



# Purchasing the future: a Custom-Built Water Injection Dredge (WID) for the North Carolina State Ports Authority

Wilmington & Morehead City, North Carolina

33<sup>rd</sup> National Conference on Beach Preservation Technology



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Mr. Wagner is a associate dredging engineer with nearly 20 years of experience planning, designing, permitting, and implementing various dredging engineering projects, including developing long-range dredged material management plans; designing upland dredged material containment facilities; creating dredging templates, performing economic evaluations, and assessing various alternate dredging technologies.

# North Carolina State Ports Authority (NCSPA)

Water Injection Dredging

# Port of Wilmington & Port of Morehead City



**NORTH  
CAROLINA  
PORTS**

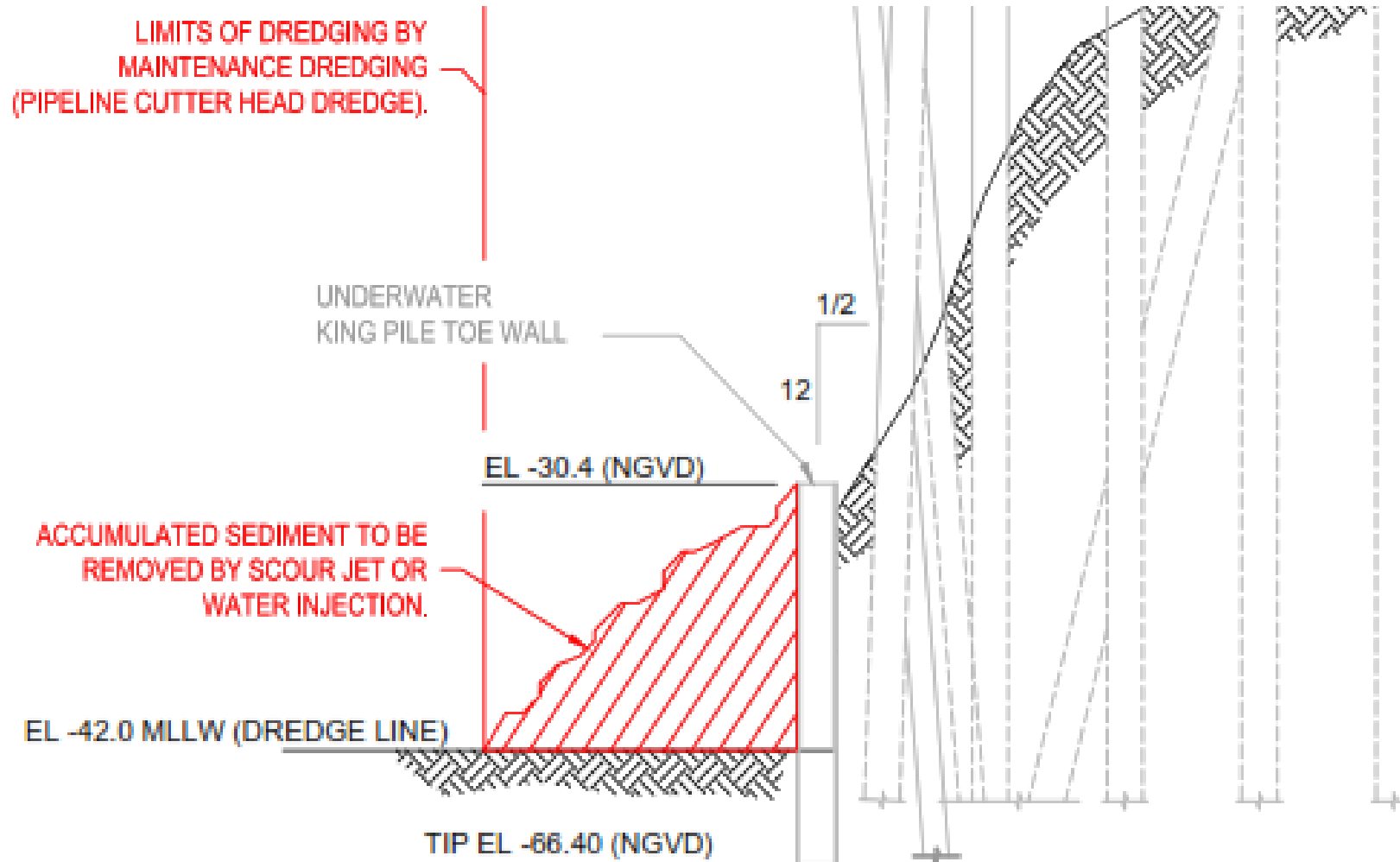
The logo for North Carolina Ports, featuring the text "NORTH CAROLINA PORTS" in a bold, dark blue, sans-serif font. Below the text is a stylized graphic of three wavy blue lines representing water.

# Port of Wilmington

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# Dredging Template



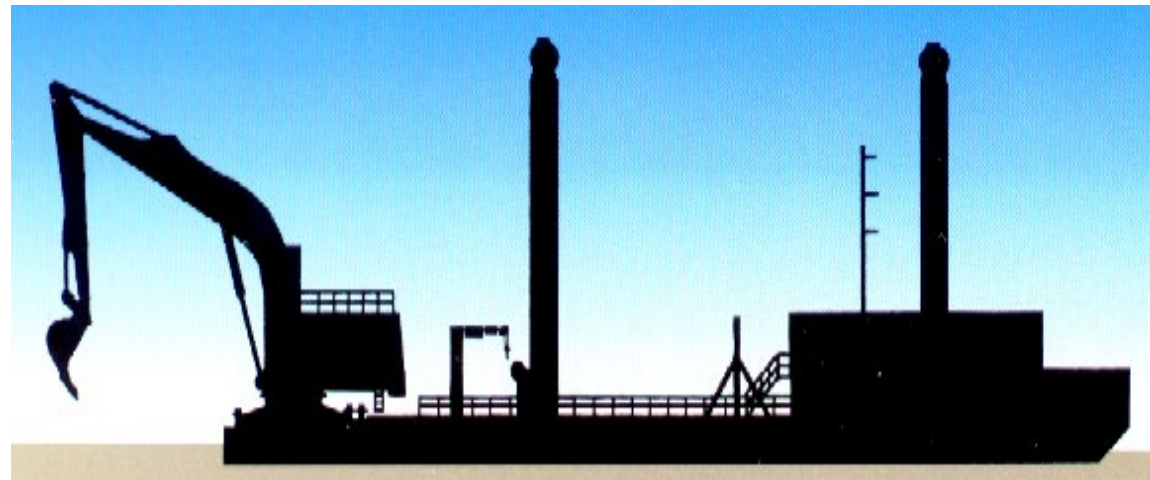
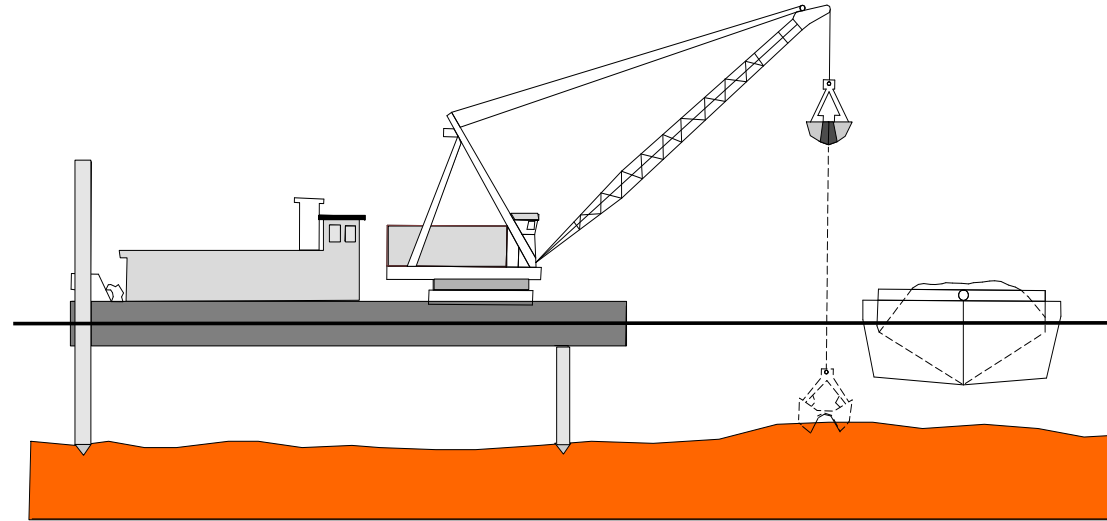
# Sediment Management through Dredging (Mechanical & Hydraulic)

Water Injection Dredging



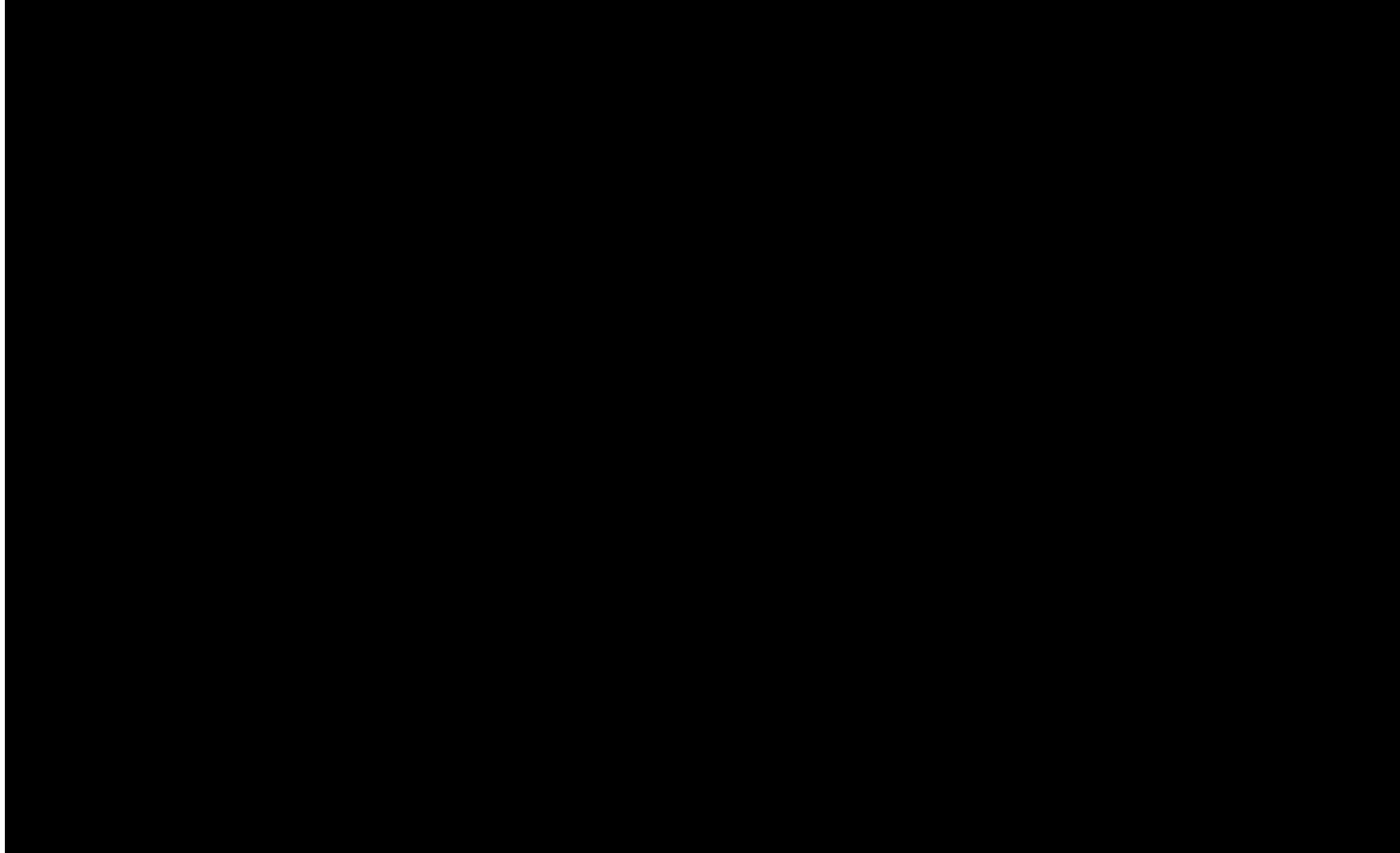
# Mechanical Dredge Classifications

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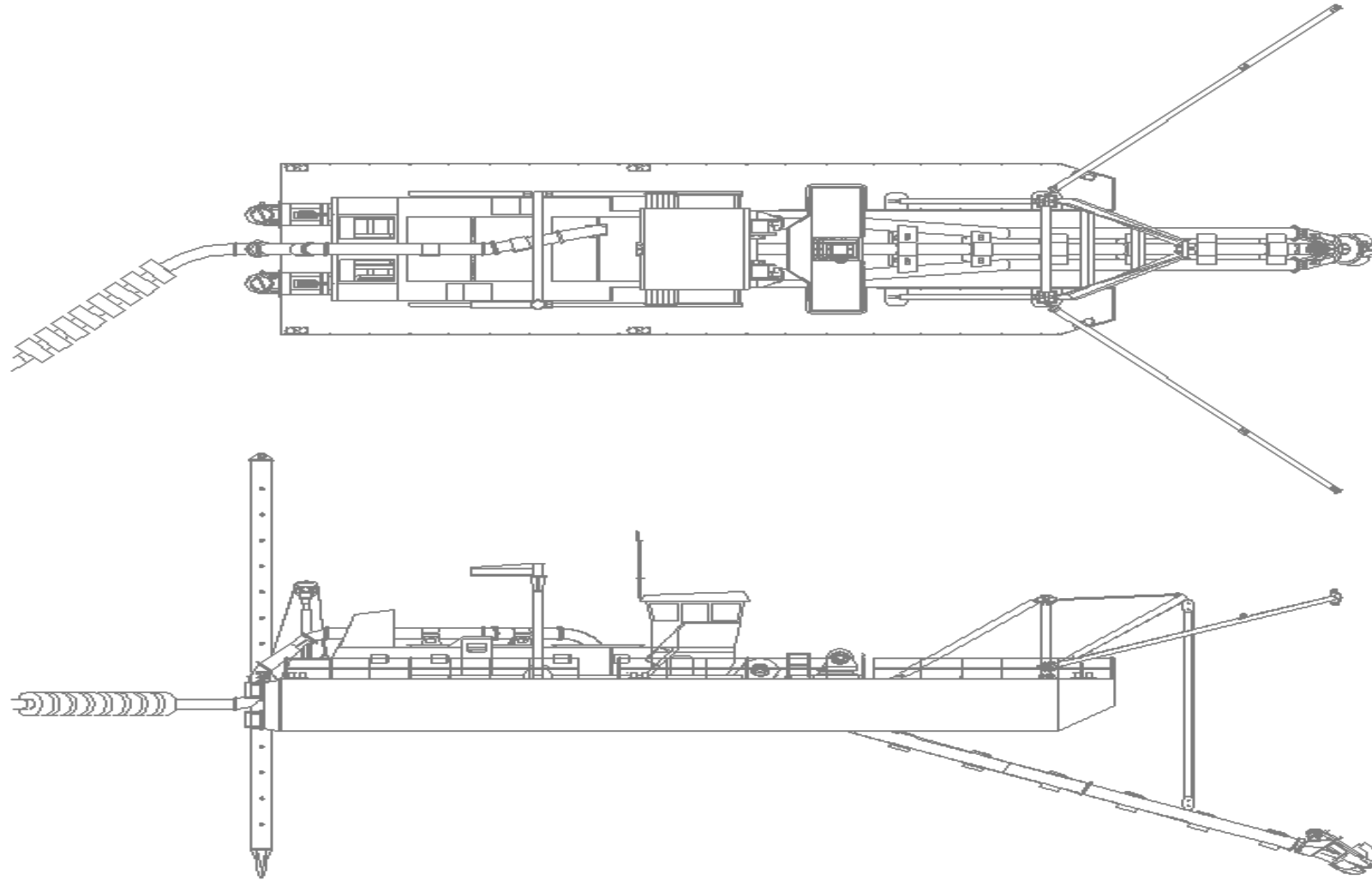
# Clamshell Dredge Operation

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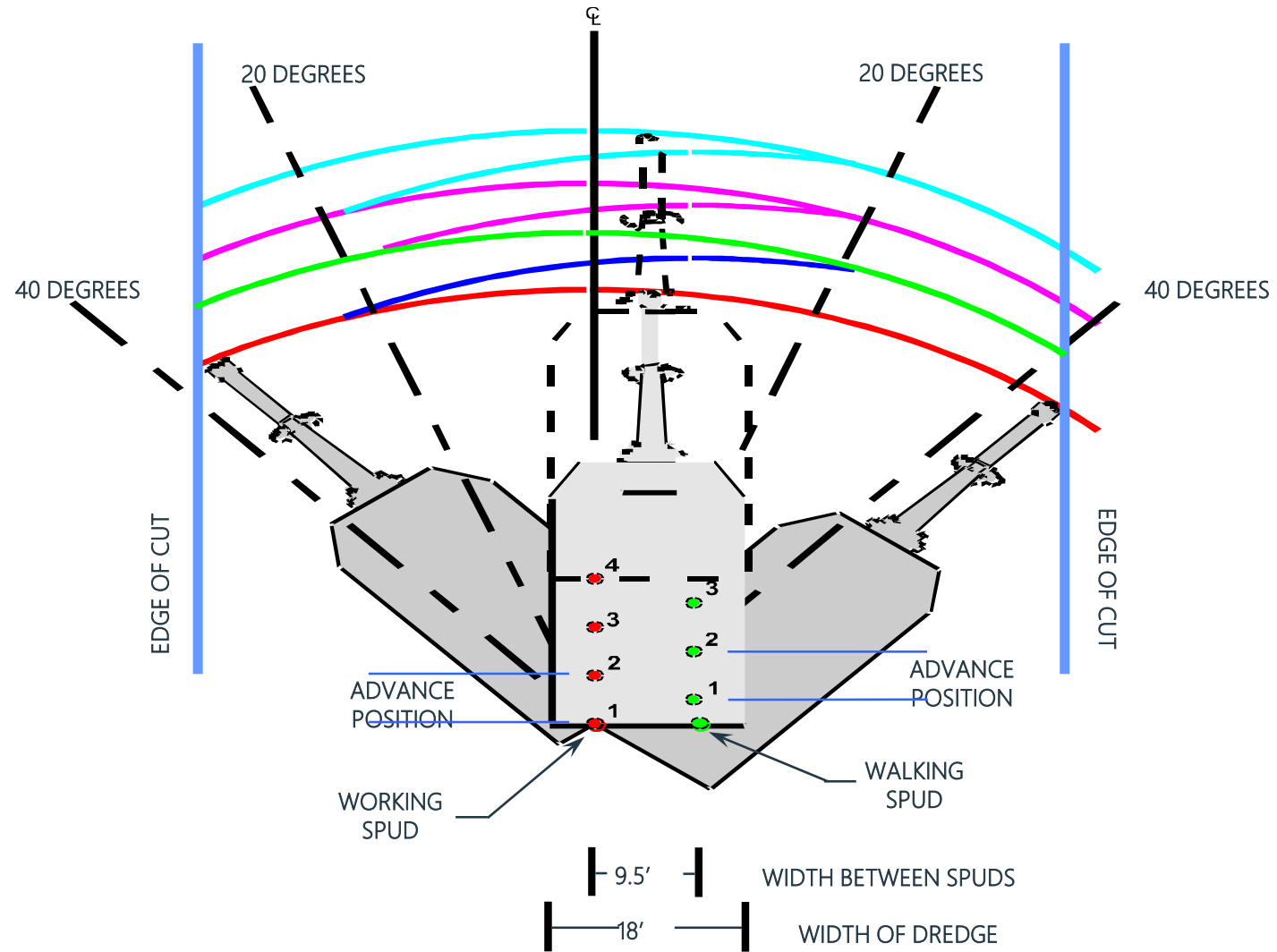


# Hydraulic Pipeline

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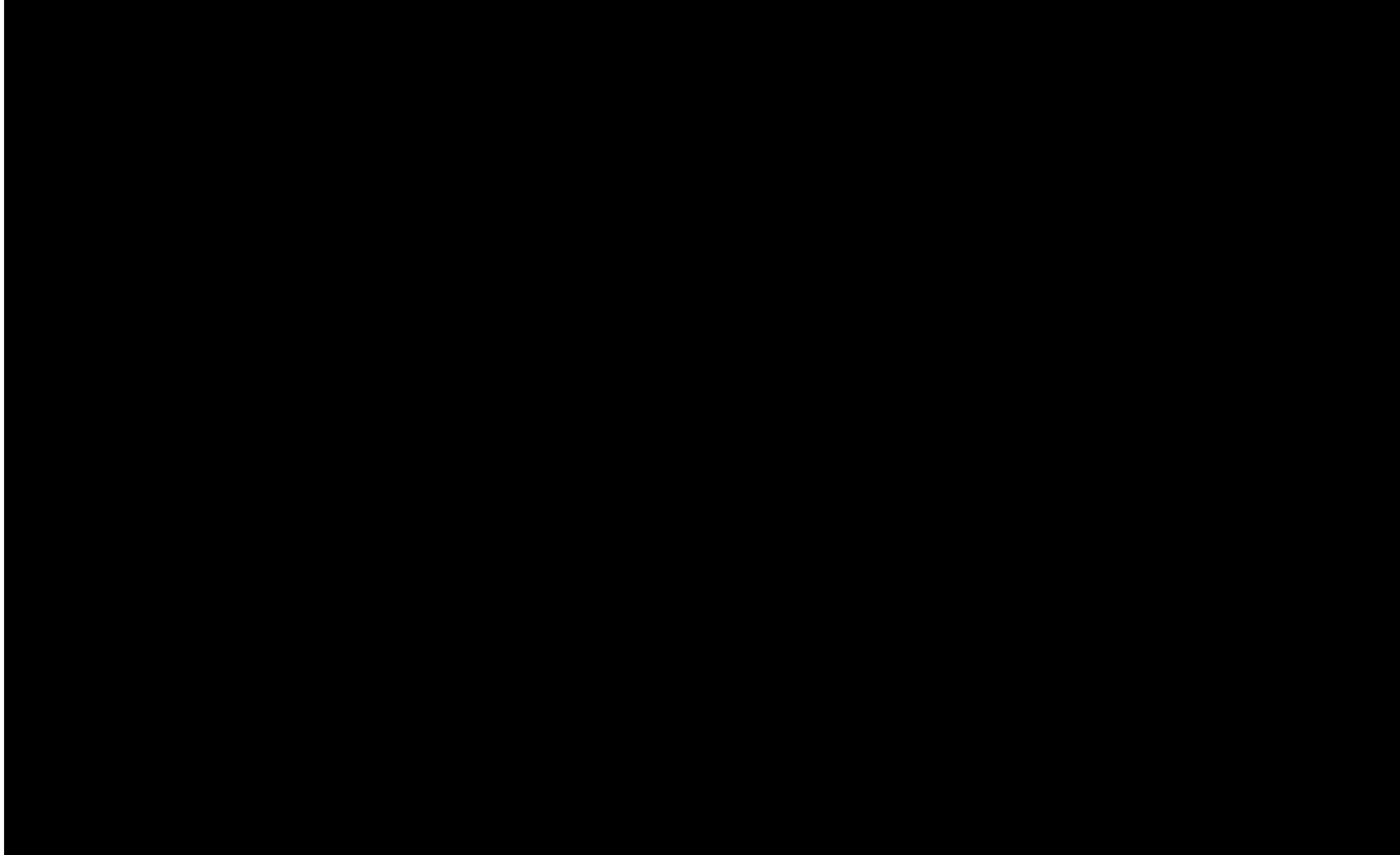


# Hydraulic Pipeline Advancement



# Hydraulic Pipeline Operation

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# Hydrodynamic Dredging Techniques

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- **Hydraulic and Mechanical Dredging** are *conventional dredging techniques* that use hydraulic or mechanical means to raise the excavated material to the water surface.
- The transport of the severed sediments from the dredge area to disposal or placement area is conveyed by buckets, hoppers, transport barges, pressurized pipelines, etc.
- In comparison, all **Hydrodynamic Dredging** techniques have the common characteristic that the horizontal transport of the dredged material takes place completely within the water.
  - No mechanical transport in hoppers, barges, or buckets
  - No pressurized movement through pipelines
- All **Hydrodynamic Dredging** sediments *flow through water* for the dredge area to the disposal or placement area



# Agitation and Plough Dredging

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- **Agitation and Plough Dredging** disperses the sediments from the bottom into the whole water column
- **Two phases** are needed for **Agitation and Plough Dredging** :
  - 1) Equipment that suspends sediments into the water column.
  - 2) Flow that transports the sediment away from the site.
- Various equipment can be used for this process, including
  - Prop-Wash
  - Hopper Dredge Agitation
  - Vertical mixers or Air Bubbles
  - Drag beams or Rakes (Plough Dredging)
- **Agitation and Plough Dredging** produce a *turbid water column* and thus, at least temporarily, higher water quality impacts.





# Agitation and Plough Dredging induced Turbidity

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# Hydrodynamic (Water Injection) Dredging

Water Injection Dredging

# Water Injection Dredging Technique

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- **Water Injection Dredging** pumps water into channel bottom sediments at relatively high-volume and low pressure.
- **Water Injection Dredging** dilutes and fluidizes the sediments, creating a near-bottom layer (density current) with higher density than the surrounding water.
- **Water Injection Dredging** allows sediments to flow horizontally out of a waterbody taking advantage of natural processes and forces, while the fluidized sediment layer remains close to the water bed.
- The objective is to remove the material from a selected area by taking advantage of the near-bottom layer (density current) and
  - **Tides**
  - **Currents**
  - **Other Hydrodynamic Forces**





# NCSPA WID Design-Build and Demonstration

Water Injection Dredging

# Procurement Fact Sheet

Task	Date
<b>NCSIPA Water Injection Dredge Procurement Fact Sheet</b>	
Issued to Potential Interested Parties	December 06, 2018
Responses from Potential Parties Due	December 21, 2018

- Contacted over 70 organizations (dredge manufactures and other possible sources of relevant information)
  - Dredging related electronic newsletters - e.g., *DredgeWire*, *Dredging Today*
  - Trade publications- e.g., *Marine News*, *Maritime Reporter and Engineering News*
  - Trade show membership and attendance- e.g., *Western Dredging Association*
  - Annual dredging related directories- e.g., *International Dredging Review*, *World Dredging Mining & Construction*
  - Hydraulic agitation dredge operators working in the Southeastern or Gulf region of the United States- e.g., *Biblia, Inc. (Savannah Marine)*



## The Jones Act

“Section 1 of the Act of May 24, 1906 (34 Stat. 204; 46 U.S.C. App. 292), provides that, “a foreign-built dredge shall not, under penalty of forfeiture, engage in dredging in the United States unless documented as a vessel of the United States.”

# Procurement Fact Sheet (Continue)

- Solicit feedback from dredge manufacturers and other regarding several crucial project factors. These key factors includes:
  - Preliminary schedule
  - Duration of time needed to fabricate and transport the dredge to the NCSPA
  - Other factors included those similar to those required of any NCSPA purchase of large, expensive equipment, such as cranes.
    - Maintenance
    - Warranties
    - Proof of concept demonstrations
    - Training requirement
    - Operation manuals
    - Etc.





# Request for Pre-Qualifications

Task	Date
<b>NCSPA Water Injection Dredge Prequalification Form</b>	
Issued to Potential Interested Parties	December 21, 2018
Responses from Potential Parties Due	January 25, 2019
<b>Notification of Qualification Letter sent to Selected Teams</b>	<b>March 02, 2019</b>

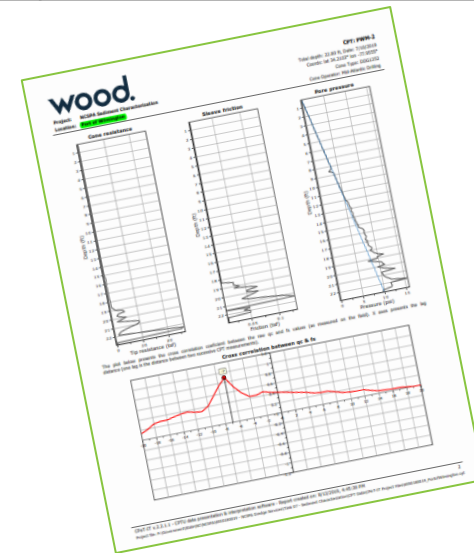
Project sequence includes the following work items:

- Commissioning of a fully equipped Water Injection Dredge (WID)
- Delivery of WID to the NCSPA Port of Wilmington dockside
  - Execution of a Port operator’s training program
  - Demonstration of a full week at the Port of Wilmington
- Delivery of WID to the NCSPA Port of Morehead City.
  - Demonstration of a full week at the Port of Morehead City
- Receipt of report summarizing the Contractor’s executed proof of concept, including pre- and post- dredge hydrographic survey data
- Modification of the WID plan, as necessary, and handover to NCSPA



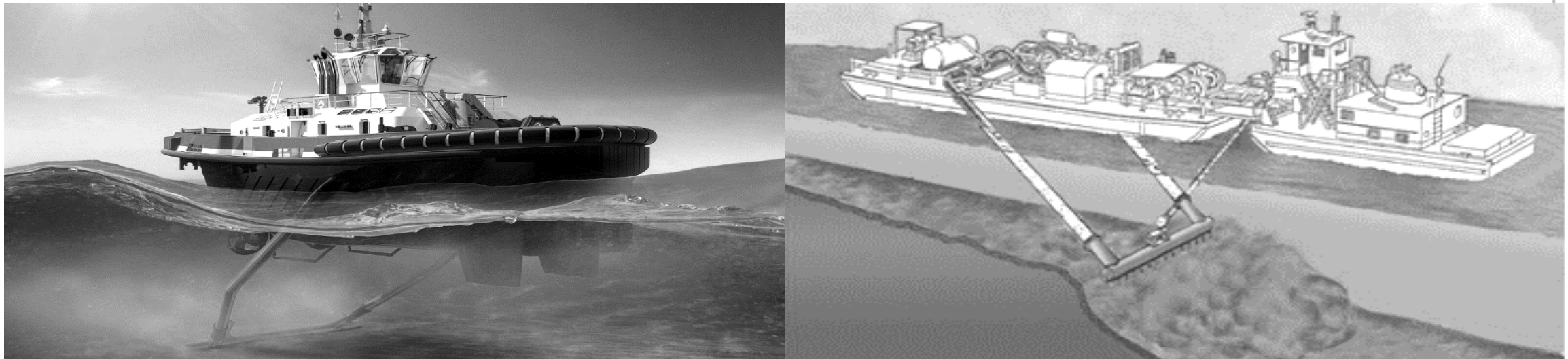
# Request for Information & Geotechnical Data Collection

Task	Date
<b>NCSA Water Injection Dredge RFI for Geotechnical Data Collection</b>	
Issued to Potential Interested Parties	March 08, 2019
Responses from Potential Parties Due	March 22, 2019
<b>Updated Proposed Schedule sent to Selected Teams</b>	<b>June 28, 2019</b>
Task	Date
<b>Geotechnical Data Collection (CPT &amp; Sediment Grab Samples)</b>	
Mobilization to Port of Wilmington	July 08, 2019
Mobilization to Port of Morehead City	July 18, 2019
Final Reports for both Ports	August 15, 2019



# Request for Proposals & Selection and Delivery

Task	Date
<b>Design-Build Request for Proposals (RFP)</b>	
Issue Design-Build Request for Proposals (RFP) to all teams	August 16, 2019
Technical Proposals and Sealed Price Proposals Due	September 26, 2019
Technical Presentations by Teams (alphabetical order)	October 01 -02, 2019
Task	Date
<b>Selection and Delivery</b>	
Recommend Selection - NCSPA Board of Directors Meeting	October 24, 2019
Final Selection - NCSPA Board of Directors Meeting	December 19, 2019
Contract Execution	January 17, 2019
Substantial Completion (dredge delivery, training materials, <u>etc.</u> )	December 11, 2020



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