Management and Control Measures

(Tab K)

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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

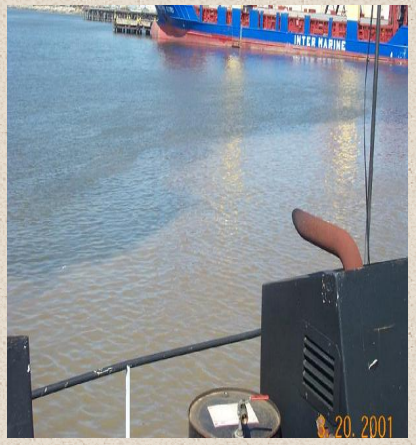
- Engineered Containment for
  - Resuspension
  - Residuals
  - Volatiles
  - Noise
- Operational Controls

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



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Resuspension Concerns

- 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.

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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

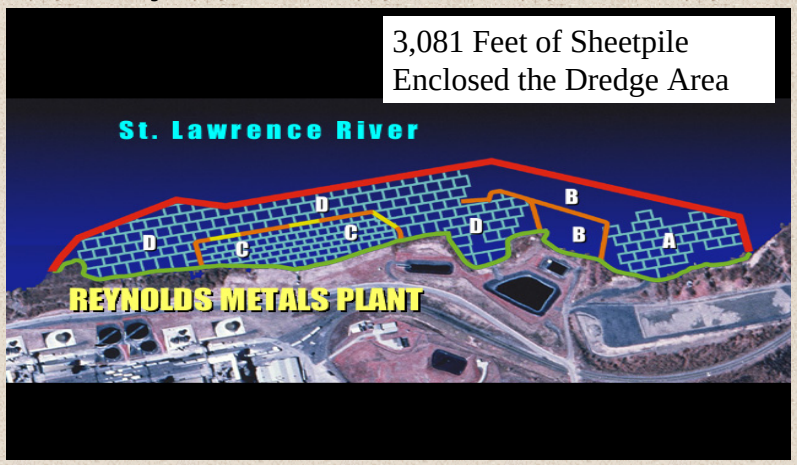
Coffer Dam

Temporary Dam/Rerouting

Portable Water Filled Dam

Sheetpiles

Sub-division of the Dredging Site by Contaminant Concentration

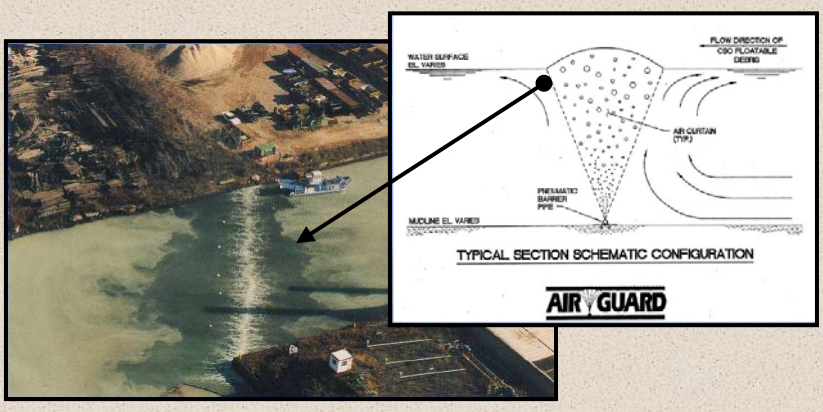


Primary/Secondary Containment

Silt Curtain

Bubble Curtain

Pneumatic Barrier
St. Lawrence River



Silt Curtains

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

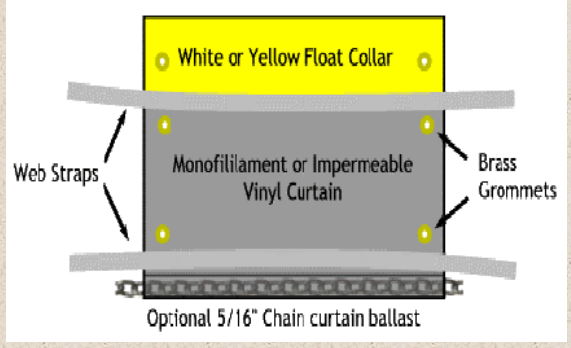
- **Florida's "Pervious Diaper"** – 12 oz. untreated canvas supported by Styrofoam lobster trap floats and driven poles
  - Plugged quickly by marine growth, sank, and rapidly disintegrated
- **Later models** – 16-mil vinyl plastic and 10-mil Visqueen
  - Torn and penetrated by sharks and turtles

Industry's Response

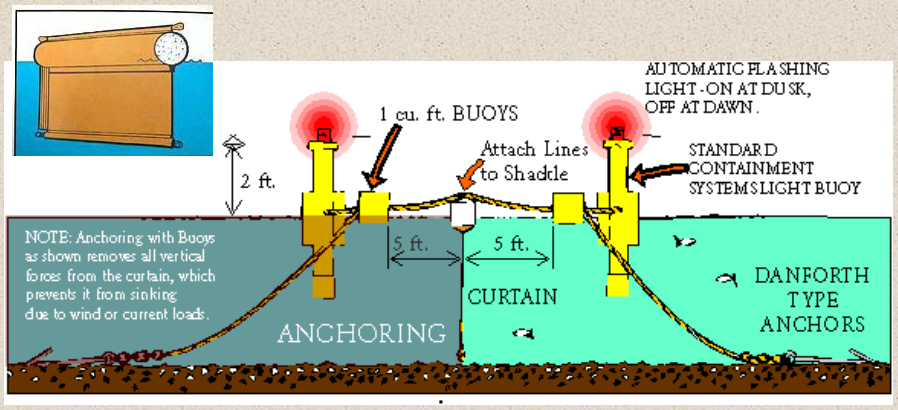
- Replace skirt material with various thicknesses of polymeric films and reinforced with embedded woven fabric
- Flotation and ballast were "heat-sealed" into material to become integral member of commercial silt curtains
- Pole and timber supports yielded to conventional anchor-buoy systems
- Spin-offs 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.

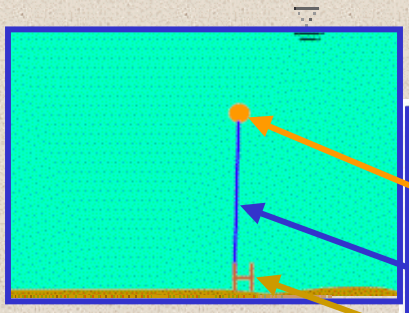


Typical Floating



Mechanical Grab & Barge Operating Inside Hanging Curtin

Typical Standing



Delivery/Assembly

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Deploy From Barge

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Assemble/Deploy From Land

4/21/2005

Environmental Dredging Workshop
Seattle, Washington 2005

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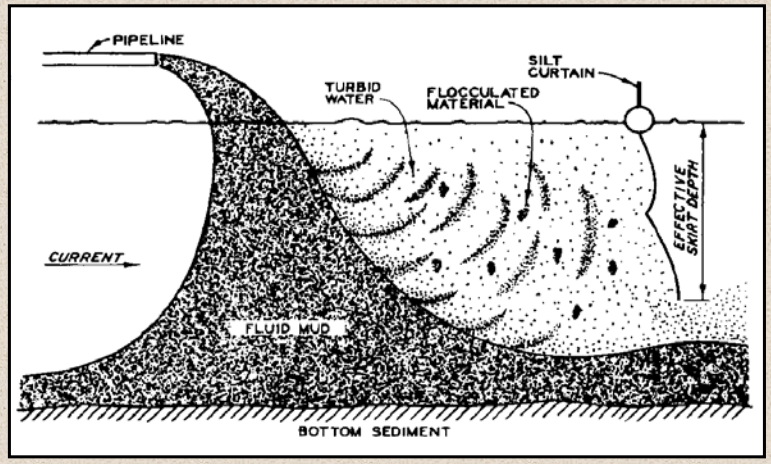
Processes Affecting Curtains



4/21/2005

Environmental Dredging Workshop
Seattle, Washington 2005

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)

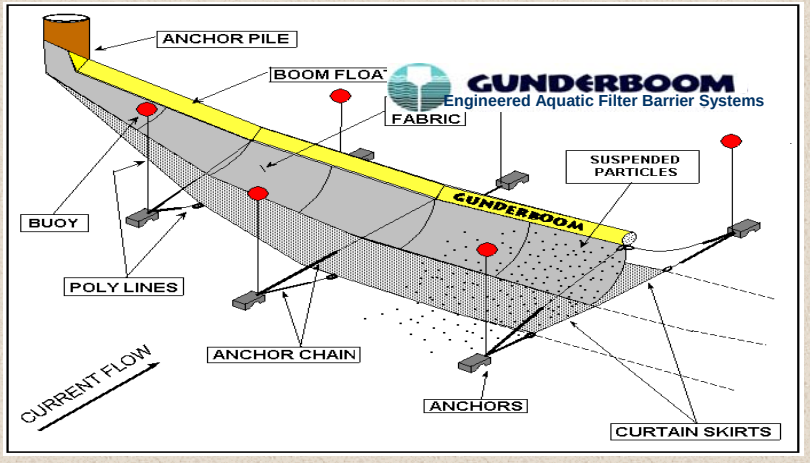
Effectiveness Depends on:

- 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



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.

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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

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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

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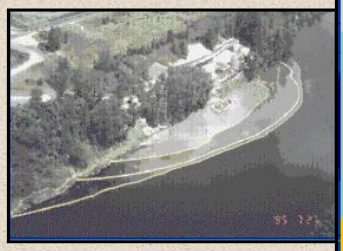
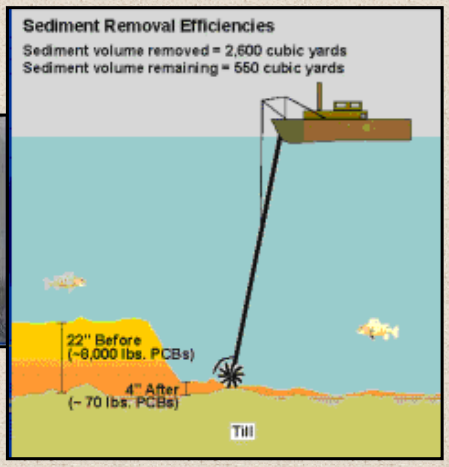
Silt Curtain Bottom Line

- 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.

Volatiles

- At the dredging site
  - Operational measures are based on
    - Nature of the site conditions
    - Very contaminant and site specific.
  - Oil sheen collection booms
- During transport
  - In barge or pipeline
- During offloading
  - Mechanically or hydraulically

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

Results:			
	Sheen:	**Present**	**No Sheen**
	Turbidity:	**96 NTU**	**1.5 NTU**
	TSS:	**350 mg/l**	**13 mg/l**
	Chrysene	**0.36 ug/l**	**ND**

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.

Acoustical Control Measure

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.

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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.

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QUESTIONS?

Thank You

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