Dredged Material Placement Considerations for *In-water Sites*

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Operationalizing RSM

FY17 RSM IPR

1. Techniques for Placing Dredged Material within In-Water Placement Sites – Realizing RSM Objectives

2. Chetco Nearshore Site – Genesis for RSM in Portland District

3. Port Orford - Particle Tracking Model (RSM pilot)

4. Coos Bay – Sediment Tracer Study

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Annual O&M Dredging
It's a "Dredged Material Placement Project"

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Dredged Material Placement Considerations for *Inwater Sites*

Manage In-water Sites at Different Time Scales

- Per Load (hopper dredge or Scow)
  For a given Volume (pipeline of hydraulic dredge)
- Per Season (year)
- Over a given Project Life-cycle (2-50 years)

Different "Placement" Approaches to Achieve Different Objectives

Dispersal of Dredged Material during Placement

- Maximize (Thin-Layer Placement, minimize deposition thickness)
- Minimize (Point Dump, maximize deposition thickness)

Dispersal of Dredged Material after Placement

- Maximize (place in high current or wave height environment)
- Minimize (place in quiet areas)

Deposition Height of Placed Dredged Material on Seabed/Riverbed

- Maximize (place within confined area, Point-Dump)
- Minimize (place over a large area, Thin Layer)

THIN-LAYER PLACEMENT

MINIMIZE DEPOSTION HEIGHT, MAXIMIZE DEPOSITION SURFACE AREA, PROMOTE MATERIAL TRANSPORT (can require more time to place dredged material)

POINT-DUMP PLACEMENT

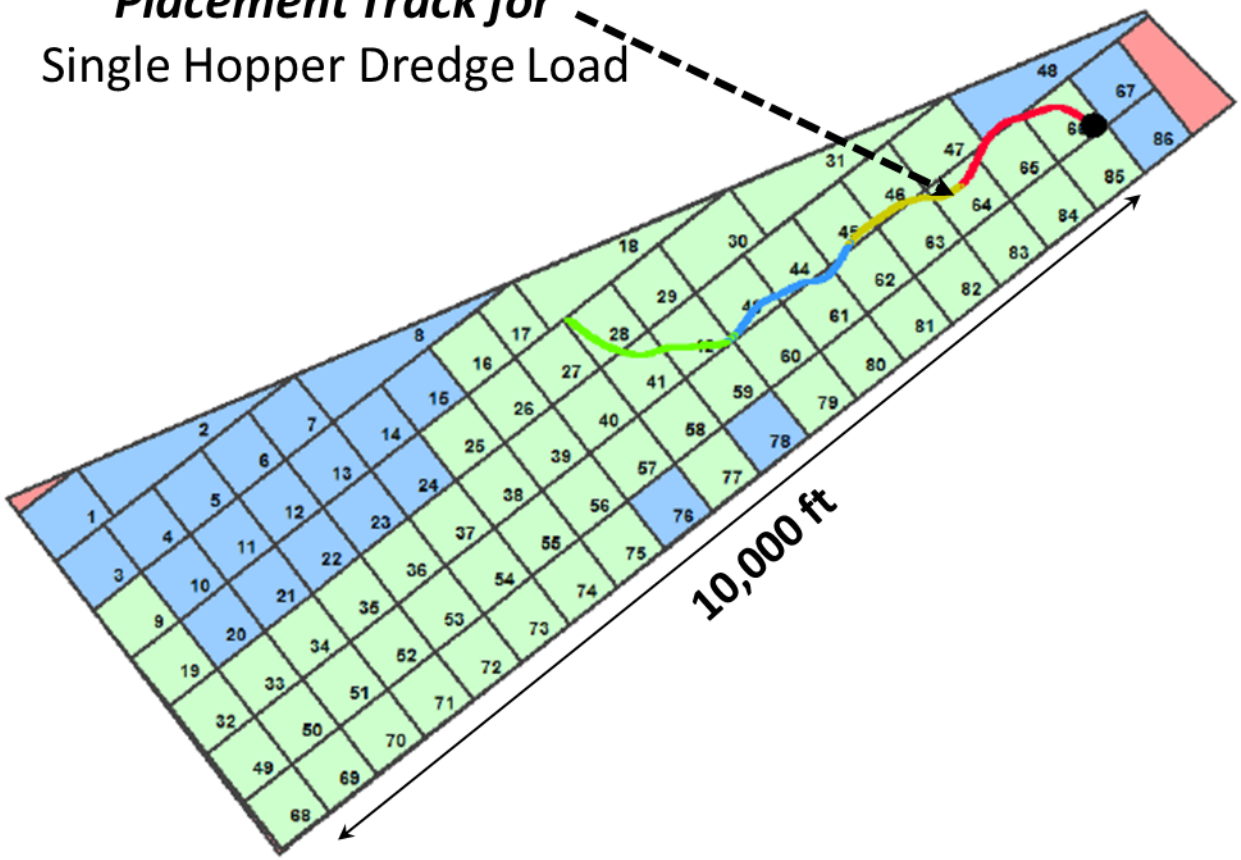
MAXIMIZE DEPOSTION HEIGHT, MINIMIZE DEPOSTION SURFACE AREA,
REDUCE MATERIAL TRANSPORT (enables efficient dredged material placement ops)

THIN LAYER PLACEMENT

Shallow Water Site at MCR

Placement Track for

Single Hopper Dredge Load



Each cell is 500 x 500 ft

Avoidance
LCZ
1
2
3
>3

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3,500 CY placed.
6-15 minutes to place each load

5,000 ft transit while placing

300 - 600 loads placed during 1 season (2 months)

Water depth = 40-60 ft

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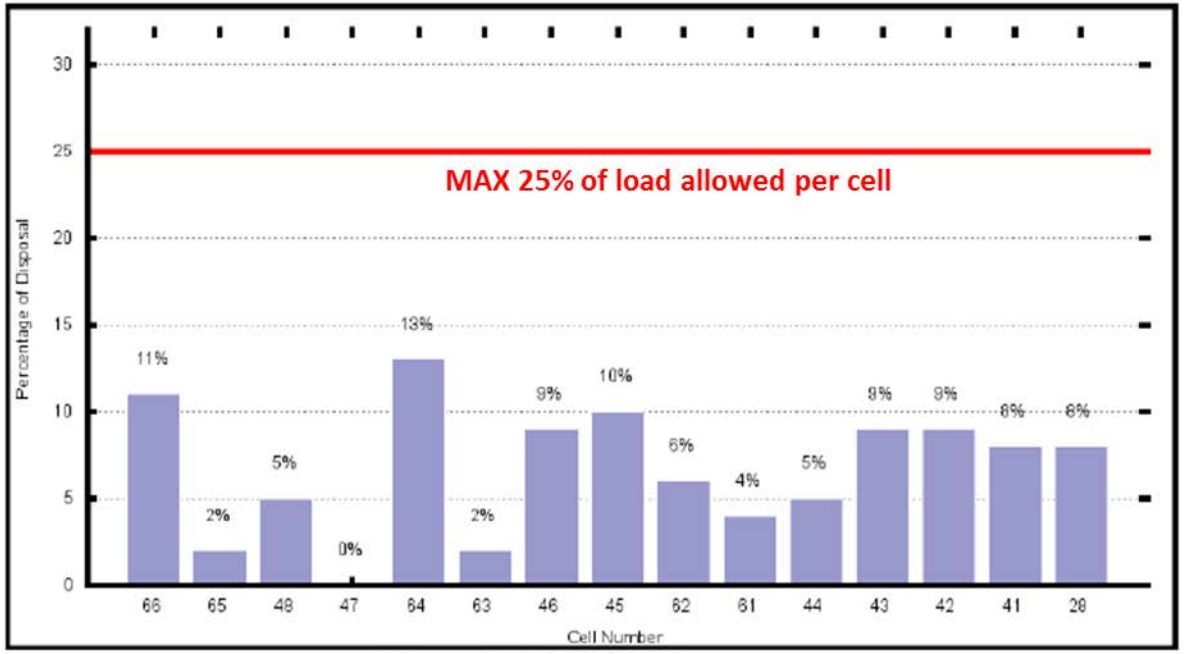
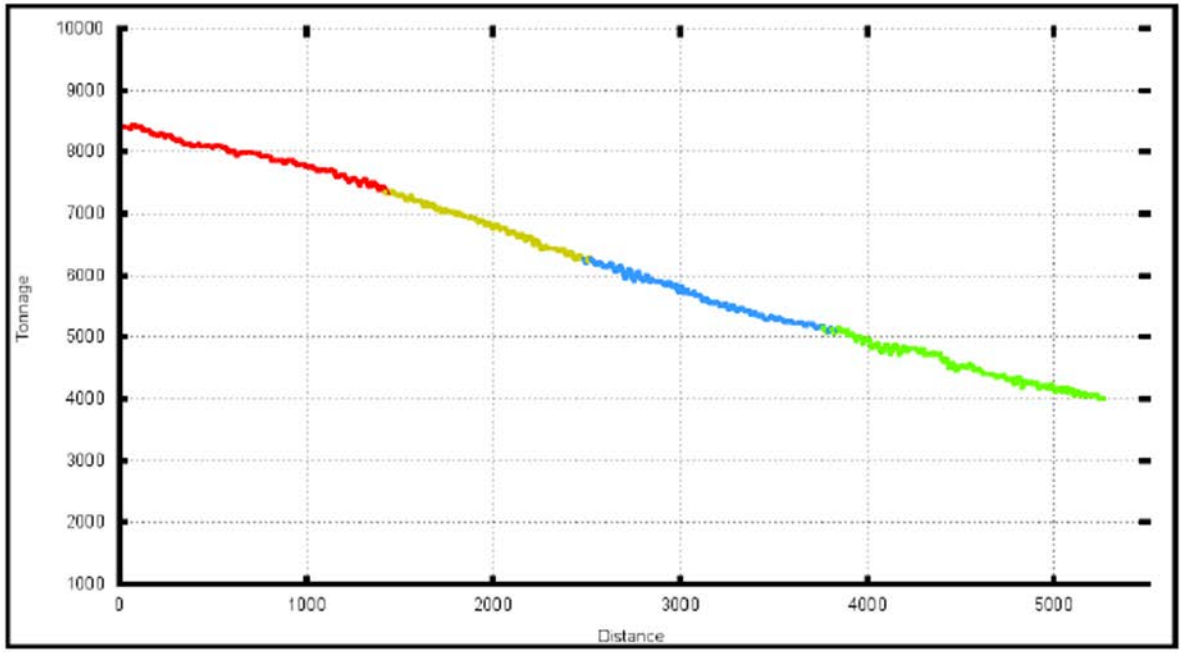


Disposal Distribution Summary

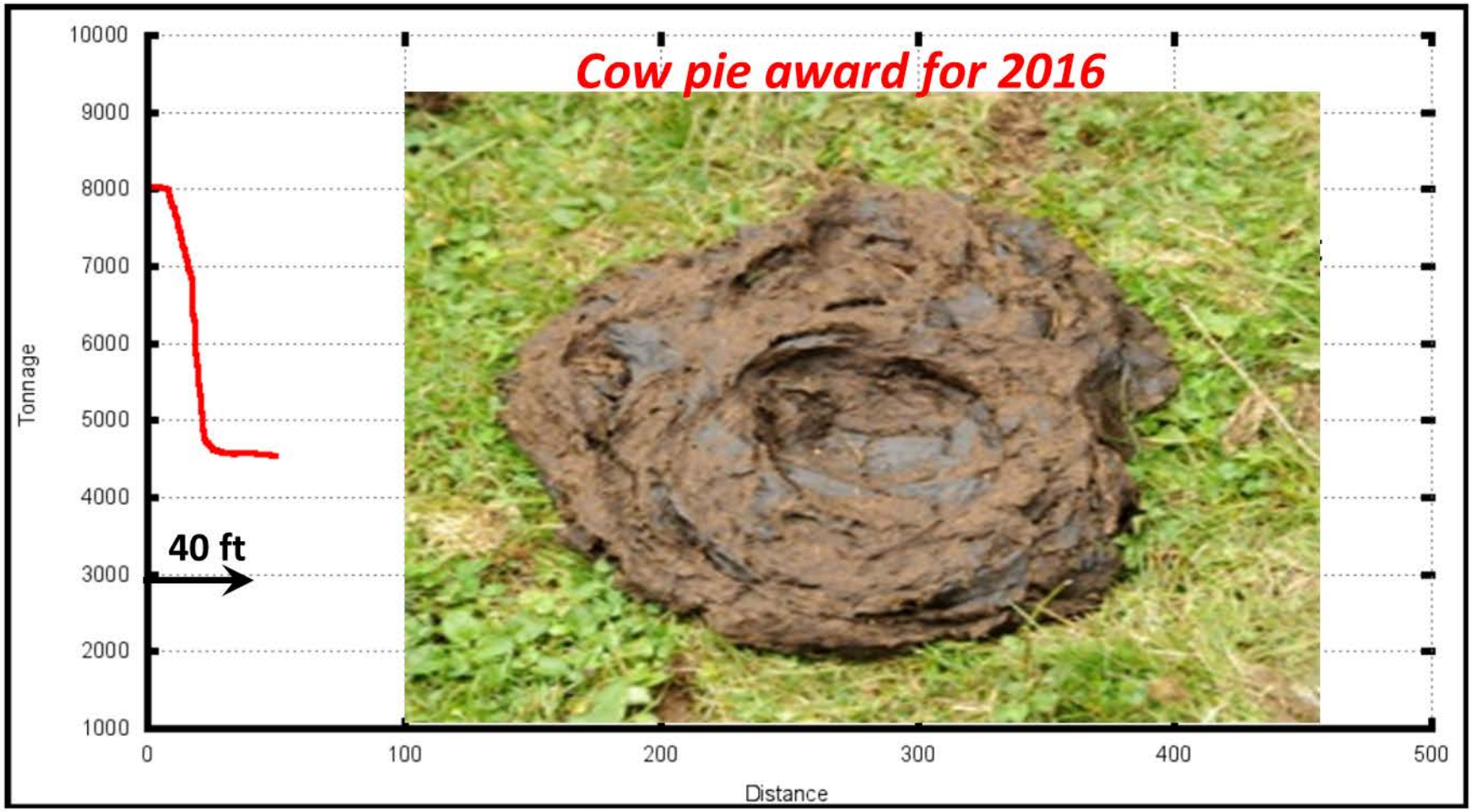


Displacement vs Distance

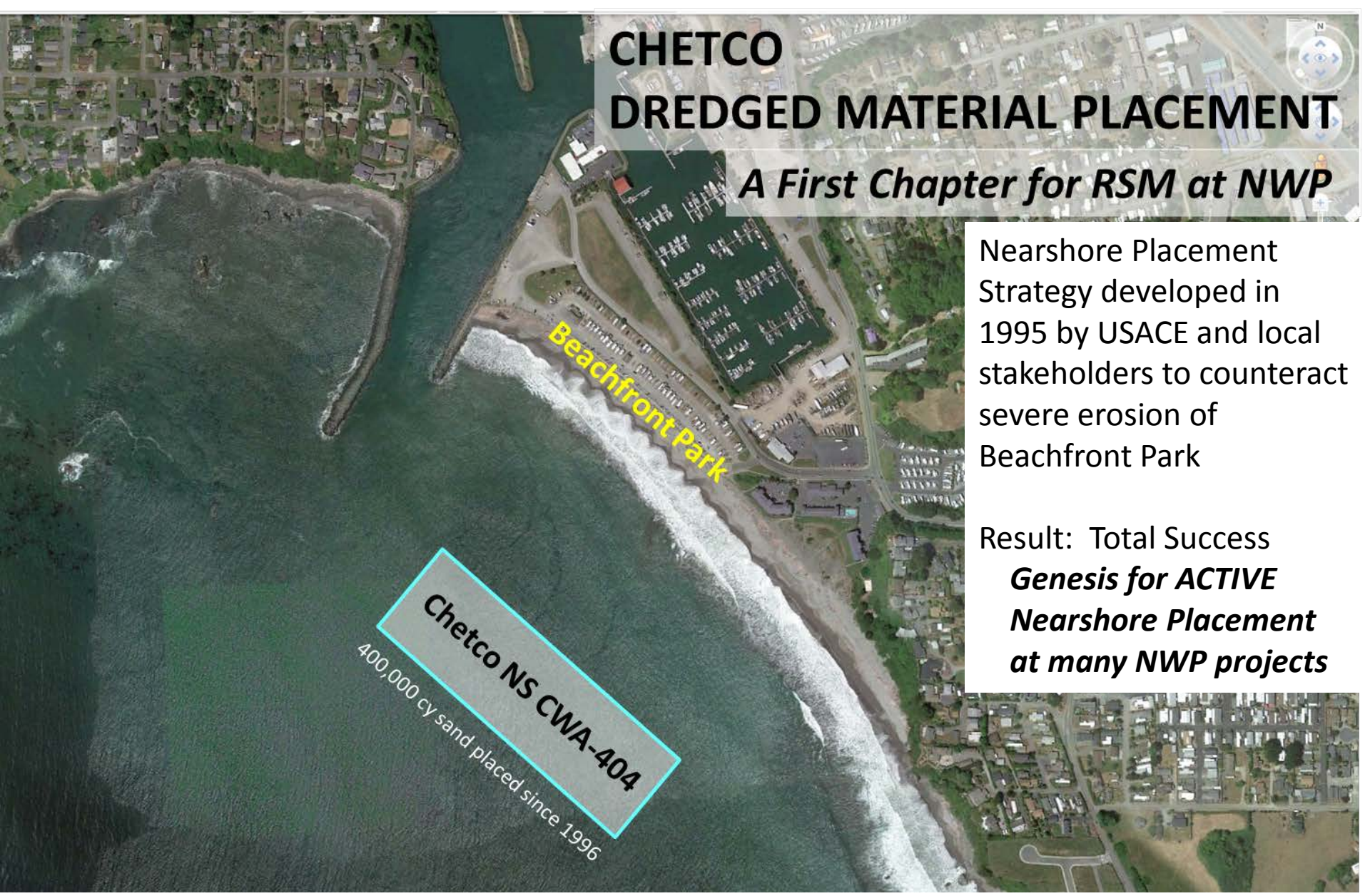
Percent of 1 load (3500 cy)
Placed within the CELLs
that were transited
By the hopper dredge

Each cell is 500 x 500 ft

Hopper Dredge: 3500 cy load of SAND placed in Columbia River



Displacement vs Distance



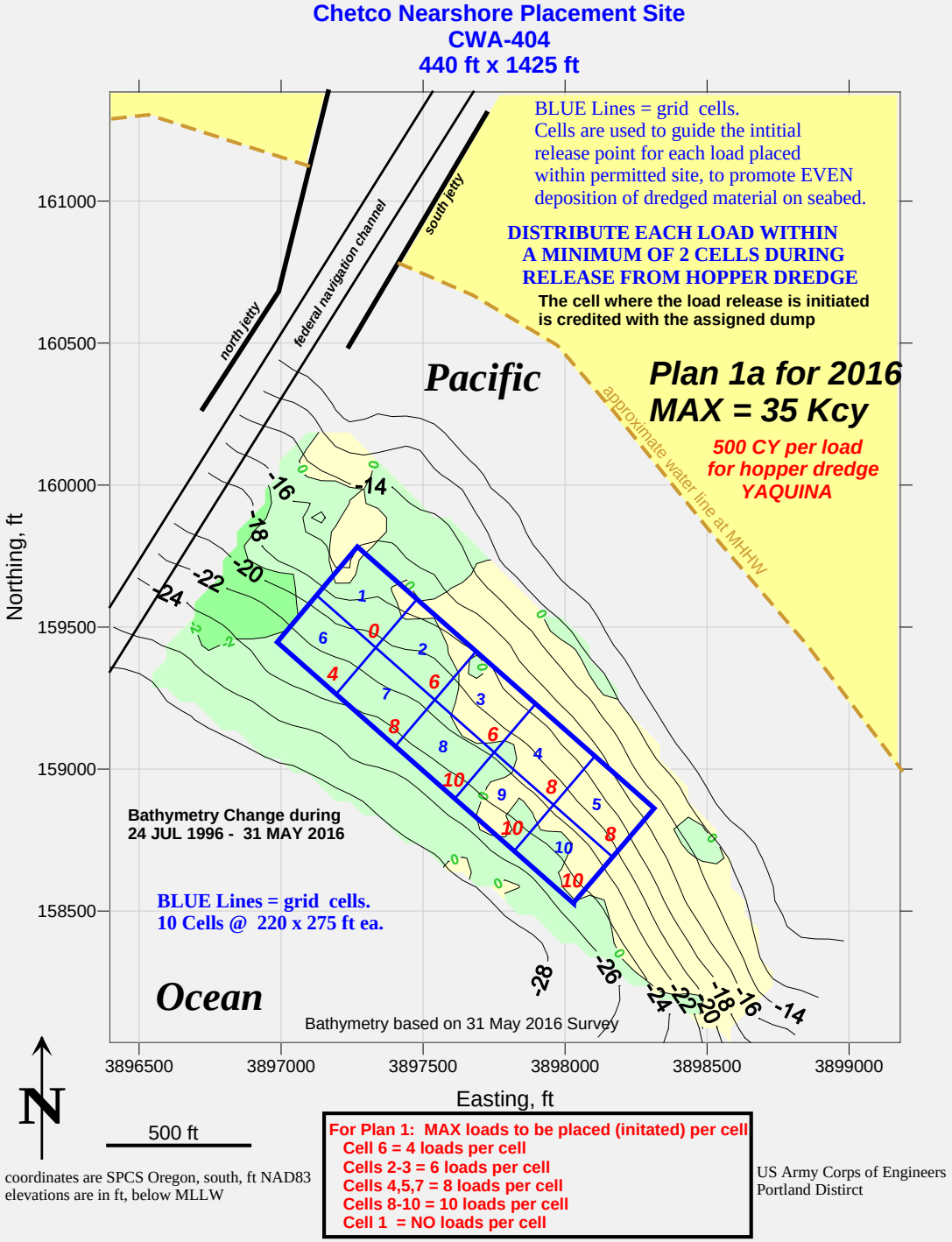
Nearshore Placement Strategy developed in 1995 by USACE and local stakeholders to counteract severe erosion of Beachfront Park

Result: Total Success

Genesis for ACTIVE Nearshore Placement at many NWP projects

Port of Bookings (Chetco River)

Nearshore Placement Site (CWA 404)
Used since 1996 – Hopper Dredge Yaquina
20-30 Kcy sand placed/year, water depth 16-30 ft



Dredged Material Placement in this 404 Site is:

1) **Performed more like a thin layer placement.**

2) **Loads are spread between cells to promote even deposition within the site over time and maximize site capacity.**

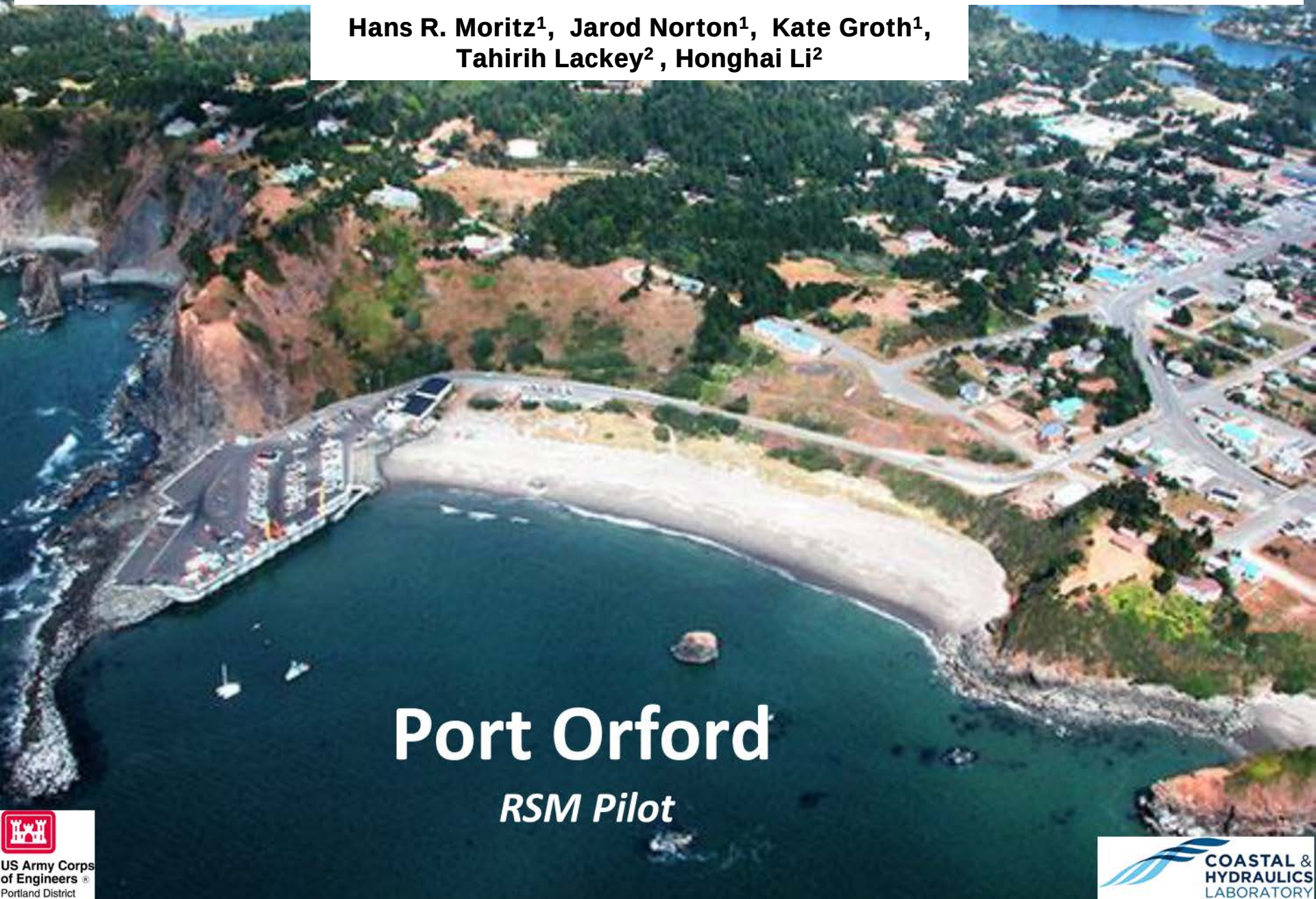
3) **Beneficial Use - Reduces shore erosion along a valued public area.**

4) **400,000 cy of sand placed since 1996**

Specialized Equipment Capability
The GVT Hopper Dredge and her able-bodied Crew

A RELATIVE COMPARISON OF THREE PROPOSED BREAKWATER REPAIR ALTERNATIVES TO REDUCE CHANNEL SHOALING, PORT ORFORD, OREGON

Hans R. Moritz[1], Jarod Norton[1], Kate Groth[1], Tahirih Lackey[2] , Honghai Li[2]



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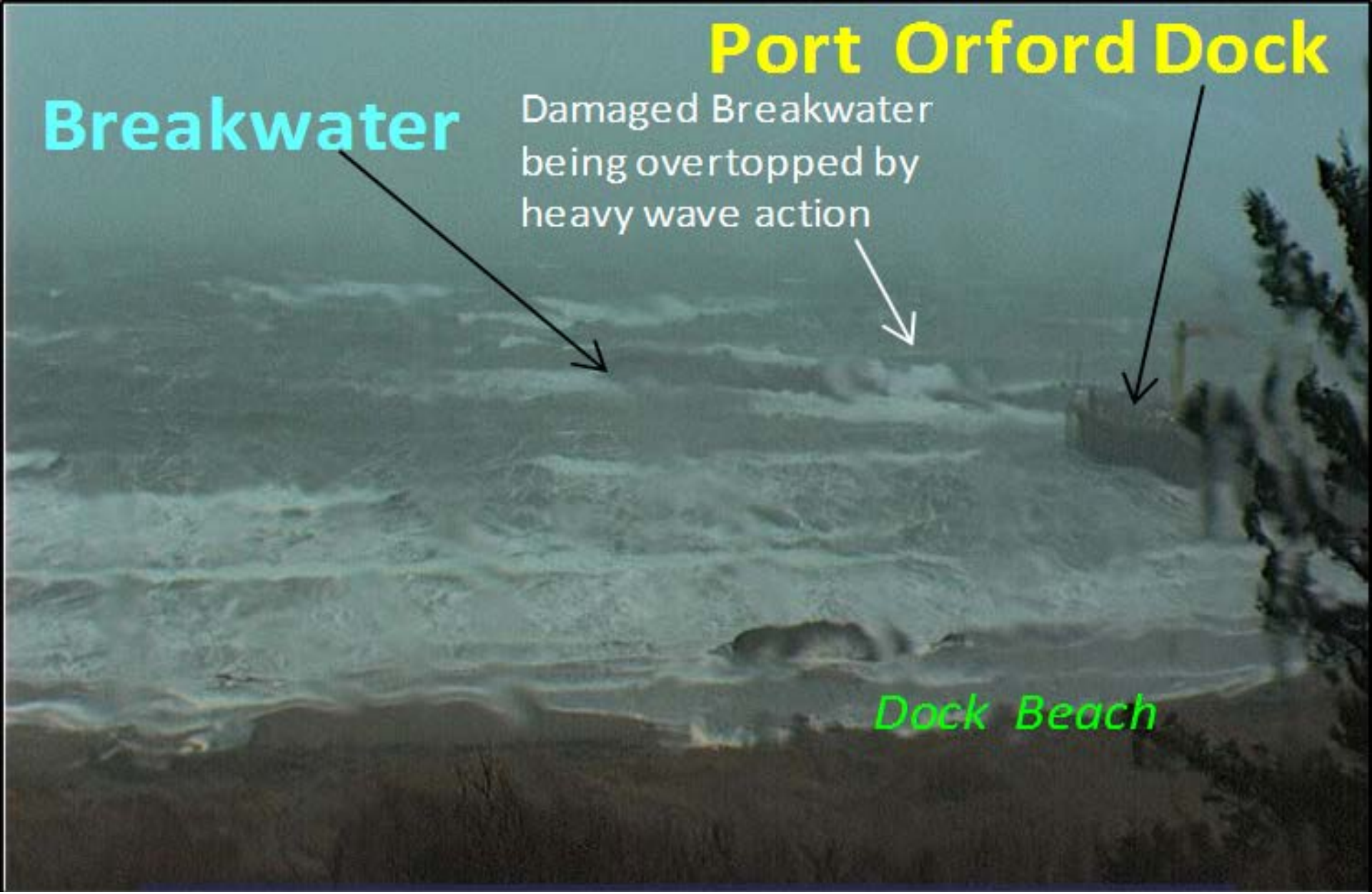
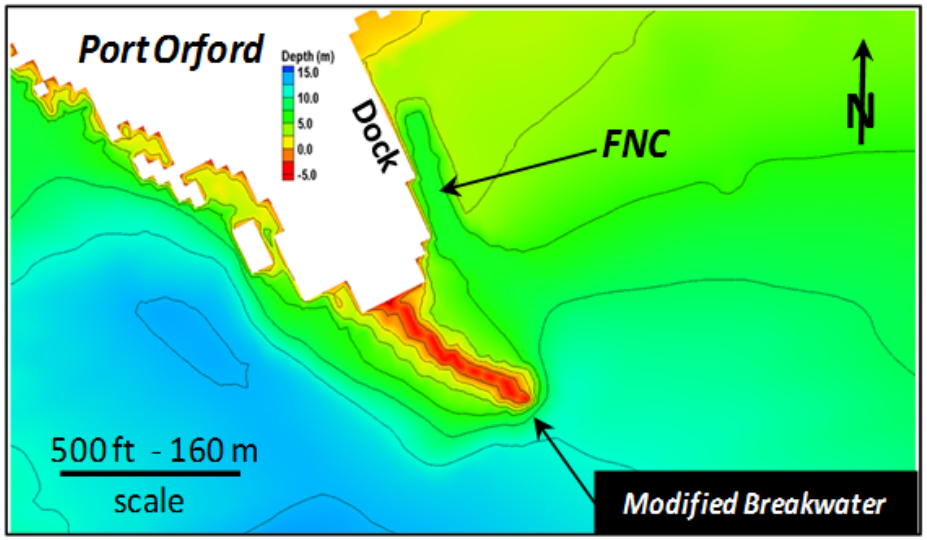
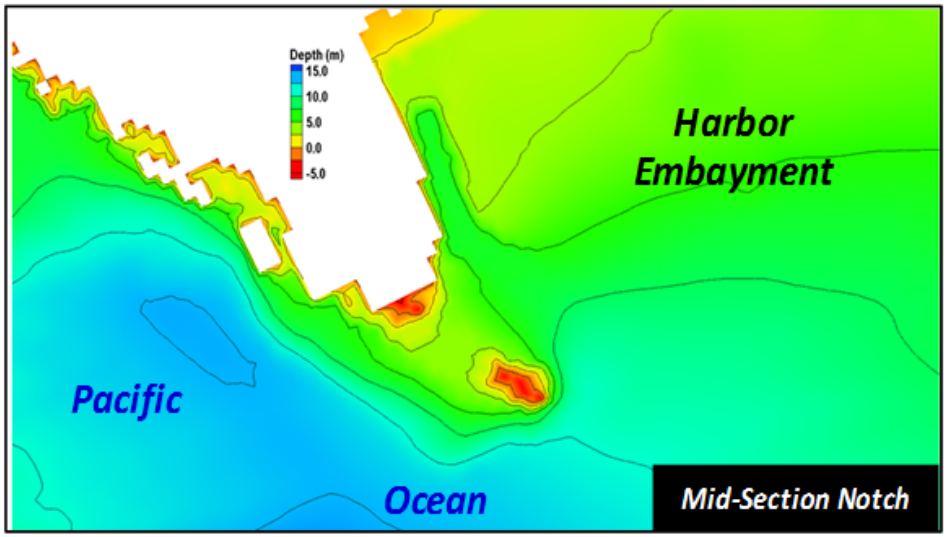
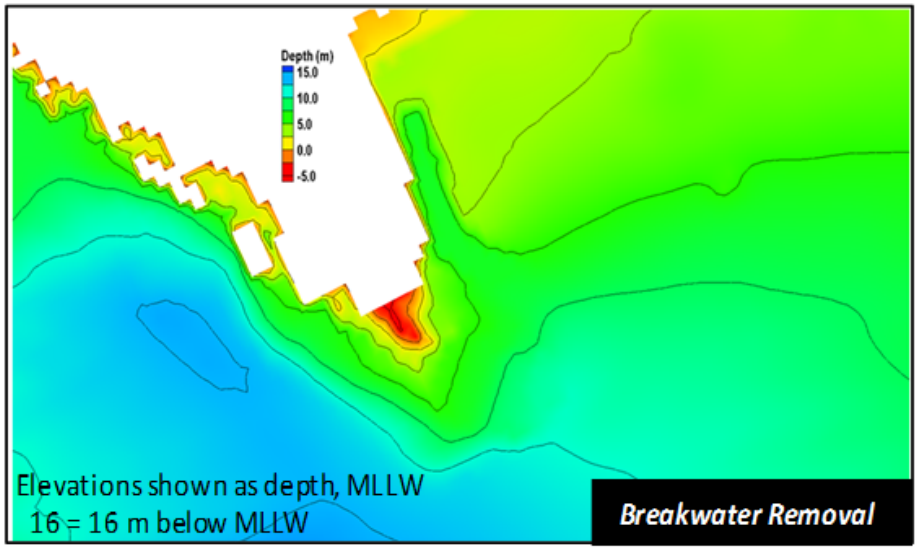


USACE Breakwater Constructed in 1969 – Worked As intended to Protect Harbor





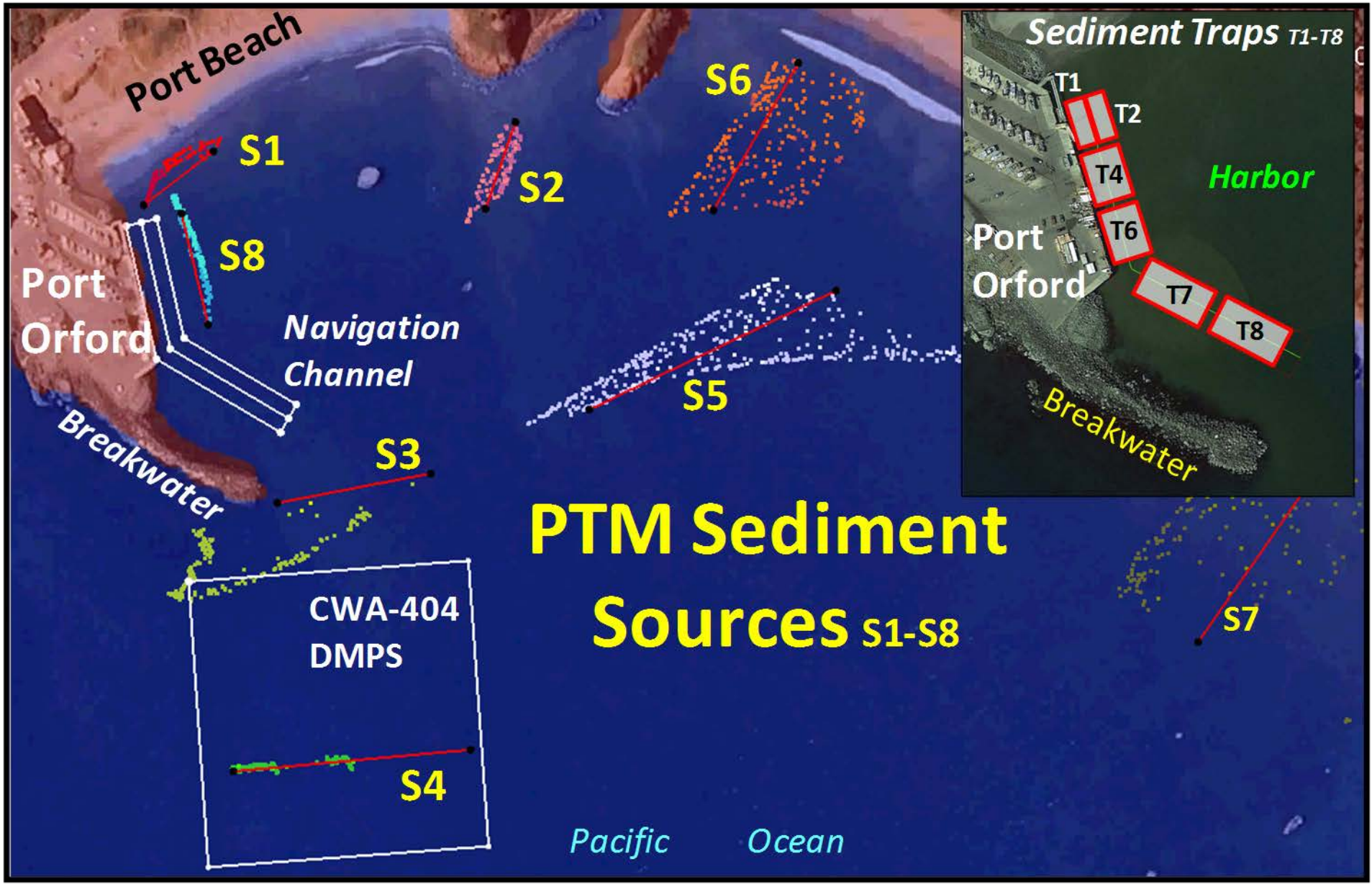


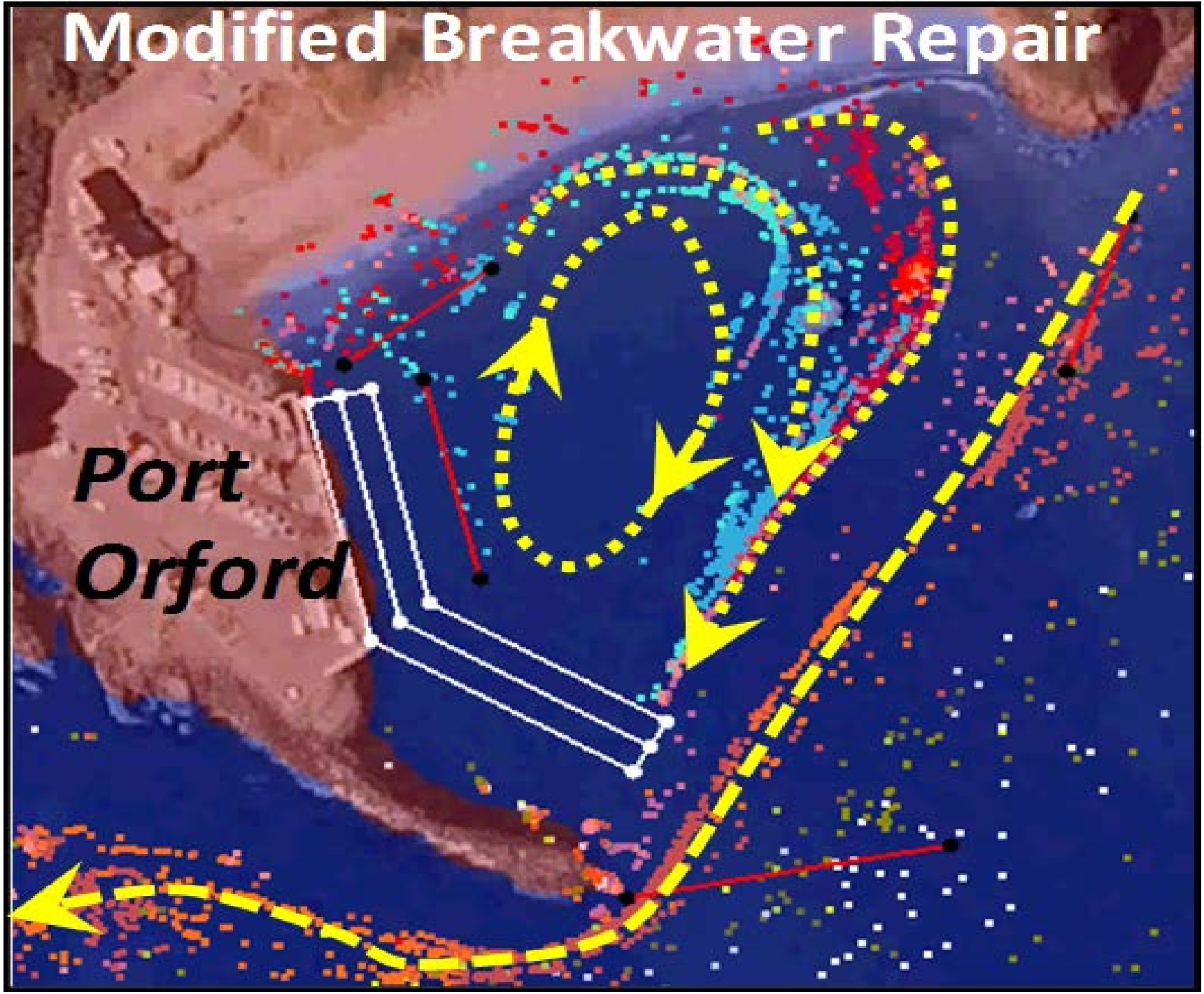
Three (3) breakwater configurations were evaluated for the potential to reduce shoaling within the Port's federal navigation channel. Modified Breakwater re-establishes the breakwater to its fully authorized foot-print, with an improved cross-section. Mid-Section Notch removes the middle 200 ft of the 550-ft breakwater extension to a pre-project elevation of -5.5 ft MLLW. Breakwater Removal removes the eastern 450 ft of the 550-ft breakwater extension to a pre-project elevation of -5.5 to -20 ft MLLW. The federally-authorized navigation channel (FNC) is 750 ft long, 90 ft wide, -16 ft MLLW

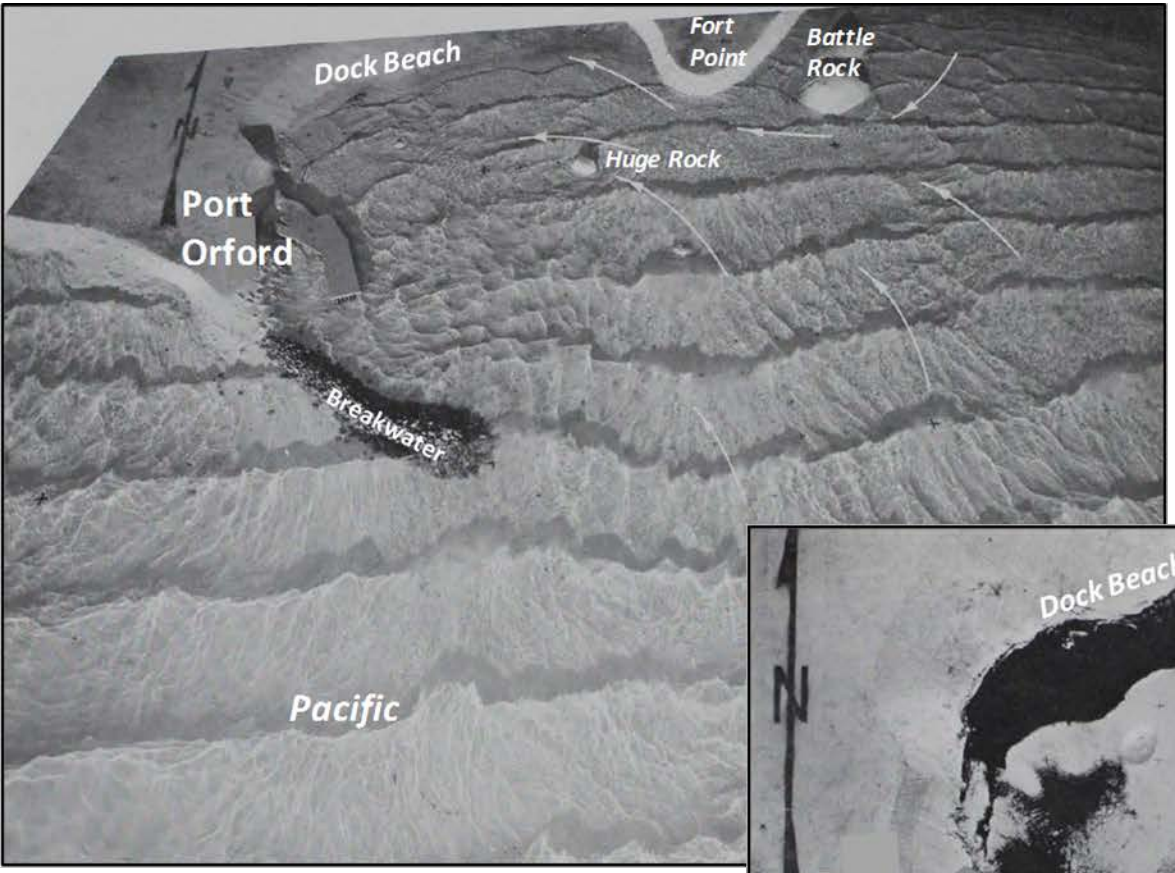
Sediment Shoaling within FNC

Chronic Problem Since Breakwater Construction

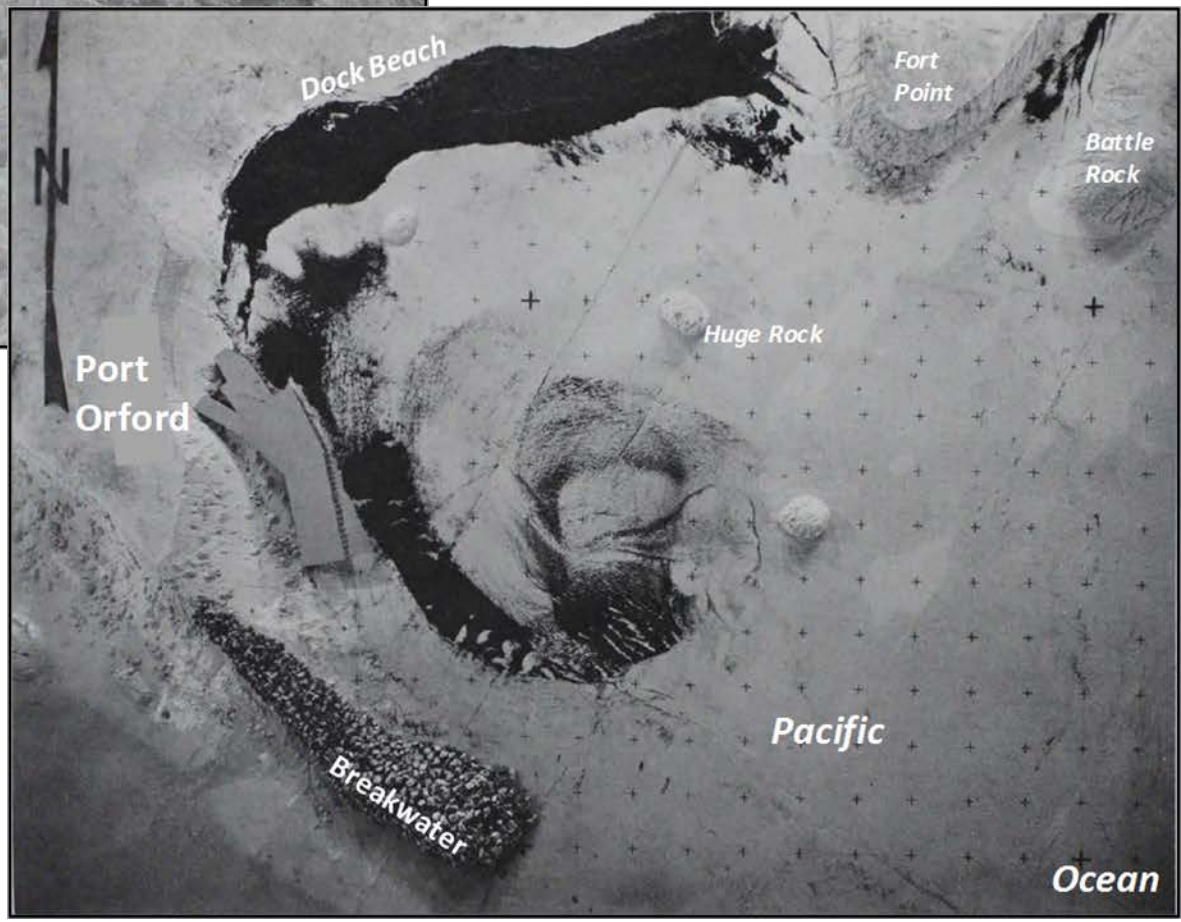
Evaluate 3 Breakwater Repair Strategies - Using CMS and Particle Tracking Model


Port Beach
S1
S2
S6
S8
Port
Orford
Navigation
Channel
Breakwater
S3
S5
CWA-404
DMPS
S4
S7
PTM Sediment
Sources S1-S8
Pacific Ocean
Sediment Traps T1-T8
T1
T2
T4
T6
T7
T8
Harbor
Port
Orford
Breakwater

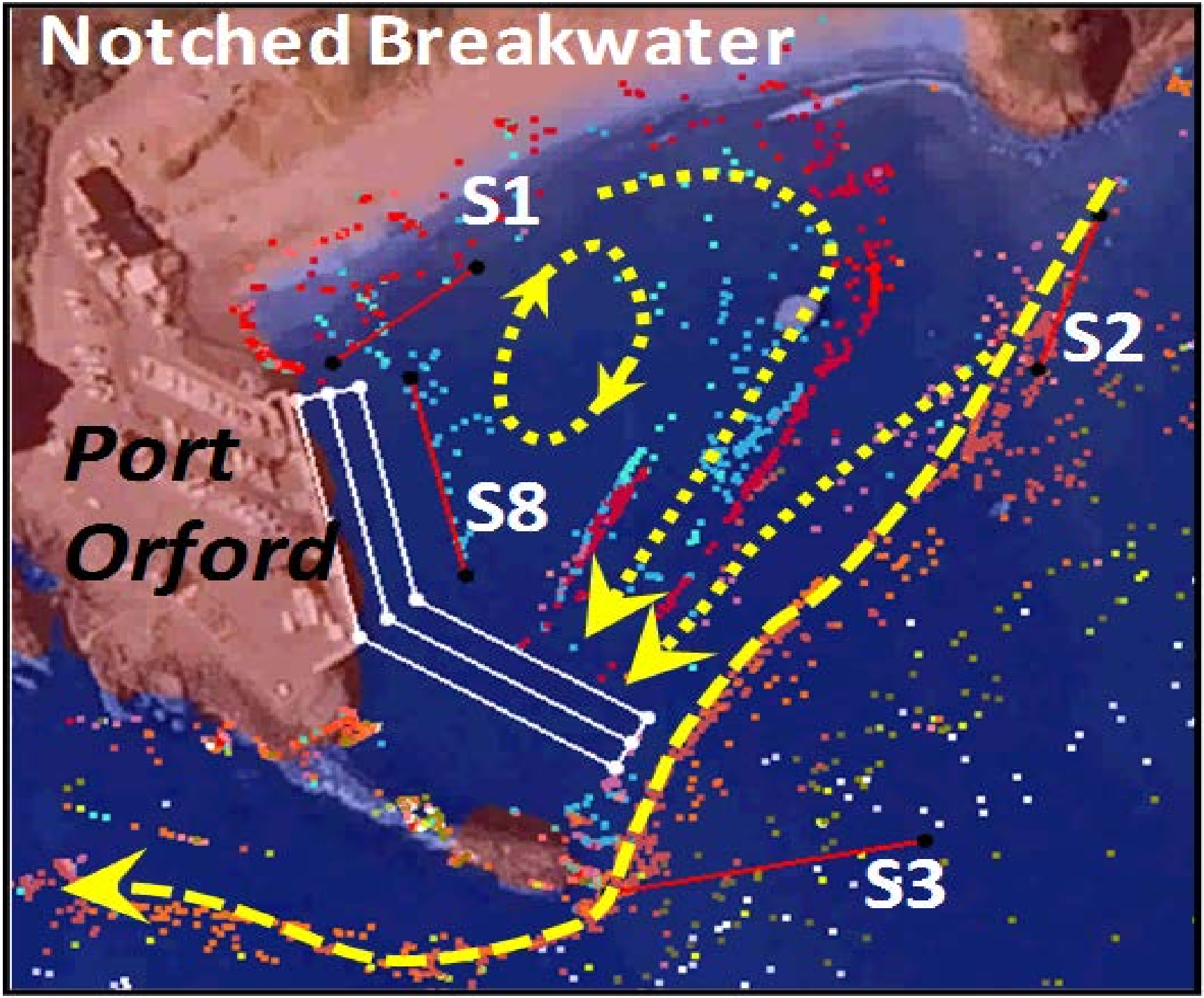

Modified Breakwater Repair
Port
Orford

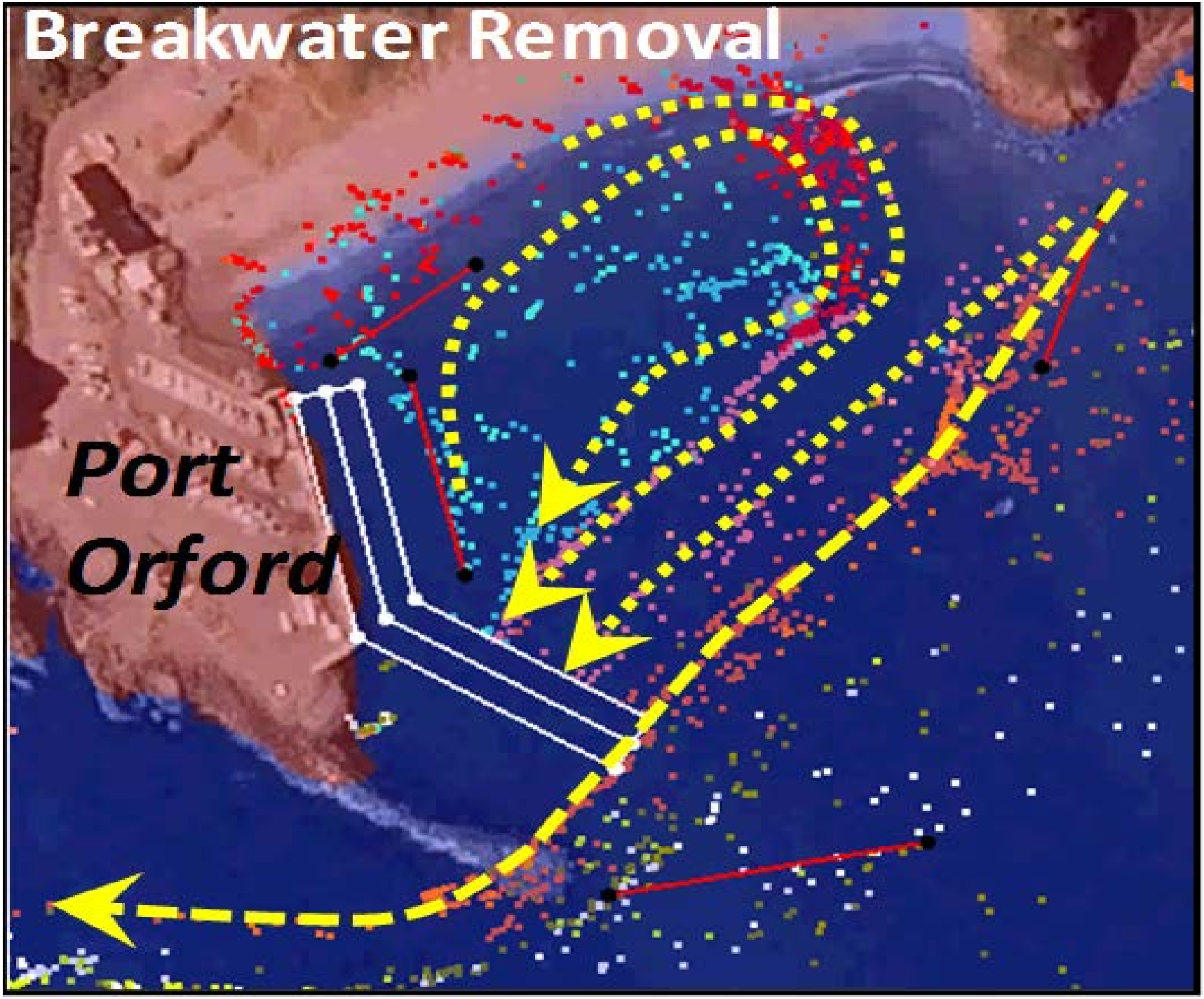


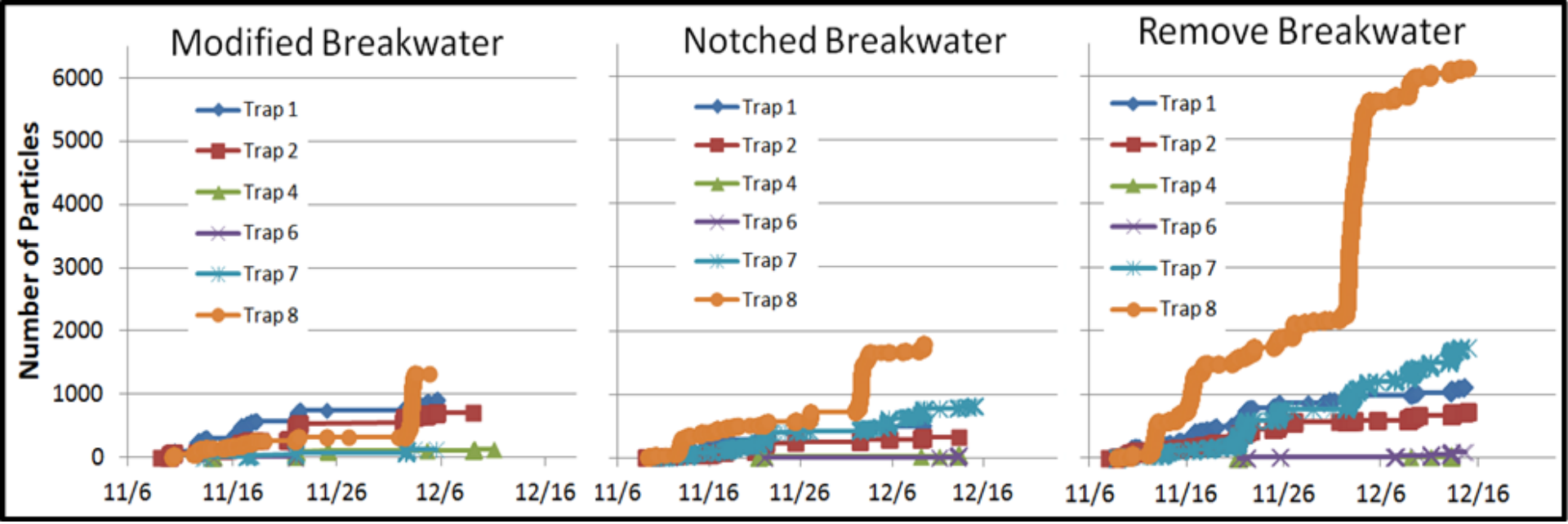
(Below) Deposition pattern of sediment tracer (coal dust) realized within the 1974 USACE physical model for Port Orford, as affected by winter wave action from the south (T=13 sec, H=17 ft).



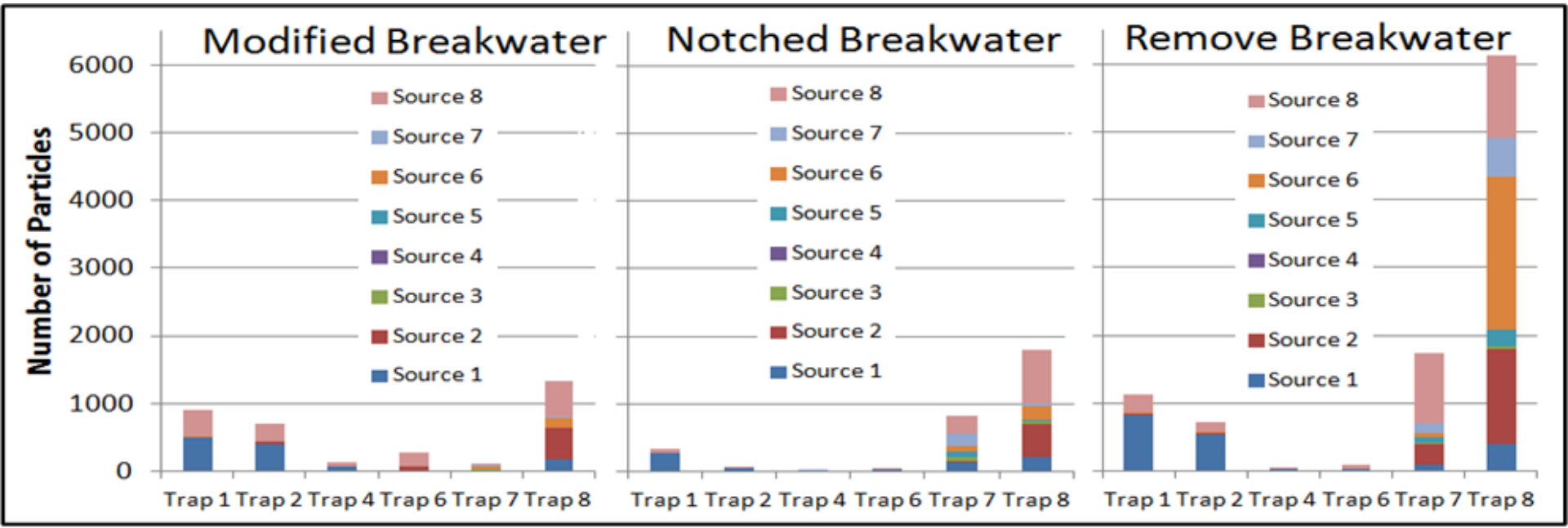
(Above) Wave pattern observed within the 1974 USACE physical model for Port Orford, as affected by winter waves from the south (T=13 sec, H=17 ft).


Notched Breakwater
S1
S2
S8
S3
Port
Orford


Breakwater Removal
Port
Orford



Draft Tech Report Awaiting Publication



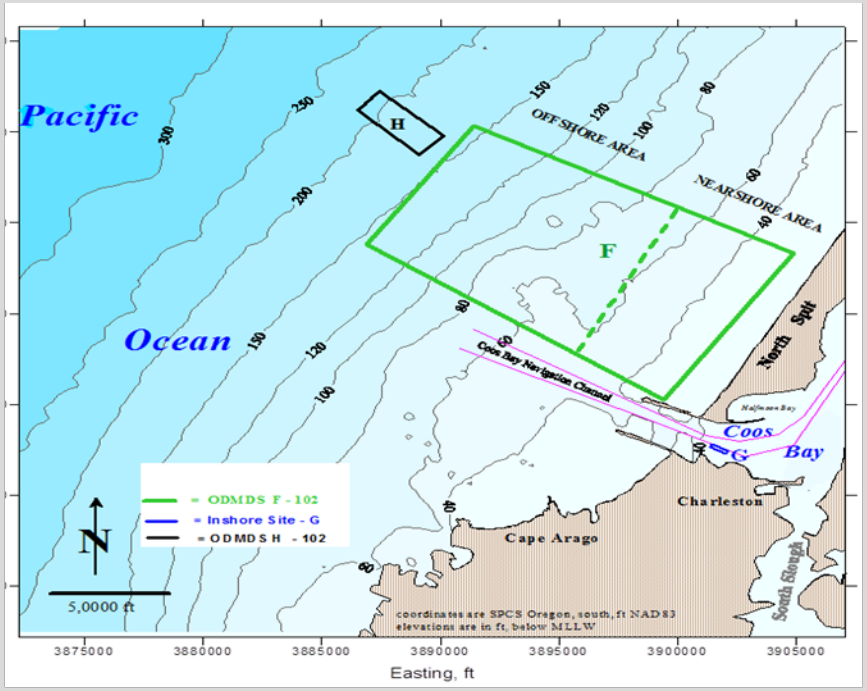
Coos Bay Sediment Tracer Study

Kate Groth, Honghai Li, Tahirih Lackey, Tanya Beck, Hans R. Moritz, Trapier Puckette, and Jon Marsh

- Corps dredges ~1.1 million cubic yards (CY) of sediment from Coos Bay annually, placed in the designated Ocean Dredged Material Disposal Site F.

- 500,000 CY placed in the ***nearshore*** portion of Site F to feed the littoral system, ensure that material is not being transported back into and depositing in the navigation channel.

- Four objectives:
  1. Collect wave and hydrodynamic field data with a sediment tracer study
  2. Setup, validate and run Coastal Modeling System (CMS) for sediment mapping
  3. Run a Particle Tracking Model (PTM)
  4. Compare CMS, PTM and sediment tracer results



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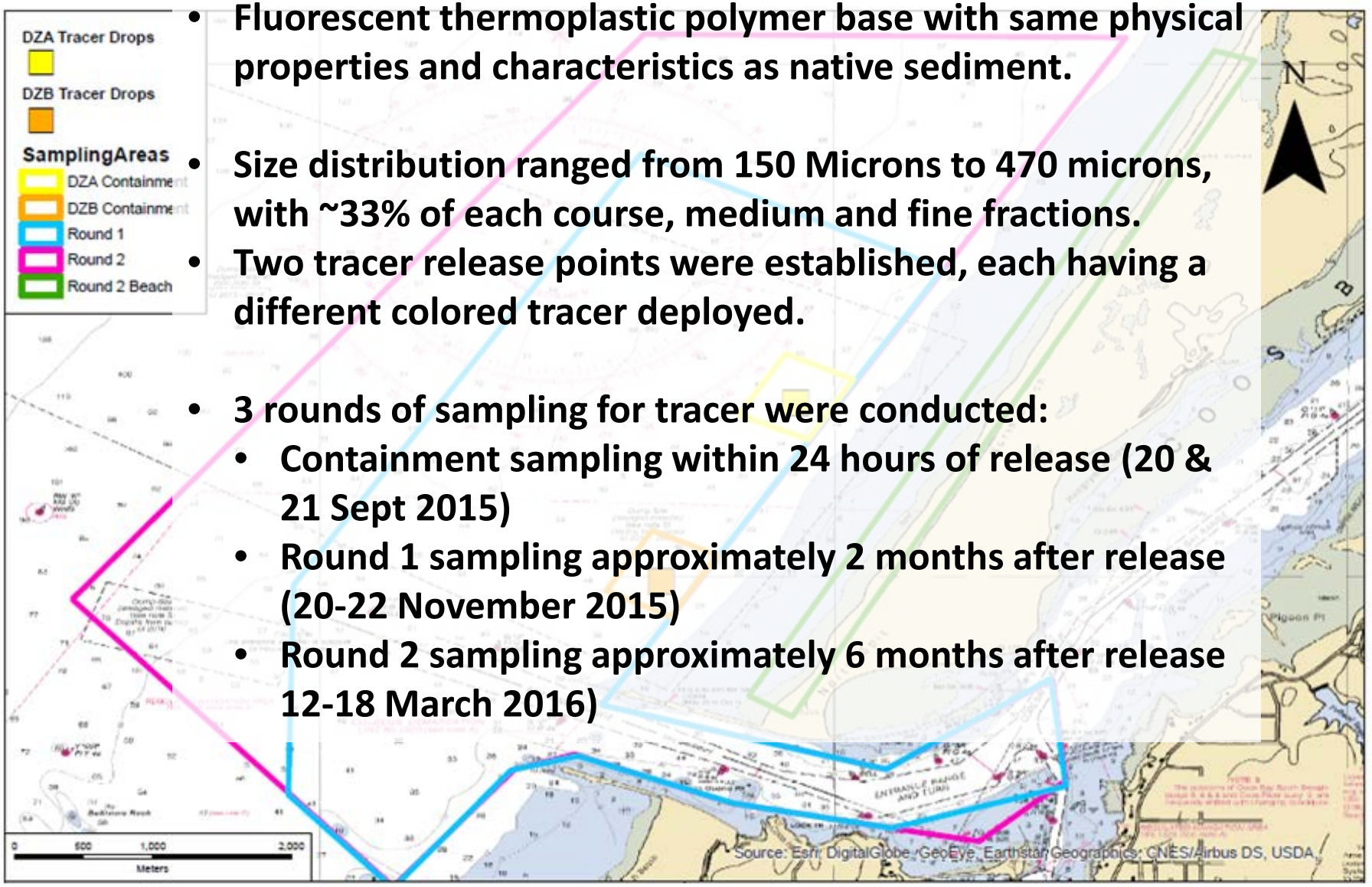
Fluorescent Sediment Particles (tracers)

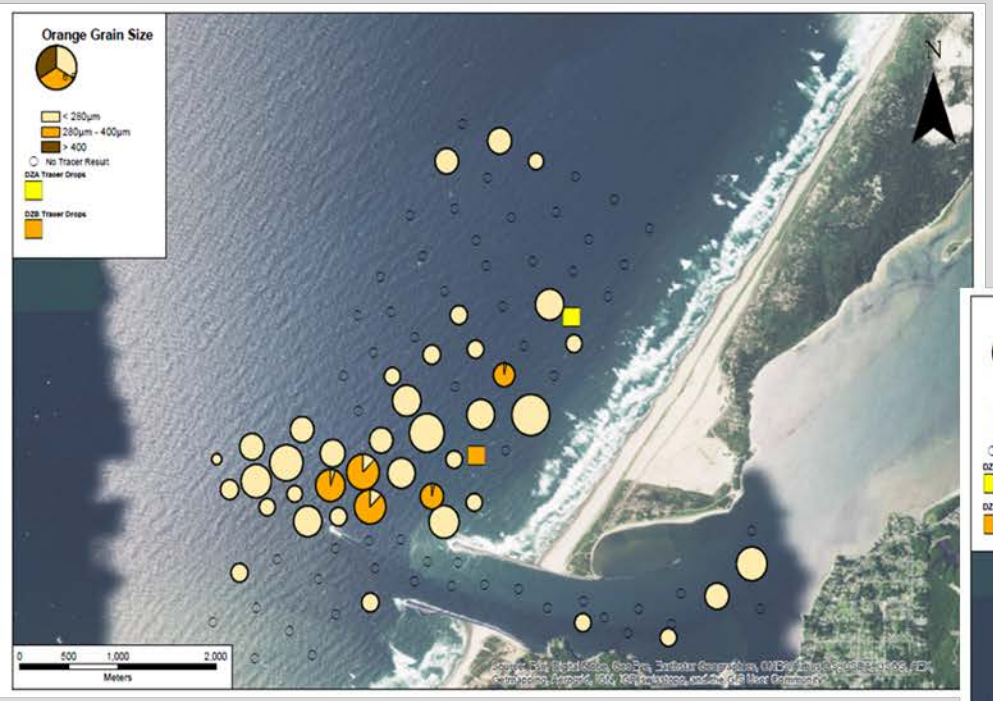
- Fluorescent thermoplastic polymer base with same physical properties and characteristics as native sediment.
- Size distribution ranged from 150 Microns to 470 microns, with ~33% of each course, medium and fine fractions.
- Two tracer release points were established, each having a different colored tracer deployed.
- 3 rounds of sampling for tracer were conducted:
  - Containment sampling within 24 hours of release (20 & 21 Sept 2015)
  - Round 1 sampling approximately 2 months after release (20-22 November 2015)
  - Round 2 sampling approximately 6 months after release 12-18 March 2016)



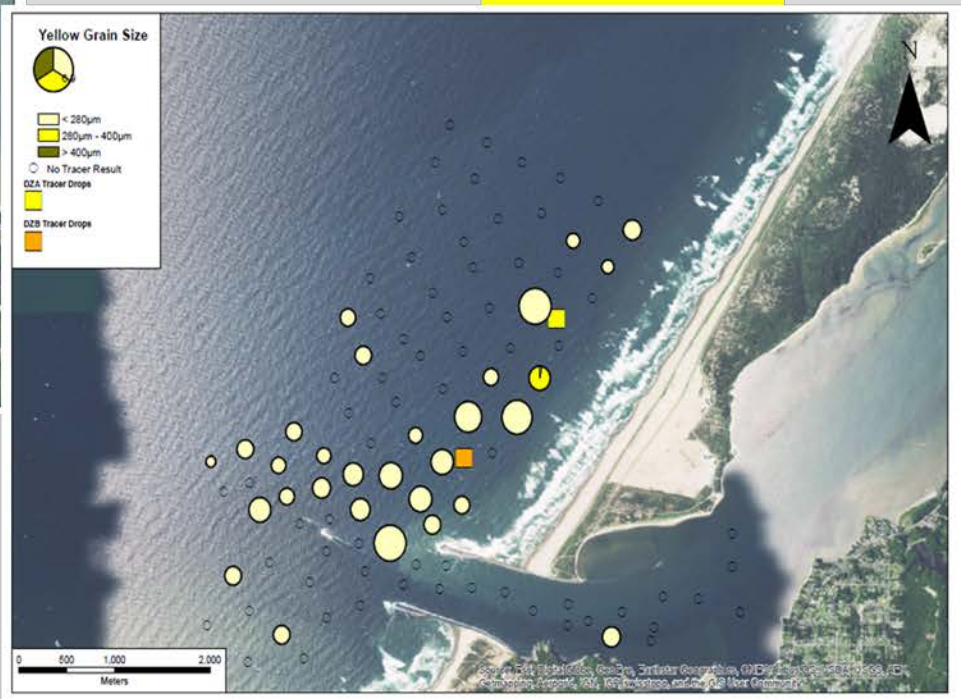
Tracer study Results – Round 1: 20-22 Nov 2015
2 months after Release

Orange Tracer

Coos Bay, OR



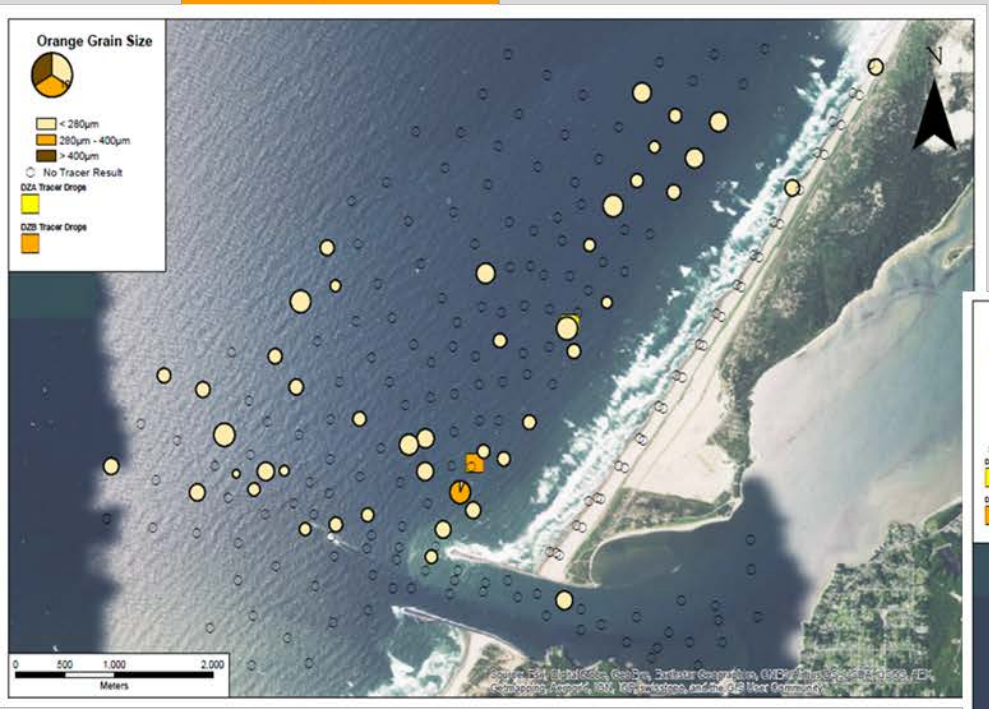
Yellow Tracer



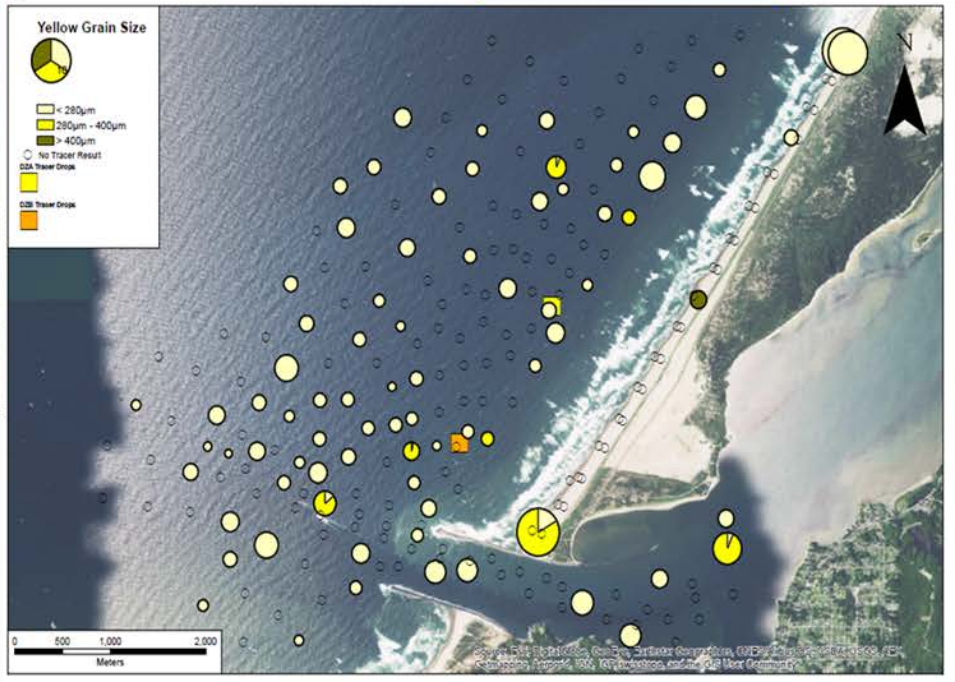
Tracer study Results – Round 2: 12-18 MAR 2016
6 months after Release

Coos Bay, OR

Orange Tracer



Yellow Tracer



More to come……See ERDC Tech Report and Tracer Presentations at OCT17 ASBPA