Hawaii Regional Sediment Management Program
Kauai Workshop Meeting Minutes
20 January 2011

I. Purpose

A workshop was held on Thursday 20 January 2011 to present the findings of the Hawaii Regional Sediment Management (RSM), focusing on Kauai in the Kekaha and Poipu regions. The meeting started at 1:00 pm and adjourned at 5:00 pm in the Kauai Veterans Center, 3215 Kapule Highway, Lihue.

Sections IV through IX below summarize the technical presentations and group discussions that took place at the workshop. These presentations are available on the U.S. Army Corps of Engineers Honolulu District public website at the following location:

http://gis.poh.usace.army.mil/rsm/index.htm

The workshop agenda is presented in Attachment A.

II. Attendees

The list of attendees is presented in Attachment B.

III. Introductions

Tom Smith, U.S. Army Corps of Engineers (USACE), Honolulu District, POH Technical Lead, presented introductory remarks to welcome everyone to the workshop. Representing the non-federal sponsor for the RSM Program was Chris Conger, University of Hawaii, Sea Grant Extension agent and technical advisor for the State of Hawaii Department of Land and Natural Resources (DLNR), Office of Conservation and Coastal Lands (OCCL). Mr. Conger, who was standing in for Sam Lemmo, administrator of the OCCL, briefly thanked the USACE, University of Hawaii, government agencies (local, state, and county), and private consulting firms for their support of this project, Jackie Conant, USACE Project Manager, then gave a brief introduction to each of the technical experts who gave the following presentations.

IV. Regional Sediment Management Overview (Presented by Tom Smith, U.S. Corps of Engineers, Honolulu District POH Technical Manager)

The remarks made by Tom Smith have been summarized below.

The U.S. Army Corps of Engineers' nationwide RSM Program has an integrated approach to sediment management taking a holistic view of coastal, estuary, and river sediments on a regional scale in the planning and maintenance of water resource projects to achieve balanced and sustainable systems. The program started in 2000 in the U.S. southern region – USACE, Mobile District, and over the past 10 years has spread throughout the east, west, and gulf coasts as well as in southeast Lake Michigan. Although there is not as much sedimentation in Hawaii and therefore not as much opportunity for RSM, the Honolulu District has gained funding for this initiative in

Hawaii. For the Southeast Oahu (SEO) RSM study, there were about 30 miles of coast covered on the island of Oahu: the first spanning from Mokapu Point to Makapuu Point and the second RSM study spanning from Diamond Head to Pearl Harbor (D2P), which includes Ewa Beach. Regional sediment budgets, historical shoreline change, modeling results, and GIS platforms have been compiled and have led to a RSM plan and identification of potential RSM projects.

The purpose of the SEO/RSM study was to optimize the use of sediment resources by gaining an understanding of complex sediment transport pathways; studying large portion of critically eroded shorelines; investigating armored shorelines; and discovering economical sand sources yet to be identified. Ultimately the goal of the study was to increase understanding of littoral processes with intentions of preserving and restoring beaches in the region with potential applications elsewhere.

It was discovered that in this region, the shoreline is highly variable due to seasonal changes causing sand loss. The University of Hawaii Manoa, School of Ocean and Earth Science and Technology (SOEST) is conducting various research efforts to support the Hawaii RSM Program. To identify offshore sand sources, graduate students have analyzed jet probe data (up to 10 feet in depth) to determine how thick the sand is in areas of Kailua Bay, Lanikai Beach, and Bellows Beach at Bellows Air Force Station. It was discovered that the sand in the Kailua stream channel is a major component of why the beach is so stable in this region. There are a number of isolated patches of sand that may be available for beach nourishment. Investigations further offshore are recommended for future study.

Wailea Point sediment sand transport analysis: This analysis was conducted by using the basic concept that sediment becomes better sorted in the direction of the transport. UH took grab samples and using various methods of analysis, such as the Gao-Collins (1992) and Roux method (1994), it was demonstrated that sand has historically been transported south to north around Wailea Point, with reversals in the southern portion of Lanikai beach. By combining the two analytical methods, it is understood that there is a northward transport and that Lanikai has historically received sand from the Bellows Beach area. Using historical analysis, modeling, and sediment trend analysis, the results indicate the following:

- In the 1950s, Bellows acted as a source for accretion in South Lanikai.
- In the 1970s, revetments stabilized Bellows and South Lanikai eroded.
- From 1970 to the present, Lanikai has a northern sediment transport without replenishment.

By studying volume and direction of sediment transport, the ultimate goal is to produce a regional sediment budget. Using the Mokapu Point to Makapuu Point offshore wave gauge data collected over the past seven years, nearshore conditions at ten points have provided input for analyzing gross and net sediment transport directions. Using

the results of this information, maps have been created for each stretch of beach illustrating sediment erosion and accretion along the shoreline.

Potential RSM Projects (PRPs): PRPs identified in the region included Kaelepulu Stream, Bellows Air Force Station, Kaupo and Kaiona Beaches, and Lanikai Beach. Although the funds to perform these projects have not been secured, it is important to identify the projects with the highest potential for improving regional sediment issues. For example, Kaelepulu Stream is plugged with sand and there is shoreline erosion downdrift. At Bellows Air Force Station, the beach is wide to the south and narrows to a hardened shoreline in the north. Sea Engineering worked with the USACE on a pilot beach restoration project involving the construction of two geotextile fabric groins along with up to 10,000 cubic yards of beach fill adjacent to the Pokole Way beach access in Lanikai.

This work has been summarized in the RSM document for this region, along with interactive mapping capabilities, available on the following website:

http://gis.poh.usace.army.mil/rsm/index.htm

Questions:

Q1: What do you foresee for funding for RSM?

A1: The climate in congress currently will not allow any earmarks and therefore the USACE unfortunately does not anticipate any funding for RSM next year.

Q2: How did you determine what regions were to be studied?

A2: The first area was Lanikai because funding was requested by the Lanikai neighborhood association through Congressman Ed Case. On Maui and Kauai, the project is funded by O&M money for maintenance dredging of the ports in this area and therefore, focuses on study areas with port maintenance issues. In the future, if funding continues, the USACE would like to study all areas of the main Hawaiian Islands.

Q3: To what extent is there consideration for biological issues when doing these studies and identifying projects?

A3: The ultimate goal of RSM report is solely to identify potential projects. The RSM project is design and study focused only, not construction. While the overall RSM Program does take into consideration the ecological issues of the regions, if a project is taken into further consideration, ecological issues would need to be examined in detail through the National Environmental Policy Act (NEPA) and other appropriated processes.

Q4: Some of the locations on the coast that may be considered for projects may be adjacent to kuliana lands and these issues tend to be addressed more on a local level than through NEPA.

A4: DLNR OCCL reviews and approves coastal development activities. There is an extensive review before, during, and after the project by agencies

evaluating all aspects of the project from ecological impacts to cultural resource impacts.

Q5: The opportunity for traditional ecological considerations used to happen prior to the NEPA process; however, the current process tends to address these considerations late in the game.

A5: Chris Conger gave the example that Office of Hawaiian Affairs (OHA) is an organization that the state has partnered with from the beginning of the Waikiki nourishment project and it is important to the state to include these types of organizations in the upfront planning process.

V. Kauai Wave Climate Overview (Presented by Jessica Podoski, POH Coastal Engineer)

Jessica Podoski, POH coastal engineer, has worked on the development of a wave information study (WIS) to generate hindcasts for each of the two study regions (Kekaha and Poipu regions).

There are WIS savepoints located throughout the Hawaiian Islands that provide hourly wave hindcast parameters for the 24-years from 1981 – 2004.

Wave modeling has been generated using computer models and observed wave fields. It has been compared to actual wave gage data for accuracy and provides a much longer term data set which is useful for establishing wave climate. Station 102 Kekaha deep water WIS Station was selected for comparison.

Wave roses show waves from all directions (dominated by NW and tradewinds) and large variations in wave height (2-6m). The wave roses also capture tradewind seas (ENE directions) and long-period swells (N&NW as well as South) directions. The data were truncated to capture only energy moving toward the island (280 degrees through 100 degrees). Three representative years (1984, 1992, and 1994) were transformed to 100 m contour using linear shoaling and diffraction, which were then analyzed in order to select most common wave cases.

For the Kekaha region, 326 discrete cases were analyzed using STWAVE to transform selected wave cases to shoreline. Wave data were saved at specific nearshore “savepoints” along coastline at areas of interest. The results were used to develop relationship between offshore/nearshore wave conditions and nearshore time series were created using WIS data for three selected years and STWAVE results.

For the Poipu region, data from deepwater WIS Station 119 were used from the same 24-year period. Wave roses show waves from all directions and mid-range wave heights (2 to 3 m) from most directions. The wave roses capture both tradewind seas (ENE direction) and long-period swells (N&NW directions and South). Data were truncated to capture only energy moving toward the island (90 degrees through 270 degrees). Again, WIS data was used for three representative years (1984, 1992, and 1994) and transformed to 100-meter contour using STWAVE.

For Poipu, 379 discrete WIS cases were used to transform waves to the region shoreline. Wave data were saved at specific nearshore "savepoints" along the coastline at areas of interest and results were used to indicate relationship between nearshore wave conditions and sediment transport.

For both regions, wave roses that were developed for nearshore locations will help to determine dominant wave direction. From this information, the direction of longshore sediment transport can be determined along the study area and this will provide valuable information for development of the regional sediment budgets.

VI. Kauai Shoreline Change studies (Presented by Tiffany Anderson as a representative for the work of Chip Fletcher, University of Hawaii, SOEST)

UH has been investigating long-term shoreline changes that have occurred over the past few decades, and has been measuring change using historical shoreline positions mapped from aerial photographs and coastal charts from as far back as the 1920s. This is a 10-year effort and there are numerous stakeholders that have supported this project including USACE, DLNR, county governments, USGS, the Castle Foundation, FEMA, Hawaii CMZ, and Sea Grant. The information gained through these studies will aid coastal managers in identifying coastal areas facing an increased risk of future beach erosion.

For these shoreline change studies, transects are generated at 20 meter intervals and by combining this with the historical shoreline the movement of the shoreline over time is shown. Data are used to orthorectify and map historical shoreline positions. Uncertainties are determined based on season variation of shoreline and other variables. These uncertainties are taken into account when running the shoreline regression analysis, in which the slope of the line (m/yr or ft/yr) with a positive or negative uncertainty indicates either accretion or erosion of the beach.

Shoreline change maps for southern Kauai were completed in 2010 for the Kauai Planning Department. In general, the entire coast is eroding except where there are barriers to longshore transport that cause localized accretion. Alternatively, breaching of certain areas of sediment mass, such as the Poipu tombolo cause beaches to destabilize. However, Poipu is mainly eroding except for one small area of accretion. In the Waimea area, there is strong accretion to the east of Kikiaola harbor and strong erosion to the west of Oomano Point. Further west in the Kekaha area, the shoreline is eroding and at Kokole Point there are intermittent areas of accretion and erosion.

Question:

Q1: If the erosion data is taken from shoreline erosion data including the 1927 data and area photos and is averaged to be an overall change, can the changes be broken out for different years to show how the change happened over time?

A1: Addition studies analyzing shoreline change in more depth will be further discussed in subsequent portions of the presentation.

Comment: Shoreline setback determinations are based on these erosion rates and policymakers should look at historical changes and apply them to future determinations on setback distances.

VII. Kauai Reef-top Sand Field Studies (Presented by Tiffany Anderson as a representative for the work of Chip Fletcher, University of Hawaii, SOEST)

The purpose of this study was to identify areas of sand sources to then address future studies of sand quality and quantity. This section of the presentation uses Waikiki to demonstrate the methodology of comparing old aerial photographs with modern aerial photographs to identify "stable" sand fields which may become targets for further testing.

Once sand sources are identified in modern imagery, they are compared with historical imagery to determine where the sand has been stable over time. A final map is created to depict three classes of sand – modern, historic and stable sand. The process of mapping these sand sources is dependent on water clarity and photo quality and therefore, the lack of sand source mapping off shore is not due to lack of sand but may be due to poor photo and water quality. Sand may potentially be taken from these areas; however, more studies are needed to determine if the sand is beach quality stand.

In Poipu the sand field only showed up well in modern photographs. Therefore, it is unknown if this sand source is stable; however, such a large area of sand which would most likely be stable. While there are no other notable sand sources in the region, this area has great potential for use in the nourishment of Poipu Beach.

VIII. Kauai Preliminary Regional Sediment Budget (Presented by Kim Garvey, Moffat and Nichol [M&N])

The study area was separated into different cells that are interrupted by some sort of barrier to sediment transport between the cells. The Kekaha Region was split into three littoral cells that are interrupted by some sort of barrier to sediment transport between the cells. An additional cell extending west from Kikiaola Harbor approximately 1.5 miles to where the color of the beach sand changes from black to tan will be added to the analysis. The Poipu region was divided into eight big cells and some of the main areas of interest were broken into smaller cells.

Beach volume is defined as beach between the stable backbeach line and the mobile shoreward tow line. First, sand sources were identified using UH erosion hazard maps that depict sand released by beach erosion, USGS beach profiles, historical records of beach nourishment, and reef production (the process and volume are poorly understood and estimated from reef area). These data were used to calculate beach widths for available historic shorelines and then beach area was calculated by multiplying the average beach width by the cell shoreline length. Volume changes were calculated by multiplying the local shoreline change rate by a factor of 0.40 and multiplying the resultant by the length of shoreline under consideration. On the graphs, the overall change can be seen; however between the data points, the

changes from year to year cannot be seen. In addition, seasonal changes are not depicted.

Beach volume change rate is determined by selecting time periods of interest based on line graphs and historical events within each littoral cell. Change rates are calculated for each time period and over complete period of the record. Rates are calculated using regression analysis and lease squares fit, and factors in seasonal variations and other uncertainties. Rates are corrected for any historic beach nourishment that occurred in each littoral cell. For sand pathways, some sand sources and sinks have been identified but sediment transport direction have not been identified or quantified.

For each cell, the study first aims to identify each of the shoreline features using GIS. Next, each cell is analyzed for beach volume history. Then plots are compiled on the maps to show the beach loss and direction per year. Seasonal changes, in some cases, are greater than the overall change over the past 100 years.

For the Kekaha region, the harbor structures and wave patterns control the longshore transport pattern and significantly impact sediment transport. There was an erosional period in 1945 and has now been accreting and very recently may be eroding. Both Kekaha and Waimea cells have experienced reversals in trends.

Because there are limited data points, there could be a case when there was a more erosional period in a short amount of time, but this cannot be captured when compared to longer periods of accretion. Also, correction was made for any beach nourishment so that the graphs represent systematic changes.

In the Kikiaola cell, there was 6,000 to 3,000 cubic yards per year change in beach sediment volumes. For the Waimea cell, there are missing data points that make it difficult to discern the transition from erosion to accretion.

In the Poipu region, erosion rates are relatively small with good opportunities for beach nourishment. West and Central Poipu cells have experienced similar erosional trends with West Poipu having fairly steady, long term erosion at about 400 cy/yr.

In East Poipu, there has been accretion and then sometime between 1970 to 1975, there must have been an event which took sand out of the beach and from which it still has not yet recovered. It would be helpful to document history from the community to help determine what the effects of any historical events were on the beach.

Although the shoreline data are meager for the early years of the study, in recent years, there is very extensive data and aerial images for these areas. It was reiterated that the purpose of this study is strictly one of preliminary investigations to identify and generalize past trends and potential resources for future projects. It does not propose specific plans or get into the minute details of each of the beaches.

Questions:

Q1: If sand is 15 feet from the beach in 20 feet of water, how much wave action does it take to get this sand back onto the beach?

A1: It is easier to bring sand off the beach because it has gravity working with it, but it depends on what types of actions and cumulative forces that are going on in the area to determine the impacts they will have on the movement of sediment.

Q2: Why don't you use satellite data for investigation?

A2: The original research by UH required very high resolution images as well as no cloud cover, etc. Note that satellite data could be considered to monitor large changes in a study area but it is not high enough resolution to use for a detailed shoreline change database.

Q3: What is jet probing (air or water)?

A3: Essentially jet probing is a water hose that is extended down into the ocean floor until it hits hard ground. The instrument does not provide specific measures; data gathered are based on observation. There is also a limit to how deep the investigation may proceed.

Comment 1: The indigenous names of each of the places have meaning that should be taken into account in these studies.

Comment 2: This workshop is not a good forum to solicit kupuna input on the coastal conditions. Traditional ecological knowledge is not represented at this workshop.

IX. Kauai Regional Sediment Management Plan (Presented by Kim Garvey, M&N)

As part of the RSM Plan for each of the regions in Kauai, existing federal projects have been taken into consideration. In the Kekaha region, projects include the Kekaha Beach shore protection project, the Kikiaola Light Draft Harbor navigation improvement project, and the Waimea River flood control project. Currently there are no federal projects in the Poipu Region.

In this region, long lengths of sandy beaches result in high volumetric rates (in comparison to along the south shore of Oahu). West and Central Poipu cells have experienced similar erosional trends and the East Poipu cell has experience significant erosion episodes between 1972 and 1975 and has not recovered since. Erosion rates are relatively small, which provides a good opportunity for beach nourishment. Based on UH offshore sand source investigations, it was found that the Kekaha region offshore sand sources are estimated to be around 189.4 acres. In the Poipu region, offshore sand sources are estimated to be around 72.2 acres.

Beach nourishment projects involve a number of different laws and regulations, including federal (Clean Water Act and Harbors Act under the USACE, and USFWS, and NMFS); State (Coastal Zone Management Act, work offshore of certified shorelines under DLNR, the Department of Health Clean Water Act, Historic Preservation Office, Office of Hawaiian Affairs, Department of Transportation, Highways and Harbors Divisions; and local (including County of Kauai, Public Works,

Planning Department and Planning Commission). Inter-agency coordination is critical for efficient permitting. However, there are a variety of regulatory and coordination issues that arise in regards to beach nourishment projects.

In 2005, DLNR and USACE issued a State Programmatic General Permit (SPGP) to streamline small scale beach nourishment (<10,000 cy) in the State of Hawaii. However, the State Department of Health Section 401 Water Quality Certification component has lapsed. Therefore, there is now a consolidated permit within the DLNR which includes the Department of the Army, SPGP; the State Department of Health, Section 401 Water Quality Certification; the State CZM Federal Consistency Review; and DLNR Conservation District Use Permit.

The intent of the RSM Plan is to give federal, state, and local agencies and groups more information to pursue sediment management projects. The Kauai RSM Plan contains the following information for each region that can be easily accessed in the reports online at the USACE website:

- Existing federal projects
- Coastal processes
- Wave climate
- UH shoreline erosion maps
- Beach profiles
- Shoreline features (maps and descriptions)
- Beach volume graphs
- Beach volume change rates
- Historical events chronology
- Ocean sand sources
- Potential RSM projects

In summary, beach nourishment may be viable and the RSM projects that have been identified through these studies do have the potential to be implemented in the future, but require more study and analysis.

Potential RSM projects in this region include the Poipu Beach Park Restoration project in which there is the potential for beach nourishment of 6,000 cy. Potential sand sources include Kekaha landfill and offshore sand sources. The County of Kauai Parks and Recreation is a proponent of this project.

Federal Input:

There are no Federal projects in this region right now because federal interest has not been demonstrated through a USACE conducted study. Therefore, it is suggested that non-federal proponents should contact their congressional representatives to gain support if there are problems and opportunities to enhance RSM in the region.

State Input:

The State would is supportive of beach nourishment as long as the sand to be used is demonstrated to be beach quality, which means that the nourishment sand has characteristics as the sand at the proposed project site.

When determining whether a project is worth doing, it is first a question of what the purpose of the project would be and who it would benefit, and at the same time, social, environmental and cultural factors should be taken into account.

Question:

Q1: Has anyone come to the conclusion on whether sand would stay in place if there were nourishment at Brenneckes?

A2: There have been small nourishments and these events would be studied in more detail before any design would be approached.

Comment 1: There is value in studying land use and how that affects changes in the beach over time. For example, there was a year in which the government bought up a bunch of the upland and cleared a lot of the vegetation and made it into a park. Their action then in turn led to the increase in sediments on the beaches.

Comment 2: Pictometry is a small company out of Rochester, NY that does low altitude aerial photography and over the past couple of years all of Kauai has been photographed, and these images could be used as part of this or other coastal studies.

Potential RSM projects in the Kekaha region include the Kikiaola sand bypassing. Kikiaola Harbor and offshore sand sink appear to block littoral sand transport. A potential project may include an initial bypassing project of 80,000 cy and future by-passing of 36,000 cy every 6 years.

State Input:

The State is very supportive of the Kikiaola Harbor sand bypassing and has also been working with some homeowners in the area on this project. The point of the project is to restore the natural flow of sand along the coastline; however, from a federal perspective the main reason for the project is to keep the sand out of the harbor.

Questions:

Q1: If the harbor affects the downdrift properties and decreases the value of their properties then do the property owners have the right to sue?

A1: It has happened in other locations.

Q2: Is there a connection between the preservation of the beach and the removal of the vegetation on the Kekaha revetment?

A2: No, in terms of O&M it is not preferable to have vegetation in the structure because it pushes the rocks apart.

Q3: Could global warming cause issues?

A3: There may be impacts by increased storms, temperature, greater swells. This impact is not addressed in study and evaluation needs to be longer term than a few years (on the order of 40 to 50 years).

Comment 1: There is a new methodology for moving sand which involved blowing dry or wet sand. This method is being evaluated for the next Waikiki beach re-nourishment. This removes problems associated with dewatering and the costs are somewhat comparable to other forms of transport.

Comment 2: Climate change may be having implications on these regions of the coastline.

Comment 3: The report needs to be written for more of a non-engineering audience and the Kauai report should focus more on Kauai rather than focused on the state as a whole, especially for the wave information. Work on readability and more visual representations. Report is missing ‘okina.

Comment 4: The work that the RSM team is doing is appreciated.

Comment 5: There is interest in work in Kapaa area. Sea Engineering is working in the area.

Chris Conger provided closing remarks and gave his thanks to all that participated.

Meeting was adjourned at 5:05pm

Attachment A: Meeting Agenda

Attachment A
Meeting Agenda