Current Dredging Research at ERDC

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Talk Outline

- ERDC – CHL, EL Background
- History of Dredging Research
- Dredging Research Highlights
- Sources of Information
- Partnering Opportunities
US Army Engineer Research and Development Center

- Coastal and Hydraulics Laboratory
- Environmental Laboratory
- Geotechnical and Structures Laboratory
- Information Technology Laboratory
- Construction Engineering Research Laboratory
- Cold Regions Research Engineering Laboratory
- Topographic Engineering Center
CHL Laboratory Overview

Hydraulics - USACE water-related projects including

- Hydraulic structures
- Navigation
- Reservoir operations

Coastal engineering - waves, currents, winds, and other natural shoreline forces

- Shore and beach erosion control
- Flooding and storm protection
- Coastal dredging
- Physical components of coastal environmental problems
Environmental Laboratory Overview

- Aquatic Resources
  - Endangered and Invasive Species
- Environmental Assessments
  - Contaminant Effects/Environmental Chemistry
- Environmental Engineering
  - Cleanup/restoration
  - Dredging
  - Ecological Restoration
Corps Navigation/ Dredging Statistics

- 40,000 km of Waterways
- 400 Major Ports - 130 of 150 Largest Cities
- Annual Dredging – Corps Cost $800M
  - Corps - Federal Channels 150- 230 M m³
  - Private Berths 70 M m³
- Dredged Material Placement
  - Inland waters and CDF 110 - 180 M m³
  - Ocean waters - 50 M m³
ERDC Involvement with National and International Organizations

- London Convention
  - 70 Nations
  - ERDC Staff Active in Dredged Material Policy
- PIANC
  - Head committees, working groups
- AAPA
  - Harbors, Navigation, and Environment Committee
Corps Dredging Research History

- Late 1972-1978 - DMRP
- 1978 - Present - DOTS
- 1978-2004 LEDO
- 1987 -1994 - DRP
- 1998 – present - MCNP
- 1997 - present - DOER
Dredging Operations and Environmental Research (DOER)

- Successful navigation program requires dredging and disposal
- Complex economic, engineering, and ecological challenges
- Excellence in operational and environmental applications
Innovative Technology

- Dredging Equipment - UXO
- Placement/handling Techniques
- Navigable Depth/fluid mud
- Dredging contract monitoring technology
Innovative Dredging Technology
**PROBLEM:**

- LA loses 25 sq miles of coastal marsh annually
- @ Head of Passes use hoppers for traffic, rigid pipeline dredges too slow
- 4.5M yd³/year disposed in water w/o BU – pump-out too costly

**IMPACT:**

- Loss of BU opportunity
- Have to re-dredge same material later

**SOLUTION:**

- Dustpan with flexible discharge capable of:
  - safely maneuvering in HOP traffic
  - efficiently pumping material far enough for BU
Navigable Depth
Silent Inspector

- Automated inspection system for dredging contract administration

SI Contractor Benefits

- Reliable digital record of operations and performance
- Minimize disputes
- Faster dispute resolution
- Reduced paperwork and reporting burden on contractors
SI Government Benefits

- 24x7 coverage of operations
- Flexible scheduling of human inspectors
- Fast response to public and environmental inquiries – archive data
- Reduced claims
- Better government estimates and planning studies
- Improved Project Management
# SI Inspector Display

## Operations Display

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<th>File</th>
<th>View</th>
<th>Help</th>
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### Port
- Material Recovery
- Pumping Water
- Min Pump Effort

### Stbd

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### Receiving Data
- Hopper Open

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<th>Project</th>
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<td>Mobile Bay Channel</td>
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Dredged Material Management

- Predicting the Fate of Dredged Material
  - Simple Algorithms
  - 2D models
- Resuspension of Dredged Material
- Beneficial Uses
Intake Velocities For Cutterhead Dredge
Fate of Dredged Material Modeling – Savannah, GA
Beneficial Uses of Dredged Material
A dredging induced turbid plume

We can see it but....

What is it that we see?

Is it important?
Resuspension of Dredged Material

Grab hoisting and grab leakage plumes
ACCORD
Advice & Consultation Committee on Resuspension by Dredging

• Promote ACCORD Research Framework
• Encourage Collection/Development of Quality Data
• Promote Sharing of Data – Organizations, Nations, Professions
• Identify Projects of Opportunity
• Promote Technical Transfer
Environmental Resource Protection

- T&E Species
  - Mitigate Environmental Windows
  - Field Studies
  - Tracking Technologies
- Impacts
  - Suspended Sediment Effects
  - Risk
  - Best Management Practices
PLUME DYNAMICS

FISH DISTRIBUTION

ADCP

SPLIT-BEAM HYDROACoustics
Best Management Practices

SILT CURTAINS

- Expensive
- Difficult to maintain
- Effective???
Risk
(Contaminated Sediments)

- Exposure
- Effects
- Risk Characterization and Management

TrophicTrace
Version 2.01 (January 2002)

The program developed by Menzie-Cura & Associates, Inc., 1 Courthouse Lane, Suite 2, Chelmsford, MA 01824.

TrophicTrace is a beta version of a program that calculates human health and ecological risks associated with potential exposure to contaminants via fish consumption. No warranties are assumed or implied and Menzie-Cura & Associates, Inc. is not responsible.
Structures to Reduce Dredging

Bendway Weirs
Coastal Inlets Research Program (CIRP)

- Sediment Transport
- Inlet Morphology
- Inlet Modeling
- Scour
Navigation Research Related to Dredging

- CADET

![Diagram of navigation research related to dredging, including channel depth availability and under keel clearance.]

- Under Keel Clearance
- Channel Depth
- Availability
- Calm Water Level
- MLLW + Tide
- MLLW
- Channel Project Depth
- Net Effective Underkeel Clearance
- Draft and Sinkage
- Motions Allowance
- Ship position (no waves)
- Ship position at extreme bow down condition.
Sources of Dredging Information
Dredging Operations Technical Support

- Databases
  - E2-D2
  - UDMEED
  - ERED
  - BSAF
  - ODDS

- Technical Responses

- Publications & Guidance
  - Technology Demonstrations
  - Interagency Coordination
  - Center for Contaminated Sediments

- Outreach

- Training

http://el.erdc.usace.army.mil/dots/

The Dredging Operations Technical Support Program, known as DOTS, provides environmental and engineering technical support to the U.S. Army Corps of Engineers Operations and Maintenance (O&M) dredging mission. Technology transfer products supported diverse field needs for years and have directly benefited O&M dredge operations throughout the United States.

Dredged Material Assessment and Management Seminar

26-28 April 2005
Boston, MA

- View Brochure
- Register Online

Close Window

Take a Trip Through a Dredge!
The Dredging Operations and Environmental Research (DOER) Program supports the U.S. Army Corps of Engineers Operation and Maintenance Navigation Program. Research is designed to balance operational and environmental initiatives and to meet complex economic, engineering, and environmental challenges of dredging and disposal in support of the navigation mission. Research results will provide dredging project managers with technology for cost-effective operation, evaluation of risks associated with management alternatives, and environmental compliance.

**USACE Program Monitors**

- Barry Holliday, Navigation
- Joseph R. Wilson, Environmental
Dredging Animations
ACCORD is an international working group of dredging professionals, including regulators, government organizations, port personnel, and academia dedicated to progress and expansion of dredging-related research with respect to sediment re-suspension.

Mission

The mission of ACCORD is to:
- Promote the ACCORD Research Framework
- Encourage the collection/development of quality data for model development and calibration through standardized sampling protocols
- Promote sharing of data among nations, within government agencies and professionals
- Provide coordination/information for upcoming dredging projects with data gathering applications
- Provide a forum for discussion of data needs and modeling tools development

News
Partnering Opportunities

- State Agencies
- Foreign Governments
  - Brazil – Contaminated Sediments
  - Mexico – Sand Bypassing
- CRADA
The End

ERDC Solves Difficult Problems