Dredging and Dredged Material Disposal Overview

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The process of dredging consists of the following stages:

- Excavation (loosening or dislodging) of the material from the bottom.
- Removal of the loosened material to the dredge vessel.
- Transportation of the material to the placement area.
- Placement of the material.

Basic Dredge Types

- Mechanical
  - Clamshell
  - Backhoe
- Hydraulic
  - Pipeline
  - Hopper
- Other / Combinations

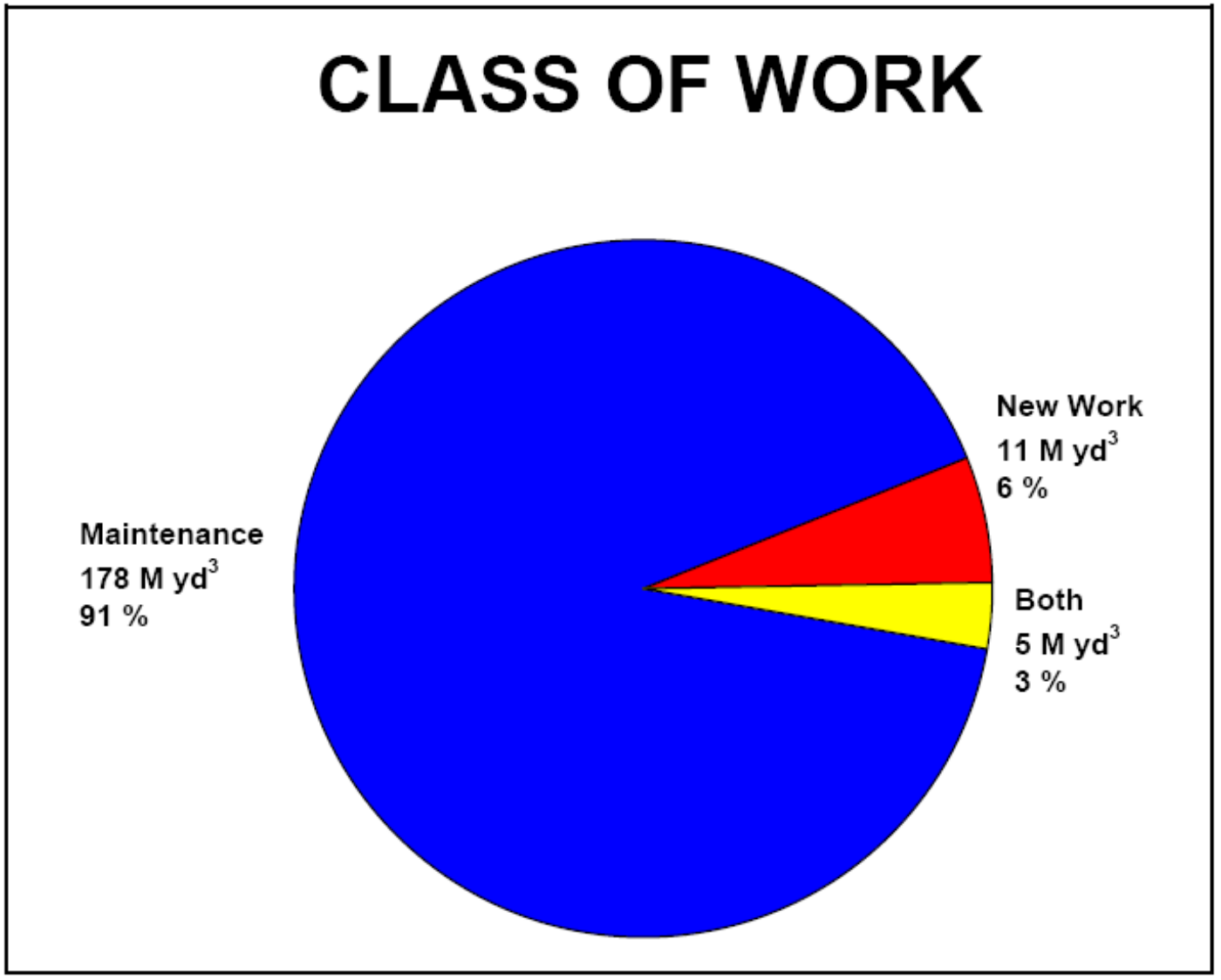
Factors in Selection of Dredging Equipment

- Physical characteristics of sediments,
- Quantities to be dredged,
- Dredging depth,
- Distance to disposal (placement) area,
- Physical environment of and between areas,
- Contamination level of sediments,
- Method of disposal (placement),
- Production required,
- Types of dredges available.

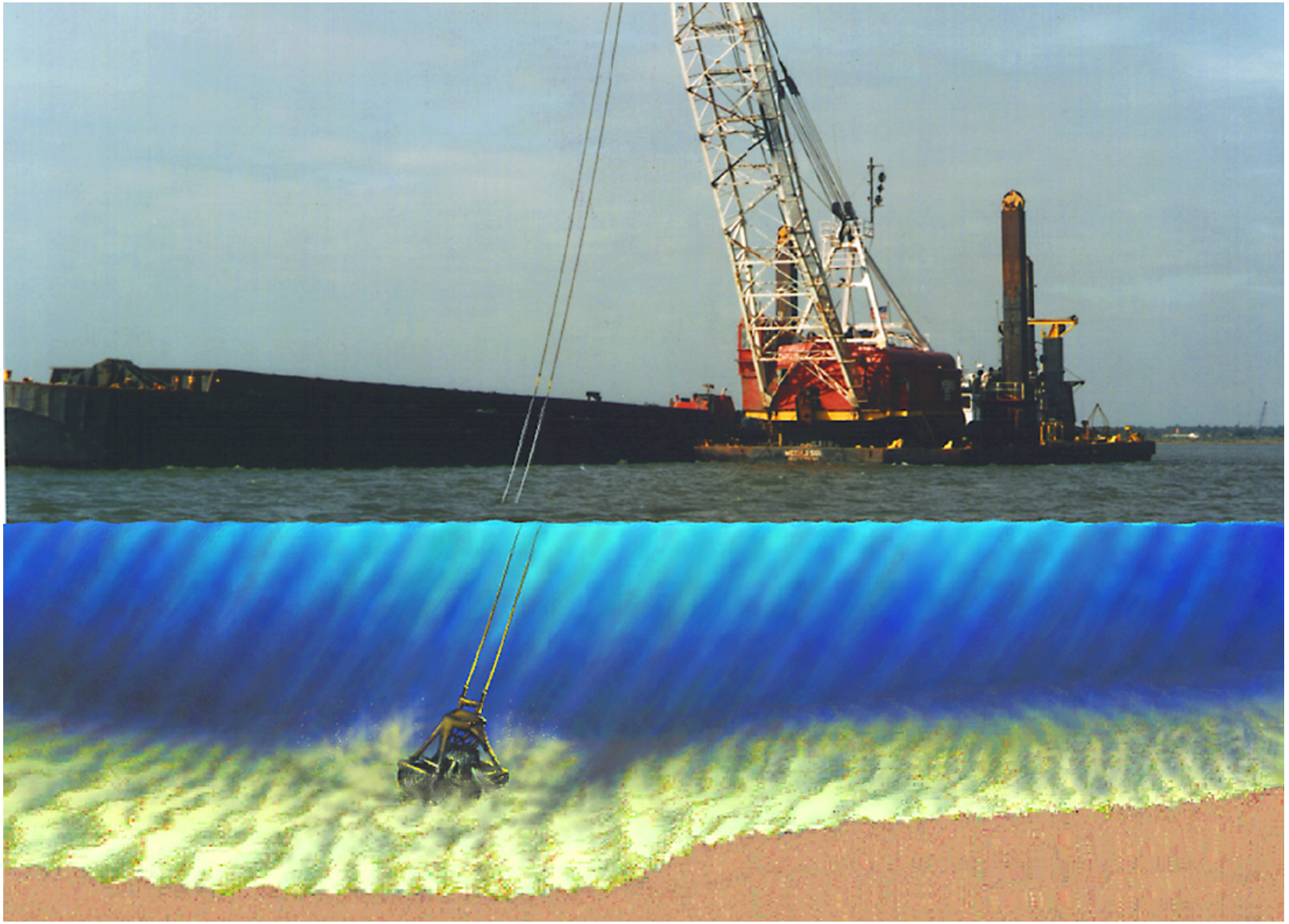
Two Types of Dredging

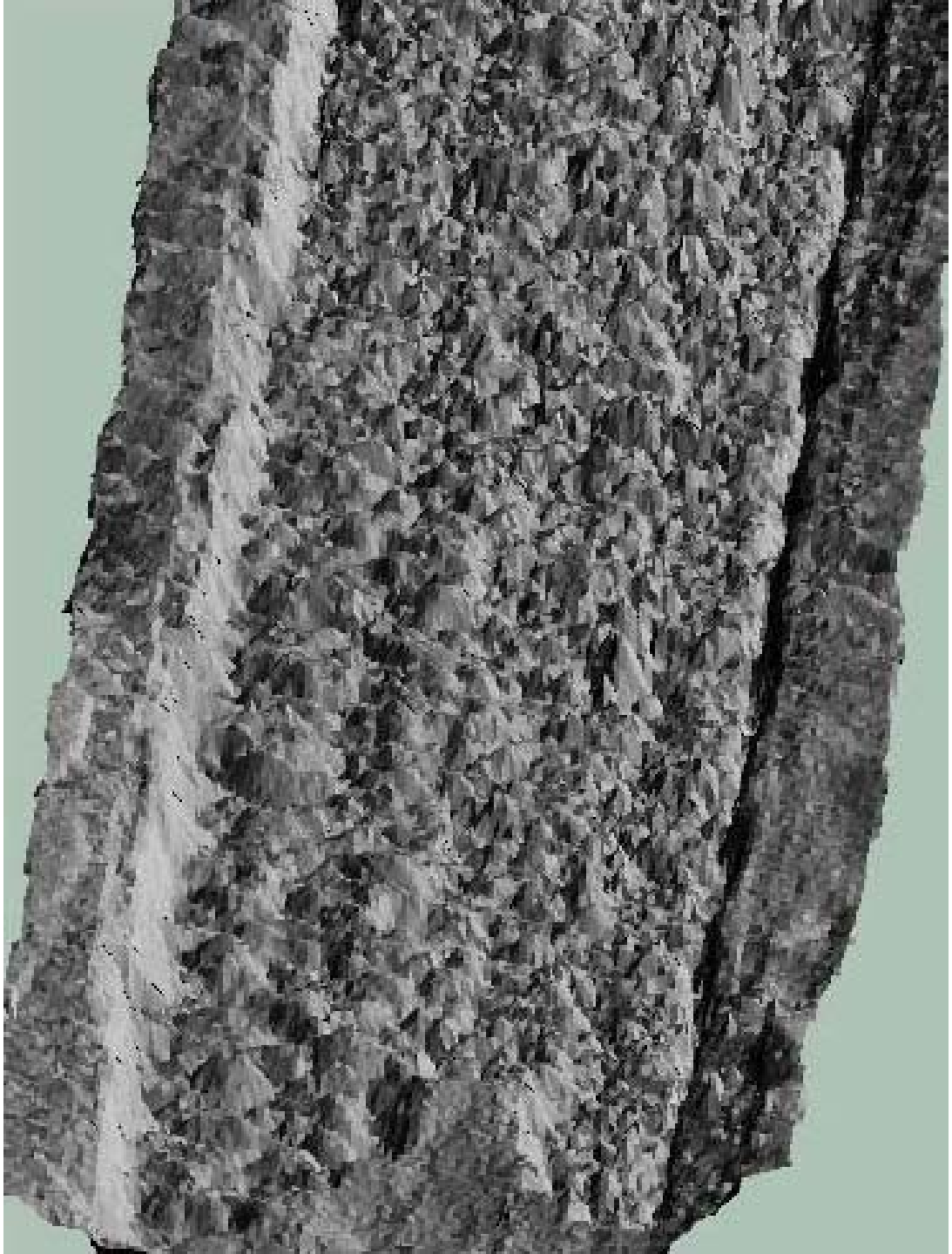
- **Maintenance Dredging:** Removal of sediments accumulated in the channel since the previous dredging project.
- **New Work Dredging:** Removal of sediments which have not been previously dredged - virgin sediments - channel deepening.

Percentage by Class of Work
Averaged from FY96-FY05



Clamshell (Bucket) Dredge





Source: Great Lakes Dredge and Dock

Backhoe (Bucket) Mechanical Dredge

Mechanical Dredges can Excavate Sediment at In situ Percent Solids

Source: Cable Arm

Hydraulic Offloaders

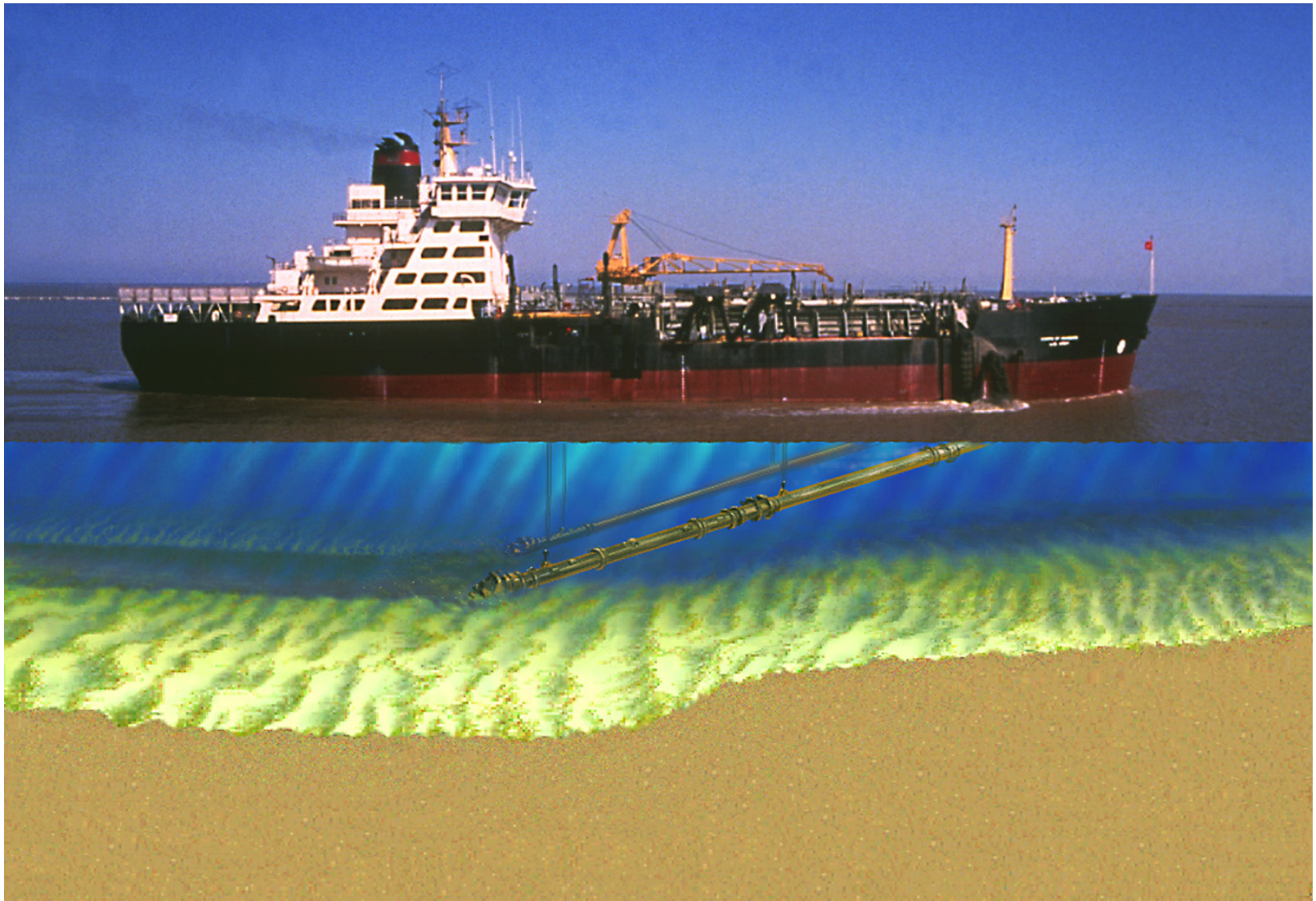
Advantages of Mechanical Dredges

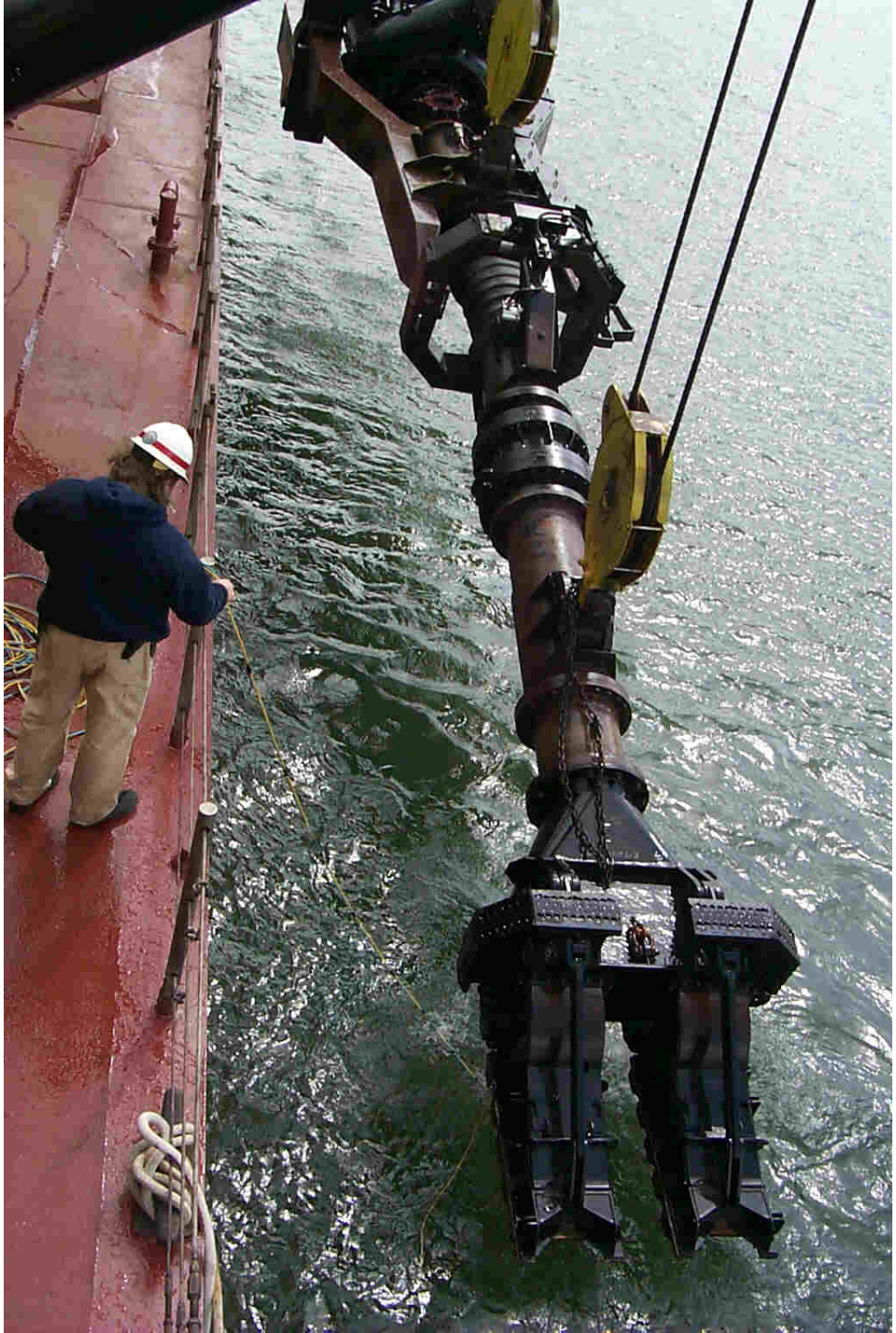
- Rugged and capable of removing hard packed materials,
- Can remove debris,
- Can work tight areas,
- Efficient for disposal at long haul distances.

Limitations of Mechanical Dredges

- Difficult to retain fine loose material in conventional buckets,
- Production low compared to pipeline dredges,
- Resuspension can be an issue, especially in presence of debris.

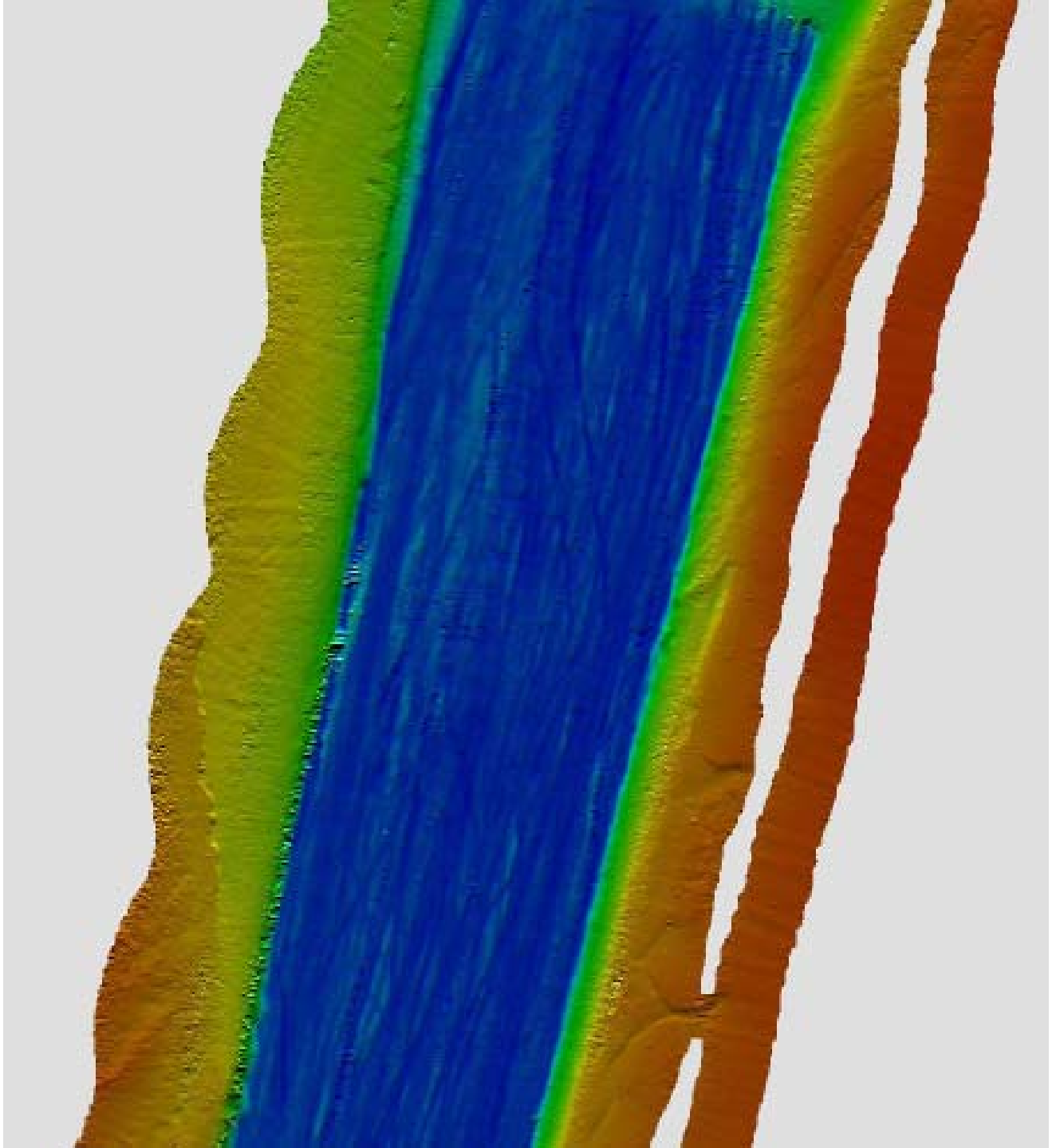
Self-Propelled Hopper (Hydraulic) Dredge





Draghead

Dragarm Assembly



Split-Hull Hopper Dredge

Advantages of Hopper Dredges

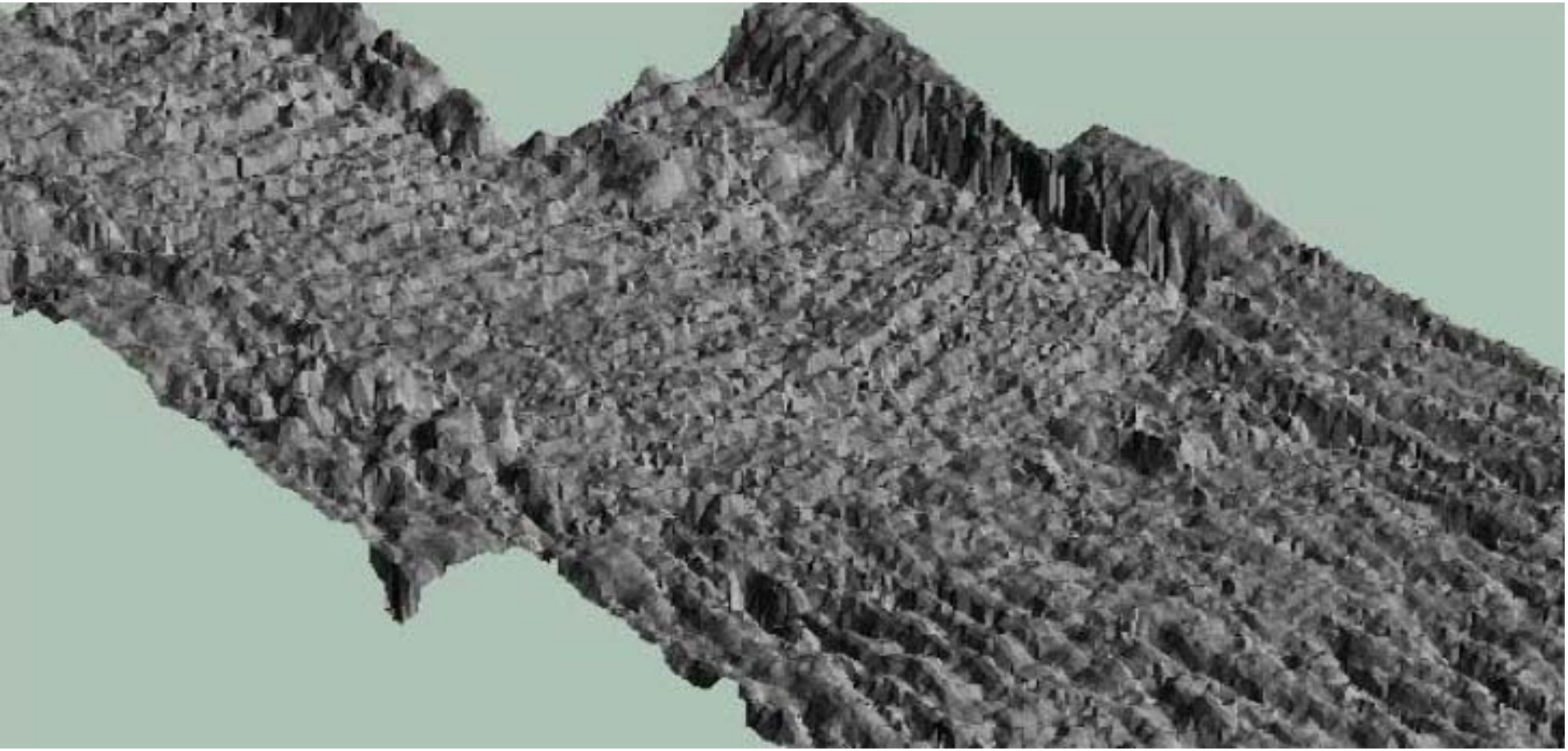
- Only dredge type for rough open water,
- Can move quickly to job under its own power,
- Minimizes traffic interference,
- Improves navigation depth quickly,
- Economical for long haul distance.

Limitations of Hopper Dredges

- Cannot work in shallow depths,
- Cannot dredge continuously,
- Excavates with less precision,
- Difficulty dredging hard banks
- Difficulty dredging consolidated materials

Hydraulic Pipeline / Cutterhead Dredge

Cutterhead



Source: Great Lakes Dredge and Dock


ILLINOIS
GREAT LAKES DREDGE & DOCK COMPANY

Floating Line

Shore Line

Submerged Line

Booster Pump

Source: Great Lakes Dredge and Dock

Spider Barge

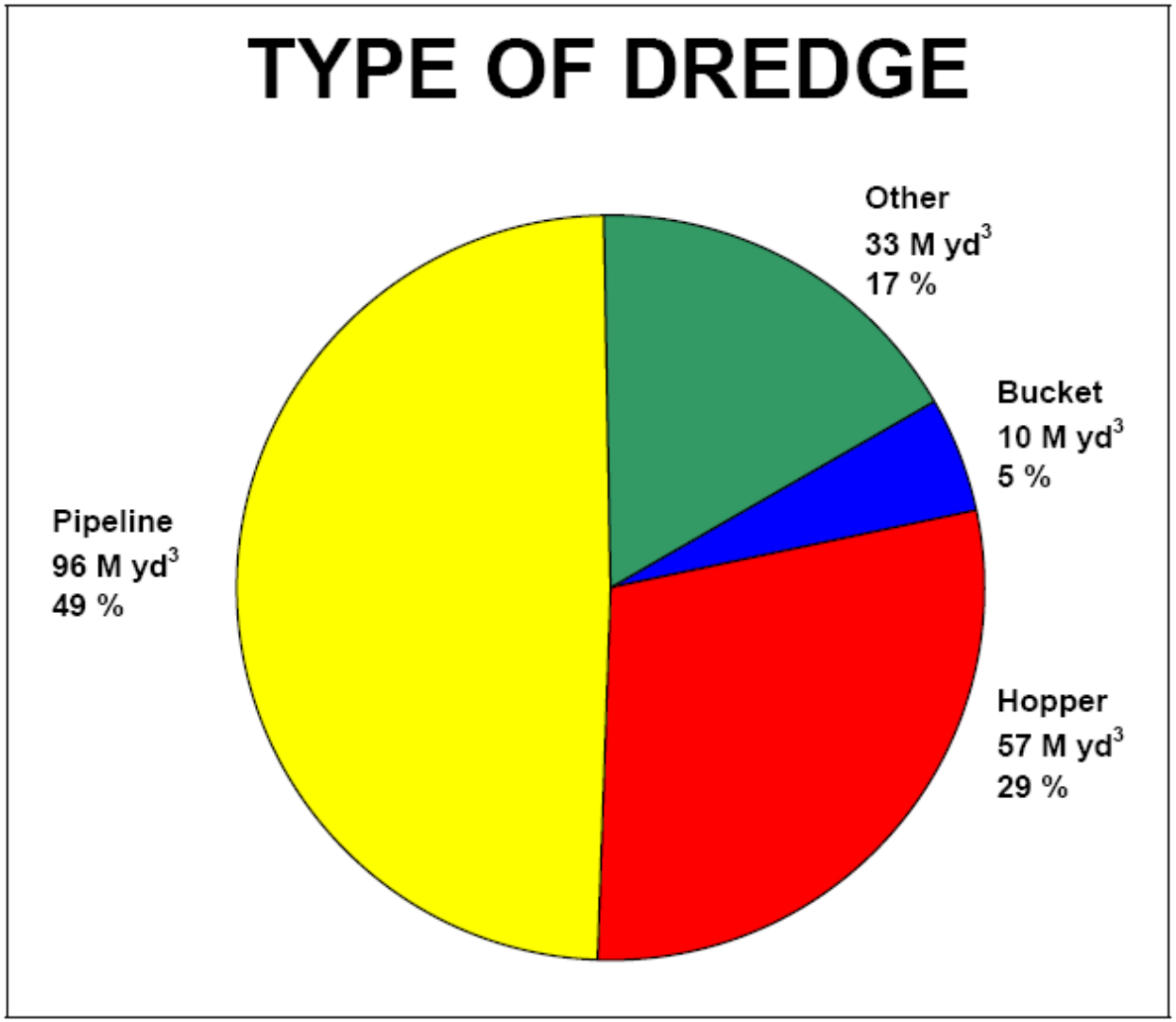
Advantages of Cutterhead Pipeline Dredges

- Capable of excavating most types of materials,
- Can pump directly to disposal sites,
- Can dredge almost continuously,
- Can dredge some rock types without blasting.

Limitations of Cutterhead Pipeline Dredges

- Limited capability in rough open water,
- Most are not self-propelled,
- Difficulty with coarse sand in high currents,
- Pipeline can be an obstruction to navigation,
- Debris in sediment can reduce efficiency.

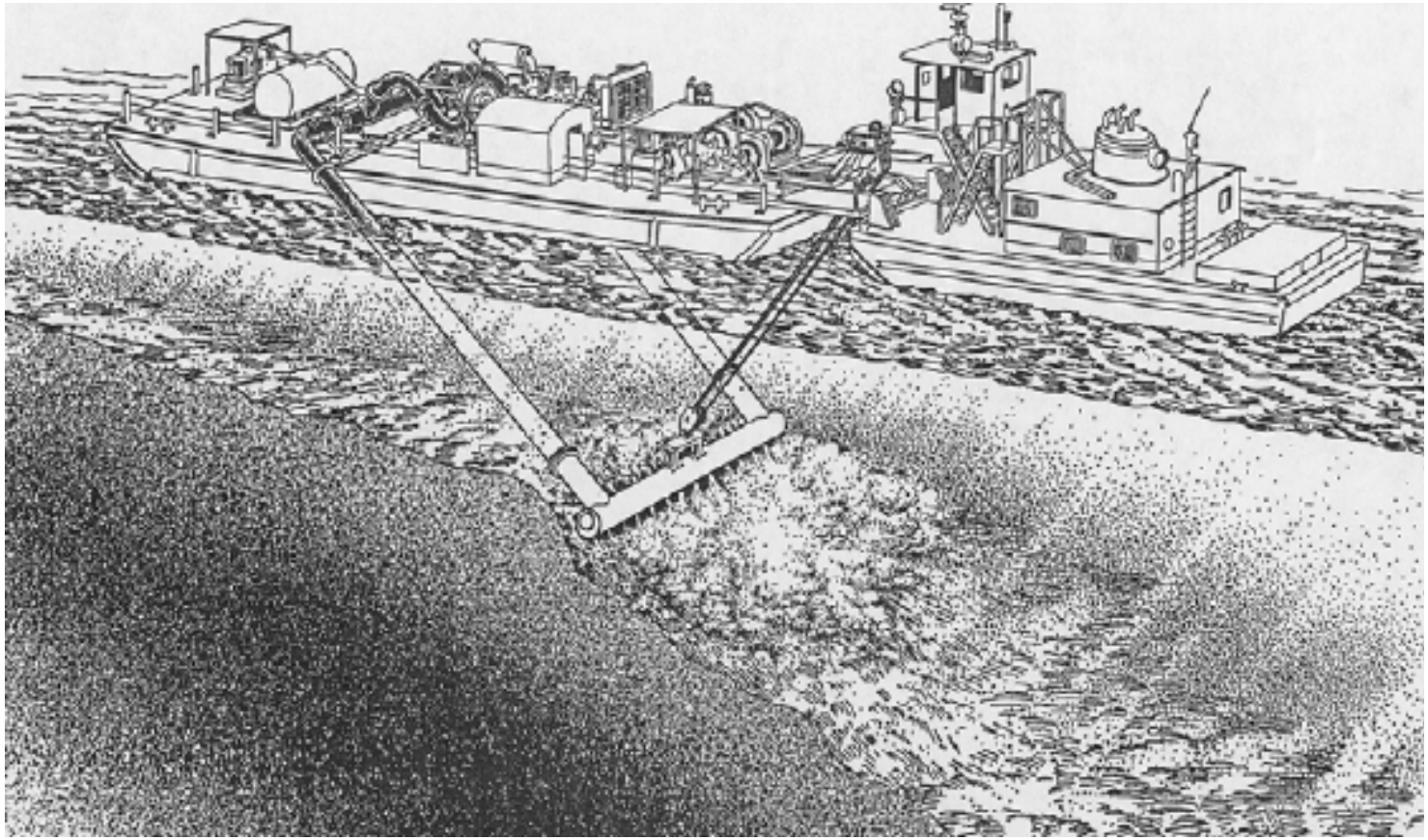
Percentage of Work by Dredge Type
Averaged from FY96-FY05



Horizontal Auger Dredge

Source: Ellicott Dredges LLC.

Water Injection Dredge



Dredged Material Disposal Alternatives

- Open Water Placement
  - Ocean ~ Estuarine ~ Lakes ~ Rivers
- Confined Disposal
  - Confined Disposal Facilities (CDFs)
  - Contained Aquatic Disposal (CADs)
- Beneficial Use Applications

Planning Considerations

- Project Requirements
  - Volumes and Frequency of Dredging
  - Planning Horizon
  - Stage of Evaluation
- Material Characterization
  - Physical and Dredgability
  - Chemical / Biological
- Regulatory or Other Constraints

Open Water Placement

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

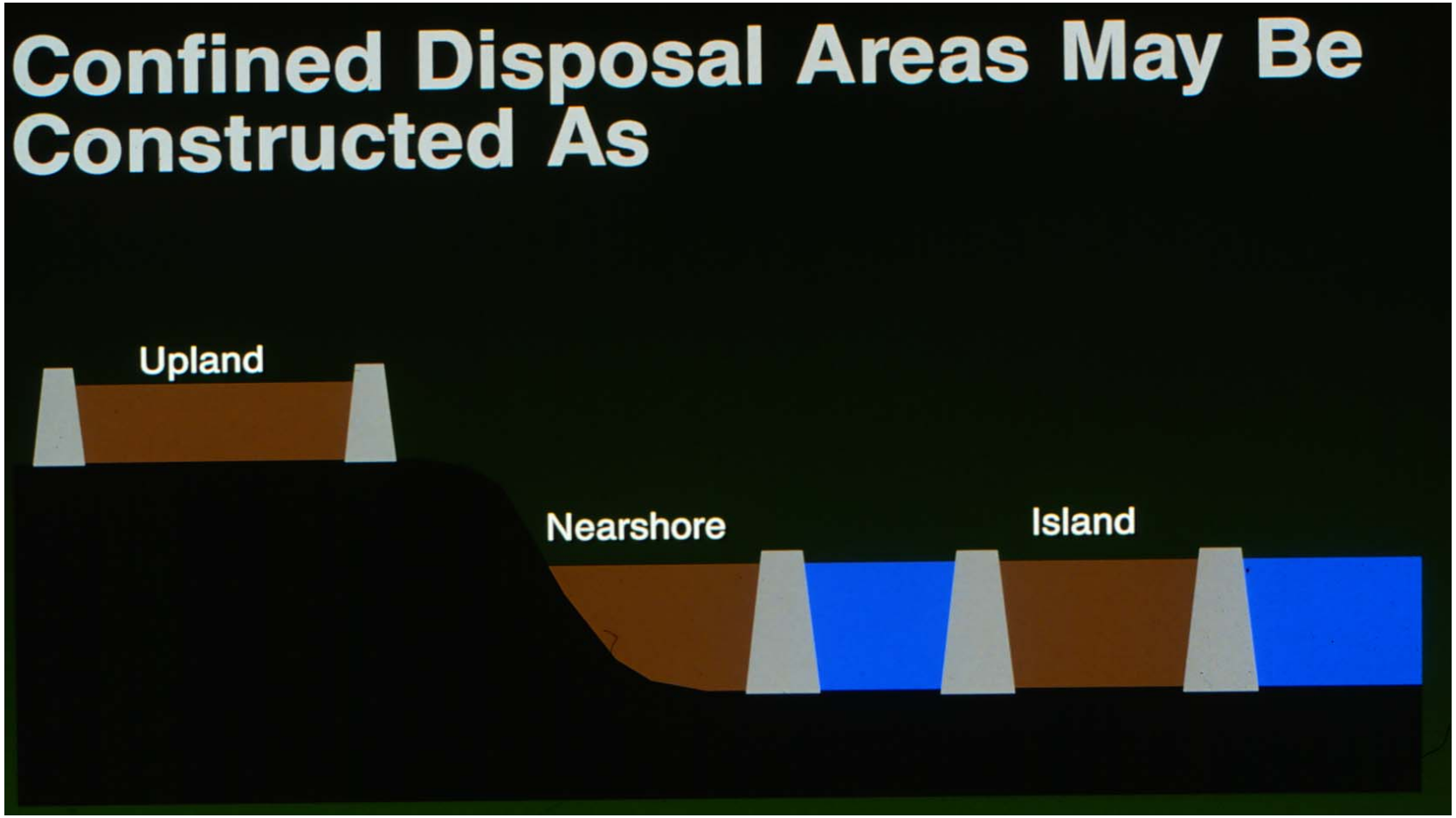
Confined Disposal Facilities

- CDFs used because:
  - More economical for some projects
  - Most common option for material unsuitable for open water
- Regulated under CWA
  - Discharge to US waters by definition
  - 404 permit
  - 401 state water quality certification

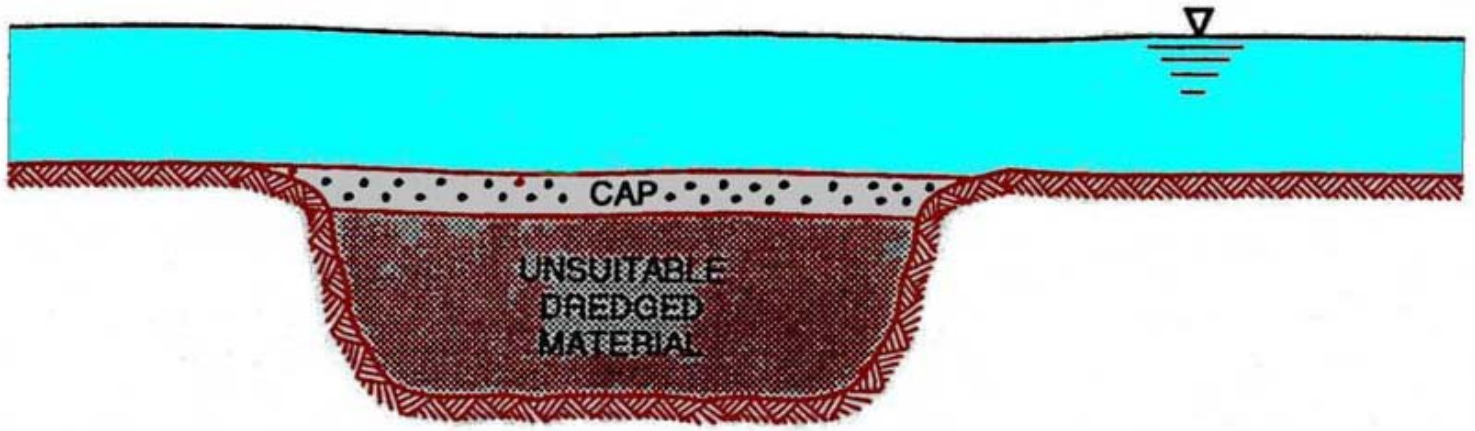
Confined Disposal Facilities

- Site characterization / selection
- Engineering design
- Operational considerations
- Contaminant pathways and controls
- Long-term management
- Monitoring

Confined Disposal Areas May Be Constructed As



Contained Aquatic Disposal (CAD)



Beneficial Use (BU) Applications

- BU is alternative of first choice
- Needs and opportunities
- Material suitability
- Logistical constraints
- Regulatory requirements vary
  - CWA / MPRSA
  - Other

Beneficial Uses Categories

- Wetland Habitat / Shoreline Protection
- Beach Nourishment.
- Mine land Restoration.
- Recreation.
- Agriculture.
- Island Habitat
- Construction Fill.
- Construction Materials.

Basic References

- EM Dredging and Dredged Material Disposal
- EM Beneficial Uses of Dredged Material
- EM Confined Disposal of Dredged Material
- Technical Framework for Environmental Evaluations
- Ocean Testing Manual
- Inland Testing Manual
- Evaluation of Dredged Material Proposed for Disposal at Island, Nearshore, or Upland Confined Disposal Facilities
- Identifying, Planning, and Financing Beneficial Use Projects Using Dredged Material

Available from http://el.erdc.usace.army.mil/dots/guidance.html

The End

Questions?