Balancing Benefits and Impacts at the Mouth of the Columbia River

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Mouth of the Columbia River—Gateway to the Columbia-Snake River System

Columbia River at the Mouth, WA & OR

- Entrance channel 55/48 feet deep, 2640 feet wide, and 6 miles long.
- Average annual dredging 3.5-4.5 MCY, June-Sept work window.
- Support Columbia-Snake River Navigation System
  - $24 Billion worth of U.S. products and 46 million tons of cargo annually.
  - Largest wheat and barley export gateway in the Nation.
  - Third largest grain export gateway in the World.
  - Over $930M in commercial investments-to-date because of the deepening.
  - Supports 40,000 local jobs.
- Large group of stakeholders (CRCFA), varying concerns cause Wicked Problems.
- Focus on the beneficial use of dredged material and Engineering with Nature to prevent ‘wasting’ clean sediment resources.
- Innovative monitoring program to build stakeholder trust, leverage opportunities, and collect baseline data for the addition of nearshore beneficial use sites.
- Disposal Mission, responsible use of the placement sites to maximize efficiency.
Channel Maintenance

Purpose: Maintain the location and depth of the navigation channel.

Passive Channel Maintenance (Jetties/Pile Dikes)
• Decrease Currents in the immediate vicinity of the structure, reducing erosion.
• Increase Currents near the navigation channel thus preventing lateral migration.

Active Channel Maintenance
• Hopper dredging the Federal Navigation Channel.
Mouth of the Columbia River

“CONSTRUCTED” 1885-1917

North Jetty

South Jetty

Peacock Spit

Jetty “A”

Pile Dikes

MCR Navigation Channel

Clatsop Spit

Pacific Ocean

6 miles long
2,640 ft wide
55/48 ft deep
Passive Structures (Pile Dikes)
Active Channel Maintenance

Dredged Material Placed in Open Water
- *Plume Dynamics*

- Hopper Dredge or Barge Placement
- Neutrally buoyant material enters water column
- Convective Descent
- Dynamic Collapse
- Passive Transport and Diffusion
- Bottom Encounter & Lateral Spreading
- Seabed
Addressing Stakeholder Concerns

Methods used to meet concerns

- Thin-layer placement with the Dredge ESSAYONS
- Benthic Video Sled
  - Presence/Absence of species
- Deposition Monitoring Instruments (CamPods)
  - Deposition
  - Acute crab response
- Acoustic Doppler Current Profiler (ADCP)
  - Dredge plume velocity, turbidity, etc
  - Deposition
- Acoustic crab tags
  - Crab mortality
  - Crab motility
- Multi-beam surveys
  - Deposition
- Environmental Buoy
  - Real-time conditions to inform monitoring team
  - Provide the public with a tool to monitor the conditions in the site
- Automated Video Event Detection and Classification (AVEDac)
  - Software to track species ID and abundance
  - Classification and Counting species
Benthic Video Sled/AVEDac Software

- Replaces trawls
  - Less invasive than traditional methods, no take
- MBARI/ERDC developing Automated Event Detection and Classification (AVEDac) Software
Acoustic Crab Tags

(Data courtesy of NOAA)
ADCP Data Collection

Data collection includes:

- Measured currents through the water column
- Directional waves
- Suspended sediments
- Bottom current regime
Deposition Monitoring Instruments (CamPods)

CamPod transect line

(Courtesy of Curtis Roegner-NOAA)
2015 Placement Site Average Transit Time for the Mouth of the Columbia River

- **DWS**: Average Transit in Minutes
- **SJS**: Average Transit in Minutes
2015 Average Transit Time Cost to Placement Site for the Mouth of the Columbia River

<table>
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<tr>
<th>Placement Site</th>
<th>Average Cost</th>
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Conclusions/Limitations

- Critical need for on-going stakeholder engagement
- Quantifying benefits of nearshore placement
  - Increased efficiency in the dredging program
  - Material remaining in the littoral cell
  - Protecting public investment (South Jetty)
- Displaying low impacts
- Alleviate stakeholder concerns
- Expand network of nearshore sites
  - Reduce localized impacts by having a large network of sites
- AVEDac software needs work to be fully operational
- Quantifying the migration of material from the nearshore site to the beach
- Passive detections
  - Green Sturgeon (*Acipenser medirostris)*,
  - Great White Shark (*Carcharodon carcharias*)