US Army Corps of Engineers®
Engineer Research and Development Center

Portland District, Mouth of Columbia River, Oregon and Washington

ISSUE

The Columbia River entrance is characterized by exceptionally strong wave-current interactions to the degree of being recognized as one of the most dangerous coastal inlets in the world. The Mouth of Columbia (MCR) is the ocean gateway for navigation access to and from the Columbia-Snake River navigation system, as the Columbia River is the boundary between the states of Washington and Oregon (Figure 1). Each year, the Portland District dredges 3 to 5 million cu yd of sand at the MCR to maintain a 5-mile-long deep-draft navigation channel. In recent times, this dredged sand has become of paramount importance for coastal areas north and south of the MCR. Sand dredged from MCR is placed in open water disposal sites. At times, the actual disposal of the sand has been the more challenging issue than the actual dredging itself. This underscores a central dilemma for RSM in that a long-term strategy for dredging and placement practices of sand at MCR must be determined.

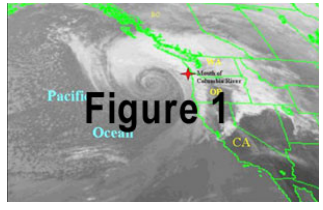
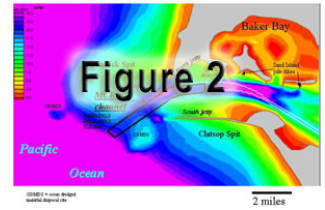


Figure 1

RSM DEMONSTRATION PROJECT GOALS



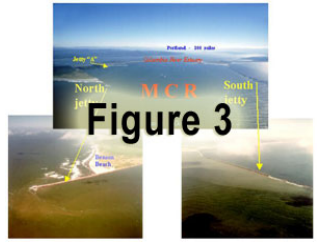
The goal of this RSM demonstration project is to implement a proactive and consensus-based decision-making process for optimally managing dredged material disposal at the MCR (Figure 2). Beach erosion north of the MCR and possible instability of the jetty structures are additional problems to be addressed by this demonstration. Implementation of RSM at MCR will sustain a biologically, physically, and economically healthy coastline in Washington and Oregon by improving management of coastal sediment resources. This RSM demonstration project will incorporate long-term regional planning and an interdisciplinary scientific approach into project decisions that affect sediment movement and availability in the Columbia River littoral cell. The approach will use open communication and collaboration between stakeholders to coordinate activities and develop recommendations that are technically sound, environmentally acceptable, safe, and cost-effective.

SUMMARY

Safe navigation at the MCR is paramount. No RSM actions will degrade navigation safety at or near the MCR. Any dredging or disposal action that has the perception of harming crab, flatfish, or other benthos is met with stiff opposition. Specific initiatives needed to implement a successful RSM at MCR include the following:

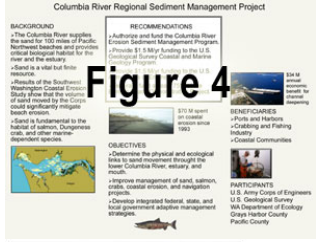
Coastal Sand Supply

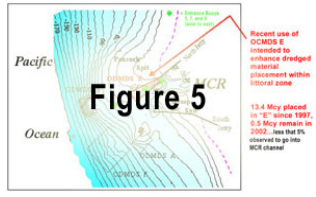
Major findings by the Southwest Washington Coastal Erosion Study include the fact that most sand inshore of 200 ft water depth originated from the Columbia River (estuary). Sand delivery to the coast will be affected by modifications to the Columbia River system. Construction of jetties altered sediment supply to adjacent shorelines, resulting in rapid accretion near the entrance (Figure 3). Management of MCR dredged material is required to abate shoreline erosion. El Nino and La Nino have been very important environmental forces.



Maintaining Columbia River Littoral Cell Sediment Budget

The sediment budget at the MCR affects coastal locations within both the Portland and Seattle Districts (Figure 4). Sediment is being transported off (to the north, onshore, and offshore) Peacock Spit at about 3 to 5 million cu yd annually. An effort by the Portland District to sustain MCR sediment budget on Peacock Spit and protect the north jetty is placing dredged sand within the nearshore area. Dredged sand placed at ocean dredged material disposal site (ODMDS) E (Figure 5) appears to be feeding Peacock Spit as intended.





Relationship of Navigation Structure Stability to Ebb Shoals

MCR jetties were built on tidal shoals (1885-1917) that are now eroding. Stability of the jetties is compromised due to scour-based failure. Between 1993 and 2000, the ebb tidal shoal was receding at an accelerated rate.

Optimum Siting of Disposal Areas

The material presently being dredged is placed in existing ODMDS and a Section 404 site adjacent to the north jetty. Since 1997, 80 percent of the sand dredged at the MCR has been placed at ODMDS E, just west of the north jetty, and at the north jetty site. Of the sand deposited since 1997, 85 percent has dispersed out of the sites. These sites have been used to the maximum extent possible, keeping sediment in the littoral system and helping to protect the north jetty from potential undermining. Use of ODMDS E and the north jetty site is limited to avoid impacting small boat navigation safety, and any remaining material is placed at ODMDS F, in deeper water offshore. Selection and use of disposal sites at the MCR are complicated by the need to balance conflicting objectives. Disposing sand in deep water results in huge transportation costs and enormous loss of a valuable resource, while placing sand directly on the beach results in huge operational costs.

STATUS

In May 2003, the Portland District convened a facilitated kick-off meeting featuring diverse private and public interests (RSM working group). This group identified RSM initiatives to pursue through FY05, including placement and monitoring of dredged material along the updrift beach (Benson Beach), and/or placement and monitoring of material placed near the south jetty. In early FY04, there will be a website for RSM at MCR, with the prime objective to provide transparent,

two-way communication on the philosophy, merits, and risks of implementing RSM initiatives at MCR.

LESSONS LEARNED

Lessons learned include:

- Due to MCR jetty construction, readjustment of the Columbia River littoral cell sediment budget and shoreline is needed.
- By protecting Federal investment in jetty structures, potential savings of $100 million could be obtained.
- Improving management of MCR dredging/disposal operations could result in potential savings of $10 million.
- Identifying hazards and maintaining safe navigation at MCR results in incalculable savings.

KEY WORDS

Littoral cell, benthos, estuary, jetty, tidal shoal, ebb

POINTS OF CONTACT

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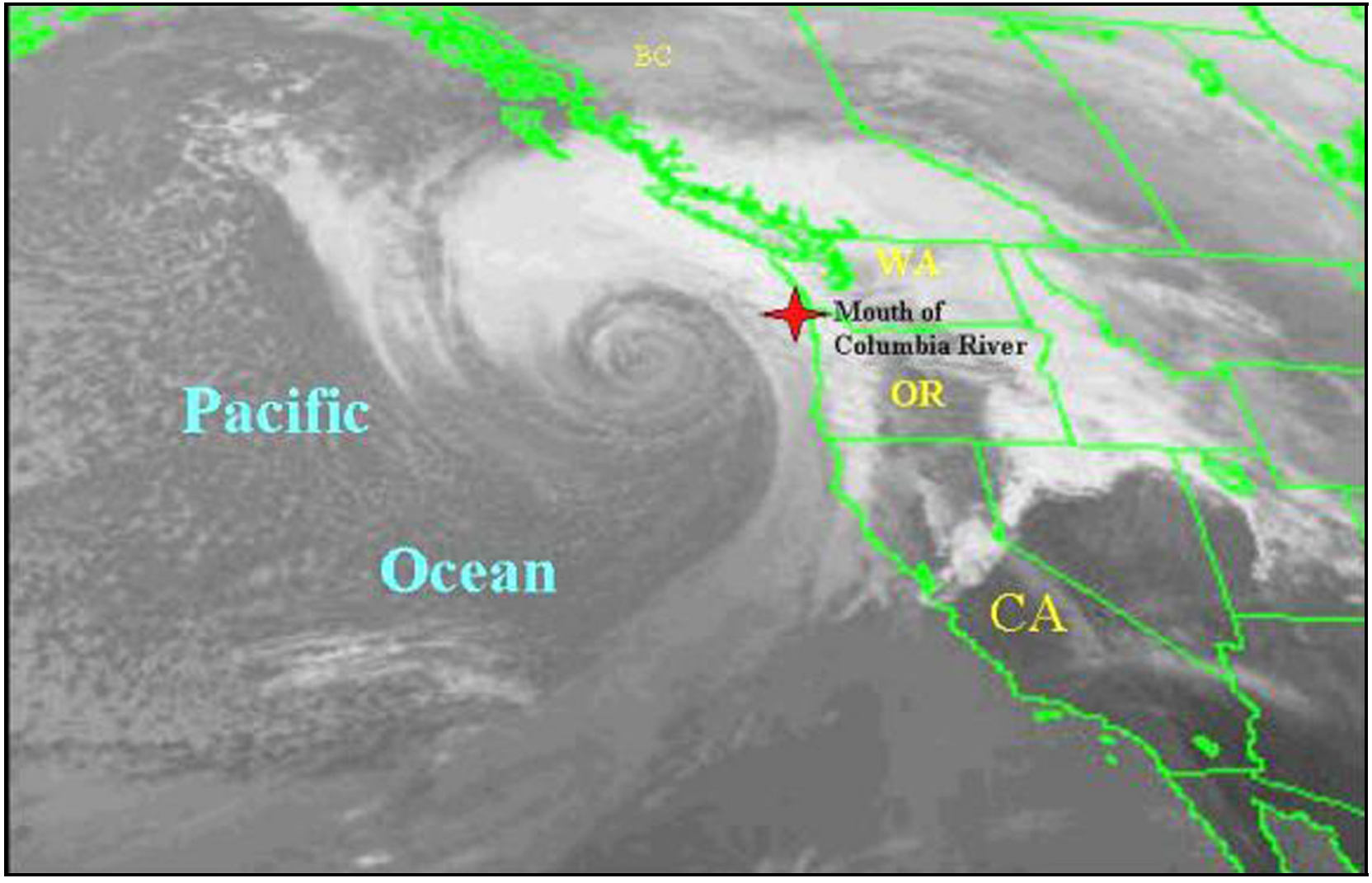


Figure 1. Pacific Coast of United States back to text

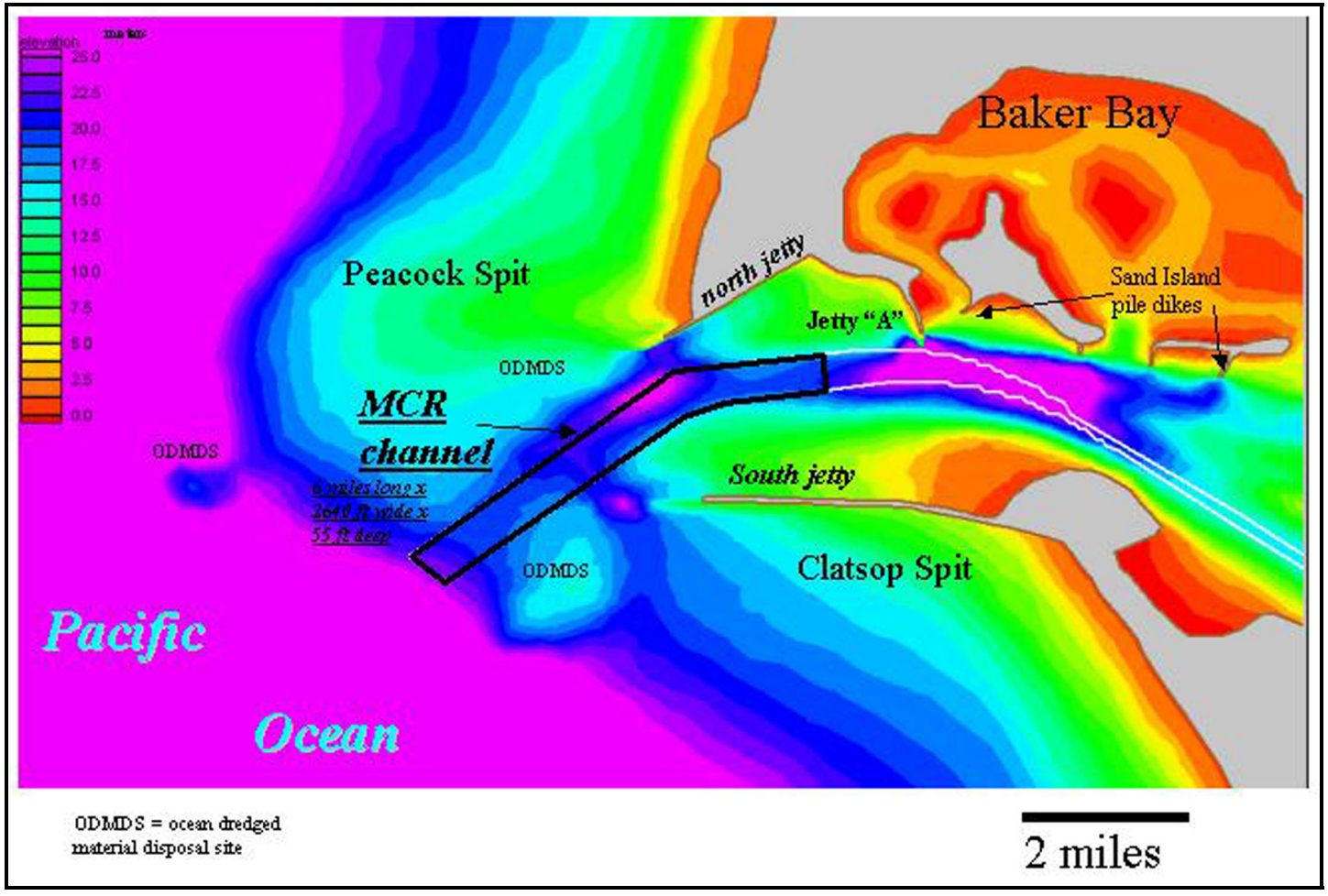


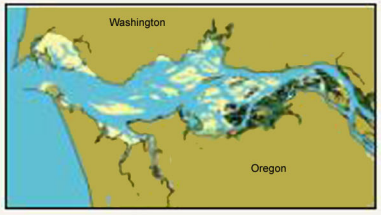
Figure 2. MCR elevation contour map back to text

Figure 3. Columbia River estuary back to text

Columbia River Regional Sediment Management Project

BACKGROUND

- The Columbia River supplies the sand for 100 miles of Pacific Northwest beaches and provides critical biological habitat for the river and the estuary.
- Sand is a vital but finite resource.
- Results of the Southwest Washington Coastal Erosion Study show that the volume of sand moved by the Corps could significantly mitigate beach erosion.
- Sand is fundamental to the habitat of salmon, Dungeness crab, and other marine-dependent species.



RECOMMENDATIONS

- Authorize and fund the Columbia River Erosion Sediment Management Program.
- Provide $1.5 M/yr funding to the U.S. Geological Survey Coastal and Marine Geology Program.
- Provide $1.5 M/yr funding to the U.S. Army Corps of Engineers.
- Federally fund at least 75% of the Benson Beach Demonstration Project.

$70 M spent on coastal erosion since 1993

OBJECTIVES

- Determine the physical and ecological links to sand movement through the lower Columbia River, estuary, and mouth.
- Improve management of sand, salmon, crabs, coastal erosion, and navigation projects.
- Develop integrated Federal, state, and local government adaptive management strategies.

$34 M annual economic benefit for channel deepening

BENEFICIARIES

- Ports and Harbors
- Crabbing and Fishing Industry
- Coastal Communities

PARTICIPANTS

U.S. Army Corps of Engineers
U.S. Geological Survey
WA Department of Ecology
Grays Harbor County
Pacific County

Figure 4. Columbia River Regional Sediment Management Program back to text

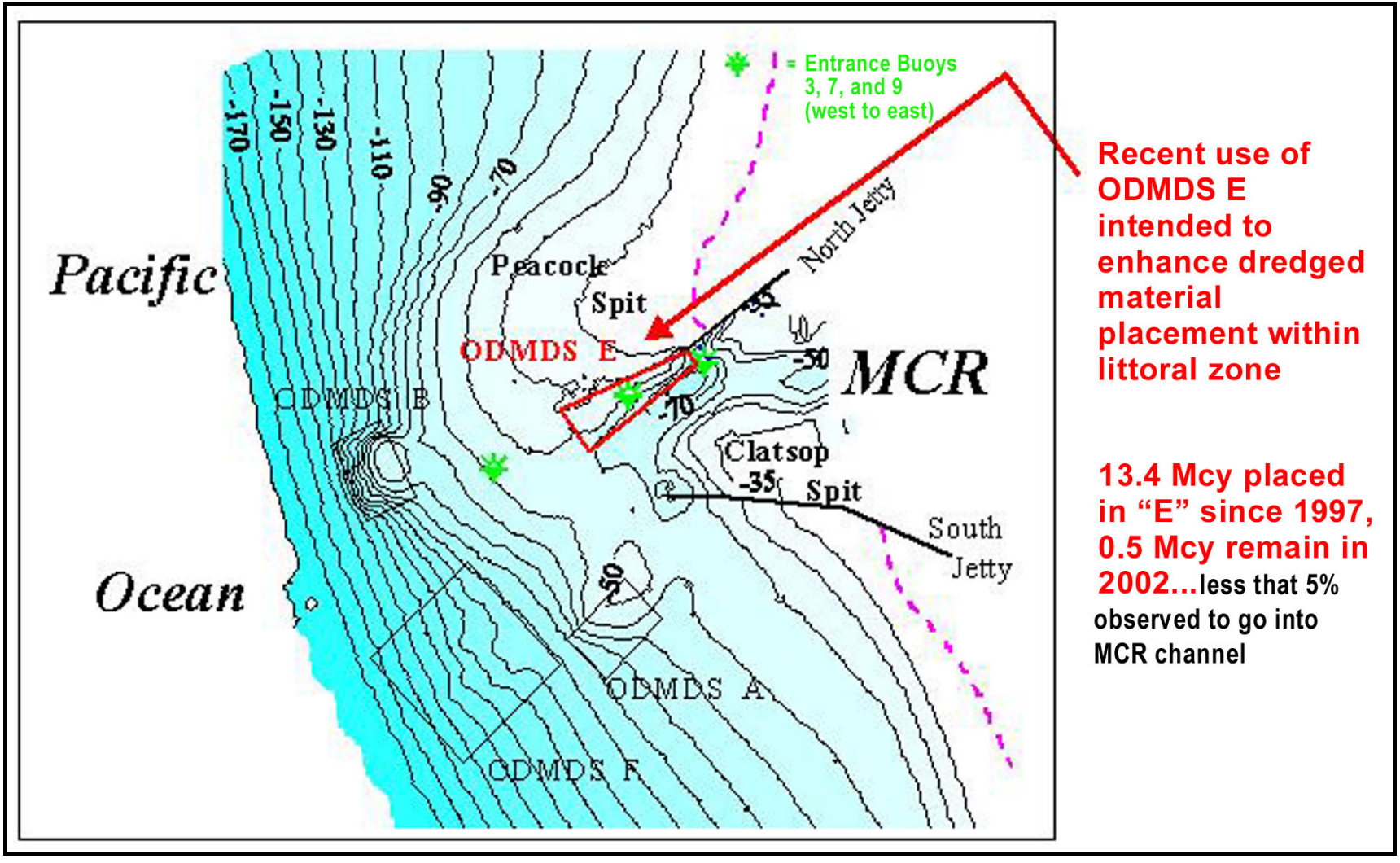


Figure 5. Ocean Dredged Material Disposal Sites back to text