Balancing Benefits and Impacts at the Mouth of the Columbia River

4th Biennial TRB-CMTS Research and Development Conference

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USACE Portland District

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US Army Corps of Engineers
BUILDING STRONG®

Mouth of the Columbia River– Gateway to the Columba-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.

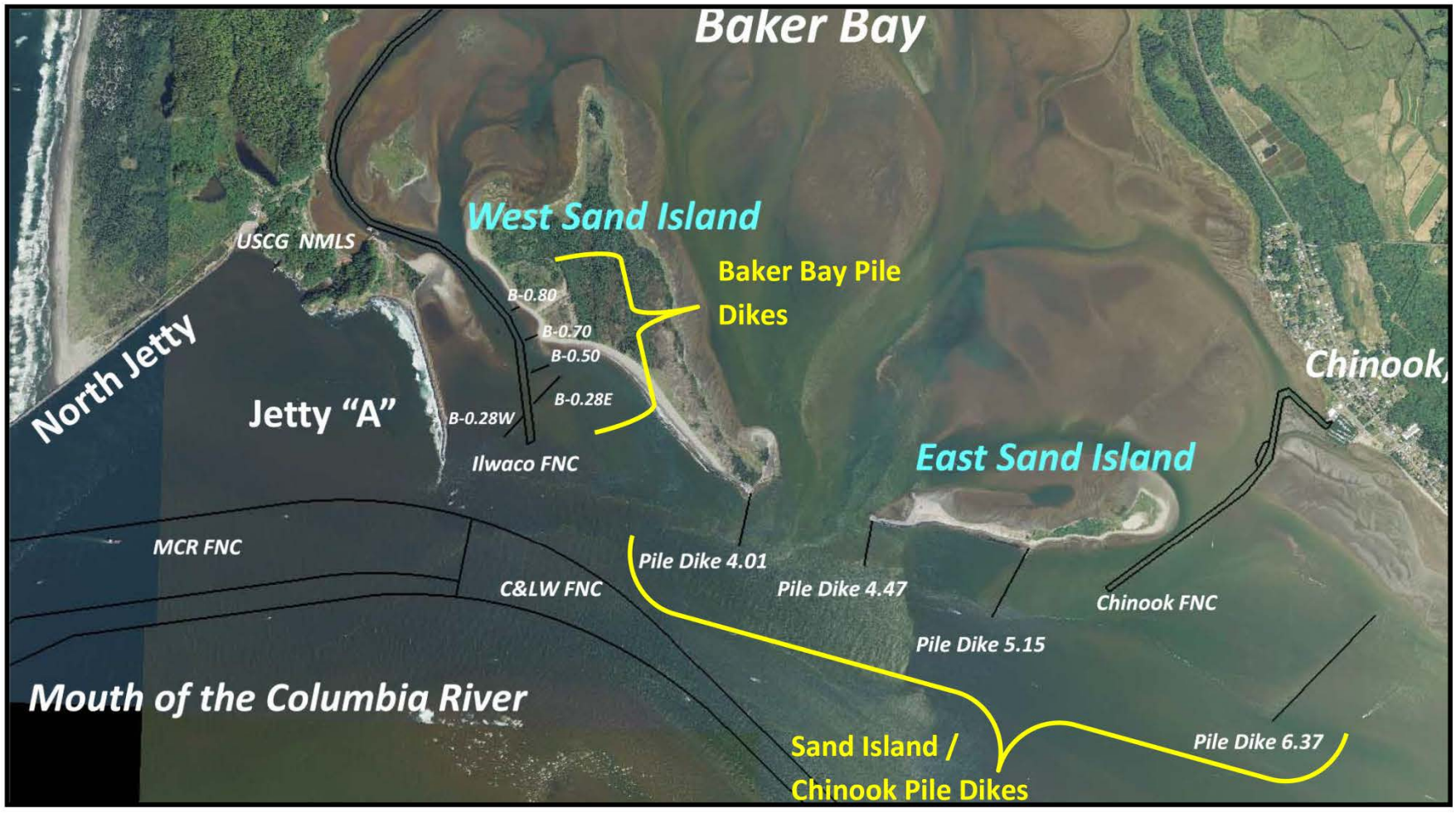
Active Channel Maintenance

- Hopper dredging the Federal Navigation Channel.

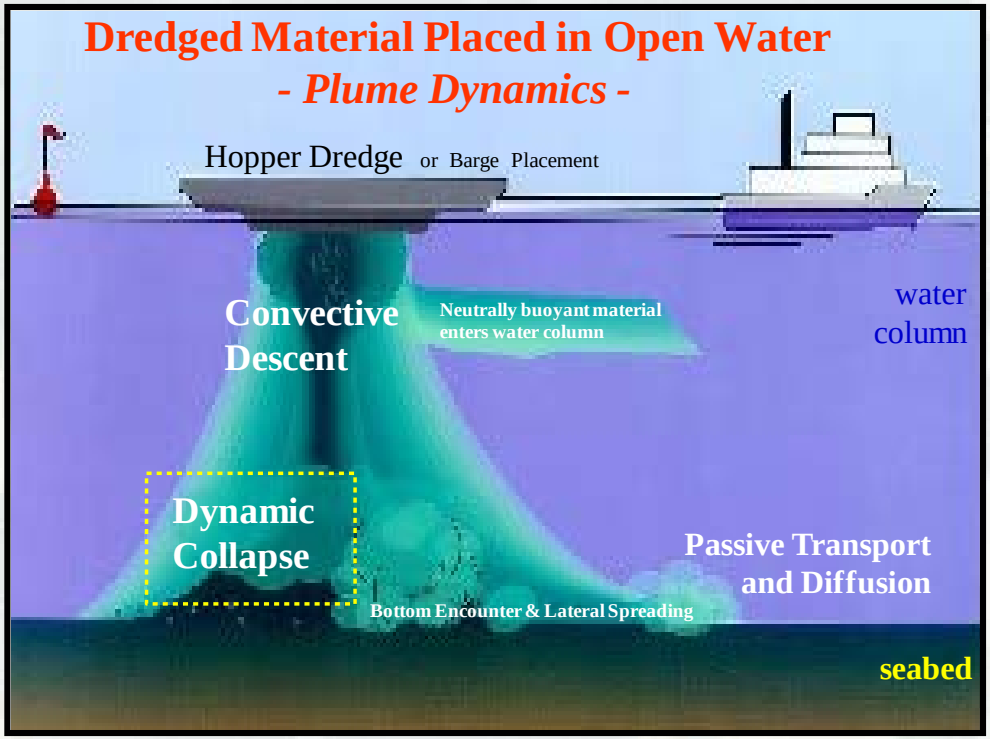
Mouth of the Columbia River

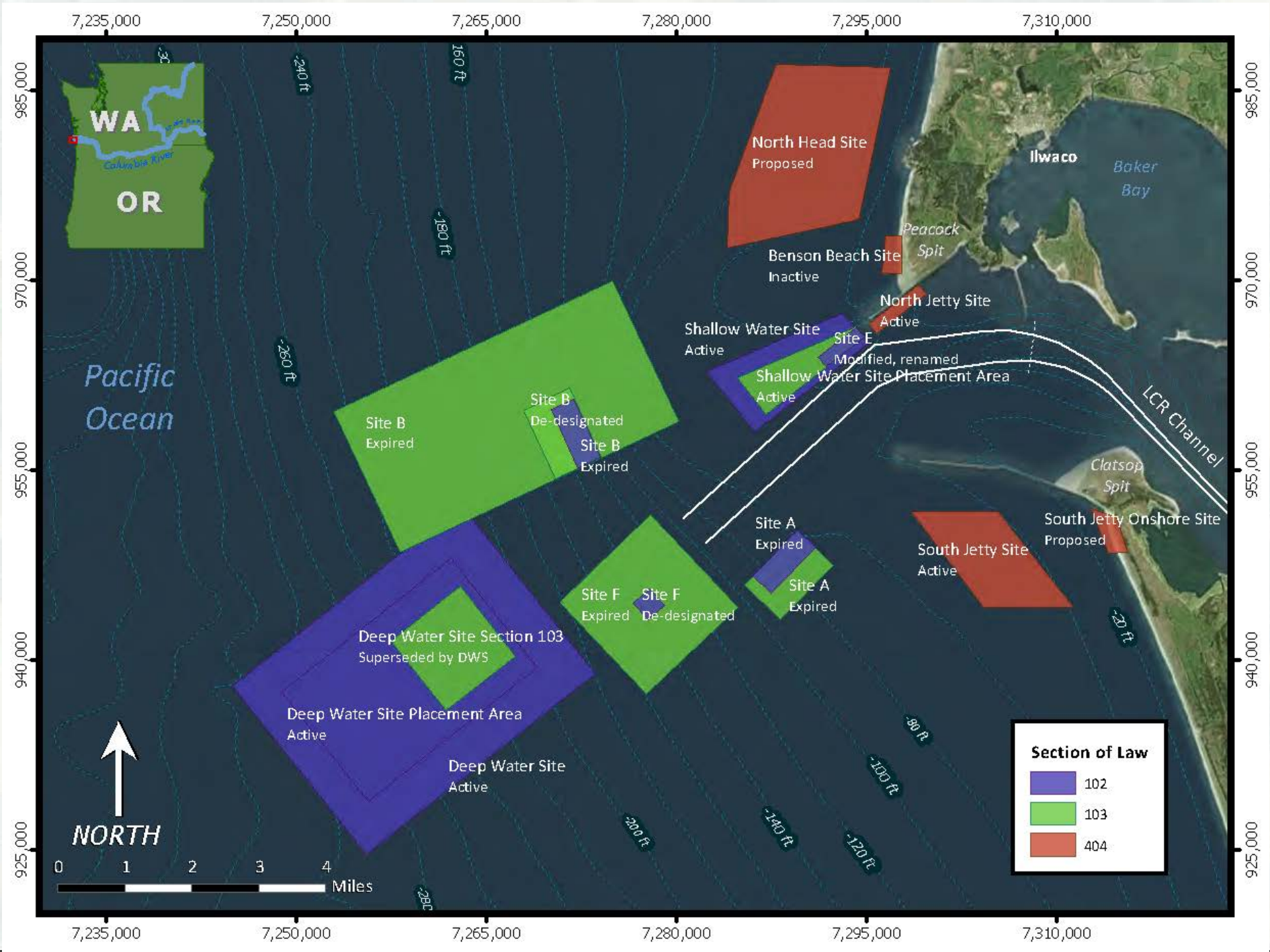
"CONSTRUCTED" 1885-1917

Passive Structures (Pile Dikes)



Active Channel Maintenance

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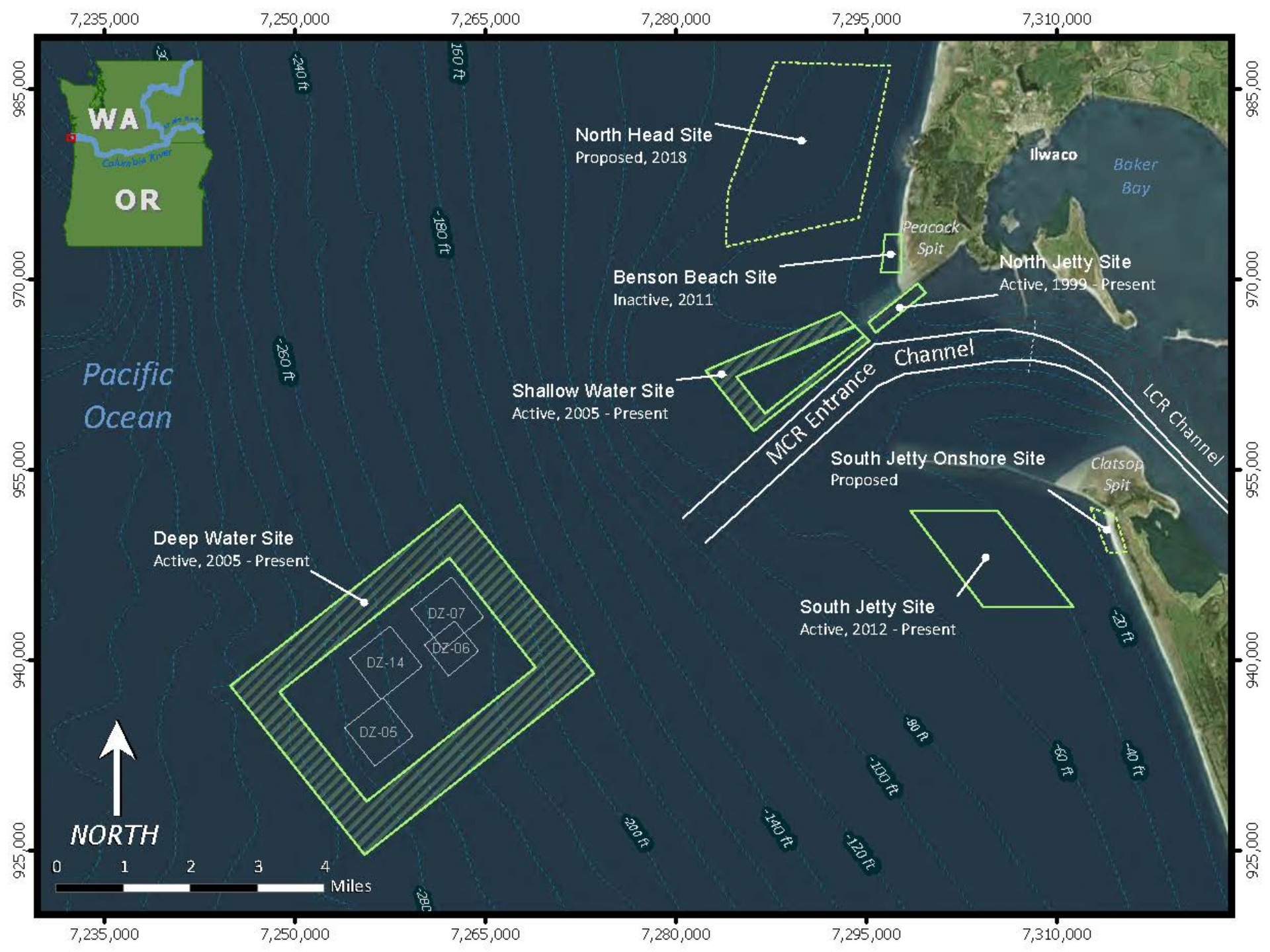
WA
OR
Columbia River
-240 ft
-160 ft
-180 ft
-260 ft
-280
North Head Site
Proposed
Benson Beach Site
Inactive
Peacock Spit
Ilwaco
Baker Bay
North Jetty Site
Active
Shallow Water Site
Active
Site E
Modified, renamed
Shallow Water Site Placement Area
Active
LCR Channel
Pacific Ocean
Site B
Expired
Site B
De-designated
Site B
Expired
Clatsop Spit
South Jetty Onshore Site
Proposed
South Jetty Site
Active
Site A
Expired
Site A
Expired
Site F
Expired
Site F
De-designated
-20 ft
Deep Water Site Section 103
Superseded by DWS
Deep Water Site Placement Area
Active
Deep Water Site
Active
-80 ft
-100 ft
-140 ft
-120 ft
-200 ft
NORTH
0
1
2
3
4
Miles
Section of Law
102
103
404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WA
OR
Columbia River
North Head Site
Proposed, 2018
Ilwaco
Baker Bay
Peacock Spit
Benson Beach Site
Inactive, 2011
North Jetty Site
Active, 1999 - Present
Pacific Ocean
Shallow Water Site
Active, 2005 - Present
MCR Entrance Channel
LCR Channel
South Jetty Onshore Site
Proposed
Clatsop Spit
Deep Water Site
Active, 2005 - Present
DZ-07
DZ-06
DZ-14
DZ-05
South Jetty Site
Active, 2012 - Present
-20 ft
-40 ft
-60 ft
-80 ft
-100 ft
-120 ft
-140 ft
-160 ft
-180 ft
-200 ft
-240 ft
-260 ft
NORTH
0 1 2 3 4
Miles

Addressing Stakeholder Concerns

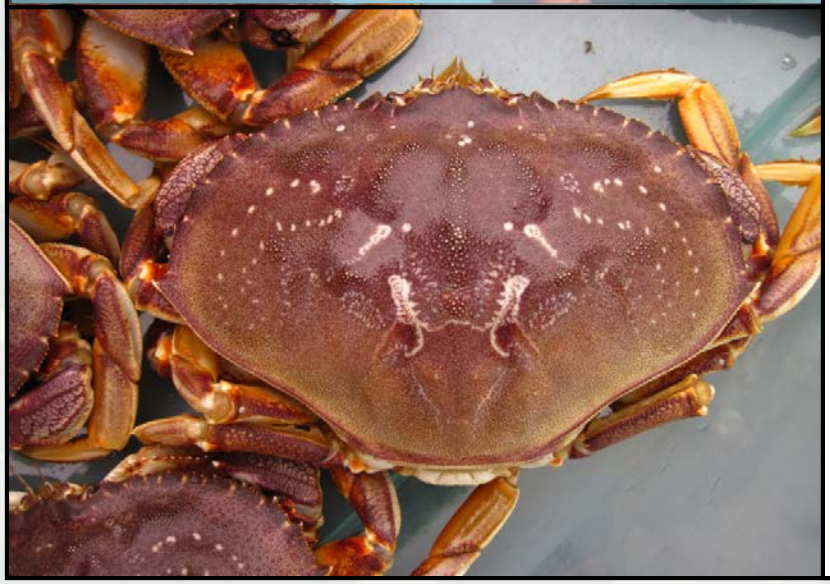
Methods used to meet concerns

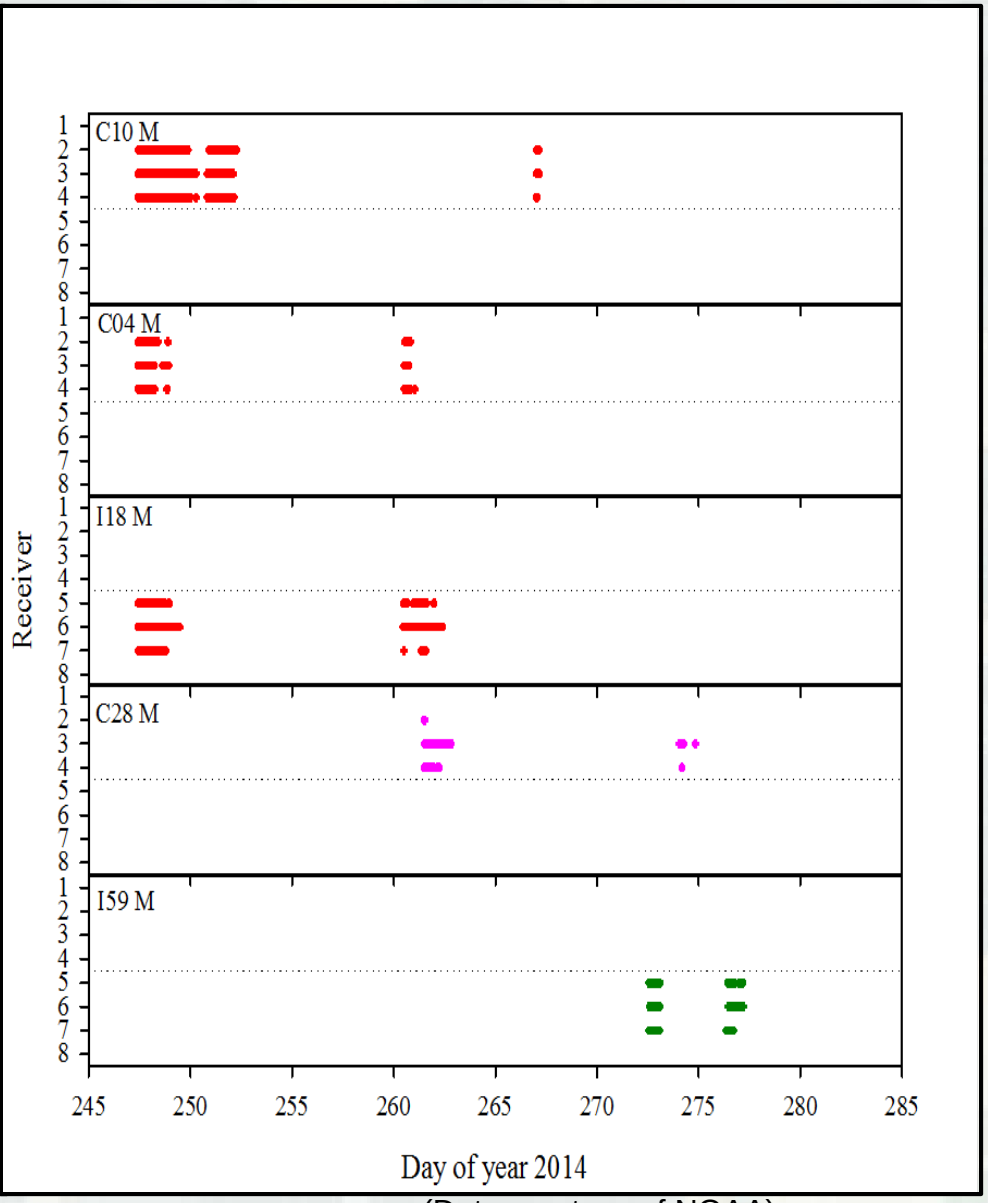
- Thin-layer placement with the Dredge ESSAYONS
- Benthic Video Sled
  - Presence/Absence of species
- Deposition Monitoring Instruments (CamPods)
  - Deposition
  - Acute crab response
- Acoustic Doppler Current Profiler (ADCP)
  - Dredge plume velocity, turbidity, etc
  - Deposition
- Acoustic crab 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



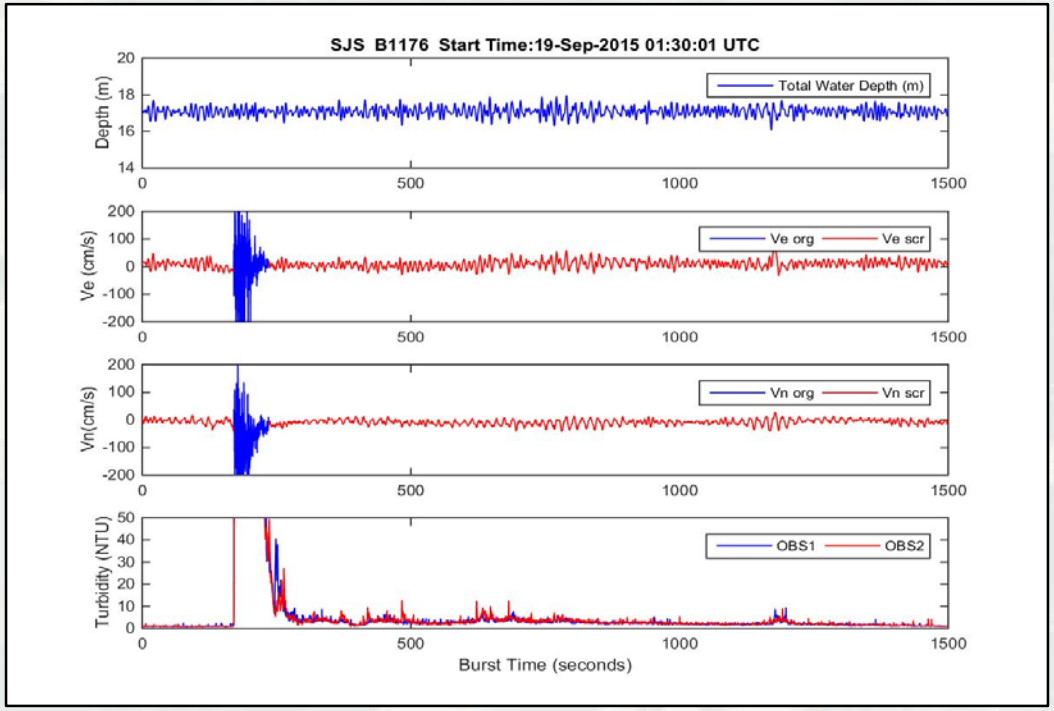


(Data courtesy of NOAA)

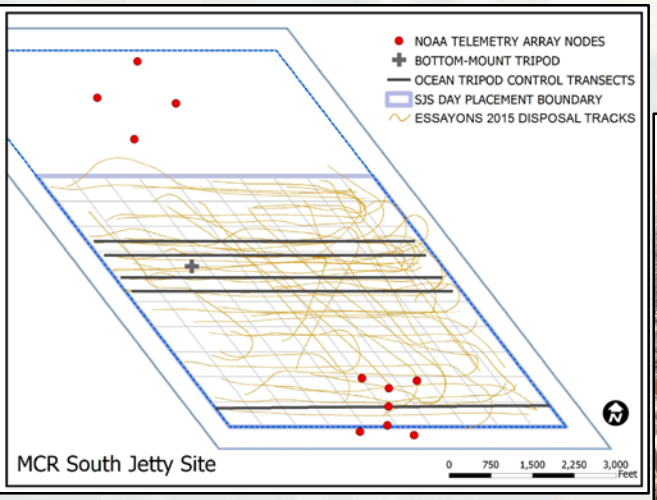
ADCP Data Collection

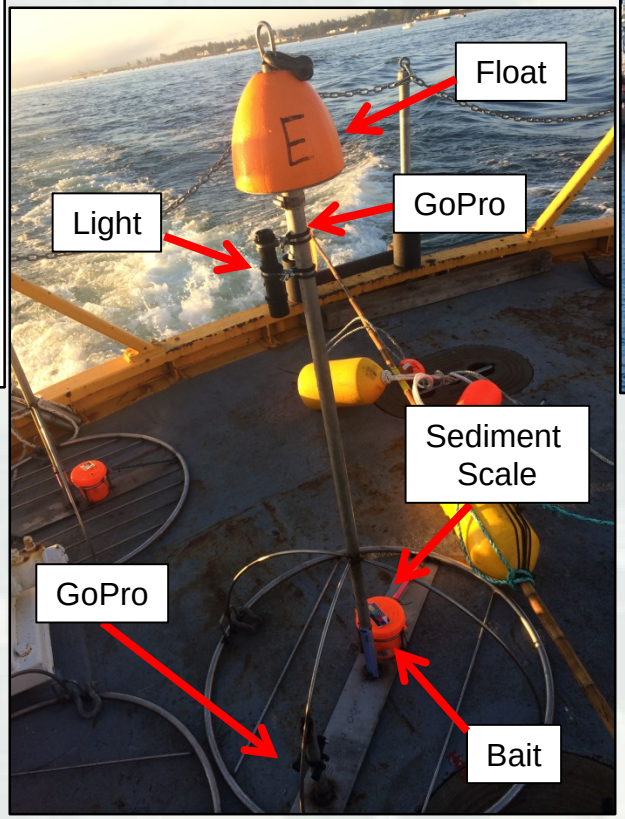
Data collection includes:

- Measured currents through the water column
- Directional waves
- Suspended sediments
- Bottom current regime



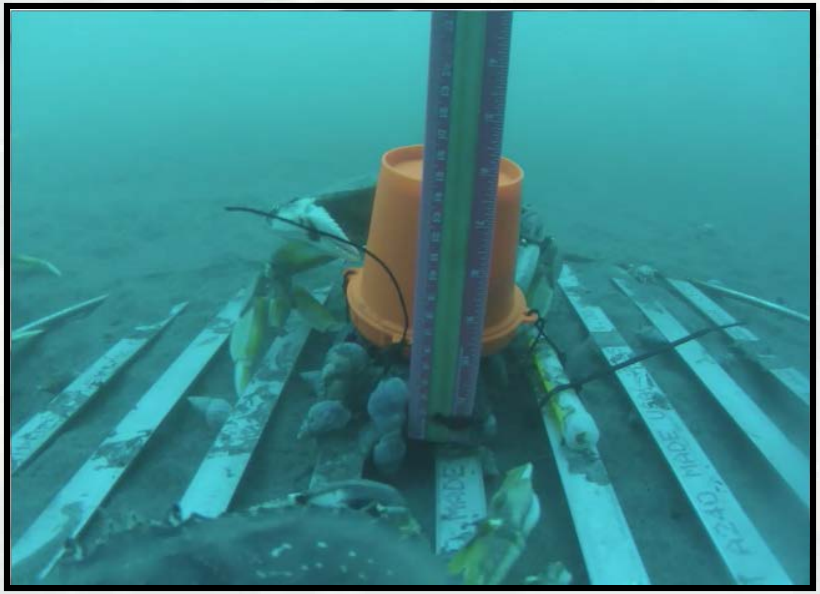
Deposition Monitoring Instruments (CamPods)

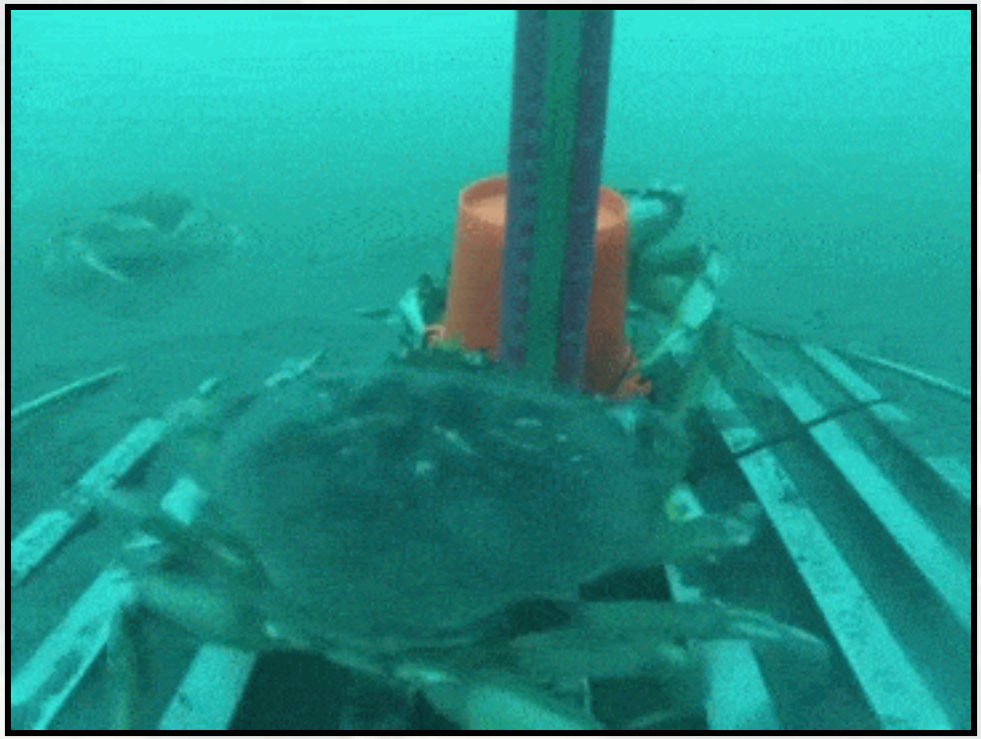


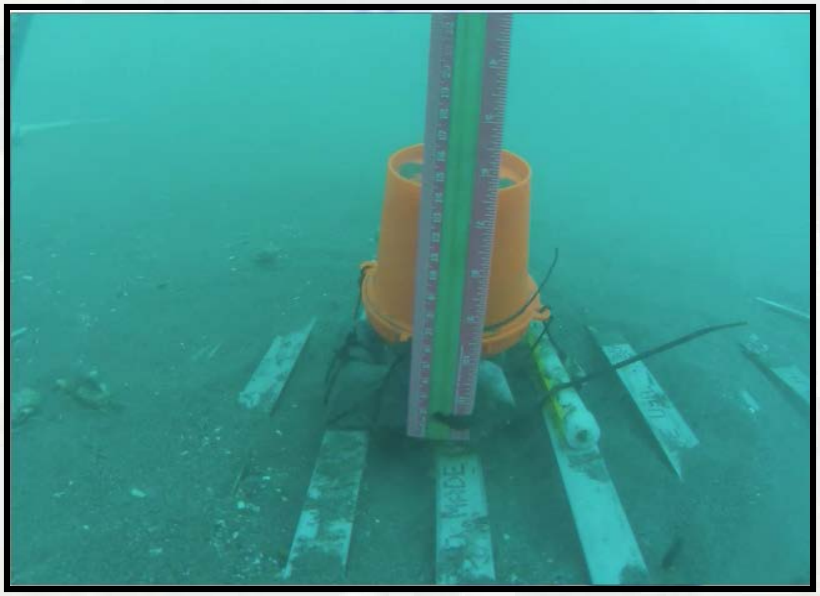


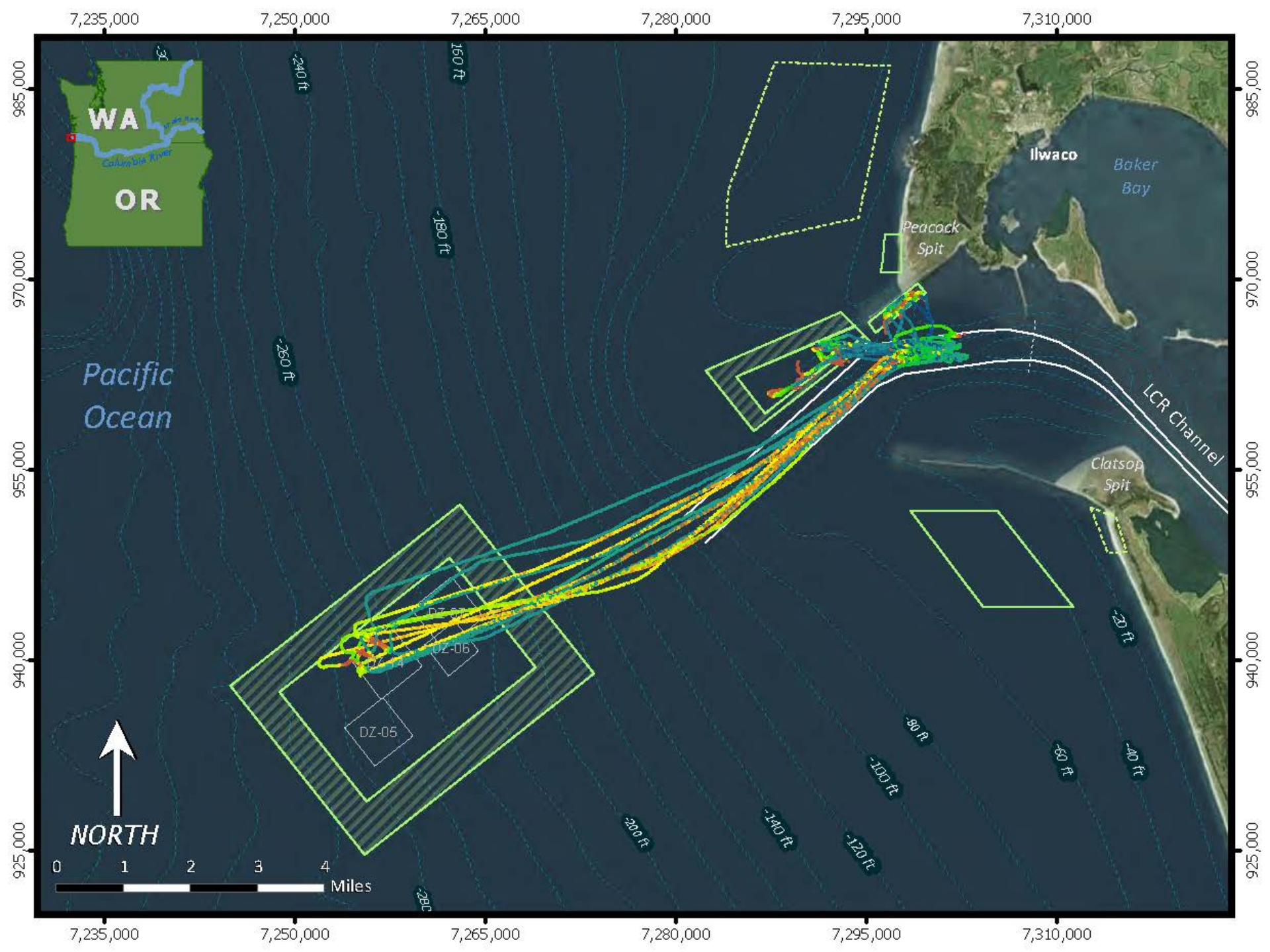
CamPod transect line

(Courtesy of Curtis Roegner-NOAA)





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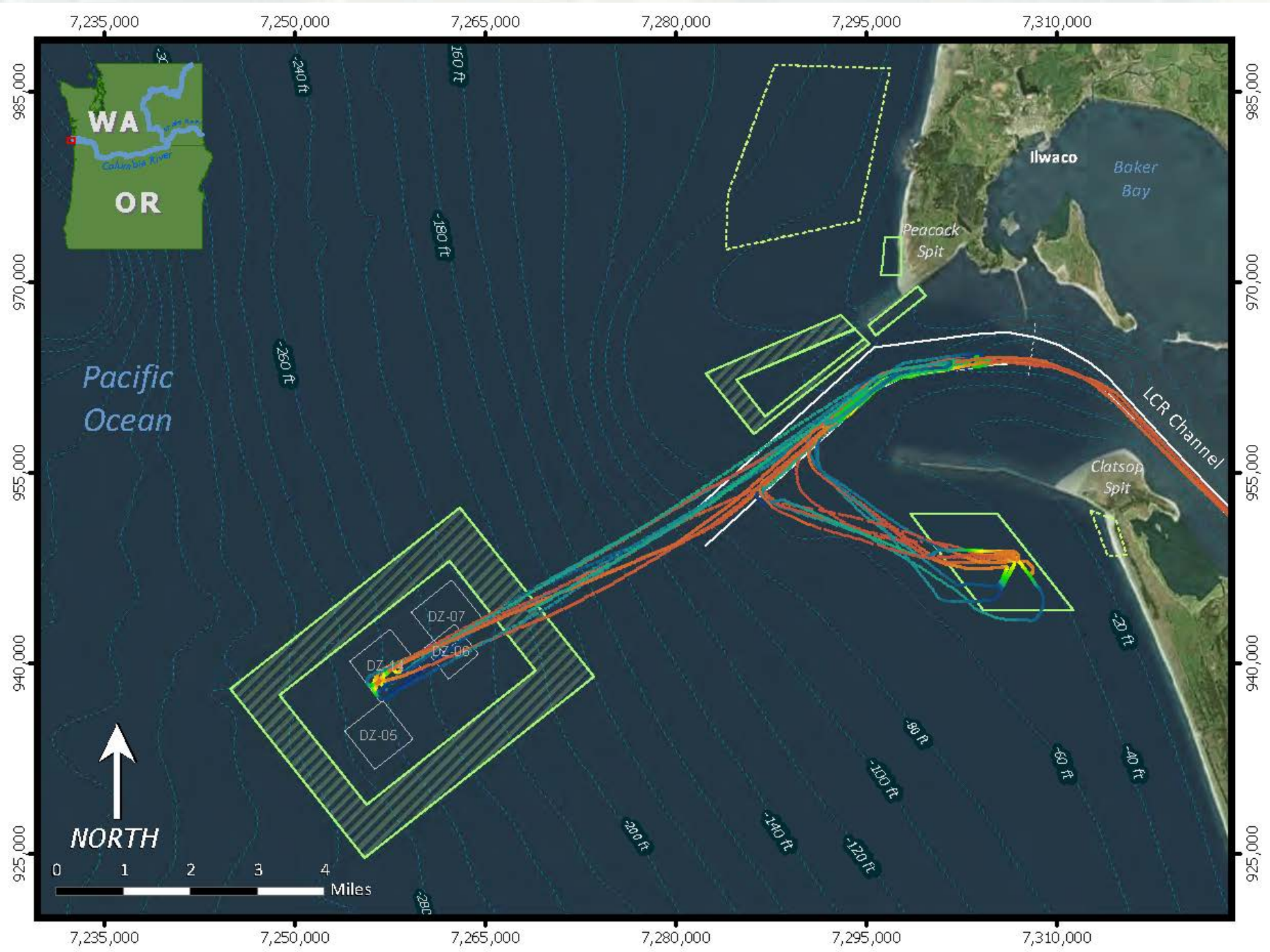
-120 ft
DZ-06
DZ-05
NORTH
0 1 2 3 4
Miles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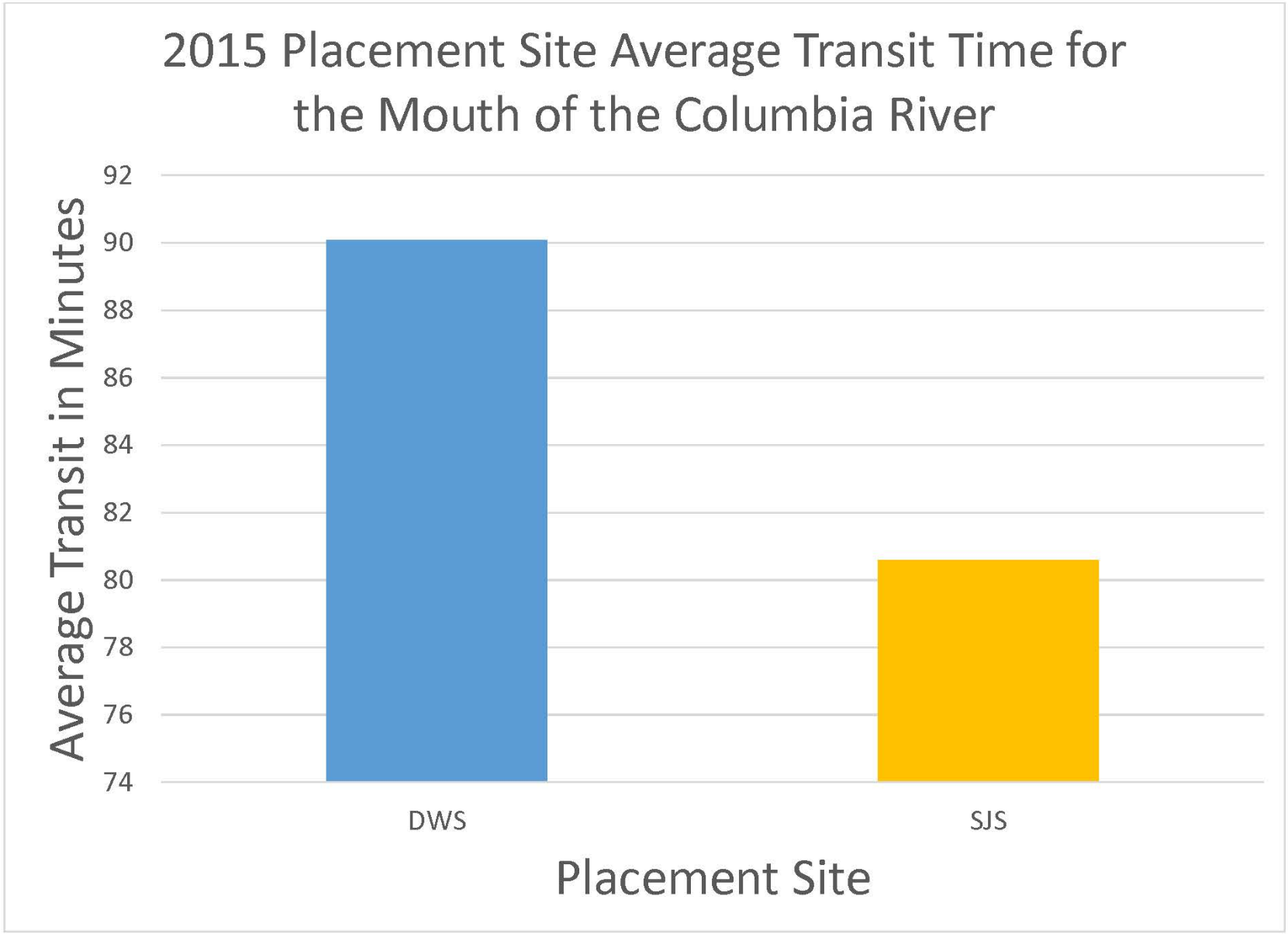
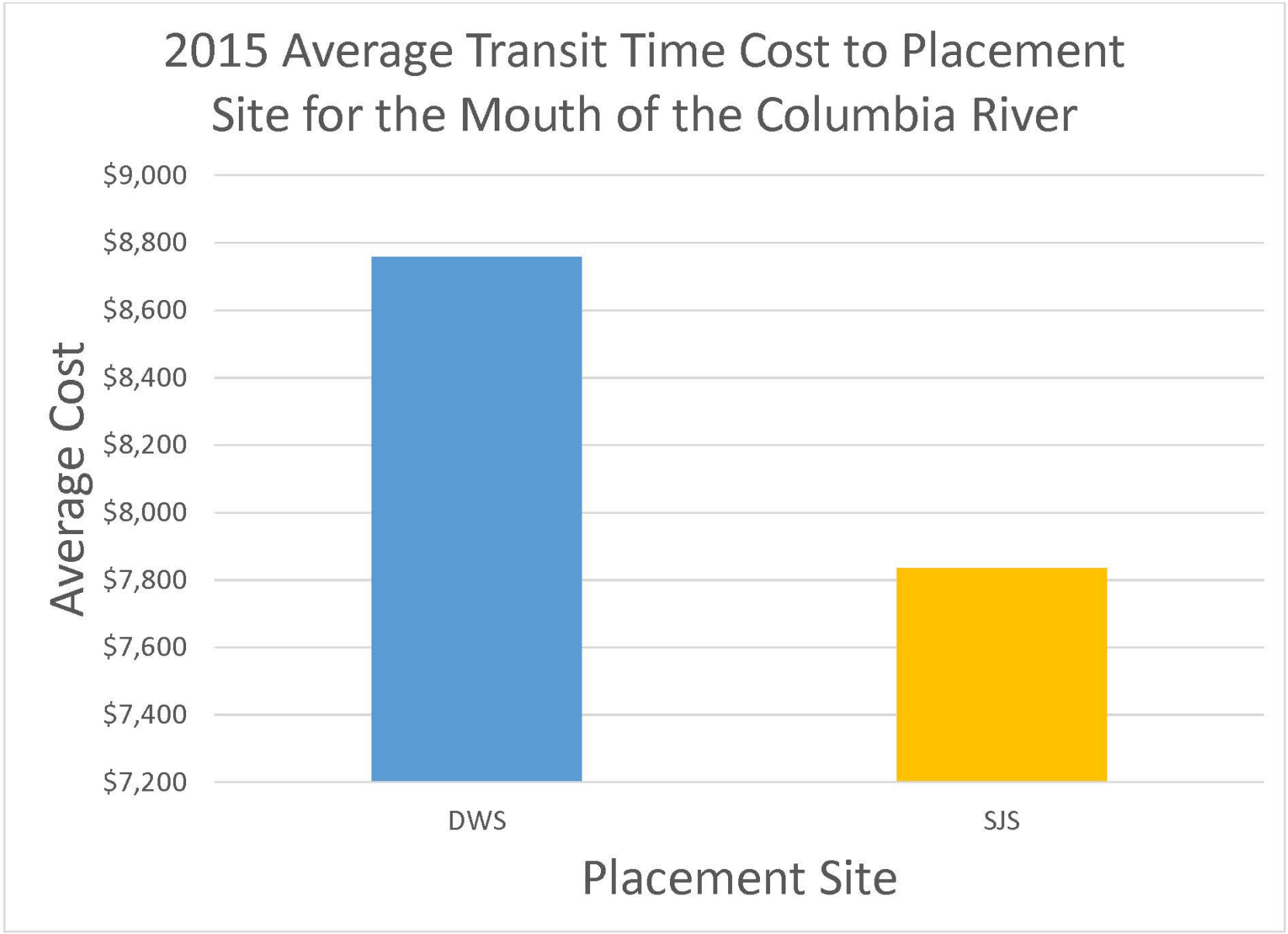

2015 Placement Site Average Transit Time for the Mouth of the Columbia River
Average Transit in Minutes
92
90
88
86
84
82
80
78
76
74
DWS
SJS
Placement Site


2015 Average Transit Time Cost to Placement Site for the Mouth of the Columbia River
$9,000
$8,800
$8,600
$8,400
$8,200
$8,000
$7,800
$7,600
$7,400
$7,200
Average Cost
DWS
SJS
Placement Site

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)*