Sediment Trends in Southwest Washington's Nearshore Zone
A Science-Policy Workshop
Presented by the Lower Columbia Solutions Group

July 9 and 10, 2007
Lewis and Clark Discovery Center
Cape Disappointment State Park
Ilwaco, WA

This 2-day Workshop brought together scientists, technical specialists, and policy-makers to discuss near shore physical processes in Southwest Washington, and their policy implications for sediment management, especially dredged material from the mouth of the Columbia River.

Goals:

- Build consensus between parties on technical knowledge of nearshore physical processes that relate to sediment management (i.e. what we know and what we don't know about the nearshore).
- Utilize that scientific consensus on the technical knowledge to guide policy discussions related to the disposal and beneficial use of dredged sediments in the north jetty area.
- Identify further technical studies and projects that would provide meaningful knowledge to guide appropriate beneficial use of clean dredge sediments including best locations, amounts, and methods of disposal.

The specific area of focus for the workshop was the Southwest Washington area including Peacock Spit, Benson Beach and areas to the north.

Co-conveners Kathleen Drew of the Washington State Governor's Office and Sam Johnson of the U.S. Geological Survey welcomed participants and observers to the workshop. Ms. Drew presented the central framing question: *How do we effectively mitigate erosion on the beaches of SW Washington and avoid impacts to navigational safety with the management of existing sediment?*

<u>During the 2-Day Workshop, a consensus emerged among both scientists and policy-makers on several key points:</u>

1. Approximately 3.25 million cubic meters of sand per year are lost from the Benson Beach and Peacock Spit area, comparable to the amount of sand dredged from the mouth of the Columbia in annual maintenance dredging.

2. While the mouth of the Columbia River is complex, we have a good conceptual understanding of sediment pathways from a variety of data sources.

3. Peacock Spit and the Shallow Water Site (SWS) induce local changes in the wave field. Depending on the recent dredge disposal history and under certain wave conditions, the possibility of significant wave amplification exists. Some model studies suggest a more pronounced wave amplification, while others indicate that wave amplification is less pronounced. These differences are somewhat puzzling because there is evidence that at other sites these models produce more similar results. As a result, our understanding of this problem will be incomplete until these differences are reconciled. Furthermore, discussions indicate that the current definitions of wave change is not specific enough to allow for consistent and objective comparisons of model results and annual observations. A complete consensus is not possible at this time. However, the group agreed that a coordinated approach to future wave modeling and observation is required to remove the present uncertainties. Obtaining wave observations on the Shallow Water Site is key to establishing the validity of any future modeling work. Issues to consider when modeling waves at the SWS include: 1) What and how data is put into the models; 2) How model generated data is post-processed; 3) Sensitivity of metrics based on model output.

4. Participants agreed that enough information exists to proceed with a beneficial-use disposal project and that this project would help reduce erosion rates if a significant volume of material were placed in the nearshore. However, it was also agreed that further scientific study is needed to determine long-term erosion mitigation and policy in the area.

5. Concurrently, we can reduce or eliminate disposal in the outer (western) portion of the Shallow Water Site, as this portion appears to have the least beneficial impact in feeding the littoral zone, and has the greatest potential to create wave amplification concerns. However, this potential closing would have to be balanced with operational maneuverability needs of dredges.

6. Long term sediment policy for the area north of the North Jetty should be coordinated with other areas as part of the Lower Columbia Solutions Group Regional Sediment Planning effort.

<u>TECHNICAL OVERVIEW OF THE REGION</u>

Guy Gelfenbaum of the U.S. Geological Survey provided a brief technical overview of erosion and sand depletion issues in the nearshore environment off MCR and along northern Oregon and southwest Washington coasts. Key points made in the presentation include:

- Much study has been done of the sediment movement in the region immediately north of the mouth of the Columbia River (MCR). The region is spatially and temporally complex with much variation in sediment levels over days, seasons, and years.

- Historically (pre-jetty years) the beaches in this area grew at a rate of 2 meters per year, with very large losses occasionally, due to earthquakes.

- In recent years, sand has eroded from the area near Benson Beach (shoreline retreat of 600 meters from 1939-2002) Among the reasons: dams that retain sediment and reduce peak discharges, changes in land use, and jetty construction.

- The period during and immediately following jetty construction (a century ago) saw an enormous increase in sediment in the littoral zone, creating a large ebb delta that has been feeding the shoreline north and south for decades.

- This ebb delta has now significantly receded, leaving little sand to feed the beaches. The recent erosion at Benson Beach is a result of the decrease in the ebb delta.

- The sediment materials dredged each year are a significant fraction of the area's sediment budget. Therefore, there is opportunity to affect change with the management of sediment.

<u>**DAY 1**: **REVIEWING THE STATUS OF THE SCIENCE**</u>

<u>FOCUS QUESTION I:</u>

<u>How is Peacock Spit changing? How are these changes affecting the North Jetty and Benson Beach? What happens to sand placed along or near Peacock Spit?</u>

The historical changes to Peacock Spit, the fate of sediment disposed at the Shallow Water Site, and the effects of erosion on the North Jetty - Rod Moritz of the U.S. Army Corps of Engineers

Key points made include:

- The large pulse of sediment from jetty construction (100 years ago) has nearly played itself out. The volume of littoral material transported off of Peacock Spit each year is expected to decrease with time. Currently, 600,000 cubic meters of sand are being lost from the Benson Beach planform each year.

- From 1973-1997, 50 million cubic yards (MCY) of sediment were placed at site E (the shallow water site). After expansion in 1997, 25 MCY have been placed at site E and 88% of this has dispersed (2 MCY has remained), moving northward onto Peacock Spit. The site is intensively managed by the Corps and EPA.

- A 2006-2007 sediment tracer study indicates that sediment deposited in the shallow water site generally moves to the north and northwest. Much of the sediment from the SWS therefore feeds Peacock Spit, slowing the erosion of the spit and helping protect the North Jetty.

The historical shoreline changes at Benson Beach and southern Long Beach, and the historical shoreface and bathymetric changes - George Kaminsky, Washington Dept. of Ecology

Key points include:

- The Benson Beach shoreline has steadily retreated since the 1950s; The rate of erosion decreases as you go north from Benson Beach, with some accretion north of North Head.

- During 1958-2000, Benson Beach lost sand at a rate of 0.18 million cubic meters (Mm3) per year while the inner delta eroded by 1.15 Mm3/yr.

- The ebb delta (the historic source of sand for beaches to the north and south) has been eroding further out to sea, away from the Mouth of the Columbia River.

- Based on comparison of 10-meter (m) bathymetric contour change with shoreline change, cross-shore processes appear to be more dominant along south-central Benson Beach than to the north or south. This interpretation is based on shoreface steepening between -10 m water depth and the shoreline. Along this section of Benson Beach the shoreline retreat rates during 1994-2003 have averaged between 6-10 m/yr, whereas the landward migration rates of the 10-m bathymetric contour line has averaged between 11-17 m/yr. In comparison, the shoreface to the south and north of this south-central region has flattened. These data suggests that the south-central nearshore area of Benson Beach may be the most dispersive with potential to transport sediment toward the south and north.

- Bathymetry, shoreline data, and dredging records from 1958-2000 suggest that approximately 3.25 Mm3 of sand is lost each year from the Benson Beach and Peacock Spit area. The Corps of Engineers dredges approximately 3.4 Mm3 per year from the MCR. Amount of sand lost and dredged are roughly equivalent.

Seasonal to interannual morphological changes and trends along Benson Beach, WA: results from 10 years of coastal monitoring - Peter Ruggiero of Oregon State University

Key points:

- Interannual nearshore bathymetric change along Benson Beach is dominated by significant shoreface lowering with more than 2 m of lowering along the southern 1 kilometer (km) of Benson Beach.

- While there was an average of 8 meters per year of shoreline lost in this area between 1997 and 2006, there was wide variation between years. Changes in nearshore bathymetry from 1999 to 2006 shows moderate accretion between 1999 and 2001 (~.25 to 0.5 million (M) m3). Since 2001 approximately 3.0 M m3 (600,000 m3/yr) of sand has been eroded from the Benson Beach planform north of North Head (Seaview), although most of that was from one year, 2006 due to heavy storms.

- Generally, there has been moderate accretion in the 1997-2006 time period north of North Head.

Argus Surveying of Benson Beach: Nearshore changes storm to storm, season to season, and year to year- implications for sediment transport. - Joan Oltman-Shay of NorthWest Research Associates

Key points:

- **Finding #1**: Sand bar movement is the dominant source of change in the intertidal zone of Benson Beach

  - The dominant seasonal signal of loss and recovery of dry-beach acreage and intertidal sediment volumes on Benson Beach is associated with the summer onshore migration and attachment of sand bars onto the shoreface and the winter detachment of the sand bars and migration offshore.

  - Sand bars march onshore in summer beginning in March and offshore in winter beginning in September.

- **Finding #2**: The shallow water site sediment may feed offshore sand bars that in turn migrate shoreward during summer months, feeding the intertidal zone of Benson Beach

  - The summer time disposal of dredge material on the SWS is not only optimal for safety but may also be optimal for sediment transport away from the MCR and onto Benson Beach. Further study is required to substantiate this.

  - Wave breaking occurs north of the SWS at times, suggesting the presence of a mound of sand fed by SWS (but the amount is not quantified)

  - A method for maintaining shorelines in the Netherlands is to place sand on the outside flank of the offshore sand bars and let waves and currents bring the sand to the shoreface in the summer and further alongshore in the winter. This method warrants consideration for Benson Beach.

- **Finding #3**: There was potential long-term loss (35,000 square meters) of dry beach acreage at Benson Beach following the harsh 2005/2006 winter

  - The previous 2003/2004 and 2004/2005 winter losses of dry-beach acreage along the full stretch of Benson Beach (monitored by Argus) fully recover the following summer. However, in the 2005/2006 winter, the losses were not recovered the following summer.

  - After extreme episodic events, such as Winter 2005/2006, a new baseline for sediment change may be established.

Discussion and Comments from Panel 1

- There is good data/consensus on the changes to Peacock Spit and how that effects the North Jetty and Benson Beach. However, more data and work is needed on how much sand is moving (quantifying) and where it is going (sediment fate).

- The sediment tracer study implies that sediment is moving northward out of the SWS. The tracer study results shown at this meeting were based on a time-integrated study conducted during OCT 2006- MAY 2007. Sediment movement was observed through fall, winter, and spring oceanographic seasons. This tracer study observed the integrated pathways of sediment movement on Peacock Spit from fall to spring. However, this is only a snapshot of what took place at one point in time. There is a need to model this out and get more data because there are so many variations. There is now enough data available that an effort to pool data could lead to effective modeling.

- The lack of sediment supply results in erosion. There are clear negative impacts of the sand deficit, including infrastructure loss (*e.g.*, jetty deterioration), property loss, and loss of State Park amenities.

- The Columbia River may no longer be a natural source of sand for the outer coast beaches. Much of the sand dredged from the MCR channel likely comes from reworked sand in the spits on the ocean side of the inlet.

- The source of sediment from dredging is on par with the needs of the littoral cell, so there is opportunity to be had with sediment management. However, even with the use of dredged material, the quantities available may not be sufficient for maintaining the current location of the shoreline along Benson Beach and southern Long Beach. Any sediment deposited in a Deep Water Site is wasted material.

- Episodic events (such as storms) cause significant change over short periods but have a lasting effect.

- The shoreline to the north of North Head (Seaview) recently developed an erosion trend that is expected to continue.

<u>FOCUS QUESTION II</u>**:**

<u>How much material is needed to mitigate erosion (hold shoreline versus restore previous accretion?</u>

Modeling the Impacts of wave climate and sediment supply on decadal scale shoreline changes along the Long Beach Peninsula - Peter Ruggiero of Oregon State University

Key points:

- Even though over ~2.0 Million m3 of sand is being dispersed away from SWS each year, and much of that sand feeds Peacock Spit, there is still 600,000 m3 of sand lost from the Benson Beach nearshore planform each year. While disposal practices may reduce rate of erosion for Peacock Spit, this suggests that the continued practice of disposing ~2.5 Million m3 of sand a year at SWS will result in continued erosion from Benson Beach.

- Shoreline change modeling results suggest that between 1995 and 2005 approximately 1.4 Million m3 /year of sand was being delivered across North Head to feed the beaches of Long Beach Peninsula. This is a reduction from the 2.3 Million m3 /year that fed Long Beach Peninsula between 1955 and 1995 and corresponds with the initiation of erosion north of North Head (Seaview) that began in the 1990s.

- Shoreline change model predictions suggest that the erosion rate immediately north of North Head over the next 2 decades is very sensitive to the littoral drift feeding the peninsula from the south. RSM practices that enhance littoral feeding to the north can significantly limit the predicted erosion rates.

Measurements and modeling of waves, currents, sediment transport at MCR and in Benson Beach nearshore - Phil Osborne of Pacific International Engineering

Key points:

- **Waves:** Waves are the dominant sediment mobilization force and therefore need to be correctly modeled and incorporated in sediment transport models. Currents modify waves and also need to be included to predict waves correctly: 2D wave models coupled with 2D depth-averaged currents allow reasonable prediction (10-15%) of steady-state significant wave properties in most areas.

- **Currents:** Large-scale circulation generally described by depth-averaged 2D combined model; both 2D and 3D models provide insights about circulation especially during storms when well-mixed; regional wind patterns exert significant control on current forcing outside MCR entrance (ebb shoal, shelf/shoreface); modeling near structures and in the surf zone on Benson Beach is more difficult & complex owing to:
    - Vertical structure (density gradients)
    - Gyres (eddy viscosity)
    - Temporal and spatial scales of beach morphodynamics

- **Sediment Transport:** Measurements and modeling of waves, currents & sediment transport suggest enhanced potential for littoral drift feeding to the north by placement on Benson Beach; focused demonstration projects would be a useful way to potentially resolve modeling issues and questions regarding beneficial use of dredged sediment
    - In all cases there is some movement of sediment to the offshore out of the SWS. But by and large, sediment that is placed on Benson Beach tends to remain in the littoral system

- *Recommendations:*
    - Focused demonstration project with monitoring needed to:
        - Validate model prediction capability for sediment transport and morphological response
        - Evaluate potential benefits of sediment placement in terms of littoral drift feeding efficiency
        - Evaluate potential benefits to mitigating Benson Beach erosion and protection of north jetty
        - Evaluate economics, social, environmental aspects of alternative sediment placement options
    - Concurrent with demonstration project:
        - process measurements from Peacock Shoal and Benson Beach areas during and after placement
        - Morphological monitoring – ARGUS and CMAP
        - Effort to Validate best available 2D and 3D modeling tools (ADCIRC/WABED/PTM) and (Delft 3D) with field measurements including morphological response

What we know about sediment transport and morphology change from modeling - Guy Gelfenbaum, U.S. Geological Survey

Key points include:

- Process-based morphological models are a powerful tool for helping inform management decisions

- Sediment transport at MCR is controlled by tidal currents, waves, river flow, estuarine circulation, and wind-driven currents

- There is strong spatial variability of sediment transport patterns over MCR and these patterns vary for different forcing conditions and mechanisms

- Tides only produce net export of sediment; tides and estuarine circulation produce net import of sediment; neap tides result in more import, spring tides more export

- Waves produce net import of sediment over shoals and net export in channel

- Net transport is also strongly controlled by river flow, with larger river flows causing more export

- Because the future is unpredictable; model output should be viewed as helping to reduce uncertainty

- It is important to make sure that the models are validated with field data. In general, models have been validated for waves and currents, but not yet for sediment transport and morphology change.

- We know enough to provide science-based guidance to decision makers for pilot dredge disposal projects. These pilot projects should be monitored and the data compared to model predictions to help validate and improve the models.

Historical sediment budget analysis and effect of sediment supply on shoreline change at Benson Beach; shoreline modeling results based on sediment budget scenarios - George Kaminsky, Washington Dept. of Ecology

Key points:

- One shoreline change model calibrates shoreline retreat of roughly 7 m/yr during 1973-2001. With present sand management practices, Benson Beach shoreline retreat rates can be expected to continue for many decades in future; in 2043 the shoreline retreat rates are extrapolated to range from 2.4 m/yr near North Head to 10.3 m/yr near the North Jetty.
    - When rates are extrapolated out 40 years, there is still a trend of erosion.

- Alongshore sediment transport rates tend to be highest between North Head and 13 km north of North Head.

- The addition of 1.5 Mm3/yr of sand supply to the present practice would not prevent erosion of the southern half of Benson Beach, but would provide modest accretion of northern Benson Beach.

- If we put all of the available sediment on north side of jetty, Benson beach will still erode.

Discussion and Comments from Panel 2:

- The amount of sediment needed is on the order of what we have available, and maybe more.

- There is an erosion wave moving northward.

- We still don't know how much sediment is required to hold Benson Beach at its current level, but it is definitely a large amount (on the order of 2 million m3/year). It may not be possible to eliminate recession of the morphology associated with Peacock Spit and the shoreface of Benson Beach.
    - Demonstration projects should be located in places that are easy to monitor.
- Ongoing monitoring and adaptive management are necessary.

- Much can be learned from the Dutch regarding sediment disposal on sand bars.

- We know enough to do some pilot placements. Ongoing monitoring and modeling of the results is extremely important. Therefore, the placement has to be a big enough volume to monitor.

- Predicting sediment transport is complex and involves many factors (waves, tides, salinity, etc), especially for Benson Beach and close to the North Jetty (versus easier prediction for farther north of the jetty).

FOCUS QUESTION III**:**

What do we know about the wave environment and how it relates to disposal options?

Wave Analysis at the Shallow Water Disposal Site (SWS), Mouth of the Columbia River - Neil McDonald of Pacific International Engineering

Key points include:

- There are several models available to use to predict wave conditions. He prefers the Bouss-2D model for the conditions north of the north jetty of the Columbia River.

- There has been gradual accretion of sediment at the shallow water site (SWS). The Bouss-2D model shows 15-32% wave amplification at this site. 65% of the area had more than a 10% increase in wave height, using the Bouss-2D model.

Wave model comparisons to radar data off Benson Beach - Merrick Haller, on behalf of Tuba Ozkan-Haller of Oregon State University

Key points include:

1. Specific selection of observational points (guided by model results) needed.

2. Comparisons of wave models to synoptic remote-sensing observations (i.e. observed conditions) indicates:

   - a. SWAN-Argus comparison provides a good methodology for calibrating the model representation of depth-limited wave breaking (given accurate bathymetry).
   - b. SWAN-radar comparison demonstrates that SWAN does a good job simulating wave angles except for very near Peacock Spit. This is likely due to uncertainty in the local bathymetry for this simulation (and highlights the need for accurate bathymetry).
   - c. SWAN-radar comparisons also demonstrate that, once calibrated, SWAN can accurately predict depth-limited wave breaking on Benson beach, but not current-induced breaking near the Columbia River navigational channel.

3. Wave-current interaction is pronounced but confined to area between the two jetties extending offshore about 5 km.

4. Suggests use of multiple models. If they lead to same conclusions you will have increased confidence in the conclusion.

5. Recommends calibration and validation of model results with available synoptic observations (Argus, radar) and point in-situ observations to lend confidence to predictions and help pinpoint the reasons for differences between wave models.

- Take home message is that for any model study to be definitive it should include multiple models with consistent inputs, outputs, and boundary conditions. In addition, differences between model results cannot be considered conclusive without first establishing the underlying physical cause(s). A more comprehensive approach in terms of the wave modeling framework, along with better ground truth is recommended for the future.

Wave model results for operations planning and capacity/life expectancy of Shallow Water Site - Rod Moritz of the U.S. Army Corps of Engineers

Key points include:

- SWS is located in a very dynamic area. The longer period waves (swell) passing over Peacock Spit combined with shorter period waves (wind) coming from mouth. You have to model both wind and swell waves where they are meeting and interacting, which is very complex.

- The most recent 5 wave years are the most active, with largest waves. Need to be concerned about sneaker waves which are associated with the interaction of wind waves and swell.

- Management of the SWS
  - Annual Use Plan prepared by the Corps and approved by USEPA
  - Placement priorities include:
    - Control mounding to avoid potential increases in wave height
    - Minimize interference to other uses - commercial and recreational fishing & commercial navigation
  - Highest priority is to avoid potential increases in wave height
  - From 1997 to 2002 there were some subtle changes with wave amplification occurring. At 6 feet mounding through much of the SWS, max amplification is estimated to be 9%. At 7 feet it was estimated to be 15%.

- Wave model results for operations planning and capacity/life expectancy of Shallow Water Site:
  - As Peacock Spit changes, so do the wave conditions within and adjacent to the SWS. There are many background influences, with a possible one being Astoria Canyon's effect on waves.
  - To minimize the potential for wave amplification, the amount of dredged material placed within the SWS is less than the operational limit: The SWS receives 0.5-2 MCY less than could be placed within the site.

Follow-up Comments from Panel 3

- Different models predict different outcomes for wave interaction/disposal.

- Bathymetry has changed in SWS and outside of the SWS (Peacock Spit reduction).

- There is consensus that wave amplification has occurred. However, amplification is a poor measure of what is going on. A better wave metric might instead be indicating how rapidly a wave field can vary in a space (rate of growth; growth of amplitude).

- In order to resolve the modeling discrepancies, it is necessary for the models to have:
  - In situ-data.
  - The same input conditions.

<u>Day 2: Implication of the science on sediment policy</u>

Policy-makers joined the scientists to review the "scientific consensus" on nearshore processes in Southwest Washington identified on Day 1, and explore the policy implications for sediment management. Again, the central Framing Question for this discussion was:

"How do we effectively mitigate erosion impacting jetties and beaches and avoid impacts to navigational safety with management of available, clean sand?"

<u>A. Summary of Panel 1 (as provided by Jennifer Hennessey and George Kaminsky):</u>

How is Peacock Spit changing? How are these changes affecting the North Jetty and Benson Beach?

- There is good data and consensus on historical Peacock Spit changes and how that effects North Jetty/Benson Beach.

- The large pulse of sand from construction of jetties built Benson Beach and moved alongshore, but has been receding since 1950s. We are starting to see a northerly pattern of increasing erosion, as a result of the "playing out" of that initial pulse of sand a century ago.

- Ebb delta moved offshore/deeper waters and is less available to feed the littoral cell.

- Peacock Spit is lowering; shoreface and nearshore along Benson Beach is also lowering. Significant source of sand declining from shoals in Mouth of the Columbia River.

- Benson Beach lost an average of 8 meters (about 24 feet) each year horizontally between 1997 and 2006.

- The amount of sediment from maintenance dredging the mouth of the Columbia is nearly equal to the estimated needs of littoral cell. If used prudently, dredged material could have a significant effect on reducing the rate of shoreline retreat in the future.

What happens to sand placed along or near Peacock Spit?

- Less data and consensus on how sand material placed on or near Peacock Spit moves.

- Although approximately 86-90% of the sand deposited at the Shallow Water Site migrates out of the site on an annual basis, it has limited and declining capacity;

sediment deposited at the Deep Water Site becomes unavailable to the littoral zone.

- A recent tracer study indicates that sediments migrate to the northwest and north out of Shallow Water Site but, this study is just a snapshot that requires further study.

- Sand bar movement is the dominant factor for sand levels at Benson Beach – sand accretes in the summer as bars moved onshore, recedes in winter as bars move offshore.

- There is littoral connectivity via offshore sand bars between Benson Beach and area north of North Head.

<u>B. Summary of Panel 2 (as provided by Phil Osborne and Doris McKillip):</u>

How much material is needed to mitigate erosion (hold shoreline versus restore previous accretion)? Process modeling – What happens to sand placed on or near Peacock Spit?

- While the MCR is complex, it is not so complex that major elements of it are not predictable; process elements such as tides, waves, currents, are largely predictable. We have a conceptual understanding of sediment pathways from a number of sources.

- Placement of 2 MCY of sediment on the SWS has not kept pace with erosion of Benson Beach or with the beach north of North Head.

- While we cannot predict what sequence of storms will occur or all the potential factors that might determine future morphological change, *we do know more than enough to act.*

- More specifically, we do know enough to choose suitable sites for exploring beneficial use of dredged sediment as alternatives to deep water disposal.

- One question: should we put sediment in the "sweet spot" that shows little change (i.e. has sand migrating through it) or into an area that is eroding?

- Recommendation: Do a limited number of focused demonstration sites, and then do monitoring and modeling of the results.

<u>C. Summary from Panel 3 (as provided by Mick Haller and Rick Parkin):</u>

- Under certain conditions, changes in wave conditions are possible at the Shallow Water Site.

- Wave models are useful and the use of multiple models can be helpful, but there needs to be consistency and consensus on the inputs used.

- Also, in using or comparing multiple models, the area measured needs to be the same.

- What is the relevant measurement? There is a difference between "wave amplification" and "wave height". Wave amplification measures the relative change in wave height; therefore, a small amount of change to a small wave can result in large wave amplification. Whereas, wave height is an absolute measure. There may need to be a new, more relevant measurement to determine impacts to navigational safety.

<u>POLICY IMPLICATIONS AND SUMMARY OF JUNE 2007 SCIENCE-POLICY WORKSHOP</u>

Framing Question: *"How do we effectively mitigate erosion impacting jetties and beaches and avoid impacts to navigational safety with management of available, clean sand?"*

After a brief summary of the panels from Day 1, the group moved into a discussion on policy implications and how to move forward with sediment management in the region. The discussion largely focused on two key policy questions:

1. What can be done to gain better knowledge of the wave environment and the impacts on navigational safety?

2. How can we best explore new sediment disposal options and develop a pilot project for a new nearshore disposal site?

THE WAVE ENVIRONMENT

Navigational safety is a priority that must be at the forefront of any regional sediment management policy. As reported in the workshop presentations, the use of two different models by different agencies resulted in different conclusions about the wave impacts from current disposal practices. There was not a scientific consensus reached about which model or application of the model was better. Rather, policy consensus was:

1. The wave models were having different results because of the use of different inputs. What is needed is the use of different models using the same set of parameters and inputs, so that a comparison can be made.

2. Use of different models (under the same circumstances) should be compared to empirical data to determine which may be better under certain circumstances.

Two questions need to be addressed: (a) What is the proper baseline condition against which sediment accretion is to be measured? (b) What is the proper unit of measure to quantify "significant" wave change?

Baseline Condition

Currently, the SWS is managed pursuant to a 1997 baseline condition. Some user groups such as CRCFA wish to maintain this baseline because it is well established and well understood (and is reflected in a legal settlement regarding the disposal site). Others noted that it may be necessary to adapt to the bathymetric changes that have occurred both within the SWS and elsewhere in the MCR. According to this view, the surrounding conditions (i.e. Peacock Spit) that existed when the baseline was established in 1997 have changed dramatically. These changes, in turn, can influence the wave climate. Additional work is needed to explore this, and should be coordinated with the additional work noted below.

Measuring Wave Change

Currently, management of the SWS seeks to keep the level of wave amplification below 10% over 1997 levels. This target was determined in recognition that some existing conditions (even in 1997) would not be considered safe for navigation. However, there was near-consensus at the workshop that amplification may not be the most accurate way to quantify significant wave change (with "significant" change meaning change that compromises navigational safety). How to better quantify and define significant wave change is an area needing further work.

NEW SEDIMENT DISPOSAL SITES

There was significant discussion about how to better utilize dredged sediment management to keep sand in the littoral zone, and reduce erosion of Benson Beach and areas north. A policy consensus quickly emerged around several principles:

- Begin with a focused demonstration project at Benson Beach. There was scientific consensus that a Benson Beach nearshore project that involves sediment placement in the inner surf zone provided the best overall potential to meet the above goals. The Benson Beach area has an established knowledge-base from long term morphology monitoring, process measurements, modeling, and analysis of shoreline and bathymetric changes. A pilot project at this location has the potential to be intensively monitored with existing proven techniques, including the Argus camera system on North Head, providing the region's best opportunity to advance understanding of nearshore placement and sediment transport modeling capability.

- Monitor and evaluate the sites for: (1) how much sediment stays in the littoral system and where it is transported, (2) the potential benefits of sediment placement in terms of littoral drift feeding efficiency, (3) the potential benefits to mitigating Benson Beach erosion and the protection of the North Jetty, (4) and the relative economic, social, and environmental aspects of alternative sediment placement options.

- Use the focused demonstration project with ongoing monitoring to create an adaptive management approach to sediment management for this area. Participants from Oregon urged that new disposal sites continue to collaborate with other pilot projects (such as the South Jetty site) and urged to fit these projects into a regional context. Any long term change in sediment management for this area should be coordinated with the regional sediment planning effort of the Lower Columbia Solutions Group.

Recommended Action Plan

1. Designate the nearshore area (surf zone) off of Benson Beach as the first experimental sediment disposal site. In water depths of 6 to 8 meters, where the sand bars are located.

    - This is the best site for monitoring the movement of deposited sediment because the monitoring infrastructure is already in place.

    - There is an established long term data set for the area which, along with the monitoring infrastructure, allows for the best benefit in terms of learning and economic efficiency.

    - Little navigational impact from sediment disposal at this site.

    - At least 500,000 cubic yards of sediment be placed here at the next available opportunity. This is the lowest amount that will be easily monitored. More sediment deposited here would be better – participants discussed having up to 2 MCY disposed here.

    - Placement would be most effective in the summer to maximize the transport as the sand bars march onshore (May through July).

    - Consider adding X-Band (radar) to the arsenal of monitoring tools for a focused study of sediment dispersal processes on Benson Beach. It’s a very powerful tool that has proven its effectiveness in San Francisco Bay.

2. Designate additional nearshore disposal sites, as such designations will help achieve the related goal of ceasing all deep water sediment disposal.

- A second site was proposed to the north (the football or "sweet spot"), just westward of the North Head at a depth of 40 feet. There were, however, questions raised about whether this location was best for feeding the littoral zone and beaches.

3. Reduce or eliminate disposal of dredged sediments on the "back" (western) portion of the Shallow Water Site. There is consensus that there is substantial wave amplification in this area under certain conditions. However, participants did not agree on how often those conditions might exist. This requires better coordination and additional analysis in using wave models.

    - This could be done by simply changing disposal practices, without additional permitting.
    - The outer-half of the SWS appears the least useful for keeping sediment within the littoral cell. The sediment in the western portion does not appear to disperse as well as the rest of the site.
    - This might alleviate navigational concerns for small craft, such as crab fisherman who navigate through this area in order to reach the fisheries to the north of the MCR.

4. Environmental Protection Agency (EPA), U.S. Army Corps of Engineers, and Washington State need to jointly determine the appropriate regulatory approach for any pilot disposal sites. (i.e. 404 permit from the Corps or research disposal permit from EPA).

5. The two Governors' Offices will convene with government agency representatives and scientific representatives to determine the next steps regarding permits and processes for new site designation. This Work Group is to report late September.

6. A subcommittee that includes Doris McKillip of the U.S.A.C.E., Phil Osborne of Pacific International Engineering and George Kaminsky of Washington State Department of Ecology will prepare a report to establish the specific parameters of the Benson Beach disposal project including scientific monitoring and modeling, and cost estimate.

    - o Coastal Communities of Southwest Washington will contribute resources to help with this feasibility study.

7. Ensure that the correct language is in the Water Resource Development Act (WRDA) that will allow dumping in the nearshore surf zone. The Governors' offices and Congressional offices agreed to do this.

8. Establish a Science Advisory Board, which would continue to review and make recommendations on scientific matters related to sediment disposal in this area.

Such an advisory board might work with the larger Lower Columbia Solutions Group on broader regional sediment management issues, as well.

9. Reconvene in 6-12 months to look at the biological issues
    - There is already an Environmental Impact Statement (EIS) for the Benson Beach project.
    - EISs need to be done for a South Jetty site and for the "football" site off of the North Head.