Residuals

- Additional cleanup passes
- Placement of a Residual Cap, a thin layer cap of clean material (few inches) to mix with and partially isolate the residual sediment
- Placement of an Isolation Cap. Thick layer same as that for in situ capping.
VOC Controls During Dredging

- Operational measures may include:
  - Reducing dredging production rates to minimize resuspension and releases.
  - Overlapping dredge passes to minimize resuspension at edge of cut where sloughing may occur.
  - Modifying dredgehead to retain oils.
  - Decreasing the sweep speed of the cutterhead.
  - Modifying the dredging sequence so most of contaminated sediments dredged in winter.
  - Using night time dredging during summer months to minimize the influence of temperature and solar radiation on valorization.
## Floating Sheen Containment

<table>
<thead>
<tr>
<th>Sheen:</th>
<th>Present</th>
<th>No Sheen</th>
</tr>
</thead>
<tbody>
<tr>
<td>Turbidity:</td>
<td>96 NTU</td>
<td>1.5 NTU</td>
</tr>
<tr>
<td>TSS:</td>
<td>350 mg/l</td>
<td>13 mg/l</td>
</tr>
<tr>
<td>Chrysene</td>
<td>0.36 ug/l</td>
<td>ND</td>
</tr>
</tbody>
</table>

### VOC Control During Transport

- Physical measures may include:
  - Covering the dredged material with physical barriers such as (foam), plastic liner, or absorbent mats or materials.
  - Degassing pipeline before discharging into onshore facility.
VOC Control During Offloading

- Physical measures may include:
  - Covering the dredged material with physical barriers such as (foam), plastic liner, or absorbent material.

Noise Control

- Monitoring of noise from dredging activities to establish operating levels.
- Provide adequate muffler systems or sound dampening methods or enclosures.
- Procedural modifications to the work schedule.
Project Managers Should:

- Recognize unique project features that require a site-specific application and adaptation of control measures.
- Be aware of the increased potential for scour to occur around the outside of structural controls.
- Recognize that resuspension will occur during placement and removal of structural controls.

4/21/2005

Environmental Dredging Workshop
Seattle, Washington 2005

(Continued)

Project Managers Should:

- Be aware that sheet piling can change the carrying capacity of a stream or river making it temporarily more susceptible to flooding.
- Select silt curtains only after careful evaluation of their intended function.
- Recognize that all dredging will result in some residuals requiring control measures.
- Should consider impacts of dredging volatiles and noise on project production rates and schedules.

4/21/2005

Environmental Dredging Workshop
Seattle, Washington 2005

(Completed)
QUESTIONS?

Thank You

Norman R. Francingues, MSEE
frasang@canufly.net