SOUTH BAY SALT POND RESTORATION PROJECT
Sediment Workshop Synopsis of Comments and Questions

Introduction
This document provides a summary of questions and comments from attendees of the Sediment Workshop. This synopsis does not provide meeting minutes, but focuses on the questions and issues attendees had relative to sediment dynamics and landscape scale geomorphic modeling for the Restoration Project.

Comments provided by Science Team members are considered advisory, and do not constitute peer review. These comments are designed to help the Consultant Team and Science Team collaborators move forward with models or predictive approaches that will provide the best estimate of how South Bay geomorphic conditions are likely to change when restoration is implemented.

Attached to this summary is an email from Kris May, modeler for Philip Williams and Associates (PWA), with initial comments on the Workshop from PWA.

Part 1. State of Knowledge of Sediment Dynamics and a Sediment Budget Model
Presentations

- Bruce Jaffe's presentation provided historical information on sediment accretion and erosion patterns in the Bay. Also, his data show that, if equilibrium in South Bay sediments exists at all, it seems to be different for the 4 different regions demarcated by Bay Bridge, San Bruno Shoal, San Mateo Bridge, and the Dumbarton Bridge. The region north of San Bruno Shoal is erosional and that south of the Dumbarton Bridge is depositional, and not just due to subsidence. His data also show that about 33% of mudflats were lost during the 1850-1980 period, a time when the South Bay also lost 85% of its tidal marsh. The relationship between these two pieces of data is not clear.
- Dave Schoellhamer presented a sediment budget model for the South Bay, south of the San Mateo Bridge. The budget uses estimates of sediment input and loss from the Bay bed, wetlands, tributaries and the ocean. Dave used an Uncles-Peterson Model to predict bed and ocean numbers. Two basic points were that models need to determine the time period of interest to determine appropriate system inputs and, overall, the system has been depositional below the Dumbarton Bridge over time, even recently.
- Dave also gave a summary of the Sediment Management Synthesis.

Comments/Questions on the Presentations

- How are wind, shear stress, and wind-wave suspension included in the sediment budget model?
- Do the model and data capture the effects of big events, such as the El Nino event of 1982-1983, which could strongly affect sediment budgets?
- With respect to Bruce's data, does the historical evidence reveal a random process of erosion and deposition or is there something more systematic occurring?
- The historical evidence and budget seem to miss the causes of changes, for example, changing inputs from watersheds due to human activities.

- It seems that we need more information on the sediment discharges from the watersheds.
- Should breaches to ponds for the Restoration Project be closer to tributary discharge points to capture sediment output?
- Evidence from Phil William's work suggests the "sweep zone" is the major source of sediments to ponds opened to tidal action. The major factors for a South Bay sediment budget are tidal flat erosion and accretion and sediment demand of newly opened ponds.
- In response, someone else noted that internal redistribution is essential but on some time scale there is a connection between sediment input and loss to the South Bay from the Central Bay and internal redistribution.
- How is sediment grain size affecting erosion rates?
- How do we retain mudflats in the face of ponds being opened to tidal action? Mudflats were maintained historically. Do we need to consider watershed differences in planning to maintain mudflats while raising the elevations of the salt ponds?
- Lester McKee agreed with the concept that local supply from the watersheds is currently a primary input to sediment supplies. But, he thought Dave's model inputs from the tributaries were too high.
- There is uncertainty with respect to the relative contribution of different sediment sources to marsh building and indeed how much sediment comes from each source. How do these uncertainties affect planning for the restoration?
- How much sediment is coming from slough, channels and different tributaries?
- How can we redesign floodwater conveyance to bring sediment down the watershed and into the Bay?
- Collecting core data in the sloughs and other critical locations can be used to assess size and periodicity of big events, to determine how far into the bay watershed material goes, and provide other data on events such as mercury deposition.
- What is the appropriate timeframe for the conceptual models and other modeling?
- How do we reduce the damage that could be caused to current ecosystem functioning by restoration actions?
- It seems that mudflat loss could be one undesirable effect of the project, with near-term mudflat gains, but long-term risk of mudflat loss over 20-40 years. To offset those impacts, perhaps we could look at examples in the Bay where vegetation is not colonizing mudflats due to inhibition by factors such as wind-wave action, and possibly design fetch areas in the project to suppress vegetation and encourage long-term mudflat retention.

Part 2. *Landscape Modeling for the Restoration Project to Predict Changes resulting from Restoration Actions.*

<u>Presentations</u>

- Phil Williams and Kris May present the modeling approach they will take to evaluate alternatives on a landscape scale. This approach was summarized in the Landscape Scale Geomorphic Assessment Summary – DRAFT of December 2004 (LSGA).
- At least two goals of the modeling approach are to meet planning deadlines for the project and evaluate the No Action and Tidal Marsh Alternatives.

- The Uncles-Peterson (UP) model to estimate suspended sediment concentration (SSC) will be linked to the MARSH98 model, which is used to predict marsh accretion or erosion.

Comments and Questions on the Presentation

- UP model results are strongly affected by SSC, pond depth, wind-wave and bulk density. These factors need to be estimated for more accurate model results.
- It seems that sea level rise has very little effect on the time to vegetation colonization, but wind-wave action is a much stronger force in preventing a site from ever vegetating.
- Data collected from tidal flat profiles on different parameters (tidal range, SSC, wave height) could be used to improve model results.
- With respect to SSC, this parameter has been measured at some sites and could be measured at more of them. Using an empirical (field data based) approach to determine SSC, rather than the UP model, is a much better way to go.
- Along these lines, SSC and sedimentation rate estimates could be collected from restored and restoring sites and used to test the UP model. This data collection could be done quickly, within the planning timeframe!
- In addition, we could incorporate the length of the sweep zone and correlate with SSC.
- Collecting data and doing modeling at particular pilot sites could be used to test models. In particular, could we develop a 1-D model with all the relevant factors for a specific breach (i.e. a local model) and then apply it to MARSH98? Perhaps we could use this approach to understand how to scale up to larger areas.
- At pilot projects, we could also measure the effects of restoration actions on local mudflats and sloughs.
- The historical data could be used to analyze mudflat change profiles in the South Bay to see if there is sediment equilibrium.
- Data are not available for SSC moving laterally across tidal mudflats, which is a necessary parameter for more accurate UP results.
- A major problem with the UP model (as modified by Dave—the so called SUPER model) is that it was developed for salinity transport and is not well-equiped to estimate sediment transport. That was not the purpose for which it was developed. Instead of the UP model, we should use an approach that is easier to do and whose limitations we understand better.
- Another approach to using the UP model, is to run it for the two alternatives and just compare the differences between the alternatives, rather than making specific predictions from each alternative. This may not meet the project needs, though.
- Use 2-D and 3-D models for local effects, which we can predict with more accuracy than the landscape scale.
- Could calibrate the model we chose (such as the UP model) for a smaller scale and see if it works or falls apart.
- Model within the 4 large regions of the South Bay, rather than boxes. The regional level allows capturing the variability in the lateral dimension of sediment transport.

Part 3. Landscape Scale versus Local Project (Phase 1 for the Restoration Project)

Presentation

- Mike Connor asks the group to consider these questions:
    - How would you design the Phase 1 project or other experiments to try to answer the important questions about where sediment is coming from and the relative contributions of different sources?
    - What parameters would you measure in Phase 1 or an experiment such as the Island Ponds?

Comments and Questions in Response

- Phase 1 design could consider how we might manage sediment by mining sediment sources in some ponds, sloughs and during extreme flood events.
- Data that should be collected or generated include:
    - Measure sediment fluxes at points of importance for the Project area, such as where tributary water meets Bay water.
    - Measure lateral variability in sediment flux.
    - Use historical information in land use, Bay changes and climate change and try to correlate these factors with bathymetry changes in different regions of the South Bay.
    - Take cores to track the Hg signal and analyze mineralogy.
    - Measure sediment properties of sediment moving into newly opened ponds.
- We need to know how geomorphic change has occurred over time to help determine the "forcing functions" that maintain or change mudflats and tidal marsh. This information would help inform our conceptual models of the system.

Key Data Gaps Identified in the Workshop that could be addressed in the Short Term

- Collect data from tidal flat profiles on different parameters (tidal range, SSC, wave height).
- Collect core data in the sloughs and other critical locations to assess size and periodicity of big events, to determine how far into the bay watershed material goes, and provide other data on events such as mercury deposition.
- Measure SSC and sedimentation rate from restored and restoring sites to test the UP model.
- Measure sediment fluxes at points of importance, such as where tributary water meets Bay water.
- Measure lateral variability in sediment flux.
- Use historical information in land use, Bay changes and climate change and try to correlate these factors with bathymetry changes in different regions of the South Bay. Example sub questions:
    - How has sediment flux to the South Bay from local tributary inputs changed over time (last 200 years since non-native land use practices) and how would South Bay bathymetry be influenced?
    - How would South Bay bathymetry be influenced just from the diking of the historic marshes even if tributary sediment supply was held constant?
    - Has there been a shift in size of sediment delivered to bay, ie perhaps more sines and less coarse bedload, and how might this effect South Bay bathymetry?

- Measure sediment properties of sediment moving into newly opened ponds and the effects of restoration actions on local mudflats and sloughs.
- How can we tap into sediment sources and direct them to restoration sites i.e., tidal sloughs, mudflats, previous ponds, deposited sediments in flood control channels and reservoirs, and floods from terrestrial streams?
  Utilize sediment in flood control channels
- How should restoration be spatially planned to maximize sediment supply to all potential sites?

Next Meeting

- We will have another meeting of the Sediment Workshop, date still to be determined.
- This meeting will most likely include the Consultant Team response to questions about the modeling, a discussion of studies that could be conducted during the planning phase to help inform planning decisions, and a discussion of Adaptive Management and longer-term modeling.

Sediment Workshop Attendees
Steve Ritchie, South Bay Salt Pond Restoration Project
David Schoellhamer, USGS
Lester McKee, SFEI
Steve Goldbeck, BCDC
Sean Michael, Alviso Task Force
Charles Taylor, Alviso Task Force
Jim McGrath, Port of Oakland
Kris May, PWA
Phil Williams, PWA
Josh Collins, SFEI
Laurel Collins, Watershed Sciences
Mark Stacey, UC Berkeley
Jessie Lacy, USGS
Lynne Trulio, San Jose State University
Neal Van Keuren, City of San Jose
Steven Osborn, City of San Jose
Dilip Trivedi, Moffatt and Nichol
Steve Moore, Regional Water Quality Control Board
Fred Hetzel, Regional Water Quality Control Board
Liang Xu, Santa Clara Valley Water District
Jen-Men Lo, Santa Clara Valley Water District
Phil Mineart, URS
Thomas Bawden, USACE
Ed Gross, Consultant
Fred Nichol, USGS (retired)
Bruce Jaffe, USGS
Sandy Olliges, NASA Ames Research Center

EMAIL FROM: Kris May, Phil Williams and Associates
SENT: December 21, 2005

SUBJECT: Sediment Workshop—Initial Comments from PWA

Thanks to everyone who attended the Sediment Workshop and offered written comments. The comments are thoughtful and constructive, and should help make the Landscape Scale Geomorphic Assessment (LGSA) more useful to the project. This is a quick response to weigh in on two overarching issues – the science advisory process and appropriate use of the LGSA – and to address a few more specific comments. We will continue this dialogue and respond more fully to additional comments as needed after the holidays.

Science advisory process. We understand that the Science Team is actively engaged in clarifying their roles with respect to the short-term planning process. We agree that it's important to be clear on roles so the Science Team can feel comfortable that their input is appropriately understood. When roles are clear, this helps keep the communication at the right level of detail and formality – which has schedule and level of effort implications for the project. It's our understanding that the Sediment Workshop discussions fall in the category of science team "advisory role," whereby the Science Team members provide ad hoc advice to the Consultant Team through informal interactions (with the exception of select members such as David Schoellhamer who would be considered formal collaborators; see the draft charter for the Science Team). In the advisory role, the Science Team provides guidance based on the information and time available, and does not necessarily "buy in to" or endorse our approach. Since this is not a formal "peer review" process, it's our understanding that the documentation -- of our approach, Science Team comments, and responses -- does not need to be at a level of detail for full scientific review. This allows the LSGA to benefit from input, and also proceed in a streamlined fashion in the time available.

Use of the LSGA. To comment effectively on the LSGA, the project context and use of the LGSA should be clear. The intent of the LSGA is to establish a better understanding of the limits of the system response at a regional or landscape scale during the early programmatic planning phase. At this stage, the footprint and phasing of the alternatives are still being defined. More detailed hydrodynamic modeling will be used later in the planning process for impact assessment of more defined alternatives. The SUP model is not intended as a tool for assessing geomorphic change on its own. We propose to couple the SUP model with a suite of analytical and empirical tools and historical data to produce a "weight of the evidence" approach. We are not relying on any one tool for "the answer."

Other comments. Below are acknowledgements of various suggestions from the workshop participants and responses to comments that we did not have time to discuss during the workshop.

- *Use of empirical sedimentation data*. In response to several comments, we plan to include a scenario that estimates pond sedimentation based solely on historical/empirical sedimentation rates. This will help bracket the system response, acknowledging that it does not account for the scale of effects of the

restoration on sediment supply. In order to account for the scale effects, we will use empirical multipliers to link the SUP model SSC's to appropriate SSC values for the MARSH98 model. Clearly, the LSGA predictions need to be consistent with historical sediment rates for the existing conditions scenario. Using a multiplier is a straightforward way of accomplishing this, and can then be applied to the future restoration scenarios as well.

- *Regional approach to the SUP*. We agree that a regional approach, rather than a more detailed approach using individual SUP Box slices is warranted, to match the level of detail of the historic bathymetry calibration data.
- *Use of estimated bed shear stresses to predict long-term mudflat profiles*. Our intention is not to reproduce detailed erosion and deposition patterns within the South Bay, but instead to understand the general mudflat profile trends over the 50-year planning horizon. This is consistent with other applications in the peer-reviewed literature (Friedrichs and Aubrey 1996; Uncles 2002).
- *Consideration of watershed inputs of sediment*. This will be considered in the bounding scenario/sensitivity analysis. We will evaluate scenarios in which all the watershed supply of sediment enters the ponds and other scenarios in which all the watershed supply deposits on the mudflats before being transferred tidally to the ponds.
- *Sediment supply from eroding tidal channels*. This sediment source is included in the LGSA.

We look forward to our continued discussions.

Kris May