



LONG TERM MANAGEMENT STRATEGY

San Francisco Bay Joint Venture Conservation Committee Meeting

Sediment Issues Facing San Francisco Bay

San Francisco Bay Conservation and
Development Commission
McAteer Petris Room
50 California Street, San Francisco

Thursday, September 1, 2011
10:00 AM – 4:00 PM

MEETING NOTES

MEETING ATTENDEES

Please email bayltms@anchorqa.com for a scanned copy of the meeting sign-in sheet.

Meeting Purpose – Beth Huning, San Francisco Bay Joint Venture (JV)

Earlier this year, Brian Ross (EPA) and Brenda Goeden (BCDC) briefly presented a status update and issues facing the Long Term Management Strategy for Placement of Dredged Sediment in the Bay Region (LTMS) Program to the JV Conservation Committee. The purpose of this meeting is delve further into the sediment issues facing San Francisco Bay and how they relate to habitat restoration projects and where collaboration and coordination with dredging projects would be beneficial. The JV has a data base which houses information regarding restoration projects throughout the Bay Area. Attendees can also build on the list of projects contained in the database, identify issues and potential solutions, and discuss specific opportunities that exist between dredging and restoration projects. Ideally, this meeting will facilitate collaboration between restoration and dredging projects, and lead to the development of recommendations for the LTMS Managers and JV to carry out.

LTMS and Wetland Project Coordination – Brenda Goeden, San Francisco Bay Conservation and Development Commission (BCDC)

Historically, dredged material was placed at in-Bay disposal sites. As a result of concerns over water quality and environmental impacts, in the late 1980's and through the 1990's the LTMS program was developed to reduce in-bay disposal over a twelve-year transition period. Since its adoption in 2000, the LTMS Program has transitioned dredging projects from in-bay disposal towards beneficial reuse of dredged sediments and ocean disposal when beneficial reuse sites are not available. Each year, the dredging community dredges of an average of approximately 2-3 million cubic yards (cy) of sediment, which is a valuable resource that can be used to beneficially to restore wetlands, levees and appropriate use in construction projects.

Recent suspended sediment monitoring efforts and examination of bay bathymetry shows a decrease in sediment supply from the Delta and erosional trends in some of the Bay's embayments. This change, in combination with sea level rise, makes discussions on beneficial reuse of dredged sediment have become increasingly important due to the need to place sediment in areas that will either not accrete as expected due to low sediment supply or will be heavily impacted due to sea level rise due the present elevation of the site . However, beneficial reuse opportunities for the dredging community are limited because the larger reuse projects have been completed or face significant implementation issues. Beneficial reuse projects that have been established in the Bay include:

- *Sonoma Baylands*. This site is complete. It was monitored following completion, and within 10 years had successfully established marsh vegetation.
- *Montezuma Wetlands Project*. This site still has capacity to accept dredged material but is challenged by the distance from dredging projects and offloading capabilities.
- *Hamilton Wetlands*. This site is complete. Its challenges included federal/local sponsor cost sharing logistics and high costs associated with pumping sediment long distances. Adjacent to this site is its expansion parcel, Bel Marin Keys. This site is limited by funding and coordinating issues, and, as such, is currently on hold. It was pointed out that the issues facing this site are similar to issues affecting the viability of other potential sites, so resolving them for Bel Marin Keys could actually benefit other sites as well.
- *Carneros River Ranch*. This is an agricultural site off the Petaluma River that reuses dredged material. It is complicated by the marina's shallow draft and lack of an offloader. However, the project sponsor is in process for permitting
- *Cullinen Ranch*. This site has a permitted offloading location at Dutchman Slough but is working to obtain permits for another location on the Napa River in order to provide better service to dredgers. To do this, a State Lands Commission lease is needed. The ultimate desire is to be able to dry out the material, but this is not currently permitted. Some disconnect with the agencies specific to this issue was noted.

Because the larger sites have been completed or are currently delayed, the LTMS is reaching out to small restoration projects that may be able to accept dredged material while work continues towards opening up Bel Marin Keys and potentially the South Bay Salt Ponds for beneficial reuse. Other possible options that could improve the feasibility of beneficially reusing dredged sediment include an aquatic transfer facility (ATF) in San Pablo Bay and a portable offloader system.

The JV Management Committee developed a database that tracks sediment disposal/reuse alternatives for restoration projects of all sizes. The JV has identified available small projects in the Bay Area and has provided a handout listing projects that both need sediment and may have sediment available (email bayltms@anchoragea.com to request a copy of this handout). The handout was derived from an online list of projects that is updated by project managers and coordinated by the JV (<http://cjvp.ducks.org/cajv/CAJVlogin.cfm>). Timing has been highlighted as a major issue to facilitating beneficial reuse of dredged sediment for restoration; tracking projects and closer coordination among stakeholders could improve timing issues.

Beth noted that the Bair Island Restoration Project is not currently accepting dredged material because Pacific States is planning to bring enough dirt to the site to fill it. The South Bay Salt Pond Project needs sediment for various efforts. The project is in the process of developing its needs for Phase II; there is potential for the needs to be as high as 5-10 million cy of material.

Dredging Projects – Brian Ross, U.S. Environmental Protection Agency (USEPA)

Changes in the Bay sediment system have led the LTMS agencies to examine issues with the LTMS Management Program regarding the movement of sediment out of the Bay to SFDODS. These changes have also prompted examination of regional sediment management opportunities beyond the dredging program. The LTMS program has historically been focused on the availability of large-scale restoration projects, such as the Hamilton and Bel Marin Keys projects. Due to the previously noted constraints of large-scale projects, small-scale projects have become more important in reaching the LTMS goal of maximizing beneficial reuse. These smaller sites will require increased coordination and collaboration between dredging and restoration project proponents. It was noted that, with smaller projects being the focus, it will be difficult to meet the goals of the LTMS and that there needs to be incentive for small dredgers to dispose of sediment in upland areas.

Brian shared with the group the GIS data that is available for dredging project footprints, eelgrass beds and disposal sites, all of which can be downloaded and imported to Google Earth. Brian noted that getting shape files of all restoration sites and their footprints would be helpful in matching up sites with sediment needs and nearby dredging projects with available sediments. Shapefiles should be sent to Brian Ross to be integrated into the master set of files. The JV database has shapefiles that could also be imported into Google Earth.

A participant noted that if SFDODS closed, dredgers would be forced to look at additional upland reuse options. Brian responded that the USEPA does not plan to close SFDODS but that upland options need to be pursued nonetheless. It was noted that there may be a way for the federal government to provide financial assistance to make reuse projects more feasible and this should be a focus of some work.

The U.S. Army Corps of Engineers (USACE) conducted a Value Engineering (VE) Study on contracting issues earlier this year to examine methods to increase the efficiency of dredging projects. The VE Study identified 11 recommendations that address topics such as: ways to make contracts more effective; potentially bundling projects; or setting up a general contact to beneficially reuse sediment throughout the Bay.

It was suggested that the agencies develop a list of dredging projects in the Bay so that contractors can better coordinate and increase competition. This information is available through the project coordination meetings that the LTMS hosts six times per year. It can also be emailed to anyone requesting the information.

It was also suggested that the definition of beneficial reuse be examined and potentially expanded to help address these issues.

It was suggested that the purpose of the ultimate purpose of the sediment should be evaluated to ensure that the material is used for the highest value, and not simply being used to fill in diked baylands for development.

Brenda presented on beneficial reuse and habitat restoration at Aramburu Island, located in Richardson Bay. The project accepted both sand and mud to create two distinct habitat types, but faced a number of challenges:

- *Timing.* Sand is only produced on a regular basis from the following Bay Area dredging projects: San Francisco Marina entrance channel; Conoco Phillips; and Suisun Bay channel. The limited availability of sandy material affected the timing for placement of material. Because the timing of the dredging did not match the restoration projects schedule, the Aramburu ended out purchasing sand from the sand miners. (It was noted that the DMMO records sediment types for various projects - a useful tool for restoration projects looking for specific types of sediment.)
- *Depth.* The island's draft was only 6 feet, which is not deep enough to accommodate most scows used for the larger dredging projects in the Bay, which through LTMS are required to take material out of the Bay.
- *Contracting.* The two companies involved were union and non-union, which complicated contracting issues of the project.

Discussion: How to Meet Beneficial Use and Restoration Needs – Marc Holmes, The Bay Institute

Based on the presentations and discussions of the meeting, Marc noted that some changes needs to occur to address sediment issues:

- Issues pertaining to the existing LTMS administrative structure goals
- Difficulty and expense of the permit process on small dredging and restoration projects
- Large-scale restoration projects are on hold (is there a way to move them forward?)
 - Costs to carry out small projects are limiting
- Assistance with funding could potentially assist the process, but funding opportunities are currently limited
- Drying out dredged material and potential acidification is limiting the volume and use of the sediment (this may be a more project-specific issue)

If the focus is on institutional problems, the LTMS would need additional money to carry out projects, therefore limiting the projects that could be carried out. The Harbor Trust Fund, which

could help fund the projects, is being pushed in Congress but needs more backing. It is unrealistic to expect that the federal government will provide enough funding to solve the issues.

If the sediment coming from dredging projects is looked at as a “market,” it may increase the effectiveness of the process.

There could be cumulative effects of letting projects accumulate sediment naturally versus bringing sediment to the site. If projects are not filled to capacity then they could end up competing for the sediment, which is already limited. Another issue to consider is whether projects that are depending on passive sediment supply will succeed with sea level rise. This may shift the focus of the requirements to the possibility of increasing in-Bay disposal and potentially shifting the in-Bay disposal sites to better feed restoration projects. There needs to be more scientific research to assess the feasibility of whether sediment could be disposed of and distributed by the tides.

Sediment Transport and Budget– David Schoellhamer, U.S. Geological Survey (USGS)

Sediment data shows that the Bay has less suspended sediment than in the past– a process known as “Bay clearing.” Monitoring of suspended sediment concentration has occurred since 1991, and several sites in the water column measure data every 15 minutes. The monitoring equipment needs to be calibrated and the most significant problem has been bio-fouling, however cleaning technology has improved over time.

The data shows a 36 percent step decrease in suspended sediment beginning in water year 1999 due to the Bay’s physical processes, including tidal and wind activities. Before 1999, the Bay was experiencing “transport regulation” (an abundance of sediment available as compared to the energy needed to expend it) from the hydraulic mining material moving down the Delta. In 1999, the Bay changed to “supply regulation” (a depletion of the sediment available on the seafloor bed). All monitored areas within the Bay are showing the same results, with the exception of a portion of the South Bay near the San Mateo Bridge, possibly because fine sediment does not accumulate there. A meeting participant asked whether a change in shear stress on the Bay floor could have changed the amount of suspended sediment. David responded that flow of water from rivers does not control the sediment as much as the tides and wind, which have not changed.

Delta suspended sediment data from 1975 to 2010 shows a decrease in sediment concentration. High summer flows during El Nino events in 1983 and 1998 appear to flush sediment from the Delta (1983) and Bay (1999) and cause sudden clearing of the waters. In addition, within the 10 years following the 1998 El Nino, suspended sediment concentrations decreased by 50 percent

in the Delta. It is unclear how the Bay will respond to the next El Nino events in the coming years since sediment in the Bay has decreased so drastically.

There are three beneficial reuse/habitat restoration demands in the Bay that require sediment to survive: restored marsh plains, maintenance to existing marshes, and mudflat preservation. If mudflats erode, waves and sea level rise may increase erosion to the adjacent marsh. The issue with these sediment needs is how to physically transport material; simply opening the hopper doors and emptying material will not necessarily result in the sediment hitting its intended target. Tidal asymmetry in the Bay could potentially move sediment places in areas near restoration sites. The net sediment flux in the South Bay is generally to the south; it is only to the north when flows entering the South Bay from land are high. Regardless of whether the tidal prism in the South Bay changed, this would likely remain unchanged as the salinity differences are what control a lot of the movement (the density difference creates a south flow). The general wind direction is also to the south, further pushing surface water and sediment south. With sea level rise, salinity levels could change so there may be changes in the sediment transport. In nearshore regions where wind is driving transport, it appears that sediment moves towards land, which should be considered when planning restoration projects.

San Francisco Bay Sediment Transport Modeling – Michael MacWilliams, Delta Modeling Associates, Inc.

The UnTRIM Bay-Delta Model has been coupled with a wind wave model (SWAN) and a sediment transport model (SediMorph) in order to simulate sediment transport scenarios in San Francisco Bay. The model is being used to evaluate future changes to sediment shoaling due to changes to sediment supply and sea Level rise and to evaluate sediment dynamics for dredged material placement scenarios. The purpose of the sediment placement scenarios is to evaluate the potential impacts of increased sediment in the Bay and whether the sediment will ultimately nourish wetlands.

The UnTRIM Bay-Delta model (www.deltamodeling.com/untrimbaydeltamodel.html) extends from the Pacific Ocean at Point Reyes through San Francisco Bay, and the the Sacramento-San Joaquin Delta. The UnTRIM model has been used in San Francisco Bay since 2002, and the TRIM model has been used since 1990. The model includes inflows and exports in the Delta, a tidal boundary at the ocean and freshwater inflows are captured throughout the Bay, including the South Bay. The model runs about 30 times real time on a desktop computer such that a one-year simulation can be run in about 12 days. The model can be run with different parameters for wind, salinity, water flows, and tidal currents, has been calibrated and proven to be successful.

A range of approaches for evaluating sediment dynamics were presented. The simplest approach to assess deposition and erosion potential is to look at bed shear stress levels. Lower

bed shear stress means less stress on the bed, resulting in less erosion to the bed. Bed shear stress was analyzed in response to the Sacramento DWSC deepening project. The erosion potential and the bed shear stress can show relative changes to the potential for erosion and deposition.

The UnTRIM model was used to evaluate where sediment would move to once it was placed at the ATF in San Pablo Bay as part of the Hamilton Wetlands Aquatic Transfer Facility (ATF) technical study. Results showed that most sediment would end up on the bed, but that some would be transported in the water column. Animation of suspended sediment at the ATF site shows that if material is placed during a flood tide, a plume will move and disperse sediment in San Pablo Bay. The ATF is designed to have the sediment stay in its vicinity as compared to SF-9, which is a dispersive site selected such that sediment placed at SF-9 moves to deeper channels out of the region. Ultimately, 3 to 5 percent of material would be dispersed from the ATF area and the remainder would move into the ATF site. Sandy material is quickly deposited but finer materials stay suspended for a long time (over a week), which means this material will move through Bay.

Several sites are being considered for the initial dredged material placement scenarios. SF-9 and Corte Madera are sites that may be used as test sites to evaluate how sediment moves in the Bay and if it feeds the wetlands in those regions. Other sites will also be evaluated. To be used as test sites, a site needs to have a nearby wetland that is sediment deprived and located adjacent to an area where dredgers can place material. Additional scenarios will evaluate the effects of sea level rise and changes in sediment shoaling in the Bay. There was a request to have the model look at placement of sediment in shoals on the bed.

The meeting participants discussed whether there is a means to add information on the restoration sites to the model, such as adding potential breaches to salt ponds in the South Bay. The model already includes a high resolution grid in the region south of Dumbarton Bridge that covers the salt ponds. They also discussed whether, since there are areas in the Bay where sediment naturally accumulates, these sites be specifically included in the model. It was also suggested that shear stress maps could be used to pre-screen potential placement sites prior to carrying out the full sediment model as there may be a way to identify potential sites for further analysis.

Discussion: What Does It Mean to Benefit or “Nourish” Mudflat, Marsh, or Subtidal Habitat? – John Callaway, University of San Francisco

The focus of the meeting is how to get sediment into the marshes - the critical issues being sediment movement and transport. However, most of the sediment transport work in the Bay has been in deep areas, away from the nearshore areas – including marshes. There are a lot less data available for the shallow areas, so it might be useful to collect suspended sediment data in

the shallow areas of the Bay, focusing on areas that have been breached. Elevation is critical in getting sediment to the marshes and should be incorporated into the discussion.

There are a number of other studies that have looked at ways to get sediment to nearshore environments. Some methods include “thin-layer” placement using spray or slurry applications (used in Louisiana and Venice, Italy). There are high rates of subsidence in these regions, so they may be good for comparison.

Intertidal sites that have relatively low elevations accumulate sediment very rapidly, but as you get closer in elevation to the marsh plain, the sediment accumulation rates are slowed down because of reduced frequency of inundation at higher elevations. Sedimentation rates at the island ponds were monitored after they were breached, from 2006 to 2009. Data collected showed that there are very high rates of sediment accumulation in the southern half of the site (approximately 20 cm of sediment over 3 years), but that the northern half is at a much higher elevation so it has a slower accumulation rate (approximately 5 cm over 3 years). Elevation and distance to the breach location are both very important to sediment dynamics. Natural, well-developed marshes are at higher elevations that will cause slower accumulation rates, even in areas of high suspended sediment concentrations.

Current and historic rates of accumulation have been determined and collected for the Bay and can be compared around the Bay. ^{137}Cs (unnatural isotope that was a result of nuclear bomb atmospheric testing that dispersed radioactivity all over the world at low but measurable levels) and ^{210}Pb (a natural occurring isotope) are used to date the sediment and determine the accumulation rates over 50 to 100 year periods. Over 50 sediment cores were collected around the Bay, and the results show less variation in sediment accretion rates across sites than expected. Most marshes are accumulating a few millimeters per year, which is keeping up with sea level rise. Whales Tale Marsh has the most rapid accumulation rates at 6.3 mm/year. The mid-marsh samples all across the Bay showed that most marshes accumulate approximately 3 mm/year with little variation around the Bay. Some of the low marsh sites showed accumulation rates of 6 to 8 mm/year, which is higher than mid-marsh areas but still not real high. Feldspar clay was also laid out on the marshes to see how much sediment accumulated over the clay over the last few years, and results for current rates of sediment accumulation from feldspar markers were similar to historic rates of sediment accumulation measured using radioisotopes. The South Bay still has the highest accumulation rates (up to 6 mm/year), whereas the North Bay sites are less (approximately 3 mm/year). Sediment availability and net transport of sediment to the South Bay could be influencing the sediment rates in that area.

To understand the sites better, data need to be collected across a range of elevations and vegetation types, including suspended sediment characteristics. These two factors are the

important in affecting sediment accretion but sediment biogeochemistry and other characteristics (landscape issues and sea level rise effects) are also important.

There could be restoration steps to assist the mudflats in expanding, such as berms. In general, there are data gaps on mudflat dynamics because mudflat sedimentation rates are extremely difficult to monitor. NOAA surveys are completed every 9 to 10 years and data from these surveys gives some general information on mudflat elevations over time, but more detailed data would be useful.

Questions and goals identified:

- What are we doing to protect marshes from sea level rise? Is there enough sediment in the system to accommodate and feed the marshes?
- How can we create wetlands?
- How can we keep sediment in the system?
- What are the impacts of carrying out these goals?

Concerns identified:

- Is there a cost effective way of carrying out the goals noted above?
- How do we know if marsh restoration will be successful, especially over the long term?
- What are the parameters of a beneficial reuse project?
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Discussion

It was brought up that the purpose of the LTMS program may need to change and that new issues have arisen, including the fact that sediment loads in the Bay are declining and that sea levels are rising. It was suggested that the purpose of the LTMS should shift to looking at how to protect marshes and mudflats from sea level rise as this would better link the program with recent goals and plans. Funding is a critical concern and the federal program needs to contribute more to the program. If the LTMS can be linked to the shoreline protection program at the USACE, then there might be more funding opportunities through the Water Resources Development Act (WRDA). If the program is shifted to protect marshes and mudflats, there may be a way around the funding constraints. It is a huge process to go through administrative reform of the LTMS, but it may save money in the long run. Federal Emergency Mapping Agency (FEMA) is currently remapping the Bay and it looks like more recognition will be given to the importance of marshes in flood and erosion control.

While all of these thoughts are important for long-term planning, stakeholders and members of the LTMS need to focus on how to meet the current program's goals. On the modeling side, the restoration community can play an important role, but it is unclear how others can become directly involved in the process. Regional Sediment Management (RSM) program efforts will

come up with a research strategy for how to move forward with addressing the sediment issues. A workshop in mid-September sponsored by Elkhorn Slough National Estuarine Research Reserve, and organized by Grey Hayes, will look at sediment issues and marsh sustainability. The Ocean Beach Master Plan, which is being led by San Francisco Planning and Urban Research Association (SPUR), is an example of an entity looking at issues and providing recommendations. For other issues, what entity could summarize existing dredging and restoration projects, prioritize and discuss issues, and make recommendations?

Summary of Ideas and Next Steps - Beth Huning, JV, and Brenda Goeden, BCDC

1. Dredging projects overview
2. Lack in coordination efforts for small projects
3. Administration operational issues
4. Permit process for large and small projects (can this process be changed?)
5. Large projects have been delayed, which needs to be fixed
6. Costs
7. Funding opportunities need to be examined
8. Interest in acidification issue related to project (dry/wet sediment)
9. Beneficial reuse definition should be further discussed
10. Concept of a recycling program for wetlands restoration

Next Steps

1. It was requested all LTMS emails show the full list of recipients
2. The JV will function as a clearinghouse for projects with sediment needs
3. A working group will be set up to further address next steps