



WETLANDS
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PROGRAM

Second Annual Report Montezuma Wetlands Restoration Project Technical Review Team



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Executive Summary

Since the Project started receiving sediment in December 2003, approximately 3 million cubic yards of sediment have been placed into Cells 1, 2, 3/4, 6/7, 10, and 8/9. These cells comprise about 350 acres of Phase I. Cells 1, 2, and 3/4 (approximately 185 acres) are completed and are expected to be restored to tidal action in fall 2007, pending agency approval of early breach plans currently under preparation and review by the TRT. Ongoing uncertainty in sediment delivery from the Corps and Port, including planned disposal of large volumes of the final Port 50 ft. dredging contract to the Ocean, compromises the Project's ability to complete Phase I. Water shortages in 2005 resulted in a concentration of salts and inorganic contaminants of concern (COCs) in surface water in the sediment cells during the Summer and Fall. However, these elevated concentrations declined after rains and sediment offloading began in Fall 2005, and no discharge of water from the site occurred. Well system upgrades completed in early 2006 are anticipated to ease the water shortage during the dry season of 2006, although concentrations of cell water inorganic COCs will still likely occur.

The Solano Mosquito Vector Control District made several visits to the Project site during 2004-2006 and found conditions to be unsuitable for mosquito larval development due to the open water, location of the wetland ponds in relation to the wind direction, and lack of vegetation that might provide harborage for developing mosquito larvae.

Several issues arose in 2004 and 2005 that required an immediate response and adaptive management. These issues included a slower than expected rate of sediment delivery from contracts, much greater than anticipated expansion of fine-grained sediment, water supply problems, the rising of soft underlying peats in one area of Cell 3/4, clogging of the make-up water pond discharge pipe preventing discharge of water from the site, and receipt of sediment classified as cover by the Dredged Material Management Office (DMMO) that contained some COC concentrations above cover criteria. Actions to these issues are discussed in detail in the section *Operations Monitoring and Design Modifications/ Adaptive Management Items and Actions*.

Over the past two years, the Technical Review Team (TRT) has assisted the Project Team with monitoring and design modifications and reviewed several reports on Project construction, biological surveys, sediment and water quality monitoring, and tidal datum reckoning. The TRT issued an *Analysis of Reference Tidal Channel Plan Form Report*, which provided information on channel plan form collected in tidal marsh areas adjacent to the Project site to guide the design and construction of the Project's tidal marsh channels. The TRT also participated in Montezuma team discussions regarding the restoration of completed portions of Phase I prior to completing an entire phase. This "early breach" idea is being developed by the Montezuma team and will be submitted to the agencies and TRT for review prior to implementation (planned for late 2007). The Contaminants Subteam provided recommendations on contaminant and reference site monitoring and pre- and post-breach sampling. The High Marsh Design Subteam discussed appropriate high marsh elevations for creation of habitat for the salt marsh harvest mouse (SMHM) and responded to the Project Team's proposal to reduce the sampling frequency for the SMHM in unfilled phases of the Project site. The TRT suggested that the Project Team pursue possible collaboration with the California Bay-Delta Authority (CBDA) fish mercury monitoring project on methods and target fish species, since this project will be monitoring mercury in biosentinel organisms (small fish and invertebrates) in marshes in the Napa and Petaluma watersheds.

Due to the uncertain schedule of the Project, the TRT has recommended changing the format of the annual report to not include subteam reports. Instead, the subteams will produce, as needed, separate interim recommendations on key issues that can be used by the Project Team in policy discussions with the agencies. While the Annual Report will continue to be reported every year, the report may be shorter in some years due to sediment delivery schedules and associated delays that impact monitoring and reporting schedules.

In addition to providing technical review of monitoring and design issues and reports, upcoming tasks for the TRT include recommendations for future reference sampling, evaluation of vegetation and salt marsh harvest mouse trap data, and review of the proposal for early tidal restoration to completed portions of Phase I.

TRT Milestones: Years 2 and 3

Summary of TRT Milestones in Years 2 and 3

During Years 2 and 3, the TRT reviewed four reports related to Project construction, biological surveys, sediment and water quality monitoring, and tidal datum reckoning. The Contaminants Subteam met twice and provided recommendations on contaminant and reference site monitoring and pre- and post-breach sampling. The High Marsh Design Subteam met twice to discuss the early breach proposal and appropriate high marsh elevations for creation of salt marsh harvest mouse (SMHM) habitat, and responded to the Project Team's proposal to reduce the sampling frequency for the SMHM in unfilled phases of the Project site. Highlights are listed in the table below.

May 2004: The **Analysis of Reference Tidal Channel Plan Form Report** is submitted to the Project Team.

December 9, 2004: **Contaminants Subteam meeting** is held at SFEI to discuss coordination efforts between the Project and the fish mercury monitoring program, and to review comments on the *Reference Site Monitoring Results Report* and results from on-site contaminant monitoring.

January 27, 2005: **Annual TRT meeting** is held in Bird's Landing to review TRT report review comments, early tidal breach options, and the adaptive management of operations monitoring and design modifications, and to discuss expected TRT assignments in Year 3.

May 12, 2005: **High Marsh Design Subteam meeting** is held at the Project site to consider returning tides to completed portions of Phase I prior to the entire phase being completed, and to consider most appropriate high marsh designs for SMHM (i.e., elevations and the managed "mouse farm").

July 5, 2005: **High Marsh Design Subteam conference call** is scheduled to review the new CDFG/DWR vegetation data from SMHM monitoring sites, clarify key questions in order to determine appropriate target elevation for the Project's high marsh (e.g., vegetation assemblage), and prioritize next steps (e.g., fill data gaps, assess on-site settlement data, visit Suisun high marsh sites).

October 20, 2005: **High Marsh Design Subteam** submitted a response to the Project Team's proposal for reducing the sampling frequency for the SMHM in unfilled phases of the Project site.

December 12, 2005: **Annual TRT meeting** is held in Bird's Landing to discuss TRT progress and the Project's adaptive management activities and monitoring efforts (chemistry, biology, and engineering), to review a proposal to restore tides to portions of Phase I, and to identify TRT tasks for the upcoming year.

March 14, 2006: **Contaminants Subteam meeting** is held at SFEI to review recent water and sediment quality data, and to discuss modifications to the monitoring plan and approach to reference site work.

December 2006: SFEI issues **Second Annual TRT Report**.

Summary of Years 2 and 3 Report Reviews and Recommendations

Update on Mosquito Control Efforts in the Project Area

Date: January 27, 2005

From: Carol Evkhanian, Solano Mosquito Vector Control District (SMVCD)

Subject: 2004 Update on Mosquito Control Efforts in the Project Area

Summary of Mosquito Control Efforts

Multiple inspections were performed during 2004. Areas within the Project site were difficult to access due to construction equipment. Ponds observed have been well constructed, and are large and subject to wind resulting in wave action. Also, there was no vegetation on the sides of the ponds.

There are no anticipated problems with the current condition, but SMVCD will monitor for excessive vegetative growth in undesirable areas.

Mosquitofish have been stocked in the small pond that is used to fill the water trucks.

Once the first levee is breached, monitoring after high tides will be critical, since the behavior of sediments is unknown at this point. Cracking could create habitat for *Ochlerotatus melanimon* or *Ochlerotatus dorsalis*.

Adult Mosquito and Disease Surveillance

Currently, the nearest fixed adult mosquito monitoring locations to the Project site are on the property adjacent to the Project on Collinsville Road, on Grizzly Island, at the west side of Rio Vista, and in central Rio Vista.

A sentinel chicken flock was placed at the Collinsville Road location in 2005. Supplemental adult trapping with CO₂ traps will be conducted when possible for additional adult surveillance and pooling for virus surveillance. From July through November, adult traps counts can definitely be influenced from duck clubs and CDFG waterfowl areas. Late winter and spring irrigations can also affect light trap counts.

Solano County Mosquito Abatement District

RONALD SCHOCK, President - Trustee-at-Large
CHARLES TONNESEN, Vice President - Fairfield
MIKE WHITE, Secretary - Benicia
JOE ANDERSON, Dixon
MELVIN FROHRIB, Vallejo
JANE GALLAGHER, Vacaville
HOWARD LUTE, Suisun
JOHN RANKINE, Rio Vista

2950 Industrial Ct.
Fairfield, CA 94533-6500
Telephone (707) 437-1116
Fax (707) 437-1187

Meetings: Second Monday Every Month
7:30 P.M.

JON A. BLEGEN, Manager
CAROL EVKHANIAN, Biologist
VICTOR BARACOSA, Supervisor
TAMI WRIGHT, Sec./Bkpr.

June 14, 2006

Cristina Grosso
Data Management/Asst. Environmental Scientist
San Francisco Estuary Institute
7770 Pardee Lane, 2nd Floor
Oakland, CA 94621

Dear Christina,

Personal observations of the site in January 2005 with Gary Dula (the technician for the area) found nothing to be concerned about at the time because of the open water, location of the wetland ponds in relation to the wind direction and lack of any vegetation that might provide harborage for developing mosquito larvae. As long as the water is open, high enough to be subject to wind generated waves and free of vegetation, there should not be problems. Gary will continue to monitor the ponds throughout the year as time permits.

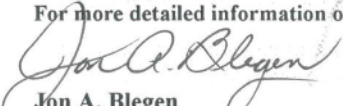
Gary made at least two more visits and found that the conditions continued to be unsuitable for larval development. No applications of any kind were needed.

Included is the data for adult mosquitoes from the New Jersey light traps closest to the Montezuma Wetlands. The three most common species found in the traps were *Culex tarsalis*, which is designated as species #37, *Ochlerotatus melanimon* (genus is now *Aedes*) #13, and *Culiseta inornata* #42. There are so many acres of wetlands on Grizzly Island as well as on private duck clubs, that counts in any one trap represent adults from a good size square mile radius. The first three species are all capable of flights in excess of 5-10 miles.

A fourth species, *Culex erythrorhax* #33 was also collected. This species has a very short flight range, usually remaining very close to their emergence site-within a matter of yards to less than 1 mile.

Culex tarsalis is the most important vector species. It is capable of transmitting West Nile, Western Equine and St. Louis Encephalitis viruses. *Ochlerotatus melanimon* is capable of transmitting West Nile and Western Equine Encephalitis viruses, but has only been found to be infected with West Nile virus rarely throughout the state. Although *Culiseta inornata* is capable of transmitting West Nile virus, no samples have tested positive from field-collected populations. The large size of this mosquito and massive numbers that can occur during the winter and fall months generate complaints from those living in areas close to the Suisun Marsh. *Culex erythrorhax* is also capable of vectoring West Nile virus.

For more detailed information on a number of mosquito species go to our website (www://solanomosquito.com/).


Jon A. Blegen
Manager


Carol Evkhanian
Biologist

**Adult Mosquito Summary Data for New Jersey Light Traps
Closest to the Montezuma Wetlands Project, 2005**

MONTH	TRAP LOCATION	<i>37: Culex tarsalis</i>	<i>33: Culex erythrothorax</i>	<i>13: Ochlerotatus melanimon</i>	<i>42: Culiseta inornata</i>	TOTAL
April	#21 Grizzly Island DFG Headquarters	14	3	0	102	124
	#22 Rio Vista - Residential Old Town	3	10			13
	#24 Collinsville	5			239	244
May	#21 Grizzly Island DFG Headquarters	91	0	64	114	269
	#22 Rio Vista - Residential Old Town	2	2	0	2	6
	#24 Collinsville	41	0	7	47	95
June	#21 Grizzly Island DFG Headquarters	158	0	59	7	224
	#22 Rio Vista - Residential Old Town	8	4	2	0	14
	#24 Collinsville	61	0	25	0	86
July	#21 Grizzly Island DFG Headquarters	22	0	90	0	112
	#22 Rio Vista - Residential Old Town	0	0	0	0	0
	#24 Collinsville	33	0	12	0	1
August	#21 Grizzly Island DFG Headquarters	49	0	93	0	142
	#22 Rio Vista - Residential Old Town	1	0	13	0	14
	#24 Collinsville	46	0	19	4	69
September	#21 Grizzly Island DFG Headquarters	97	0	67	9	173
	#22 Rio Vista - Residential Old Town	29	0	17	5	51
	#24 Collinsville	125	0	13	15	153
October	#21 Grizzly Island DFG Headquarters	58	0	17	63	138
	#22 Rio Vista - Residential Old Town	32	0	3	7	43
	#24 Collinsville	86	0	46	212	344
November	#21 Grizzly Island DFG Headquarters	67	0	19	154	240
	#22 Rio Vista - Residential Old Town	42	0	1	54	97
	#24 Collinsville	37	0	27	331	395

Summary of West Nile Virus Results, 2005

Human Cases

No cases occurred in the southern or central portions of the county-all six were in the Dixon/Vacaville area.

Horse Cases

No cases occurred in the Rio Vista-Collinsville area.

16 cases confirmed in:

American Canyon	1
Davis	3
Dixon	1
Fairfield area	4
Vacaville area	4
Winters	3

Chicken Seroconversions

Only 1 positive chicken occurred in the Collinsville Flock (1 out of 12)

Cordelia Flock	11 out of 12
Vacaville Flock	11 out of 12

Birds

All zip codes were closed by October 1, 2005 (i.e., the SMVCD discontinued collecting birds) due to the increased demands on staff for inspections for mosquitoes in waterfowl habitat as a result of Fall flooding for the duck hunting season.

44 birds tested positive:

Western Scrub Jay	14 (31.8%)
American Crow	13 (29.5%)
Yellow-billed Magpie	10 (22.7%)
American Robin	2 (4.8%)
House Sparrow	2 (4.8%)
House Finch	1 (2.2%)
Snowy Egret	1 (2.2%)
Western Bluebird	1 (2.2%)

Analysis of Reference Tidal Channel Plan Form Report, May 2004

Prepared by Sarah Pearce and Josh Collins

TRT Commentary

Introduction and Purpose

The Montezuma Wetlands Project will restore approximately 1,820 acres of tidal, seasonal, and managed wetlands in an eastern portion of Suisun Marsh where the Project site has been diked and used for agriculture for more than 100 years. The approximately 2,400 acre site is located on the eastern side of Montezuma Slough near the town of Collinsville, California in Solano County. As a result of perimeter levees that isolate the site from Bay-Delta tidal waters and the historical pumping of surface water off the site for agricultural purposes, the current surface elevations have subsided about 4-6 feet below sea level. Approximately 17 million cubic yards of sediment dredged from the San Francisco Bay-Delta will be used to raise surface elevations to conditions suitable for tidal marsh to be re-established at the site. Material dredged from the Bay-Delta (cover and noncover sediment suitable for restoration purposes) will be barged to the site, off-loaded, and placed in settling cells until target elevations are reached. The largest, primary tidal channels in each settling cell will be designed and constructed, with smaller channels allowed to develop naturally.

A need exists for accurate local data that quantifies tidal channel plan form measurements. A dataset specific to the North Bay, the larger Bay Area, or even a general dataset of this type has not been gathered or published. Successful wetland restoration will require data from surrounding wetlands to help inform and guide the design and construction of tidal marsh channels so that they mimic natural channels. Tidal channels with geometries similar to natural channels will function most like natural channels, allowing physical processes such as water and sediment transport, channel evolution and vegetation community development to occur. Accurately quantifying these metrics is one of many prerequisites for successful wetland restoration.

The purpose of this study is to collect information on channel plan form in tidal marsh areas adjacent to the Montezuma Wetlands Restoration Project site to help guide the design and construction of tidal marsh channels. Necessary metrics include channel plan form (channel width, and meander characteristics), drainage basin area, and confluence location and angle. The collected data will quantify the range of observed values for each metric analyzed, while also illustrating the natural variability of these tidal channel systems. The data will serve as a guideline to help design appropriate channels that have the functions of natural channels, including supporting the physical processes that occur in a dynamic tidal marsh system, and supplying diverse and adequate habitat for many species of plants and animals.

Methods

Analysis of current and historic channel plan form focused upon map and aerial photograph interpretation, utilizing a series of aerial photographs and maps from many different sources and dates. Because these sources were already in electronic format, the methodology used on-screen interpretation rather than working off of physical hard copies. These electronic sources were analyzed in ArcView GIS, because this program enabled the easiest and most accurate measurement of channel features.

Conclusions

Wetland areas adjacent to the Montezuma Wetlands Restoration Project site near Suisun Bay, Rush Ranch, and near the Napa River, represent analogue models for natural channel plan form patterns. Analyzing these neighboring systems and collecting data on plan form and tributary confluence metrics provides a local data set to help guide the design of new channels. Modeling new constructed channels on existing natural channels increases the likelihood of success; that is, encouraging the functioning and physical processes found in natural channels.

Relationships between channel width and order, the radius of curvature, and meander wavelength and amplitude are observed and quantified. Generally, average channel width increases with order. Most of the metrics are linearly related, with the datasets from the Napa and Rush Ranch areas typically plotting slightly lower than the dataset from the Suisun area. The data illustrate the range of natural channels in each of these measured metrics. Additionally, it appears that most tributary confluences occur on the outside of meander bends, with most occurring between 0 and 30° deviation from the generalized downstream direction of mainstem flow.

MWLLC Response

Based on the Analysis of Reference Tidal Channel Plan Form Report and experience of placing approximately 500,000 cy of sediment during December 2003 through April 2004, the Project Team proposed several changes to the Project design that will increase the stability of the long-term wetlands and improve sediment and water management operations at the site. A summary of the proposed design modifications is presented below. A detailed description of each modification is available in the Technical Memorandum Modifications to Tidal Channel Design (May 6, 2004). Table 3 provides a comparison of the analysis of the reference tidal channel plan form to the Project's proposed design.

Wetlands Design Modifications

- *Relocation of the single channel breach for Phase I northward to an outside bend of Montezuma Slough.*
- *Construction of larger settling cells by combining low marsh Cells 3 and 4, and Cells 6 and 7, high marsh Cells 8 and 9, Cells 10, 11 and 12, and the diked pickleweed marsh 5a and 5b.*
- *Construction of channel banks for selected 4th and 3rd order channels that occur within the combined larger settling cells will be modified using a set of levees called "channel bank levees." These levees are similar to the interior cell levees, except that they are built slightly lower.*
- *Shortening some of the smaller 3rd order constructed channels.*

Table 3. Montezuma Wetlands Project Comparison of Measurements Proposed Tidal Channel Modifications

Montezuma Wetlands Tidal Channel Planform Measurements											
Montezuma Site - Proposed 2004 Channel Layout with Proposed Modifications							SFEI Report - Historic Stable Channels (note 2)				
<i>channel number</i>	<i>channel order</i>	<i>mhhw width (m)</i>	<i>meander wavelength (m)</i>	<i>amplitude (m)</i>	<i>radius of curvature (m)</i>	<i>approx drainage area of 3rd order channel (acres)</i>	<i>width range (m)</i>	<i>range of meander wavelength (m)</i>	<i>range of amplitude (m)</i>	<i>range of radius of curvature (m)</i>	<i>drainage area of 3rd order channel (acres)</i>
I (main breach channel)	5	35	823	237	290	na	33-60	200-1100	90-600	50-350	na
I-A	4	27	457	201	247	na	5-40	100-800	50-550	22-250	na
I-A-1	3	10	274	110	177	85	5-25	30-600	40-400	16-200	10-100
I-A-2	3	9	402	146	67	58	5-25	30-600	40-500	16-200	10-100
I-B	4	19	275	109	137	na	5-40	90-500	40-400	20-200	na
I-B-1	3	6	110	55	37	36	5-25	30-200	18-150	10-90	10-100
I-B-2	3	16	366	183	160	26	5-25	90-600	30-450	18-175	10-100
I-B-2-a	3	9	--- (note 1)	---	---	na	5-25	30-600	na	na	na
I-B-2-b	3	10	457	128	135	na	5-25	30-600	50-550	16-200	na
I-C	4	19	402	219	223	na	5-40	90-500	40-500	20-200	na
I-C-1	3	9	219	225	183	42	5-25	30-600	30-300	16-200	10-100
I-C-2	3	11	311	147	91	50	5-25	70-500	35-450	16-200	10-100
Notes: Channels in bold include changes to existing approved design. Other channels are unmodified. Values within boxes fall outside SFEI historic ranges. na= not applicable (1) Linear channel without measurable planform sinuosity; therefore doesn't meet historic values. (2) SFEI Report - Analysis of Reference Tidal Channel Plan Form, MWP, May 2004											

2003 Combined Quarterly and End of Season Construction Report

Reviewed by Demetrious Koutsoftas

TRT Commentary

1. It appears that the embankment for the Make-Up Water Pond (MUWP) performed well, although no specific data regarding the performance of the reservoir are included in the report.
2. It appears portions of the levees constructed for Cells 1 and 2 had experienced larger settlements than anticipated by the designers and required remedial work. Hultgren-Tillis Engineers were engaged by Far West Restoration Engineering (FRE) to implement the necessary design modifications to control the settlement problems. Mr. Koutsoftas met with Mr. Edwin Hultgren at his Concord office to review the work. During that meeting, soils data, including vane shear strengths of the soft soils, and design modification concepts, were discussed.
3. It appears that two different methods were employed to correct the settlement problem. Where the settlement was less than 1.5 feet, additional fill was placed to make up for the settlement and restore the design grades. In areas where settlements in the range of 3 to 5 feet were experienced, some of the fill was excavated and replaced with material having lower density. In addition, very wide stability berms were constructed to restore the stability of the levee. These measures were reported to have been effective in controlling the settlements.
4. It appears that the heavy fills used to construct the levees are causing instability, which is expressed as large lateral deformations beyond the toe of the slopes of the levee and as settlements of the levee itself. An effective way to reduce the weight of the levees is to use lightweight foam concrete (with total unit weights in the range of 40 to 50 pounds per cubic foot) or expanded polystyrene blocks that can have densities as low as several pounds per cubic foot. Expanded polystyrene is being used effectively for the construction of highway embankments by a number of state highway departments across the country. If these materials are environmentally acceptable, they would be good candidates for constructing the levees, and eliminating the problems with instability and settlements. Perhaps this option could be explored for future levee construction.
5. The report did not include any settlement or other monitoring data that were assumed to be obtained as part of the Project's MMRP plan. Are there any data available, and if so, will they be made available for review? Also, it would be of interest to describe the specifics of the geotechnical monitoring plan that may be currently in place, and have the consultants involved in the project comment on the adequacy of the program.

MWLLC Response

We provided a response letter, from Hultgren-Tillis (Montezuma's geotechnical engineers) to Mr. Koutsoftas dated November 19, 2004 (see below).

2003 Report on Biological Surveys for the Montezuma Wetlands Project

Reviewed by Joe Didonato and Letitia Grenier

TRT Commentary

Overall, the surveys have been adequately performed and are in compliance with the MMRP. Each of them was sufficient to capture the target animal occurrences in the project area.

Burrowing Owls:

It was difficult to determine when surveys were performed during the 24-hour period. While the ARA report refers one to the DFG protocol, the report should include a brief description for the reader on the daily timing of the surveys. Also, the DFG site listed in Appendix A, Page 4, should be http://www.dfg.ca.gov/hcpb/species/stds_gdl/bird_sg/boconsortium.pdf.

MWLLC Response

Surveys are conducted either in early morning or late afternoon/early evening, at times when the winds are not too strong. We will advise ARA regarding the DFG web site address.

TRT Commentary

Although the project has complied with the MMRP tasks for burrowing owls, the overall program for relocating the breeding population to artificial burrows doesn't seem to be working. The owl population is excluded from the impacted areas, but the artificial burrows do not support any resident owls. Burrowing owls are stated in the report to readily inhabit artificial burrows. Therefore, if the project scientists choose to pursue this matter, they should consult with biologists who have successfully established breeding pairs in artificial burrows in the past, as they may have some useful insight. Lynne Trulio at San Jose State University or the authors of the owl publication (Garvais and Rosenberg 2003) cited in the report (Appendix A) are potential experts to consult. Overall, further analysis of why owls are not colonizing the artificial burrows would be of interest.

MWLLC Response

As discussed at the January, 2005 TRT meeting and presented in the Report on Biological Surveys, 2004 (LEG 2005), ARA has consulted with other owl biologists and identified several possible reasons for the lack of owl colonization of the mitigation burrows. These reasons include:

- Absence of ground squirrels in the mitigation burrow area*
- Abundance of mesopredators at the site, especially striped skunks*
- Limited extent of foraging habitat that is dependent on grazing pressure*
- Trampling of burrow entrances by sheep and cattle*
- Small local owl population*
- Possible high local mortality related to offsite activities, such as the nearby windfarm*

To address the factors that the project can control, ARA has undertaken the following actions in 2005:

- Construction of additional mitigation burrows to the east of the existing burrows, near a ground squirrel colony.*
- Modification of burrows to exclude skunks, reduce trampling by grazing animals, and raise the elevation of the burrow floors to reduce moisture in the burrows.*
- Coordination with ranchers to develop a grazing plan that increases bare ground and short grass near the burrow systems.*

MWLLC Response (cont'd)

Annual surveys of the mitigation habitat will continue. The above actions and their results will be described in more detail in the report on 2005 surveys.

TRT Commentary

Listed Branchiopods and Associated Taxa:

Based on the report, it seems that the ponds/pools filled once and retained water consistently until they dried, or were still holding water past the last survey period. Is there any possibility that the pools dried in between rain events and that there was not a continuous viable pool through the season, leading to a reduction in the numbers of species and individuals observed?

MWLLC Response

The pools do not dry out in between rain events, so there is a continuous viable pool through the season.

TRT Commentary

Vernal Pools:

Adding swales to the map of natural and created pools would make it easier to review the placement and hydrological design of the created pools relative to the hydrological system of the natural pools. It seems important not to disturb the natural pools while creating the new pools, and being able to visualize the swales would assist with review of the report.

MWLLC Response

The locations of natural and created vernal pools were plotted on a 1:200 topographic map and presented in the MMRP (Appendix A, Attachment B, Figure 1). Swales and drainage patterns are apparent on that figure, and the topographic map was used during the created pool design and construction to avoid hydrologic impacts to natural pools. However, the locations and sizes of some created pools were adjusted during construction to minimize excavation and to fit the pools more closely to the existing topography. So, although the swales and the relationships between created and natural pool drainage areas have not changed, some created pool locations have changed. To facilitate review of the pool locations in relation to swales, the as-built pool locations will be re-plotted on the topographic map and presented to the TRT.

TRT Commentary

On Page 6 of the report, "Vegetation", Line 3, is the number "493%" vernal pool-affiliated species correct?

MWLLC Response

"49%" and not "493%" were vernal pool-affiliated species.

Recommendations on Contaminant and Reference Site Monitoring for the Montezuma Wetlands Project

Prepared by the Contaminants Subteam
(Jay Davis, Ben Greenfield, Letitia Grenier, Don Yee)

TRT Commentary

Conduct pretreatment monitoring for biota at the Project site for pesticides, PCBs, and Hg as soon as possible to establish a reference condition pretreatment and pre-breaching, since the site could already be contaminated. Montezuma Slough was recommended as a good choice for contaminant reference for pre-breaching. Salt marsh harvest mice would also be important for pre-treatment monitoring of Hg. Since these mice are already being trapped, collection and analysis of hair samples would be feasible. For Hg monitoring, only total Hg needs to be measured in hair.

[See section on *Recommendations for Pre- and Post-breach Sampling* for further discussion of this recommendation.]

MWLLC Response

Since the site is not already contaminated as suggested by the comment, we do not believe that pretreatment monitoring of PCBs, pesticides, and Hg in biota at the site is necessary. Soil samples collected at the site in the 1990s for Montezuma's environmental documentation showed that metals concentrations were extremely low relative to background sediment concentrations in Suisun Marsh and other marshes in the Bay-Delta. Mercury in Montezuma soils averaged 0.06 mg/kg (about an order of magnitude less than Bay sediments and Suisun Marsh background) and no sources of organic contaminants at the site are known (the site was used for grazing animals, not raising high-value agricultural crops that would have used recalcitrant pesticides in the past). The relatively low concentrations of metals in the site's existing soil are expected given that the soils are predominantly oxidized and leached peats resulting from the diking of the historical tidal marsh more than 150 years ago. While the measurement of Hg in the hair of SMHM on-site might be of interest from a research perspective, we are not sure of its relevance to this project because those mice live in wetlands (in Phases II-IV) developed on oxidized and heavily leached soil that contain very low levels of Hg and other contaminants.

We agree that Montezuma Slough is an excellent reference site that should be characterized prior to breaching Phase I. We sampled Slough sediment in 2002 adjacent to Phase I and analyzed all COCs (including inorganics, PCBs, pesticides, PAHs, dioxins/furans, and radiation). We are planning to sample the Slough again in January 2006 with a focus on sediment near the re-located Phase I breach and collecting animal (invertebrates and fish) tissues for an assessment of COCs in the biota (including Hg, PCBs, and pesticides as suggested).

TRT Commentary

Incorporate food web monitoring in the cells and possibly in the channel next to the site.

MWLLC Response

Although the project MMRP and permits do not require food web monitoring or assessment of contaminants in on-site biota prior to tidal breaching, we are considering pre-breach on-site food web interactions in order to plan for possible tissue collection on-site in 2006; tidal breaching of Phase I is not expected to occur before 2007. On-site tissue collection and assessment will depend, in large part, on the availability of relevant biota in numbers sufficient to sample. While suggestions have been made to assess COCs in mosquito fish, bird eggs, SMHM, etc.

MWLLC Response (cont'd)

prior to tidal breaching we are unsure of their relevance to answering the main question reference site and tissue analysis is supposed to address: are contaminant levels in biota in the wetlands created by Montezuma significantly higher (or lower) than the overall range of conditions found throughout Suisun Marsh? We will continue conversations with the TRT to better define what questions they feel pre-breach monitoring would answer.

TRT Commentary

Analyze only total Hg in fish.

MWLLC Response

We have implemented this suggestion, since almost all of the Hg in fish is methyl-Hg. Since that is not the case in invertebrates, we are analyzing for total Hg and methyl-Hg in invertebrates.

TRT Commentary

Should we analyze for MeHg in sediment due to the spatial and temporal variability in MeHg concentrations (i.e., concentrations at the reference sites may be higher than at the Project site)?

MWLLC Response

We have considered adding sediment methyl Hg analyses to our monitoring efforts but at every instance of discussing this possibility with RWQCB, TRT members, or scientists working in the Bay-Delta, we have received a similar answer: no one is sure how it would be interpreted or if it is even meaningful beyond a research perspective given the very high variability of MeHg concentrations in sediments and the myriad of factors effecting its levels and uptake into the food web (e.g., salinity, pH, redox conditions, organic carbon, sulfides, biota present, food web interactions, etc.).

TRT Commentary

Archive fish samples instead of releasing them.

MWLLC Response

We will archive fish samples to the extent possible.

TRT Commentary

Reduce deep sampling and focus on sampling the first few centimeters of surface sediment. The benefit of taking 3-4 ft. sediment samples is not clear, since this does not sample the active layer. There is concern that conditions at any depth below the most active root zone are unlikely to change (that is why cores are good for reconstructing past conditions), and so one good sample of historical conditions should suffice for all future comparisons.

MWLLC Response

Assessing the “active layer” of the sediment (the first few cm of the surface) is not part of the monitoring program nor one of the questions the agencies were interested in assessing at Montezuma. The vast majority of agency and public concerns about sediment placed at Montezuma were with the noncover sediment that would be covered by at least 3 feet of “cleaner” cover sediment; not with cover sediment that would comprise the surface of the newly created marsh. Consequently, sampling of sediment in natural marshes at the 3 to 4’ has specific relevance to Montezuma and its design and is required by the project permits and MMRP. We do not agree that “one good sample” at the 3 to 4 foot depth would represent the historical conditions of Suisun Marsh; we have observed varying degrees of heterogeneity in almost a dozen subsurface sediment samples that we have collected to date from

MWLLC Response (cont'd)

reference sites. However, we do agree that future reference sampling should focus more on surface sediment than subsurface. We could see that sampling of the active layer might play a role in future assessments should certain COCs accumulate into the biota in unexpected ways or at elevated concentrations.

TRT Commentary

What is the geographic scope to which the historical perspective applies? What is the sample frame to which the project needs to be compared? See comments on reference sites below.

MWLLC Response

As we understand your question, Montezuma's reference site work focuses on Suisun tidal marshes and will be conducted over a period of many years (at least 10 years after restoration is completed in each Phase, per the MMRP) or until the agencies (and the TRT) are comfortable that enough data has been collected to answer the important questions and concerns. Certainly, other tidal marshes in brackish parts of the Bay-Delta could also inform the overall effort to characterize appropriate "reference" conditions that could apply to Montezuma.

TRT Commentary

Incorporate replication into the monitoring design in order to be able to compare strata within and between reference sites. Replication both within a site and within a stratum (high/low marsh and big/small channel) was suggested. The four main strata should be vegetated plain of low marsh, of high marsh, beds of large channels (ones with beds below MLW), and beds of small channels (ones with beds above MLW). These are the main strata (habitat types) that the Project will create. Low marsh may be more important than high marsh (since low marsh will for years be more common at the Project).

MWLLC Response

We look forward to working with the TRT to help inform and guide our approach to reference site work. We try to incorporate replication to the extent feasible, but are constrained by the vast extent of Suisun Marsh and the smaller than expected cash flow into Montezuma due to much slower rates of sediment delivery than expected from Corps sediment delivery contracts. Also, sampling different areas of Suisun Marsh (or in different areas of one discreet marsh or stratum) may provide a better picture of actual "background" conditions than replicating sampling at the exact same station. Also, it depends on which parameter or medium you are interested in characterizing: sediment, water, plant, tissue, etc. Since the TRT has made it clear that animal tissue concentrations of COCs are the most important monitoring aspect for addressing contaminant questions, replication may be less of a concern (and less feasible). As suggested, we have examined the main marsh strata that Montezuma will create: low marsh, high marsh, and large channels (with beds below MLW). In the future we will consider assessing smaller channels as suggested, but would expect they would be more difficult to access and sample.

TRT Commentary

Don't restrict reference sites to only those that contain all strata. Since there may be different reference sites depending upon the stratum, this further supports replicating within a stratum (high/low marsh and big/small channel).

MWLLC Response

We agree and have sampled in areas that do not contain all of the main strata, e.g., Montezuma Slough.

TRT Commentary

Randomly sample different reference sites in order to more broadly capture the ambient condition in Suisun.

MWLLC Response

Instead of randomly sampling reference sites, we have selected sites over the years based on our best judgment of a site's geomorphic and habitat features that represent "strata" that will be comparable to the project's created wetlands and that can best meet objectives at the time. As discussed above, more reference site sampling is planned in 2006 and in the future; therefore, the potential for random sampling reference sites will continue to be explored with the TRT.

TRT Commentary

Should the actual geographic scope of the reference envelope be confined to randomly selected surface (upper 5 cm) plots in low marsh and channels (large and small) along Montezuma near the intended breach locations? Where are appropriate sample locations? While low marsh along the Montezuma Slough and otherwise near the Project may be the best reference for what the project will be for many of its early years, high marsh and places far off like Rush Ranch may not be good reference sites for the Project.

MWLLC Response

See our previous response regarding sampling only the "active layer." We believe that Rush Ranch is a good reference site; it is one of the few natural tidal marshes in Suisun and it contains many of the strata that the other TRT comment suggests we should assess. As noted above, we sampled in Montezuma Slough in 2001 and are planning another sampling round in the Slough in January 2006.

TRT Commentary

Take into account the age and length of fish when sampling. It was suggested to define a target size range.

MWLLC Response

Our tissue sampling efforts are somewhat opportunistic since it is not easy to catch exactly what you want. Please let us know your ideal target size ranges, and we will try to achieve them in future sampling efforts.

TRT Commentary

Consider that on-site non-cover may be a better comparison for tissue than comparing to an outside reference site.

MWLLC Response

We do not understand this comment. Noncover sediment is brought from off-site, placed at the bottom of constructed sediment cells, and then buried under at least three feet of cover sediment. Therefore, noncover sediment will be isolated from the most active biological zone and will generate insignificant amounts of tissue (except possibly some plant roots).

TRT Commentary

Recommended target fish species list:

- Striped bass
- Longjaw mudsucker - Kathy Hieb (CDFG) questioned the presence of longjaw mudsuckers in an area with such low salinity and asked how the taxonomy of samples is being verified. There is also a concern of how much fishing pressure this population could support.
- Shimofuri goby - The home range size of this goby is not well known, but it is likely to be more abundant than the longjaw mudsucker in the long run. Also, there is less concern about depressing the population, because this species is non-native.

Recommended contaminants of concern:

- It is not necessary to analyze PAHs in fish, but should continue to do so in clams.
- Concentrate on analyzing for dioxins in only Sacramento suckers. It was suggested to use Frontier Analytical Labs for the dioxins analysis.
- First look for PCBs and Pesticides in Sacramento suckers.

MWLLC Response

We appreciate your suggestions and will incorporate them into our monitoring efforts to the extent possible.

TRT Commentary

- Page 12, Table 5: Selenium detection limits varied greatly (0.46-1.75 mg/kg).
- Page 21, Table 14: The reported lipid concentrations are high.
- Page 22, Table 16: All of the pesticides and PCBs are reported as non-detects. Does this meet the Project's needs?
- Fish length measurements were not included in the report.

MWLLC Response

We have found a better lab to do our selenium analysis. We will look into the apparent high lipid contents. Non-detects are fine as long as detection limits are documented and recognized as important when comparisons are made between different sampling and analytical periods. We will include fish lengths in future reports.

Recommendations for Pre- and Post-breach Sampling

Prepared by Ben Greenfield

TRT Commentary

In the first sampling year, reference station biota monitoring consisted of fish and aquatic invertebrate sampling and analysis at the rush ranch reference site (MEC Analytical Systems Inc., 2004). A total of six species were sampled for contaminants, with a single composite analyzed for each species. I was happy to see that analyses included methylmercury, and that effort was geared towards sampling for a variety of aquatic biota. Nevertheless, I am concerned that the current sampling design will not be adequate to statistically evaluate whether the Montezuma wetlands project will have any impact on contaminant bioavailability at the treatment site.

I have two major concerns, which will be addressed separately below:

1. The need for a clear and consistent treatment versus reference station monitoring design; and
2. The need for pretreatment sampling adjacent to the treatment stations.

1. The need for a clear and consistent treatment versus reference station monitoring design

At this time, I have not seen any documentation or heard any discussion suggesting that a clear plan has been outlined for monitoring contamination in treatment and reference stations. There was some great discussion during the meeting regarding monitoring objectives and how that would affect the sampling design, but a specific design has yet to be established. It seems to me that the main goal of the Montezuma contaminant monitoring should be to evaluate whether the Montezuma restoration program causes significant changes in contaminant bioavailability, as compared to reference conditions. Josh and I discussed two potential approaches for addressing this concern. I will refer to these approaches as the Before-After-Control-Impact (BACI) design and the spatially variable design.

In the Before-After-Control-Impact (BACI) design, the treatment station and at least one reference station would be monitored consistently before and after breaching of the Montezuma levee. The BACI design is readily analyzed using a t-test comparing the difference between the treatment and reference station before versus after the treatment effect. This is a relatively straightforward method that has been well addressed in ecological literature (e.g., Stewart-Oaten et al., 1986; Stewart-Oaten et al., 1992; Smith, 1993). For the BACI design to work, each station would need to be monitored at the same time sequence (e.g., every season or every year), and analyzed for the same parameters. Additionally, the same stations would need to be monitored each time, with continuous sampling of at least one fixed treatment and reference station. ***For the Montezuma project, the BACI design would specifically answer the following question: does the development and breaching of the Montezuma wetland cause any increases or decreases in biota contaminant concentrations, when compared to reference conditions?***

The BACI design does not specifically evaluate how Montezuma Slough varies in its baseline ecology compared to the range of different ecological conditions present in northern San Francisco Estuary. Rather, the design uses the reference station and pretreatment data at the treatment station to simply assess whether breaching causes significant changes in contaminant availability. If the BACI design were implemented, my recommendation would be that Rush

Ranch continue to be used as the reference station, and that sampling begin immediately (January 2005) on Montezuma Slough and on Rush Ranch. The BACI design does not preclude the use of multiple reference stations. If it was desired, additional reference stations could also be sampled, provided that they were sampled consistently along with the treatment and main reference station.

In the **spatially variable design**, the treatment station would be monitored, in addition to multiple reference stations, with the reference stations changing with each sampling period. The objective of this design would be to establish an overall assessment of wetland conditions in North San Francisco Estuary, which could then be compared to the conditions at Montezuma Slough. The Regional Monitoring Program For Trace Substances in San Francisco Estuary has recently established a spatially variable design, in which a specified number of monitoring stations is randomly selected in each segment of San Francisco Estuary, in order to establish an overall assessment of conditions in that segment for a given year (SFEI, 2004). However, the size of the Regional Monitoring Program spatial sampling effort is considerably greater than current expenditures of the Montezuma project.

The simplest form of a spatially variable design would be assessment of the created Montezuma wetland, in addition to reference stations that vary from year-to-year. For example, sampling Rush Ranch in 2004, Hill Slough and 2005, Suisun Slough and 2006, and so forth. Conditions in Montezuma wetland could then be graphically or statistically compared to the range of conditions found in other wetlands and sloughs throughout North San Francisco Estuary. ***For the Montezuma project, this type of design would specifically evaluate the following question: is the new wetland created by the Montezuma project significantly higher or lower than the overall range of conditions found throughout the North San Francisco Estuary region?***

It should be noted that in a spatially variable design without continuous repeated sampling at reference stations, it would not be possible to distinguish between spatial and temporal variation among reference stations. These sources of variability would be combined, leading to a greater amount of overall variation in the reference data set, and making it less likely that the treatment station (i.e. Montezuma wetlands) would fall outside of reference conditions. Additionally, a comparison between one marsh and the rest of Suisun would create problems of scale. Alternatively, Montezuma could be compared to a different reference station each year, which might be more statistically viable. However, such an analysis would require a larger sample size than currently put forth (including at least three samples from each animal species from each location and date) and results from such an analysis might not be very easy to interpret.

For there to be a clear assessment of whether changes over time in Montezuma wetland are different from reference conditions, it would be necessary to monitor at least one reference station over the same time sequence as the treatment station. Consultation with a statistician may be warranted. In any case, the lead scientist of the Montezuma project needs to choose and document a sampling design that will best meet project needs.

2. The need for pretreatment sampling adjacent to the treatment stations

Previously, the Technical Review Team recommended that, in addition to pretreatment sampling for sediments along Montezuma Slough, it is extremely important to also sample for biota contaminant concentrations, prior to levee breaching. In particular, fish should be sampled along

the Slough, adjacent to the planned levee breach areas. I'd like to lobby for this again, because without taking this measure, it will not be possible to evaluate whether establishment of the Montezuma wetland changes the bioavailability of contaminants to nearby biota. This winter, I hope to see the fish collection along Montezuma Slough and analysis for the same contaminants as the reference station (MEC Analytical Systems Inc., 2004).

Pretreatment monitoring becomes a particularly important concern because of the substantial interest in assessing whether wetland restoration and other management activities influences contaminant cycling in the Bay Delta ecosystem (Suchanek et al., 1999; Davis et al., 2003). Without pretreatment monitoring, it will not be possible to determine if contaminant concentrations along adjacent Montezuma Slough are elevated in biota as a result of the Montezuma wetlands project actions, or pre-existing conditions. It is certainly in the best interest of the project managers to be able to make this distinction.

Looking over some of the CalFed reporting, I learned that in fact CalFed has already conducted some pretreatment mercury monitoring along Montezuma Slough. Methylmercury concentrations in sediments have already been observed to be elevated in the channel adjacent to Montezuma Slough, compared to other sediment locations throughout San Francisco Estuary (Heim et al., 2003). In 1999, mercury concentrations were also monitored along Montezuma Slough in inland silversides, threadfin shad, *Crangon* shrimp, and *Corbicula* (Asiatic clams), suggesting that these may be appropriate monitoring species (Slotton et al., 2002). Note that the lead author on this work, Darrel Slotton, should be contacted regarding sampling logistics along Montezuma Slough. Additional monitoring needs to be conducted, in order to determine concentrations of other contaminants, and update prior findings.

In addition to fish monitoring, salt marsh harvest mice may be appropriate for monitoring mercury at the Montezuma wetland. These mice are already being captured at the site, making it straightforward and cost-effective to analyze hair samples for total Hg (most mercury in hair is methylmercury). This approach would provide before and after contaminant concentrations in a special-status species for which few, if any, data are currently available. Clark (1992) suggested that salt marsh harvest mice were not present in areas where mercury or PCBs were high in other species of mice.

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MWLLC Response

*We appreciate the effort Ben Greenfield made in providing his thoughtful and detailed comments on Montezuma's reference site work. Our replies to earlier comments provide answers to some of his points. Our overarching reply is that our reference site approach is designed to answer the 2nd main question he poses under his section that discusses spatially variable design: **"is the new wetland created by the Montezuma project significantly higher or lower [in terms of COC concentrations] than the overall range of conditions found throughout the North San Francisco Estuary region?"** Specifically, our reference site work on Montezuma is trying to address the question of whether the new wetlands created at Montezuma will produce and support biota that contains contaminant concentrations within the range of Suisun Marsh biota. Consequently, consistent with his suggestion, we have been sampling in Rush Ranch (2002 and 2004), Hill Slough (2002), and Montezuma Slough (2001 and planned for January 2006), and plan to continue sampling in those same ones and others in future years on an approximately annual basis to establish a more complete database of "background" chemical characteristics (for sediment and, especially, animal tissue).*

We recognize that the spatially variable approach increases the uncertainty of the data, for example by combining temporal and spatial variability in reference sites. However, focusing on a comparison of pre-and post-breach conditions, as described above under the "BACI" approach, would not address the objectives of the monitoring program. Gaining statistical rigor by sampling the same reference site every year (sampling of multiple sites each year is not economically feasible at this point) would limit the project's ability to characterize the range of conditions present throughout Suisun Marsh tidal wetlands. Please also note that characterization of the range of background dioxin and radiation levels in Suisun Marsh sediment, although it may be of limited interest to the TRT, is required by the project's permits since no regulatory criteria exist for these analytes, and is one of the drivers of the reference site monitoring program. Reference site monitoring is planned to continue for many years (at least 10 years following completion of each Phase, per the MMRP) so please bear in mind that the uncertainties associated with the spatially variable approach should be reduced as the data set grows over time.

Report on Sediment and Water Quality Monitoring - Quarters 1 and 2, 2004

Reviewed by the Contaminants Subteam

(Jay Davis, Ben Greenfield, Letitia Grenier, Don Yee)

TRT Commentary

These comments reiterate verbal comments made at the annual TRT meeting Jan 27, 2005.

The monitoring of incoming sediments and project cells for sediment and water in large part appear to meet the project's monitoring needs. In addition, the concentrations of chemicals of concern (COCs) mostly met the project's operational limits and the cover or noncover criteria for the project, as appropriate. Concentrations of many COCs in noncover cells in fact often meet cover criteria, which provides further assurance that possible negative project impacts are minimized.

The resampling and reanalysis plan as outlined in the QAPP for samples exceeding criteria provides some reassurance that exceedances found are analytically reliable and representative of project conditions. When cells are resampled and reanalyzed, with concentrations averaging lower than in the initial sampling, it may be reasonable to expect that concentrations found would be different, yet equally representative of site conditions.

However, when exceedances are found that are not replicated in reanalyses of splits of a composite sample by either the original or a second laboratory, or in reanalyses of individual homogenized samples making up a composite, concerns are raised about the variability or reliability of any individual measurement. For example, a selenium measurement of 2.38 mg/kg in Cell 2 for Q1 (page 16) was reanalyzed and found at 1.95 mg/kg. However, concentrations in the 4 samples making the composite were all non-detect or below 0.7 mg/kg. There can be a number of causes, from contamination introduced in compositing, to matrix interferences on the initial analysis and reanalysis of the composite, to incomplete recovery on the individual sample analyses. All the possible explanations indicate areas where the sampling or analytical methodology may need some refinement, so the project team should work with the contract lab on assuring that results are more consistent in the future.

A second example was a zinc detection at 251 µg/L (page 25) confirmed by a second laboratory, but that was not repeated by the initial laboratory (found at ND, <20 µg/L) on reanalysis. Again multiple explanations are possible, but the variability found on reanalysis by the initial contract laboratory raises the question as to whether underestimates are equally probable. If the order of results had been changed, i.e. the ND <20 µg/L result found first, the sample would not have been reanalyzed, and neither the contract lab finding 251 µg/L nor the second laboratory confirming approximately the same high concentration would have occurred. Again, this is an issue that the project team should review with the contract laboratory, to ensure that there is sufficient confidence in the sample handling and quantitativeness of the analytical results.

MWLLC Response

A detailed audit of field and laboratory procedures was conducted in early 2005. A number of changes were made in field procedures, such as improvements in sampling equipment and sample handling methods. More recently, staffing changes have been made at the site to improve the quality of the sampling program.

For the period of 3rd quarter 2004 through 4th quarter 2005, the results have been fairly consistent and unusually high detections have generally been explainable either by site conditions (e.g. evaporation and concentration of water in sediment cells) or by laboratory error. On several occasions, reanalysis of samples replicated the original results fairly closely, in which case both the original and confirmatory results were considered representative. On two occasions, laboratory contamination was found to be responsible for some unusually high detections of inorganics. Late in 2005, high salinity in water samples was found to be biasing inorganics results. Since that time the laboratory has been closely monitoring QC of water samples and diluting as needed to overcome salinity interferences.

On a few occasions, apparently anomalous results were reported by the lab and despite thorough investigation of sampling and analytical procedures, no explanation could be found. Three of these events involved high total concentrations and non-detectable or low concentrations of nickel, selenium and/or zinc in the same water samples. One event involved a high detection of PCBs in makeup water pond sediment, although previous and subsequent samples were non-detect.

We are continuing to work with sampling staff and the laboratory to identify and minimize factors that could affect the accuracy of the results. We would be happy to discuss QC issues in more detail, and as always, specific recommendations and guidance from the TRT are welcome.

Tidal Datum Reckoning Report, December 2004

Reviewed by James Hubbard, NOAA/NOS, Silver Spring, MD

TRT Commentary

Vertical Control

Geodetic vertical control was established at water level stations through leveling ties to published geodetic bench marks. At both stations, Montezuma Slough and Barge, the Calibration Measuring Point on each gauge was referenced to NAVD 88. The NGVD 29 elevation conversion to NAVD 88, 2.73 ft is consistent for the region.

Water Level Gauges

As described in the project report, the water level gauges used were vented pressure transducers, with a 12 minute sampling rate. This should be adequate for generating a time series from which high and low tides can be processed. In addition, water level readings were referenced to NAVD 88, by applying an offset, which was calculated between the gauge/sensor readings and actual water levels. It was reported that this procedure was repeated during the course of the project to ensure that the gauge maintained its original zero throughout the survey. It's presumed that the constants were applied correctly to reference sensor readings to NAVD 88.

Port Chicago Station

The NOS Port Chicago tide station 9415144 was used as tidal datum control for the tide by tide simultaneous comparison method of datum reckoning. In order to compare data directly with the subordinate short-term stations, the Port Chicago high and low tabulated data was converted from MLLW to NAVD 88 by applying a constant. The constant, 1.102 ft was calculated from published NGS geodetic elevations and tidal datums published for Port Chicago based on the most recent National Tidal Datum Epoch (NTDE) 1983-2001. The NAVD 88 elevations were obtained by adding the 1.102 ft constant to Port Chicago tide heights referenced to MLLW. The constant value was independently verified by NOS.

Tidal Datum Reckoning

The NOS simultaneous comparison method was used to reckon/compute tidal datums at both subordinate stations, Montezuma Slough and Barge. In this procedure, the accepted NTDE tidal datums of MHHW, MHW, MLW, and MLLW for Port Chicago were correctly converted to NAVD 88 and then applied to the tide by tide differences calculated between the high and low waters at the control and subordinate stations (see Appendices C&D) However, there were a few instances found in spot checking the simultaneous comparison differences, where presumably the HH and H tides were not matched up correctly, resulting in 0.2-0.3 ft discrepancies. Example: page 2-11 Appendix C: Barge approximately 2/23/2004 16:24 - 3/04/2004 1:48. If these differences were used in the final average it could have biased the results.

Tidal Datum Reckoning Results

The final tidal datum results are found in Table 5. Tidal datums are referenced to NAVD 88 for the NOS station at Port Chicago and two subordinate stations, Barge and Montezuma Slough.

Port Chicago

The NOS Port Chicago tide gauge, is located in Suisun Bay, Sacramento River, west of the Project site. Tidal datums are listed as referenced to NAVD 88. This was accomplished by applying a 1.10 ft constant to all the published 1983-2001 NTDE datums.

The mean tide level MTL/NAVD 88 is 3.68 ft which is by definition, the mid- point between the mean high water (MHW) 5.51 ft and mean low water (MLW) 1.84 ft. The mean range (MHW-MLW) is 3.67 ft.

Barge

The Barge water level gauge, located in the Sacramento River at the entrance to Montezuma Slough, lists computed tidal datums referenced to NAVD 88. The mean tide level MTL/NAVD 88 is given as 4.25 ft., which is considerably higher than would be expected for this region. The MTL/NAVD 88 at Port Chicago is 3.68 ft. and other stations nearby in the Sacramento River, including NOS historic station 9415176 Collinsville, Sacramento River, show the MTL/NGVD 88 elevation to be approximately 3.7 ft. One contributing factor to the large difference is that MTL at the Barge was not calculated correctly. With a mean range of 2.91 ft. the MTL should be at the mid-point between MHW and MLW, 4.05 ft. not 4.25 ft. In addition, mean high water (MHW) is shown to be at elevation 5.51ft./NAVD 88, the same as Port Chicago. This would be expected only if the mean ranges were the same. Based on data from the NOS historic Collinsville station, MHW at the Barge gauge site should be at least 0.4 ft lower or at about 5.1 ft./NAVD 88. Besides the obvious error noted in calculating MTL, other errors which may have contributed to the unexpected high datum elevations at the Barge station are not so easily detected. They may be related to the initial gauge configuration or in the application of the NAVD 88 gauge offset, since all datums shown in the table 5 Reckoning Results are consistently higher than expected.

Slough

The Slough water level gauge, located just south of the former NOS gauge site 9415307 Meins Landing, Montezuma Slough, lists computed tidal datums referenced to NAVD 88. As was the case with the Barge station, mean tide level (MTL) at the Slough station was incorrectly calculated as 4.11 ft./NAVD 88 instead of 3.87 ft. The calculated mean range of tide 3.60 ft, the difference between MHW and MLW is generally consistent with nearby NOS data, although the MLW value 2.07ft/NAVD 88 and MLLW 1.42 ft./NAVD 88 seem about 0.3-0.4 ft higher than would be expected. This may be due to the effect on low waters from the Marsh Salinity Control Gates that were reportedly in operation during the tide study. However, the listed mean high water (MHW) 5.67 ft/NAVD 88 and mean higher water (MHHW) 6.19 ft./NAVD 88 show good correlation with nearby data and would be considered acceptable for this location.

Summary

The tidal datum reckoning/computation procedures used in the project, simultaneous tide by tide comparison of tide heights, is an acceptable method for reckoning datums from short term tide observations. But, in order to keep errors to a minimum, careful attention must be given to the pairing sequence of tides between the control and subordinate stations. A QC check of the time and height differences will usually catch errors in the comparison procedure.

The mean tide level (MTL) determination relative to NAVD 88 is a critical elevation in any wetland restoration project. This relationship determines the water level slope throughout the estuary and should be computed with the highest degree of accuracy. The MTL is considered the basis for all other datum computations and is determined first by NOS procedures, from tabulated high and low waters before the computed ranges are applied in the calculation of the mean high and low water datums. However, as was done in this project, the direct calculation of high and low water datums are an acceptable procedure when adequate QC controls are in place.

The complicated hydraulics of the Montezuma Slough tidal system requires an accurate MTL/NAVD 88 determination, this was not achieved at either station. In addition, all mean high and low water tidal datums reported in Table 5 for the Barge station were found to be 0.4 ft higher than expected and the MTL was found to be approximately 0.6 ft too high. For the Slough station, the values reported for MHW and MHHW were found to be acceptable, however the MLW and MLLW appeared to be somewhat elevated, possibly due to the Tide Gate effect. The MTL/NAVD 88 at the Slough station was found to be approximately 0.4 ft too high, based on published elevations at NOS station 9415307 Meins Landing, Montezuma Slough.

MWLLC Response

We provided a response report (prepared by Wetlands and Water Resources, June 2005- see next page) to Mr. Hubbard, Mr. Collins and Mr. Malamud-Roam in August 2005. The June 2005 report noted and revised some minor aspects of the Dec 2004 tidal reckoning report; however, the tidal statistics (i.e. MHW, MHHW) were essentially left unchanged. At the December 2005 TRT meeting, we brought up the possibility that calculating tidal statistics within such a fluvial dominated system might result in different values depending on when the reckoning is conducted, i.e. winter versus summer Spring tides. We agreed to evaluate a suggestion by the TRT to install a permanent gauge to collect water level data and evaluate water level changes over a longer period. We are currently evaluating options and are planning to install a gauge in 2007.

Tidal Datum Reckoning, Revised Montezuma Wetlands Project

June 2005

Introduction

Wetlands and Water Resources (WWR) collected original water level field data and processed that data to determine tidal datums at two locations at the Montezuma Wetlands Project. This report presents all aspects of this work. Specifically, this report includes the following sections:

- Summary of James Hubbard June 2005 comments and response to comments
- Benchmark survey
- Water level stations: location and surveying
- Water level time series data
- Port Chicago reference station data
- Tidal datum reckoning: methods and results

This revision to the tidal datum reckoning responds to comments provided in June 2005 by James Hubbard of the National Ocean Service, who reviewed the December 2004 report at the request of Josh Collins of the Technical Review Team. His comments are summarized first and the revisions to those comments noted in each section as necessary with the following section summarizing the responses.

Summary of James Hubbard June 2005 Comments and Responses to Comments

Mr. Hubbard reviewed the December 2004 version of this tidal datum reckoning effort. We would like to thank Mr. Hubbard for his thoughtful and knowledgeable comments and we have endeavored to address every comment. His comments and a summary of our responses follow.

1. **Port Chicago NAVD conversion** – Mr. Hubbard confirmed our calculation of the MLLW to NAVD conversion for the Port Chicago reference station. This confirmation provides an increased certainty in these datum results.
2. **Mean tide level results** – Mr. Hubbard indicates the method for calculating MTL was incorrect and should be the mid point between MHW and MLW.

Responses: Correction to calculation method incorporated into the results and shown in the updated Table 5.

3. **Temporal matching of synoptic higher high and high tides** – Mr. Hubbard identifies possible incorrect matching of Montezuma observed tides with Port Chicago reference tides for the higher high and high tides.

Responses: We have emphasized our stated methods employed (we rely solely upon NOS tide type determinations and pair tides based on tide time) and have reviewed our pairing of synoptic tides by adding columns to Appendices C and D showing time and height differences between site stations and Port Chicago and looking for mismatched tides. We found no discrepancies in pairing synoptic tides.

4. **Barge Station inconsistency with past NOS Collinsville Station, expected conditions, and height matching of synoptic tides** – Mr. Hubbard states that a number of inconsistencies appear with these data:

- MHW at the Barge station, 5.51ft NAVD, matches that at Port Chicago which he states would be expected only if the mean ranges were the same.
- MHW at the NOS Collinsville Station (941-5176), occupied by NOS from July 1977 to September 1978, was 0.4 ft lower than Port Chicago station at that time.
- Synoptic tide height differences occur during part of the period of record that could influence the calculated results.
- He does not identify possible sources of error and speculates could be related to initial gauge configuration or NAVD offset calculations.

Responses: We have reviewed the possible sources of error. Aside from the possibility of underlying errors in establishing local benchmark control (which we believe are not present but could be verified through a new survey), the discrepancies Mr. Hubbard notes are likely not errors but reflect actual variable environmental conditions during the winter data collection period. First, the Barge Station is immediately adjacent to the confluence of the Sacramento and San Joaquin rivers whereas Port Chicago is about 8.5 miles west in Suisun Bay. Large Delta outflows disperse rapidly once in Suisun Bay, so we would not be surprised by variability in observed water level differences between the Barge Station and Port Chicago during such flow conditions.

There are two methods to filter out Delta Outflow storm effects: (1) collect new data in the dry season when these conditions are not present, and (2) manually filter existing data to remove all high tides potentially affected by storm flows. At this time, we have not taken either action. The latter approach will have some degree of subjectivity as one must establish criteria for which tides to exclude.

However, it is important to bring attention to REAL conditions showing seasonally-variable tidal heights that have a direct influence on tidal marsh ecology – the closer geographically one moves towards the Delta with its stochastic Delta outflow conditions, the more actual tides are affected by non-astronomical parameters in unpredictable ways. Note also that the NOS Collinsville station was occupied during a major drought period in California (1977-1978) and thus results from that time greatly minimize climatic variables in the tidal datum. So while the recent results may be different than previous, they cannot be assumed erroneous but instead reflective of differing environmental conditions.

Mr. Hubbard's comment raises two general issues. First, we have the inherent limitation of establishing tidal datums in the San Francisco Estuary at locations distant from a continuous-recording NOS station (only five are in operation within the Estuary) and accounting for differing physical processes affecting tides between a subordinate and reference station. Second, while we can endeavor to distinguish astronomical tides from other influences on water levels at any given location, estuarine ecology *experiences* the combined influences of astronomical tides, fluvial inputs, engineered structures, and the like. So an important question is to determine what is of interest in estuarine tidal marsh restoration then move forward based on that determination.

5. **Slough Station MLW and MLLW values appear elevated** – Mr. Hubbard notes that the calculated MLW and MLLW values appear elevated relative to what would be expected and indicates may be due to operation of the Montezuma Salinity Control Structure.

Responses: We have reviewed the possible sources of error. Aside from the possibility of underlying errors in establishing local benchmark control (which we believe are not present but could be verified through a new survey), the discrepancies Mr. Hubbard notes are likely not errors but reflect actual variable environmental conditions. In this case, the differences are likely the effect of the Salinity Control Structure. Collecting new data when that structure is not in operation would help address this topic.

Benchmark Survey

All benchmarks for Montezuma were originally established relative to the National Geodetic Vertical Datum of 1929 (NGVD 1929). The National Geodetic Service (NGS) has discontinued supporting this vertical datum nationwide, having replaced it with the North American Vertical Datum of 1988 (NAVD 1988). In order to complete the tidal reckoning work, we established NAVD values for the benchmarks to which the water level sensors were calibrated. Appendix A contains the surveyors results and we have incorporated these results into Table 1.

Response to Hubbard Comments. The underlying issues raised by Mr. Hubbard regarding the general view of results making sense could be related to topographic surveys that provided NAVD88 elevations to the control points. While the data collected to date, compiled from three separate surveys, appear correct, a new level loop between known NAVD88 benchmarks and the station control points would provide final resolution on this matter.

Water Level Stations: Locations and Surveying

We collected water depth data at two locations (Figure 1):

- **Barge** station is located at the southeast corner of the Project on the Sacramento River adjacent to the barge sediment offloading station
- **Slough** station is located at the northwest corner of the Project on Montezuma Slough and north of the Department of Water Resources Montezuma Salinity Control Gate.

We surveyed between the water surface elevation offset measurement points and nearby benchmarks installed for the Project in order to establish vertical datums for each station's water depth data relative to the North American Vertical Datum (NAVD) of 1988. Table 1 presents these survey data.

Response to Hubbard Comments. No responses unless benchmarks are resurveyed.

Water Level Time Series Data

We collected water level data with vented pressure transducers, In-Situ model SP-8000. We sampled water level at 12-minute intervals beginning at the top of each hour, in order to achieve synoptic data with National Ocean Service-operated continuous recording stations in the Estuary. To convert sensor water levels (measured as feet above the sensor) to water surface elevations (measured as feet NAVD), we measured sensor readings concurrent with independent measures of water surface elevation (distance to water surface below the surveyed water surface elevation offset measurement points) on several occasions during the deployment period. Tables 2 and 3 present these offset measurements for the barge and slough station, respectively.

The time series water level data set for each station covers the following dates:

- **Barge** station recorded data from 21 November 2003 to 23 March 2004
- **Slough** station recorded data from 9 December 2003 to 23 March 2004

Port Chicago Reference Station Data

The method of corresponding tides used to perform the tidal datum reckoning calculations (see next section) requires use of the nearest NOS continuous recording tidal benchmark station as the reference station. Port Chicago, NOS station 941-5144, is the nearest station. In order to use this reckoning method, all water surface elevation must be referenced to the same vertical datum, in this case NAVD. The Port Chicago station tidal benchmark, however, does not report its elevation relative to NAVD. Instead, it references several geodetic benchmarks and reports elevations of those benchmarks relative to the tidal datums of mean lower low water (MLLW) and mean high water (MHW).

We calculated the MLLW to NAVD conversion for the Port Chicago station based on the geodetic benchmarks referenced by the Port Chicago tidal benchmark sheet (Appendix B). This calculation has the potential to introduce a systematic error of unknown magnitude as it is not practical to verify independently the elevations of these geodetic benchmarks; such a task belongs to NOS. The NOS tidal benchmark referenced several geodetic benchmarks, four of which had National Geodetic Survey (NGS) benchmark sheets available for internet download (included in Appendix B). We examined the reported MLLW, MHW, and NAVD elevation of each benchmark, the NGS-stated method of establishing NAVD, and the NGS-stated benchmark stability. We then calculated the MLLW to NAVD offset. Table 4 presents results of this analysis.

The calculated offsets matched identically for two of the four benchmarks analyzed. Both these benchmarks indicated the potential for relatively high data quality: both had elevations reported to the nearest 0.01 meter; one had NAVD established by “precise” GPS methods and the second had NAVD established by VertCon, an NGS software package to convert between NAVD and its predecessor, the National Geodetic Vertical Datum (NGVD) of 1929. Given the identical conversion factor and their relatively high indicated data quality, we used these two benchmarks here. The other two benchmarks indicated poor or questionable data quality: elevations reported to the nearest 0.1 meter; one had NAVD established through GPS methods (but not “precise” methods) and the other via VertCon.

Response to Hubbard Comments. We appreciate NOS independently confirming our MLLW to NAVD88 conversion.

Tidal Datum Reckoning: Methods and Results

We used the NOS method of corresponding tides to calculate tidal datums (Swanson 1974; Gill and Shultz 2001). In summary, these methods utilize a data set of high and low tide events matched between the subordinate station (location to which tidal datums being established) and the reference station (location from which known tidal datums are derived). All high and low tides are extracted from the subordinate station time series data and paired to their corresponding reference station tides. *We then sort by tide type as determined by NOS for the reference station* and calculate averages of each tide type at the subordinate and reference station, using all high or low tides for mean high water (MHW) or mean low water (MLW), respectively, and higher high or lower low for mean higher high water (MHHW) or mean lower low tide (MLLW), respectively. We then add the difference between the paired averages to the known values for the reference station to arrive at the desired results, tidal datums for the subordinate stations.

Response to Hubbard Comments. We have added the emphasis above that we rely solely upon NOS determination of tide type. Further, our method to determine the “synoptic tide” is to pair subordinate station to reference station by tide time. We have added a column to Appendices C and D to show the calculation of this time difference. We reviewed these time differences and found all data as presented in the December 2004 report corresponded and thus we have made no changes to our synoptic tides. Mr. Hubbard’s reference to temporally variable height differences are probably due to effects of winter storm runoff and the effects of Delta Outflow being different once storm flows enter Suisun Bay and travel the 8.5 miles from Collinsville to Port Chicago (see discussion above).

The final step is to calculate uncertainties around the results. Uncertainties arise from two aspects of the data collection: variation around the offset measurements at the subordinate stations (shown in Tables 2 and 3) and variation due to the number of tide events measured (provided in Swanson 1974). These errors are combined to yield overall uncertainty. As stated above, we cannot evaluate any systematic error due to our method of establishing NAVD at the Port Chicago reference station.

Table 5 presents the tidal datum results for the Barge and Slough stations. Appendices C and D present the data and calculations for the barge and slough stations, respectively.

Response to Hubbard Comments. We have revised Table 5 to correct the MTL calculation and we have added a column in Appendices C and D to show the synoptic tide difference time calculation (no changes made to pairing of synoptic tides as no discrepancies were found).

Suisun Marsh Salinity Control Gates and the Slough Station. The Slough station is located north of the Suisun Marsh Salinity Control Gates (SMSCG) and thus tides can be affected when the gate is in operation. There are two operational controls at the gate – a set of flashboards (termed “stop logs”) that can be removed and installed manually and a

set of mechanical gates that can be opened and closed on a tidal basis. WWR obtained the SMSCG operations schedule for the period of data record collected here:

- Stoplogs installed November 12, 2003 and remained in place throughout data collection
- Gates in operation from November 12 to December 14, 2003 and in the open position for the remainder of the data collection period.

This SMSCG operational schedule may have influenced the Slough station calculated tidal datum values; we have not performed analyses to examine the presence or magnitude of that effect.

References

- Gill, S.K. and J.R. Schultz, eds. 2001. Tidal datums and their applications. NOAA Special Publication NOS CO-OPS 1. National Oceanic and Atmospheric Administration, National Ocean Service, Silver Springs, MD. February.
- Hubbard, James. 2005. Review of December 2004 Montezuma Wetlands Project Tidal Datum Reckoning Report. Unpublished memorandum to Montezuma Technical Review Team. National Ocean Service, Silver Springs, Maryland.
- Swanson, R.L. 1974. Variability of Tidal Datums and Accuracy in Determining Datums from Short Series of Observations. NOAA Technical Report NOS 64. October.

Table 1
Topographic Survey Data, Montezuma Slough and Barge Tide Gauge Stations
Montezuma Wetlands Project

All data in feet						Notes
Station	Backsight	Foresight	Intermediate Foresight	Height of Instrument	Elev (ft NAVD)	
1) Montezuma Slough Station						Surveyed 3/1/04, EDS Book #5, Page 85
BM A	5.03			14.68	9.65	Established 6.92ft NGVD from Chris Newton 12/16/03 level line from Montezuma CP #1003, converted to NAVD with Nov 2004 Tucker survey (see 3 below)
BM B	5.71			14.68 14.68	8.97	Average of both HI's. Will use for survey
TBM1		5.54			9.14	Edge of bdwk. Pressure transducer calibration pt
TBM2		5.13			9.55	Metal plate above still well: Unable to get stadia onto still well measurement point (Calib Ref Pt) ← Field measured distance from TBM2 down to Calib Ref Pt
			1.18			
BM A	5.03					
BM B	5.71					
Calib Ref Point					<u>8.37</u>	Calibration measurement point, top of PVC
2) Barge Station						Surveyed 3/1/04, EDS Book #5, Page 85
BM	4.20			14.87	10.67	Point = top of disk BM at base of witness post. Established 7.94ft NGVD by Centerline Surveyors. Converted to NAVD with Nov 2004 Tucker survey (see 3 below)
Calib Ref Point		4.55			<u>10.32</u>	Calibration measurement point, top of PVC
BM	4.20					
3) November 2004 NGVD to NAVD Conversion						See PLS note in Appendix A
Cattle No. 1					33.00	NGS benchmark sheet, confirmed with Tucker call to NGS Nov 2004
1005					6.42	Nov 2003 Static GPS 3.69ft NGVD → +2.73ft conversion to NAVD

Table 2
Water Level Time Offset Measurements, Barge Station
Montezuma Wetlands Project

Deployed on 11/21/03; pulled 3/23/04

Date	Environmental Conditions	Measurement from top of PVC to WSE	Top of PVC EL= 10.31 WSE ft (NAVD)	Sensor Read	Measured WSE/ sensor read difference
11/21/2003	semi glass / 0.10 wavelets	4.78	5.54	4.751	-0.79
2/3/2004	choppy 0.0 - 0.20	5.83	4.49	3.65	-0.84
3/1/2004	very choppy 0.0 - 0.20	4.01	6.31	5.35	-0.96
		4.07	6.25	5.36	-0.89
		4.06	6.26	5.33	-0.93
		4.06	6.26	5.35	-0.91
		4.04	6.28	5.38	-0.90
3/23/04 Final Calibration					
mod chop 0.0 - 0.30	3.59	6.73	5.782	-0.95	
	3.59	6.73	5.789	-0.94	
	3.59	6.73	5.792	-0.94	
	3.58	6.74	5.801	-0.94	
	3.57	6.75	5.81	-0.94	
	3.56	6.76	5.812	-0.95	
average difference					-0.91
SD diff					0.049
SE diff					0.014

WSE = water surface elevation

Table 3
Water Level Time Offset Measurements, Slough Station
Montezuma Wetlands Project

Deployed on 12/9/03; pulled 3/23/04.

Date	Environmental Conditions	Measurement from top of PVC to WSE	Top of PVC EL= 8.36 WSE ft (NAVD)	Sensor Read	Measured WSE/ sensor read difference
12/9/2003	glassy. No wind	3.64	4.73	5.737	1.01
2/3/2004	semi glass very small wavelets	3.41	4.96	5.93	0.97
		3.42	4.95	5.93	0.98
3/1/2004	glass	2.66	5.71	6.68	0.97
		2.65	5.72	6.694	0.98
		2.63	5.74	6.7	0.96
3/1/04 POST OPEN AIR RECALIBRATION					
		2.54	5.83	6.788	0.96
		2.54	5.83	6.79	0.96
		2.535	5.83	6.797	0.97
3/23/04 Final Calibration					
		3.59	4.78	5.782	1.01
	mod chop 0.0 - 0.30	3.59	4.78	5.789	1.01
		3.59	4.78	5.792	1.02
		3.58	4.79	5.801	1.02
		3.57	4.80	5.81	1.01
		3.56	4.81	5.812	1.01
Average Diff:					0.990
SD Diff					0.022
SE Diff					0.006

WSE = water surface elevation

Table 4
Port Chicago Benchmark MLLW to NAVD Conversion Calculations
Montezuma Wetlands Project

All data in feet

BM ID	NOS (MLLW)	NGS (NAVD)	BM Notes	Conversion MLLW to NAVD
5144 H	9.823	11.2	Third Order, Class I, GPS Obs	1.332
Harley 1954	40.379	39.4	VertCon	1.007
5144 J	7.395	8.50	Fourth Order, Class I, Precise GPS Obs	1.102
CT26	18.879	19.98	VertCon, First Order, Class II	1.102
Add conversion value to MLLW data to obtain elevations relative to NAVD -->				1.102

NOS = National Ocean Service
 NGS = National Geodetic Service

See NOS and NGS benchmark sheets in Appendix B

This conversion estimates the MLLW to NAVD relationship; field topographic surveys at the Port Chicago NOS station would be necessary to confirm the conversion and are beyond the scope of this project.

Table 5
Tidal Datum Reckoning Results
Montezuma Wetlands Project

All elevations shown in feet NAVD 1988

Datum	Port Chicago Elev ¹	Barge Station ²			Slough Station ³		
		Elev	# Tides	Uncert (ft) ⁴	Elev	# Tides	Uncert (ft) ⁴
HOWL	9.03	7.84			7.93		
MHHW	6.02	6.00	118	0.13	6.19	102	0.13
MHW	5.51	5.51	237	0.10	5.67	203	0.10
MTL ⁵	3.68	4.06		0.01	3.87		0.01
MLW	1.84	2.60	238	0.10	2.07	203	0.10
MLLW	1.10	2.00	119	0.12	1.42	102	0.11
LOWL	-0.36	1.16			0.84		

Notes:

HOWL = highest observed water level (Jan 1983-Dec 2001 at Port Chicago)
MHHW = mean higher high water
MHW = mean high water
MTL = mean tide level
MLW = mean low water
MLLW = mean lower low water
LOWL = lowest observed water level (Jan 1983-Dec 2001 at Port Chicago)

- 1 Port Chicago datums estimated from tidal benchmark sheets. National Ocean Service does not report NAVD for this station due to insufficient number of NAVD reference benchmarks. June 2005 update: NOS (James Hubbard) comment letter confirmed our MLLW to NAVD conversion for Port Chicago station.
- 2 Period of data record for Barge Station = 11/21/03 to 3/23/04
- 3 Period of data record for Slough Station = 12/9/03 to 3/23/04
- 4 Uncertainty derived from Swanson (1974) based on record duration which was derived from field calibration (Tables 2 and 3).
- 5 Mean tide level (MTL) recalculated June 2005 as mid-point between MLW and MHW, per James Hubbard comment letter.

2004 Report on Biological Surveys for the Montezuma Wetlands Project

Reviewed by Howard Shellhammer, Joe Didonato and Letitia Grenier

TRT Commentary

From: Howard Shellhammer

Salt marsh harvest mouse. I am concerned that house mice, no matter how numerous, are being killed, evidently as a measure to improve the size, or catchability, of SMHM populations. I see monitoring as just being that, monitoring the rodents and their habitat in the more saline portions of diked marshes and not modifying the populations. I don't think there should be an attempt to increase the capture efficiencies of SMHM; it may be difficult enough to create sizable populations of SMHM in the restored marshes as it is. Outbreaks of house mice are just that – part of what is being monitored, likely something not all that common but part of the ecology of these patches of wetlands just the same. I also question, and it may be a mammalogist's quibble, the suggestion that house mice might be preying on SMHM; I think Tom Kucera should say why he thinks they are or give a reference. I lean towards trap swamping by the numerous house mice for the apparent decrease in the number of SMHM in the absence of other reasons. And now a few minor things. In Appendix D it states that SMHM were monitored in September and early October; on page 22 of the introduction and summary, i.e. in the last paragraph, it states that "SMHM monitoring (was, my insert) conducted in *August*" and should be changed. On page 4 of Appendix D, last line of the first paragraph under "Discussion" it should be "abundance of" rather than "or".

I do appreciate the addition of vegetation data to the SMHM trapping record. I think that the mouse habitat that will be created in the various phases will have a different mix of plant species and a lower percentage of pickleweed than in the present diked wetlands hence I think having good vegetation data from the diked wetlands will be of value in the negotiations that the management team will have with the regulatory agencies either before or after phases are fill, or at both times.

Rare plants and invasive exotic plants, Page 19 of summary. I question lumping peppergrass and star thistle in the same "category" and suggesting that what affects one species, affects the other as peppergrass will inhabit moister areas than the thistle, especially in brackish tidal areas. The comment is made (second full paragraph) that "Currently, the most invasive and prevalent weeds at the site(...) do not inhabit low-lying seasonal wetlands ...". There are other areas on adjacent Grizzly Island where peppergrass does do so, e.g. the Hill Slough areas (light to moderate concentrations) and Rush Ranch (heavy). Again diked areas are being compared with future tidal ones. The grading activity noted in that paragraph may hold back peppergrass initially but I think opening the system to tidal inundation may increase the possibility of peppergrass invasion rather than decrease it, especially if a high percentage of fresh to slightly brackish water is allowed to reach high in the restored high marsh. Here again I think that input from Laureen Thompson (CFG) and or Patty Quickert (DWR) would be helpful, both as to nearby areas infested with peppergrass but also it potential effects on SMHM.

"Interim Habitat Enhancement Monitoring", Section 2.7 on page 20 and Figure 8. If anyone other than those fully familiar with the project read this report I think they will be confused by this use of words; it suggests that there is such interim habitat management when what the

TRT Commentary (cont'd)

section seems to discuss is the possible effects of seasonal flooding, not proactive interim management. It would make things a lot clearer if a short descriptive paragraph preceded what is presented in the present draft.

Burrowing owls. I am a bit confused about the efforts to increase burrowing owls in the present configuration unless their areas will always be found above and outside of the restoration area, i.e. filled areas. If grazing is used to improve burrowing owl habitat and nesting sites I trust that any grazing plan that is developed will incorporate the management plans of the other important species in it.

MWLLC Response

Tom Kucera responded via email (dated September 7, 2005) to the comment regarding killing house mice. His response was as follows:

"I kill house mice (and Norway and black rats) when trapping for anything, not just smhm, in the belief that our ecosystems are better off without them, however trivial and quixotic the effort is. At Montezuma, I assume we are primarily attempting to monitor the status of the salt marsh harvest mice in the area; information on other species, however important and interesting, is next in line. Given the apparently huge and growing numbers of house mice at Montezuma (evidenced by the increasing captures over years and, within years, the lack of diminution of capture rates of house mice after five consecutive nights of trapping), I suspect that any influence of not killing house mice on capture success of smhm would be negative on smhm capture rate, making even more obscure the population status and trend of smhm in the area.

If the decrease in smhm capture rate is real, I agree with the suspicion that trap swamping by house mice may be reasonable; however, given the data, we can't rule out a real decrease in smhm population size as the reason for decreased captures. The decreasing capture rate for smhm is correlated with an increase in capture rate for house mice; the cause of this relationship is unknown. In the absence of other evidence, it is impossible to rule out that a real decrease in smhm population size is the cause of the decrease in smhm captures. If that is the case, my speculations as to the cause of the decrease were just that, speculations in the absence of data on population sized and change, diets, dispersal, survival, etc.

The speculation on predation grew from the thought of an irrupting population of house mice, members of which will probably reach some food-limited state at some time. House mice are known to eat invertebrates and carrion; in 2003 I opened a trap at Montezuma with a dead and partially consumed smhm and a live house mouse and imagined the scenario. (I duly reported the mortality to the agencies). My sleep-deprived brain subsequently pictured a house mouse finding a smhm nest with neonates, and assuming they would be consumed. All admittedly speculation, and I think presented as such. Another speculation is that the smhm population varies independently of the house mouse population, and any real decrease in smhm capture rate is purely an artifact of the overwhelming number of house mice and not an indication of a decreased smhm population. This is more difficult for me to imagine, given the specialized habitat requirements and relatively low numbers of smhm and the worldwide success and huge numbers of house mice.

So, the phenomena we know of are an increasing capture rate of house mice and a decreasing capture rate of smhm. Important questions are:

- 1. Is the decreasing capture rate of smhm real, or just part of normal variation?*
- 2. Will the decreasing capture rate of smhm continue? We'll see this year.*
- 3. If the decreasing capture rate of smhm is real*

MWLLC Response (cont'd)

- a. Is it caused by a real decrease in population size of *smbm*?
- b. If so, what is the cause of the decrease; is ecological interaction (of whatever sort) with house mice involve?

We can't address these questions with the current methodology.

Please let me know if you have any questions or want to discuss any of these issues further.” (End of Kucera’s email reply)

*Regarding invasive exotic plants, we don’t believe that *Lepidium* and yellow star thistle are in the same “category” or have the same habitat requirements, nor do we believe the report makes that representation. The report merely observes that currently these plants are found in higher-elevation areas of the site (co-occurring primarily with non-native grasses) rather than in the lower-lying seasonal wetland areas that are dominated by pickleweed and other halophytes. We do feel that this is a hopeful sign for the future of the created wetlands. However, this note of optimism is in no way intended as a proposal to alter the Project’s required performance criteria, monitoring, or control program for *Lepidium*. As described in the report, weed monitoring will continue to be conducted in accordance with the MMRP. We have been in contact with Ms. Quickert and Ms. Thompson about several SMHM and Suisun high marsh habitat questions, and we will continue to seek their valuable insights as we move forward.*

Regarding interim habitat enhancement monitoring, we agree that the terminology is unfortunate but it is not ours to change. The terminology (and concept) originated in Montezuma’s EIR/S and was carried over into the MMRP and project permits. As a result, we were required to prepare an “Interim Habitat Enhancement Plan for Unfilled Phases” (dated August 16, 2002) and report to the agencies on the results of monitoring. As described in that Plan, the project site infrastructure is extremely limited in its ability to influence the amount of water in unfilled areas of the site and possible conflicts with other habitats in unfilled phases (e.g., those of burrowing owls or vernal pool fairy shrimp) preclude making large-scale changes in the amount of ponding, even if such changes were feasible. Therefore, the required reporting does end up being largely an account of the extent and possible effects of seasonal ponding. The 2004 report does discuss the important “interim habitat management” issue for that year, which was the clogging of the return channel that precluded any pumping of accumulated water, and the actions taken to restore drainage. In future reports we will add a short explanatory paragraph to clarify the origin and purpose of the monitoring as you suggest.

*Regarding burrowing owls, the mitigation areas referred to in the report are located east of the tidal restoration area at elevations of approximately +20’, well above and outside the area that will be filled or affected by tidal action. Grazing management efforts are geared to jointly benefit burrowing owls, vernal pools, and native grasses (primarily *Nasella pulchra*), all of which occur in the subject area.*

TRT Commentary

From: Joe Didonato

It appears the surveys followed protocol and were done adequately to detect the target species. I like the suggestions from Avocet Research on the modifications to the burrowing owl burrows and the increase in the grazing pressure. Note that this year, grasslands are particularly high and dense due to the high rainfall year. This may not be the case in the future so modifications to the level of grazing should be keyed to each rainfall season. Although heavy grazing is good for Burrowing owls and I don't think we can really overgraze this year.

Speaking of grazing, I suspect the vernal pools are open to livestock grazing but I could not pull that out of the report. Are they grazed the same as the grasslands? I can concur on the effectiveness of sheep to produce higher densities of *Nasella pulchra*. We are seeing the exact same results at one of our parks after switching from cattle to sheep. Of course, electric fencing and managing sheep more intensely helps as well.

Even though it may make little difference in the overall SMHM results, are the house mice being sacrificed when captured?

MWLLC Response

As Mr. Didonato notes, heavy rains in recent years have increased grassland biomass. The sheep rancher has also reduced the number of animals on his parcel in recent years for his own economic reasons. We are continuing to work with the rancher to optimize the level of grazing, and the amount and timing of rainfall each year is part of the equation.

*The grazing regime in the vernal pool area is described on pages 9 and 10 of the report and in more detail in Section 5.2 of Appendix B. In summary, grazing in the vernal pool preserve is subdivided roughly in half; the northern half is grazed by sheep and the southern half is grazed by cows. Enclosure fencing was placed around the newly created vernal pools in the southern area and sheep from the northern area were allowed access to this area. Vollmar's monitoring encompasses study plots in all three treatment areas, and will explore the effects of different regimes on the occurrence of *Nasella pulchra* and other plant species.*

TRT Commentary

From: Letitia Grenier

My assessment of the report is that the surveys have been done in compliance with the MMRP.

The Project made several voluntary improvements and additions to their biological surveys, including improvements to the artificial burrows for the burrowing owls, new upland plant monitoring, and new nesting shorebird monitoring. I was pleased to see this attention to the biological communities at the project site, and I was glad the Project documented that the creation of new vernal pools did not significantly affect the hydrology of the natural preserve ponds. On the down side, it appears that two salt marsh harvest mouse trap lines in Phase 3 were affected by construction activities. However, the affected area was likely very small relative to the total mouse habitat in the Project area.

MWLLC Response

To clarify about the SMHM trap lines, Tom Kucera was unable to survey two traplines in Phase 2 mainly because he couldn't get access to them due to water in the return water channel at the time of his surveys. No mouse habitat was lost.

One of the Phase II trap lines is situated in a thin (~2 to 3') strip of pickleweed that runs along the return water channel bank in northern Phase 2. When the channel was dredged in '04 (described in Section 2.3 of the bio report) they piled the excavated sediment along the top of the bank, and Tom told me the strip of pickleweed lower down on the bank where his trapline is located got scraped by equipment during the dredging. The pickleweed had grown back when I went out there a month or so later. The water in the ditch prevented Tom from crossing on foot as he previously had done to get to the trap line along the bank and another one on the far side of the channel - in previous trapping years it had been dry in late summer since sediment placement had not yet started. So one of the traps was affected temporarily and both were inaccessible due to water in the channel. No trap lines in Phase 3 were affected.

TRT Response To Project Proposal for Reducing SMHM Sampling Frequency

Josh Collins, Howard Shellhammer, Joe Didonato, Letitia Grenier

October 20, 2005

The Montezuma Project has asked the High Marsh Design Subteam of the TRT to respond to the idea of reducing the frequency of pre-restoration sampling of the Salt Marsh Harvest Mouse (SMHM) in Phase II-IV from annual to biennial. The pre-restoration sampling design would otherwise not be changed and the post-restoration sampling design would also not be changed. The Montezuma Project has raised this idea as a way to cut costs while still providing the data that are needed to comply with the monitoring objectives.

The Sub-Team recognizes that the objectives of the pre-restoration SMHM sampling effort are (1) to determine if the SMHM continues to be supported in Phase II-IV; (2) determine if any major change in site conditions during project construction impacts the existing SMHM populations in Phase II-IV, and (3) determine if an adequate population of SMHM exists in the year prior to when SMHM are expected to colonize restored habitat. The Sub-Team also recognizes that one unstated objective of any good monitoring program is to provide relevant data to decision makers in a timely way at reasonable cost.

The Sub-Team has reviewed the five years of annual sampling data collected from 2000-2004. The existing data indicate that the capture efficiency for SMHM has been decreasing in Phase IV since 2001 (after an initial increase between 2000 and 2001); generally increasing with minor fluctuations in Phase III; and fluctuating over a wider range with no evident trend in Phase II. These data may be confounded by trap competition or interference between SMHM and house mice that favors the latter species. For example, the decreasing capture efficiency for SMHM and the increasing capture efficiency for house mice tend to be negatively correlated in Phase IV.

These monitoring data so far do not unequivocally indicate that the population of SMHM is increasing or decreasing. What we know for sure is that SMHM have continued to exist at the project. There is no compelling evidence that they won't continue to exist there in the future. Based on this information, the Subteam recommends the following.

1. The pre-restoration sampling for SMHM should be conducted in Phases II, III, and IV during the year before SMHM are expected to colonize restored habitat.
2. The pre-restoration sampling for SMHM should be conducted in Phases II, III, and IV after any major site alteration, such as extensive wildfire or catastrophic flooding due to levee failure that happens before SMHM habitat is restored.
3. Pre-restoration sampling for SMHM can be conducted biennially, beginning in 2006 (i.e., sampling will not be conducted in 2005 and in odd numbered years thereafter).
4. The Sub-Team will revisit the sampling frequency for SMHM after the Sub-Team reviews the sampling data for 2006.

Possible Relationship Between Project and Mercury Monitoring

At the January 27, 2005 Annual TRT Meeting, the group discussed the California Bay-Delta Authority (CBDA) fish mercury monitoring project (FMP) and potential collaboration efforts between the projects. The FMP will monitor mercury in biosentinel organisms (small fish and invertebrates, but not sport fish) at some CBDA restoration marshes and probably other marshes in the Napa and Petaluma watersheds. The TRT suggested that points of collaboration between the Montezuma Wetlands Project and other projects in the area should focus on methods and target fish species.

The FMP will take place over the next three years, so concurrence of the two projects' monitoring efforts could provide an opportunity for the Montezuma Wetlands Project to both contribute to the region-wide picture of mercury in marsh biota and take advantage of datasets for comparison from nearby marshes in the same years. There is a high probability that Montezuma Slough will be a FMP sampling site and that mercury data from 1999-2000 exists for the Montezuma Slough.

Operations Monitoring and Design Modifications / Adaptive Management Items and Actions

Project Items/Issues		Adaptive Management Actions	Results
A. Slower Than Expected Rate of Sediment Delivery from Corps Contracts			
(1)	Longer time to complete sediment cells	More monitoring and water management activities.	Water additions needed for longer periods of time to keep sediment cells ponded, especially noncover sediment. Intensive efforts to pump and pipe water to open cells, especially during driest months when sediment has not been delivered to the site. Accumulation of more salts in the system. More monitoring data collected.
(2)	Longer time to complete Phase I	Development of early Phase I breaching and tidal sequencing design to restore habitat to completed cells sooner.	Proposal to restore tides to Cells 1-4 by 2007. Sequence return of tidal action to remaining Phase I cells as they are completed.
(3)	Longer time to move into future Phases	Re-consideration of strategies to obtain habitat restoration in future Phases.	Consideration of connecting northern part of Phase III with adjacent Meins Landing tidal restoration project (DWR).
(4)	Slower influx of dollars to project	Enhancing project efficiencies and maximizing value of overall property potential.	More intensive cost-control. Consideration of "banking" ideas for existing and created habitat in excess of project's self-mitigating needs (e.g., vernal pools, SMHM habitat, etc.).

Project Items/Issues	Adaptive Management Actions	Results
B. Expansion of Fine-grained Sediment		
(1) Longer settling times required to consolidate sediment, achieve target elevations, and achieve decant water clear enough to release over cover-only weirs.	Tested flocculants to enhance settling efficiencies and decrease expansion.	Poor field results caused re-assessment of sediment cell design to solve the problems of settling efficiencies and expansion.
	Combined sediment cells to increase settling areas and enhance decant water quality. The following cells were combined: Cells 3 and 4; 6 and 7; 8 and 9.	The larger combined cells resulted in much better settling of sediment and control of decant water over weirs.
	Increased drying of noncover sediment to enhance consolidation and create stronger surface layer to sustain cover flow without mixing of layers. More monitoring implemented (e.g., bird use, elevations).	Achieved target elevations and increased strength of top surface to minimize mixing of cover sediment placed over the top. Increased the period of time left exposed and without ponded water.
	Filled Cells 1 and 2 to approximately 1 foot above target elevations to account for initial expansion of fine-grained sediments and their subsequent consolidation and subsidence of underlying peats.	Consolidation and subsidence after filling lowered sediment in Cells 1 and 2 to approximately 1 foot below design elevation. More sediment was added to Cells 1 and 2 in 2006 to achieve target elevations. All completed cells will be surveyed prior to levee breaching in accordance with project permits to confirm final elevations. Data obtained from Cells 1 and 2 (re expansion, consolidation, and settlement) will be used to refine initial sediment placement elevations for cells not yet completed.

Project Items/Issues	Adaptive Management Actions	Results
C. More Water Needed		
(1) More water needed to keep sediment cells ponded, especially during driest months when sediment has not been delivered to the site as planned.	Development of proposal to pump water from Montezuma Slough.	Cost and regulatory issues (predominately fish related) caused re-assessment to improve existing water supply system. Stopped pursuit of proposal to pump water from Slough or river.
	Redesigned and rehabilitated existing well system, and added new wells.	Water supply has been improved, but not enough to sustain pumping water to all sediment cells in Phase I. Helped inspire the idea to restore tides to completed portions of Phase I.
D. Soft Underlying Peats		
(1) Extensive compressible peats caused reconsideration of levee design and construction approaches.	Levees were built much slower and larger than anticipated in order to achieve geotechnical stability requirements.	Many interior cell levees were constructed over more than 1 construction season; Cell 6/7 will be built over 3 years. Overall geotechnical monitoring was revised to include more real-time field measurements that allowed for more immediate assessment of levee stability.
	Built interior levees with lighter-weight peat soils.	Geotechnical requirements achieved.
	Built counter-balancing small levees (toe berms) adjacent to the larger constructed levees.	Geotechnical requirements achieved. Will also provide shallower slopes on banks of the constructed large channels.
	Used water as counter-balancing geotechnical stability weight during 2004 construction of interior levees.	Geotechnical requirements achieved, but the important project need to keep additional sediment cells ponded in 2005 precluded using water in that construction year.

Project Items/Issues	Adaptive Management Actions	Results
D. Soft Underlying Peats (cont'd)		
(2) Highly compressible peats in the area of the original Phase I breach location precluded the construction of necessary levees in that area.	Re-assessed breach location and historical tidal marshes with SFEI in order to adjust channel (and thus, levee) layout appropriately.	Phase I breach was re-located to the north between Cell 3/4 and Cell 6/7, on a bend in Montezuma Slough. New location is more similar to the geomorphology of channels in natural tidal marshes.
E. Make-up Water Pond Discharge Pipe Clogged		
(1) Increase in concentrations of salt and some inorganic COCs (e.g., Ni and Zn) in sediment placement cells.	Additional monitoring implemented to track COC concentrations and compare against operational action levels (i.e., 1/2 of the WDR criteria). Efforts made to pump fresher water into sediment cells, and to reassess overall water supply system.	Salinity and some inorganic COCs remained above operational action levels (1/2 WDR limits) through most of the dry season. The constraints on water availability (see item C) led to the rehabilitation of the original well system and development of new water wells plus the idea to return tides earlier to portions of Phase I as soon as sediment cells are completed.
(2) Increase in ponding extent and duration in Phase IV SMHM habitat	Pumped water out of the return water channel (that drains Phase IV) into the make-up water pond and recycled into Phase I cells as much as possible.	The pumping of the return water channel was constrained by the capacity of the make-up water pond and the inability to discharge water into the Sacramento River/Suisun Bay.
		Led to a re-examination of the discharge pipe design. Options being explored included raising the discharge pipe off the bottom of the Sacramento River/Suisun Bay sediment, and removing the diffuser. Raising the discharge pipe has proved to be infeasible. So, additional dilution modeling was conducted and the options are being discussed with RWQCB.

Project Items/Issues	Adaptive Management Actions	Results
F. Cover Sediment Containing Some Elevated COCs		
(1) Cover sediment from some Port dredging polygons (cells 3-6) were known by the DMMO agencies to contain concentrations of mercury, DDT, and PCBs above 1992 RWQCB cover criteria. (The DMMO agencies approved this sediment as "wetland cover" suitable for placement at the surface of the marsh).	An additional confirmation sampling plan and placement approach was prepared and submitted to the agencies prior to accepting this sediment. The main elements of the plan and approach were to: 1) increase the frequency of testing; 2) speed up the analytical work to get faster results; 3) place the sediment into a noncover cell until confirmation testing showed the 1992 cover criteria were achieved; and 4) then place the sediment into the deepest part of a cover cell so it can be buried by at least 3 feet of additional cover sediment.	All of the sediment from Port cells 3-6 were placed into Montezuma's sediment cells so that it could be buried by at least 3 feet of other cover sediment. Sediment was initially placed into the noncover portion of Cell 3/4 until the confirmation testing results showed that COC concentrations met the 1992 RWQCB cover criteria. Sediment was then placed into the bottom of Cell 8/9. The confirmation testing showed that all COCs met the 1992 RWQCB criteria, except for Hg and PCBs in Cell 8/9. Elevation monitoring showed that all of the Port's cell 3-6 sediment was placed into deep enough portions of Cell 8/9 so it will be buried by at least three feet of additional cover sediment.

Appendices

Appendix 1: TRT and Project Team Roster

Last Name	First Name	Role/Area of Expertise	Organization
Batha	Bob	Operations	SF Bay Conservation and Development Commission
Bonnefil	Rachel	Montezuma Project Ecologist	Acta Environmental
Breaux	Andree	Vegetation/Wildlife	San Francisco Bay Regional Water Quality Control Board
Collins	Josh	Monitoring Design/TRT Project Manager	San Francisco Estuary Institute
Davis	Jay	Contaminants	San Francisco Estuary Institute
Didonato	Joe	Wildlife	East Bay Regional Parks District
Greenfield	Ben	Contaminants	San Francisco Estuary Institute
Grenier	Letitia	Contaminants/Wildlife	San Francisco Estuary Institute
Grosso	Cristina	Data Management/TRT Project Assistant	San Francisco Estuary Institute
Herbold	Bruce	Aquatic Wildlife	US Environmental Protection Agency
Jones	Paul	TRT Facilitator	US Environmental Protection Agency
Koutsoftas	Demetrious	Geotechnology/ Engineering	Arup
Leventhal	Roger	Montezuma Project Chief Engineer	FarWest Engineering
Levine	Jim	Managing Member	Montezuma Wetlands LLC
Lipton	Doug	Montezuma Project Manager	Lipton Environmental Group
Malamud-Roam	Karl	Physical Processes/Vector Control	Contra Costa Mosquito and Vector Control District
Polson	Eric	Operations/ Engineering	Consulting Civil Engineer
Shellhammer	Howard	Terrestrial Wildlife	Independent Consultant
Thompson	Bruce	Benthic Ecology	San Francisco Estuary Institute
Yee	Donald	Contaminants	San Francisco Estuary Institute

Appendix 2: TRT Record of Communications, 2004-2006

Date	TRT/Project Team Member	Contact Description	Action/Response
3/5/04	Bruce Herbold	Sent TRT IEP Proposal for <i>in situ</i> monitoring for parallel time-series of physical, chemical, and biological parameters in the Suisun marsh for funding consideration.	Doug Lipton responded on 3/9/04. Given the large resources already being expended on necessary on-site and reference monitoring requirements, the Project doesn't have extra money to fund what seems to be predominately an academic research project that goes beyond the scope of the TRT scope.
3/10/04	Bruce Herbold	Bruce is concerned that the sediments may move with the ebbing tides out of the shallow sloughs in the project site and dump their loads in the deeps of Montezuma Slough before cleaner water returns on the next tidal cycle to repeat the process, thus eroding the constructed wetlands and mobilizing contaminants. He suggested arranging a meeting with Chris and others to see if there are ways that they could choose comparable sites, etc. that would maximize the values of the IEP study to Montezuma's efforts.	Doug Lipton responded on 4/1/04. He agreed a meeting with the IEP to coordinate efforts would be useful. He also addressed Bruce's concerns regarding sediments moving out of the constructed sloughs, and water exiting the site being impacted by noncover sediment. He noted that he would be interested in learning more about small channel development in Suisun and how this knowledge might be used to predict/plan small channel development at Montezuma, and that the Project is not wed to the point bars (higher elevation areas within the inside bends of constructed channels) and is open to other options that don't require the cost of building and maintaining them.
5/5/04	NA	Doug Lipton emailed Cindy Paulson at Brown and Caldwell regarding other mercury monitoring efforts (South Bay Salt Ponds).	NA
7/16/04	Doug Lipton	In response to Marc Beutel's email regarding the South Bay Salt Ponds Restoration Project's Special Meeting on Mercury on 7/15/04, Doug suggested a meeting with Josh, Ben, and Jay to discuss aspects of the <i>Public Draft Mercury Technical Memorandum</i> that can apply to monitoring work underway at Montezuma and Suisun reference sites.	Josh Collins responded on 7/16/04 and suggested scheduling this meeting in early August due to July being a busy vacation month.
8/6/04	Demetrious Koutsoftas	Submitted review comments on the <i>2003 Combined Quarterly and End of Construction Completeness Report</i> . Comments included: (1) Suggested exploring the use of lightweight foam	A response letter from Hultgren-Tillis, Montezuma's geotechnical engineers, was sent to Mr. Koutsoftas on 11/19/04.

Date	TRT/Project Team Member	Contact Description	Action/Response
8/6/04	Demetrious Koutsoftas (cont'd)	concrete or expanded polystyrene blocks for future levee construction to resolve the problems of instability caused by heavy fills being used for levee construction. (2) Questioned if settlement or other monitoring data are available for review. (3) Suggested having the consultants involved in the project comment on the adequacy of the geotechnical monitoring plan.	
10/5/04	Joe Didonato	Submitted review comments on the <i>2003 Report on Biological Surveys</i> . Comments included: In the burrowing owls section, he (1) commented on the difficulty in determining when surveys were performed, (2) suggested including a brief description on the daily timing of the surveys from the DFG protocol, and (3) noted that the DFG site listed in App. A on page 4 was not correct. In the listed branchiopods and associated taxa section, he (1) questioned the possibility of the pools drying up in between rain events and not having a continuous viable pool through the season, thus leading to a reduction in the observed numbers of species, and (2) questioned “493%” were vernal pool-affiliated species on page 6, “Vegetation”, Line 3.	Refer to the <i>Summary of Year 2 Report Reviews and Recommendations</i> in this report for Project Team’s responses.
10/18/04	Jay Davis, Don Yee, Ben Greenfield	Distributed a copy of “Reference Site Monitoring Results Report for Sediment, Water, and Tissue Sampling” report for Contaminants Team review.	
10/29/04	Howard Shellhammer	Suggested that the Project Team review a draft copy of PWA’s “Design guidelines for tidal wetland restoration in San Francisco Bay” (PWA Ref. 1632) prepared for The Bay Institute and participate in a workshop on the draft being held in San Francisco on November 16. Howard Shellhammer remarked that the report is extremely valuable information for anyone interested in marsh restoration.	

Date	TRT/Project Team Member	Contact Description	Action/Response
12/9/04	Contaminants Subteam	Contaminants subteam meeting was held at SFEI from 10:30-1. Major topics discussed included: main results from on-site contaminant monitoring and suggestions to enhance program; reference site monitoring results report for sediment, water, and tissue sampling; coordination with other mercury monitoring programs; and coordination with CBDA proposal being developed to monitor along Montezuma Slough.	Meeting minutes were distributed to the TRT and interested non-TRT parties on 6/6/05.
12/10/04	Letitia Grenier	Follow-up email to the Project Team and Contaminants Subteam regarding goby questions discussed with Kathy Hieb (CDFG). Topics addressed included: (1) Whether monitoring might depress longjaw mudsucker populations and if one of the introduced gobies would be a good substitute. Shimofuri goby, which was caught slightly more often and in a greater percentage of trawls, might be a better choice. (2) Letitia will follow-up on how much fishing pressure mudsuckers might be able to support. Shimofuri gobies probably are not territorial like the mudsuckers (although our knowledge of shimofuri behavior is not very complete), but they are likely to be much more abundant in the long run, and they are nonnative. Yellowfin gobies make seasonal migrations, which make them less suitable for monitoring one site, and fewer of them were caught. (3) Kathy was interested in your marsh fish data, so she was copied on the email in order to put her in contact with the Project Team.	Doug responded on 12/13/04 and noted that Rachel Bonnefil, the Project's Ecologist, would follow-up with Kathy Hieb on the issues discussed in the email.
1/25/05	Letitia Grenier	Submitted comments on the <i>2003 Report on Biological Surveys</i> . Comments included: (1) Although the project has complied with the MMRP tasks for burrowing owls, the overall program for relocating the breeding population to artificial burrows doesn't seem to be working. Suggests consulting with biologists that have successfully established breeding	Refer to the <i>Summary of Year 2 Report Reviews and Recommendations</i> in this report for Project Team's responses.

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Date	TRT/Project Team Member	Contact Description	Action/Response
1/25/05	Letitia Grenier (cont'd)	pairs in artificial burrows in the past. (2) Adding swales to the map of natural and created pools would make it easier to review the placement and hydrological design of the created pools relative to the hydrological system of the natural pools.	
1/27/05	Montezuma TRT	TRT Annual Meeting was held at Birds' Landing Hunting Reserve from 9-3.	Meeting minutes were distributed to the TRT and interested non-TRT parties on 6/6/05.
2/2/05	Agency Staff	Doug Lipton sent an email discussing upcoming meetings. Highlights included: (1) TRT subteam and annual meeting dates will be made available as they are set. (2) The next TRT meeting is scheduled for June/July 2005. (3) An agency meeting will be scheduled in late summer after the TRT meeting. (4) A public meeting in Solano County will be scheduled for May/June.	NA
2/15/05	Bruce Herbold	Per Action Item identified at Montezuma Annual TRT Meeting, the list of recommended target fish species proposed by the Contaminants Subteam and a copy of the "Reference Site Monitoring Results Report for Sediment, Water, and Tissue Sampling" report was sent to Bruce for his review.	NA
2/22/05	James Hubbard, NOAA	Submitted review comments on the <i>Revised Montezuma Tidal Datum Reckoning Report, 2004</i> . Comments included: (1) Simultaneous tide by tide comparison of tide heights is an acceptable method for reckoning datums from short term tide observations. Recommended a QC check of the time and height differences to catch errors in this comparison procedure. (2) The complicated hydraulics of the Montezuma Slough tidal system requires an accurate MTL/NAVD 88 determination; this was not achieved at either station. In addition, all mean high and low water tidal datums reported in Table 5 for the Barge station were	A response report was prepared by Wetlands and Water Resources and distributed to Mr. Hubbard, Mr. Collins and Mr. Malamud-Roam in August 2005.

Date	TRT/Project Team Member	Contact Description	Action/Response
2/22/05	James Hubbard (cont'd)	found to be 0.4 ft higher than expected and the MTL was found to be approximately 0.6 ft too high. For the Slough station, the values reported for MHW and MHHW were found to be acceptable, however the MLW and MLLW appeared to be somewhat elevated, possibly due to the Tide Gate effect. The MTL/NAVD 88 at the Slough station was found to be approximately 0.4 ft too high, based on published elevations at NOS station 9415307 Meins Landing, Montezuma Slough.	
3/21/05	Don Yee	Submitted review comments on the <i>Report on Sediment and Water-Quality Monitoring – Quarters 1 and 2, 2004</i> . Comments included: (1) The monitoring of incoming sediments and project cells for sediment and water in large part appear to meet the project's monitoring needs, and the concentrations of chemicals of concern (COCs) mostly met the project's operational limits and criteria. (2) When exceedances are found that are not replicated in reanalyses of splits of a composite sample by either the original or a second laboratory, or in reanalyses of individual homogenized samples making up a composite, concerns are raised about the variability or reliability of any individual measurement. (3) Recommended refining the sampling or analytical methodology with the contract lab to assure that results are more consistent in the future and to ensure that there is sufficient confidence in the sample handling and quantitiveness of the analytical results.	Refer to the <i>Summary of Year 2 Report Reviews and Recommendations</i> in this report for Project Team's responses.
5/12/05	High Marsh Subteam (Collins, Grenier, Malamud-Roam, Shellhammer) and SCMD staff	Meeting was held at site from 10:30am to 2pm. Meeting objectives were (1) to consider returning tides to completed portions of Phase I prior to the entire phase being completed; and (2) to consider most appropriate high marsh designs for SMHM (i.e., elevations and the managed "mouse farm").	Meeting minutes were distributed to the TRT and interested non-TRT parties on 9/9/05.

Date	TRT/Project Team Member	Contact Description	Action/Response
5/12/05	Howard Shellhammer	Distributed a summary of the group's discussion. Main topics included appropriate elevation, vegetation mix, retaining dikes, trapping at other sites, channel development. Suggested having monthly conference calls to follow-up on these issues.	Doug responded on 5/13/05. He concurs with the suggestion to have monthly conference calls for the "Marsh" committee and also suggested perhaps doing the same for the contaminants subteam. On 5/16/05, Doug forwarded Howard Shellhammer's summary to Bob Batha, Joe Didonato, and Karl Malamud-Roam for comment.
5/17/05	Howard Shellhammer	Email summarized conversation with Patty Quickert regarding general vegetation mix at various mouse preserves she and Laureen Thompson have been trapping over the past 3 years. (1) Detailed summary will not be available for some time. They are examining if SMHM captured in <i>Scirpus</i> tend to move around less than those captured in pickleweed or other species. (2) Radio-collar work done later this year will also help in understanding the relative use by SMHM of various communities. (3) Howard Shellhammer suggests the goal of the high marsh should be loosened to create a mix of saline and brackish water species, but ensuring that there is a reasonable amount of halophytes.	Doug responded on 5/18/05. Rachel will follow-up on these issues with the High Marsh Subteam.
5/20/05	Karl Malamud-Roam	Roger sent Karl a review of the Montezuma tidal reckoning conducted by James Hubbard of NOAA. James found some errors in the work performed that will require redoing the work.	
6/2/05	Josh Collins	Suggested a field trip to discuss SMHM habitats at 3-4 sites that span the range of floristic conditions expected for high marsh at Montezuma in order for the Subteam to understand the range of community types that might result from the various design options.	6/6/05: Howard Shellhammer and Doug thought a field trip was premature and proposed having several teleconferences to discuss the Subteam's next steps. 6/7/05: Josh expressed concern that the Subteam needs to understand the range of community types that might result from the various design options. Therefore, SFEI will compile photos and vegetation maps to provide a sense of overall character for the Subteam (see Appendix 4 of this report).

Date	TRT/Project Team Member	Contact Description	Action/Response
7/1/05	Rachel Bonnefil	Forwarded preliminary information on vegetation and SMHM trapping results from Laureen Barthman-Thompson and Patty Quickert. Preliminary data suggest that plant cover is a bigger factor in SMHM densities than vegetation type. In a general discussion about SMHM habitat in Suisun, Ms. Barthman-Thompson suggested that 20-25% cover of pickleweed (mixed with other halophytes) is probably fine for SMHM and also about the highest %cover of pickleweed achievable in Montezuma high marsh.	NA
7/5/05	High Marsh Subteam (Collins, Grenier, Shellhammer)	Conference call from 10:30-12 noon. Meeting objectives included: review of CDFG/DWR vegetation data, clarify key questions to determine appropriate target elevation, and prioritize next steps.	Doug summarized meeting highlights (7/5/05): (1) The Project Team will work with CDFG/DWR to try and overlay their SMHM data with pictures and maps of the high marshes they have trapped. (2) The Project Team will try to gather as much elevation data from existing sources, and then could fill in the data gaps with additional surveys where necessary. (3) Rachel will keep the whole subteam informed via e-mails as she makes progress.
7/5/05	Howard Shellhammer	Provided written comments on the <i>2004 Report on Biological Surveys</i> report. Highlights include: (1) Concerned house mice are being killed as an attempt to increase capture efficiencies of SMHM. (2) Questioned the suggestion that house mice might be preying on SMHM and requested rationale. (3) Questioned lumping peppergrass and star thistle into the same category and suggesting that what affects one species will also affect the other (p. 19). (4) Suggested adding a short descriptive paragraph for clarification to “Interim Habitat Enhancement Monitoring” section to discuss proactive interim management. (5) Questioned efforts to increase burrowing owls with present configuration; if grazing will be used to improve habitat and nesting sites, than grazing plan	Refer to the <i>Summary of Year 2 Report Reviews and Recommendations</i> in this report for Project Team’s responses.

Date	TRT/Project Team Member	Contact Description	Action/Response
7/5/05	H. Shellhammer (cont'd)	should also incorporate management plans for other important species in area.	
7/6/05	Howard Shellhammer	Presented a follow-up comment to July 5, 2005 High Marsh Conference Call. The issue of salt marsh harvest mouse removal from cells to be filled needs to be addressed by the subteam.	Doug responded (7/6/05): Doug suggested postponing the discussion until Phase I has been completed and the Project begins moving into Phase II, which will have mice, or when a remedy for CDFG Section 4700 is being actively discussed within the critical agencies.
7/27/05	Rachel Bonnefil	Provided CDFG/DWR maps of SMHM trap locations and vegetation types to Cristina Grosso. Revised files sent by Sarah Estrella at CDFG on 8/22/05.	Cristina (2/25/06) forwarded files showing the trap locations and vegetation types to Howard Shellhammer so that he could associate them with his own trapping data. Further emails (2/28/06) between Rachel, Howard, and Cristina discuss the possibility of obtaining CDFG/DWR trapping data prior to publication, and/or a site visit to some of the CDFG/DWR trapping areas in spring 2006.
8/15/05	Joe Didonato	Provided written comments on the <i>2004 Report on Biological Surveys</i> report. Highlights include: (1) noted that surveys were done adequately to detect target species (2) agreed with modifications to burrowing owl burrows and increase in grazing pressure (3) suggested future modifications to the level of grazing should be keyed to each rainfall season (4) questioned if vernal pools are grazed the same as grasslands (5) concurred on effectiveness of sheep to produce higher densities of <i>Nasella pulchra</i> (6) questioned if house mice are being sacrificed when captured.	Josh responded on 8/15/05. (1) Provided an update on the High Marsh Subteam activities, including the central issues of what plant community will be supported at what elevations, and what will be the associated level of SMHM support. (2) Noted that the emerging view of the group is that the mixed halophytes and fresher plants that dominate high marsh near the project site have important SMHM support functions and that the “more <i>Salicornia</i> is better” model of the agencies is not applicable and needs to be adjusted.
8/25/05	Howard Shellhammer	Rachel emailed Howard Shellhammer about the option of reducing mouse monitoring to every 2 years due to the expense of sampling, the project construction timeline being longer than anticipated, and because less frequent sampling may provide the same level of information about SMHM on the project site.	Howard Shellhammer responded on 8/26/05. He thought trapping every two years was a reasonable option. He also suggested either studying the increase in house mice problem thoroughly (if it can be as it may be a variable phenomenon), or accepting what animals are present as the situation on-hand.

Date	TRT/Project Team Member	Contact Description	Action/Response
9/12/05	Joe Didonato, Howard Shellhammer, Letitia Grenier	Josh emailed the group posing the question if the sampling frequency for SMHM can be reduced from once a year to once every two years, for the reasons cited above.	NA
9/14/05	Letitia Grenier	Agrees with reducing sampling frequency to once every 2 years, but sampling should occur the year before a phase is restored to evaluate the population there at the time. Also, if actions other than tidal restoration, such as putting in a pipeline or something else likely to have an impact, occur in a Phase, then we might recommend that monitoring occur shortly before and shortly after the action (i.e., yearly rather than once every two years) in order to address that the sampling is conducted to monitor the effects of pre-restoration activities on the SMHM.	Doug replied 9/15/05. He agreed with both recommendations to do surveys a year before moving into another phase, and before and after any activity in a phase with mice.
9/15/05	Josh Collins	<p>Emailed group following questions: Don't you think that restoration of high marsh in 2006 or 2007 triggers the post-restoration SMHM monitoring plan as outlined in the MMRP? Doesn't this "early" restoration make moot any discussion of reducing the SMHM sampling frequency? Don't we need to know that source pops exist in 06, and then need to monitor on 6-month cycles after restoration?</p> <p>What about the idea raised last year about farming the high marsh plain for the right vegetation 1-2 seasons before breaching, to encourage plant and mouse colonization? Wouldn't that also trigger at least annual sampling?</p>	<p>Rachel responded 9/19/05. She noted that tidal breaching of the only high marsh cell completed to date (Cell 8/9) is planned for the second stage of the early breach, several years in the future. Breaching that cell would not trigger post-restoration mouse monitoring until vegetation criteria are met in that cell and mice can be translocated. Even with the planned early breach, it would be at least four to six years before Cell 8/9 has enough vegetative cover to support mice. There would also need to be a change to Section 4700 before the project can either impact mouse habitat in Phases II-IV or translocate mice. So the early breach does not make moot the discussion of reducing the SMHM monitoring frequency in Phases II-IV.</p> <p>Regarding "farming" of halophytes before breaching, the project's permit requirements to keep the sediment covered with at least 1' of water prior to breaching would preclude substantial pickleweed growth.</p>

Date	TRT/Project Team Member	Contact Description	Action/Response
9/15/05	Josh Collins (cont'd)		Rachel also reviewed phasing requirements for mice from the MMRP and permits and referred the subteam to the relevant portions of the MMRP for more details, in case the phasing requirements would affect the subteam's consideration of the question of SMHM monitoring frequency.
9/21/05	Joe Didonato	<p>Provided comments on proposal to reduce SMHM sampling frequency. He agreed that it is absolutely necessary to monitor before or after any planned or unplanned events that take place in any of the phases or that cause a significant change in the SMHM habitat. He noted that switching to biennial trapping may make it more difficult to determine trends in SMHM and <i>Mus</i> populations, if that is what is needed by the Project. He noted Hayward Shoreline data show that trap competition with <i>Mus</i> and <i>Microtus</i> clearly reduces capture of SMHM, and that <i>Mus</i> may disrupt nesting and compete for habitat with SMHM. He further noted that the Hayward data show fluctuating SMHM capture rates in a stable and relatively unchanging environment.</p> <p>If cost was not a factor, he would recommend continuing the annual population monitoring and utilize this data to (also) monitor the trends in the <i>Mus</i> population.</p>	NA
10/21/05	High Marsh Design Subteam	Provided a written response to the Project Team's proposal for reducing SMHM sampling frequency.	NA
11/2/05	Andree Breau	<p>Andree requested a short summary of the current SMHM sampling program and questioned:</p> <p>(1) Does pre-restoration sampling deal with all 3 phases (i.e., should it read "pre-restoration sampling for SMHM should be conducted biennially in Phases 2, 3, & 4 beginning in 2006"?)</p> <p>(2) When are the 3 different phases expected to be restored?</p>	<p>Doug replied on 11/4/05.</p> <p>(1) SMHM Sampling Program: See MMRP (lines 65 & 66 and Appendix F) and for survey details see our recent Bio report (all Montezuma reports are addressed to Beth Christian)</p> <p>(2) Phasing and future SMHM sampling: Yes, future sampling pertains to phases II, III, and IV. The schedule of future Phase restoration is a guess and certainty</p>

Date	TRT/Project Team Member	Contact Description	Action/Response
11/2/05	Andree Breauux (cont'd)	(3) Does the field consultant (Tom Kucera?) have an opinion about skipping years (i.e., will it provide reliable data to make statements about the permanence or impermanence of SMHM populations?)	decreases with each additional phase: Phase II will probably not start before 2008; Phase III will hopefully begin 3 to 5 years later. (3) Tom Kucera's view: Of course, he would have liked to continue doing annual monitoring. However, he also agreed yearly monitoring wasn't providing answers to explain population increases/decreases or permanence/impermanence.
12/12/05	Montezuma TRT	TRT Annual Meeting was held at Birds' Landing Hunting Reserve from 9-3.	Meeting minutes were distributed to the TRT and interested non-TRT parties on 2/1/06.
2/21/06	Letitia Grenier	Provided written comments on the <i>2004 Report on Biological Surveys</i> report. Highlights include: (1) Surveys conducted in compliance with MMRP Pleased to see attention to biological communities at the site. (2) Project documented creation of new vernal pools did not significantly affect the hydrology of the natural preserve ponds. While two SMHM trap lines in Phase 3 were affected by construction activities, the affected area was likely very small relative to the total mouse habitat in the Project area.	Rachel responded on 3/6/06 with a clarification about the SMHM trap lines: Tom Kucera was unable to survey two traplines in Phase 2 mainly because he couldn't get access to them due to water in the return water channel at the time of his surveys. No mouse habitat was lost. No trap lines in Phase III were affected. One of the Phase II trap lines is situated in a thin (~2 to 3') strip of pickleweed that runs along the return water channel bank in northern Phase II. Tom reported that this area got scraped by equipment during dredging of the return water channel in 2004. The pickleweed grew back a month or so later. Water in the ditch prevented Tom from crossing on foot as he previously had done to get to the trap line along the bank and another one on the far side of the channel. So one of the traps was affected temporarily and both were inaccessible due to water in the channel.
3/14/06	Contaminants Subteam	Contaminants Subteam Meeting was held at SFEI from 10:30-2:30.	Distributed final copy of Meeting Minutes to TRT and interested non-TRT parties on 6/6/06. Revised Minutes sent on 6/9/06.

Appendix 3: TRT Meeting Minutes

December 9, 2004: Contaminants Subteam Meeting Minutes

**Montezuma Wetlands Project
Technical Review Team
Contaminant Subteam Meeting Minutes
December 9, 2004
10:30 am – 1:00 pm
San Francisco Estuary Institute**

Participants:

SFEI: Josh Collins, Jay Davis, Ben Greenfield, Letitia Grenier, Cristina Grosso, Don Yee
Project Team: Rachel Bonnefil and Doug Lipton

Main results from on-site contaminant monitoring:

- Doug Lipton presented the following primary findings from the 1st and 2nd quarter contaminant monitoring:
 - All cover sediment results were less than the cover criteria. Noncover sediment also met cover criteria for all COCs except mercury, total PCBs and total DDTs, which all met their respective noncover criteria.
 - There was no apparent difference in contaminant concentrations between surface water collected from the cover sediment cells and surface water collected from noncover sediment cells. Some inorganics in surface water (notably arsenic, nickel and zinc) exceeded the Project's operational action levels, prompting further sampling and/or corrective action.
 - Organics were almost never detected in sediment and water, so less frequent sampling for organics was proposed, especially in water. Don Yee noted that if the dredged sediment source changes, sampling for organics should be increased again at least temporarily.
- The group suggested including a summary of conclusions in the quarterly reports to accompany the tables and an Executive Summary on the reference monitoring.
- Ben Greenfield suggested statistically showing that there is no relationship between the cover and noncover sediment, and he would be willing to assist with this analysis.

Recommendations on contaminant and reference site monitoring:

- The group discussed the following ways to improve the Project's contaminant monitoring. These recommendations will be presented at the Annual TRT Meeting on January 27th:
 - ***Conduct pretreatment monitoring for biota at the Project site for pesticides, PCBs, and Hg as soon as possible to establish a reference condition pretreatment and pre-breaching, since the site could already be contaminated.*** Montezuma Slough was recommended as a good choice for contaminant reference for pre-breaching.

(The Project has already conducted sediment chemistry monitoring in the Slough). Salt marsh harvest mice would also be important for pre-treatment monitoring of Hg. Since these mice are already being trapped, collection and analysis of hair samples would be feasible. For Hg monitoring, only total Hg needs to be measured in hair.

- ***Incorporate food web monitoring in the cells and possibly in the channel next to the site.*** Biota of interest that were mentioned to monitor in the cells were 1) fish, 2) birds that were feeding in the cells, and/or 3) invertebrates. The justification was that the cells were being maintained as shallow ponds longer than expected and that this type of monitoring would be the only way to detect a problem in the food web prior to breaching. [Note that Joe DiDonato brought up the same issue at the Annual Meeting, suggesting contaminants monitoring of bird eggs from nests of species that were feeding in the cells and breeding immediately adjacent in higher areas.] Biota to monitor in the adjacent slough were fish species with small home ranges.
- ***Analyze only total Hg in fish.***
Question: Should we analyze for MeHg in sediment due to the spatial and temporal variability in MeHg concentrations (i.e., concentrations at the reference sites may be higher than at the Project site)?
- ***Archive fish samples instead of releasing them.***
- ***Reduce deep sampling and focus on sampling the first few centimeters of surface sediment.*** The benefit of taking 3-4 ft. sediment samples is not clear, since this does not sample the active layer. Doug Lipton indicated that the 3-4' layer was sampled for comparison purposes with the Project's noncover sediment layer that is placed under at least 3 feet of cover sediment. There is concern that conditions at any depth below the most active root zone are unlikely to change (that is why cores are good for reconstructing past conditions), and so one good sample of historical conditions should suffice for all future comparisons.

Question: What is the geographic scope to which the historical perspective applies? What is the sample frame to which the project needs to be compared? See comments on reference sites below.

- ***Incorporate replication into the monitoring design in order to be able to compare strata within and between reference sites.*** Replication both within a site and within a stratum (high/low marsh and big/small channel) was suggested. The four main strata should be vegetated plain of low marsh, of high marsh, beds of large channels (ones with beds below MLW), and beds of small channels (ones with beds above MLW). These are the main strata (habitat types) that the Project will create. Low marsh may be more important than high marsh (since low marsh will for years be more common at the Project).
- ***Don't restrict reference sites to only those that contain all strata.*** Since there may be different reference sites depending upon the stratum, this further supports replicating within a stratum (high/low marsh and big/small channel).

- ***Randomly sample different reference sites in order to more broadly capture the ambient condition in Suisun.***

Question: Should the actual geographic scope of the reference envelope be confined to randomly selected surface (upper 5 cm) plots in low marsh and channels (large and small) along Montezuma near the intended breach locations? Where are appropriate sample locations? While low marsh along the Montezuma Slough and otherwise near the Project may be the best reference for what the project will be for many of its early years, high marsh and places far off like Rush Ranch may not be good reference sites for the Project.

- ***Take into account the age and length of fish when sampling.*** It was suggested to define a target size range.
- ***Consider that on-site non-cover may be a better comparison for tissue than comparing to an outside reference site.***
- ***Recommended target fish species list:***
 - Striped bass
 - Longjaw mudsucker - Kathy Hieb (CDFG) questioned the presence of longjaw mudsuckers in an area with such low salinity and asked how the taxonomy of samples is being verified. There is also a concern of how much fishing pressure this population could support.
 - Shimofuri goby - The home range size of this goby is not well known, but it is likely to be more abundant than the longjaw mudsucker in the long run. Also, there is less concern about depressing the population, because this species is non-native.
- ***Recommended contaminants of concern:***
 - It is not necessary to analyze PAHs in fish, but should continue to do so in clams.
 - Concentrate on analyzing for dioxins in only Sacramento suckers. It was suggested to use Frontier Analytical Labs for the dioxins analysis.
 - First look for PCBs and Pesticides in Sacramento suckers.
- Since it may be 7-10 years before breaching occurs due to the slower anticipated delivery of dredged sediment to beneficial reuse projects, there was a brief discussion on restoring tides to portions of Phase I sooner than other Phase I areas. Josh Collins suggested presenting this issue at the TRT Annual Meeting and asking the TRT for possible alternatives.

Additional comments on the *Reference Site Monitoring Results Report: Results of Sediment, Water, and Tissue Sampling (January 2004)*:

- Page 12, Table 5: Selenium detection limits varied greatly (0.46-1.75 mg/kg).
- Page 21, Table 14: The reported lipid concentrations are high.
- Page 22, Table 16: All of the pesticides and PCBs are reported as non-detects in water samples. Does this meet the Project's needs?
- Fish length measurements were not included in the report.

Coordination between Project and other monitoring programs:

- Jay Davis mentioned that Doug Lipton might be interested in attending the San Francisco Bay Wetland Mercury Coordination Meeting scheduled for February 23, 2005. Doug Lipton and/or Rachel Bonnefil plan to attend.
- Don Yee discussed his CALFED project that will examine methylation in marshes up the food chain in the Petaluma marsh. When the analytical methods have been developed, he will forward them to the Project Team.
- Josh Collins suggested including an article on the Montezuma Wetlands Project in the next issue of the RMP Newsletter (The next newsletter is scheduled for Summer/Fall 2005) or the San Francisco Bay Mercury News (A bi-annual on-line newsletter of mercury research and activities underway in the Bay-Delta region produced by SFEI)

Action Item: Once it has been decided on which or both of the newsletters the article should be included in, Cristina Grosso will write a draft of the article for review.

Coordination between the Project and a proposal to CBDA Science Program

- Jennifer Hayworth presented a proposal being developed by UCD and SFEI for contaminant monitoring along Montezuma Slough that could complement the Project's reference monitoring by targeting the same species. Jennifer will send the Project Team a draft copy of the proposal.

January 27, 2005: Annual TRT Meeting Minutes

**Montezuma Wetlands Project
Technical Review Team
Annual Meeting Minutes
January 27, 2005
9:00 am – 3:00 pm
Birds Landing Hunting Reserve**

Participants:

Bob Batha	Letitia Grenier
Andree Breaux	Cristina Grosso
Beth Christian	Timotheus Hampton
Josh Collins	Bruce Herbold
Joe DiDonato	Paul Jones
Gary Dula	Eric Polson
Carol Evkhanian	Howard Shellhammer
Ben Greenfield	Don Yee

TRT Members not present: Jay Davis, Demetrious Koutsoftas, Karl Malamud-Roam

Project Team: Rachel Bonnefil, Roger Leventhal, Doug Lipton, Mark Sutton

Agenda Item: Field trip to Montezuma Project Site

- The Project Team provided a brief overview of the physical changes that had occurred at the Project site during the past year and discussed how project operations focus on managing water as much as managing sediment.
- The Project has been receiving the second contract of mud from the Port's 50' Project so that about 1 million cubic yards have been placed since December 2003; the current contract is expected to be completed in early April.
- Due to the lower than anticipated volumes of sediment available from Bay-Delta dredging projects, the completion of Phase I will take longer than expected.
- Bob Batha commented that the scheduling and delivery of mud is very important, since it affects how the Project integrates monitoring, designing of the diked pickleweed marsh, and breaching schedule.
- For the above reasons, Doug Lipton discussed the possibility of an early breach to completed cells in Phase I before the entire Phase is filled with sediment.
- Andree Breaux provided digital photographs from the site visit.
- **Action Item #1:** Josh Collins suggested that any changes to the schedule should also be included in the Operations Monitoring reports.

Agenda Item: TRT Reviews and Annual Report

- The group discussed the reviews of several reports that will be included in the 2004 TRT Annual Report, which is scheduled to be completed by the end of March.

Update on mosquito control efforts in the Project Area

- Carol Evkhanian and Gary Dula from the Solano County Mosquito Abatement Control District provided the group with an update on mosquito control efforts in the Project Area. They noted that the wind waves and lack of vegetation in the site's ponded areas keep mosquitoes to a minimum.
- **Action Item #2:** The group agreed that Carol Evkhanian should participate in future TRT Annual Meetings, either as a formal TRT member or as an informal participant, to provide updates on mosquito control efforts.
- **Action Item #3:** Carol Evkhanian will send Rachel Bonnefil the survey data results and locations of traps for inclusion in the database.
- **Action Item #4:** A detailed summary of mosquito control efforts should be included in the TRT Annual Report.

Analysis of Reference Tidal Channel Plan Form Report

- **Action Item #5:** Roger Leventhal will send the group his comparison of the analysis of the reference tidal channel plan form to the Project's proposed design. A summary of this comparison should also be included in the TRT Annual Report.

2003 Report on Biological Surveys for the Montezuma Wetlands Project

- Rachel Bonnefil responded to two outstanding questions that Joe DiDonato posed in his review.
 - The pools do not dry out in between rain events, so there is a continuous viable pool through the season.
 - On page 6, "Vegetation", Line 3, "49%" and not "493%" were vernal pool-affiliated species.
- Rachel Bonnefil discussed that the mitigation burrows have not been populated with breeding owls, possibly due to low regional populations or the influence of the nearby wind farms. She also summarized Jules Evens' suggestions that there are no ground squirrel nests near the mitigation burrows, skunks may be a problem, and concrete block entries may help avoid entrances from being crushed.

Reference Site Monitoring: Results of Sediment, Water, and Tissue Sampling

- Ben Greenfield summarized the Contaminants Subteam Meeting and discussed a few additional suggestions, such as needing a well-formulated sampling design to compare treatment versus reference sites, addressing the sampling design question of visiting different sites, and augmenting sediment and water monitoring along Montezuma Slough with tissue monitoring.
- Letitia Grenier suggested monitoring hair from the salt marsh harvest mouse to gain information on mercury bioaccumulation in mice. Howard Shellhammer cautioned that federal and State permits take a year to reissue, so advance planning is necessary.
- Bruce Herbold noted that it would probably be difficult to find longjaw mudsuckers and that striped bass and Shimofuri gobies should be sufficient.
- Ben Greenfield commented that the contaminants subteam is interested in cutting back on bulk chemistry monitoring and focusing on bioavailability. Doug Lipton explained that the Project still needs to comply with the plethora of permit conditions that require bulk chemistry monitoring, but would also like to cut back in that area.

- **Action Item #6:** Due to the lack of time, the group agreed that Doug Lipton and Rachel Bonnefil should send the TRT a proposal to review for reference site monitoring. Josh Collins suggested beginning with Ben Greenfield's comments.
- **Action Item #7:** Bruce Herbold should review and comment on the recommended target fish species to sample proposed by the Contaminants Subteam.

Agenda Item: 1st and 2nd Quarter Contaminant Monitoring Results

- Doug Lipton provided highlights from the 1st and 2nd quarter monitoring results. For sediment, inorganics were all below their respective cover and noncover criteria, and all organics results met the cover criteria. Pesticides, PCBs, and PAHs were infrequently detected. For most COCs in noncover sediment, concentrations met cover criteria; only mercury, lead, selenium, DDTs, and PCBs were above cover criteria.
- For water, operational action levels in the sediment cells are based on 1/2 the Water Boards' discharge limits. There were some exceedances in cells 1 and 2; when this occurred, more water was added.
- There was some discussion on how to interpret and report split samples.
 - Don Yee questioned that when an exceedance occurs and a split is sent to a different lab for analysis, how can these data be interpreted with such high levels of variability?
 - Rachel Bonnefil responded that the Project Team reviews the QA/QC carefully and another sample is taken to confirm results when necessary.
- Due to the volume of data, the group questioned the need for quarterly reports and suggested reporting on an annual basis.
 - Doug Lipton explained that quarterly reporting is a requirement of the agencies.
 - Eric Polson recommended changing to annual reporting, but also allowing interim reporting to address any problems that may occur during the year.
 - Rachel Bonnefil suggested a 2-volume report with the 1st volume containing text, figures and summary data tables, and the 2nd volume containing the detailed data tables with all results and QA/QC data. The 2nd volume could go only to those agencies (such as the RWQCB) that are likely to do detailed data review.
- Paul Jones suggested the Contaminants Subteam, Project Team, and agency representatives meet to discuss modifications to the amount of monitoring. While Andree Breau thought this was sensible, she commented that the public's concerns should also be taken into consideration and questioned if annual public county meetings have been scheduled, since it is in the permits to conduct these meetings.
- Doug Lipton also commented that one option for timelier reporting is to report dioxins and radiation separately due to the longer time required to analyze these samples and receive their final QA reports. Beth Christian thought this was a good idea, since there are no regulatory criteria for these data.
- **Action Item #8:** Josh Collins recommended at least including error bars around the mean monitoring results. If the agencies aren't concerned with the mean or range, then could use the cumulative distribution frequency boxplots.
- **Action Item #9:** The group should reevaluate the sample handling and collection for QA samples.

- **Action Item #10:** The Contaminant Subteam should meet to discuss the format and scheduling for reporting contaminant monitoring results. The meeting should address the following options: (1) reporting results on an annual basis with interim reports when necessary, (2) reporting dioxins and radiation results separately, (3) posting the data tables on the Project's website located at www.wetlandtracker.org instead of providing hardcopy reports to the agencies, and 4) producing a 2-volume report with only text, figures & summary tables going to most recipients

Agenda Item: Possible relationship between Project and mercury monitoring

- Letitia Grenier explained that the California Bay-Delta Authority (CBDA) fish mercury monitoring study (FMP) will be monitoring mercury in biosentinel organisms (small fish and invertebrates, but not sport fish) at some CBDA restoration marshes and probably other marshes in the Napa and Petaluma watersheds.
 - Darrell Slotton is the lead on this part of the project and should be contacted for more details on their monitoring protocols.
 - The FMP will take place over the next three years, so the concurrence of the FMP and Montezuma monitoring could provide an opportunity for Montezuma to both contribute to the region-wide picture of mercury in marsh biota and to take advantage of datasets for comparison from nearby marshes in the same years.
- Ben Greenfield indicated that there is a high probability that Montezuma Slough will be a FMP sampling site and that mercury data from 1999-2000 exists for the Montezuma Slough.
- **Action Item #11:** Points of collaboration between the Montezuma Wetlands Project and other projects in the area should focus on methods and target fish species.

Agenda Item: Operations Monitoring & Design Modifications/Adaptive Management

- Roger Leventhal noted that there were fewer problems during 2004 and summarized some of the highlights included in the 2004 construction report, such as the pipeline spill, small pipe leaks, adding PAM to enhance clay flocculation, bird monitoring, banking water, and development of peat islands.
 - Roger Leventhal and Mark Sutton, who oversees the Project Site's operations, explained that operational water adjustments needed to be made on a daily basis.
 - Roger Leventhal discussed that it is very difficult to cover the noncover sediment during the rainy season since the sediments don't settle quickly without removing excess water. Consequently, the bird monitoring has been more intensive due to the noncover cells being uncovered for longer periods of time.
 - Joe DiDonato questioned if there is a measure to look at bird nesting and mercury monitoring in eggs. He suggested adding mercury monitoring in eggs, with shorebirds being the target species.
- Roger Leventhal noted that the tidal reckoning indicated that the datums have risen by 3-6 inches. Karl Malamud-Roam and Josh Collins asked to review the data.
 - **Action Item #12:** Roger Leventhal is currently finishing the 2004 Operations Monitoring Report and expects to distribute the report to the TRT by the end of February.
 - **Action Item #13:** Roger Leventhal has suggested geotechnical changes to the MMRP and will send Demetrious Koutsoftas and Eric Polson a copy for review.

- **Action Item #14:** Roger Leventhal noted that there have been large areas of raised peat formed within cell 3 due likely to placement of the dredged sediments. Eric Polson commented that diversity on marsh elevation could actually be a plus for the restored marsh. He will send the tidal reckoning results to Karl Malamud-Roam and Josh Collins for review.
- Doug Lipton discussed the option of early breaching of cells 1-4 to create low marsh habitat due to the problems associated with the delays in sediment delivery and difficulties in maintaining ponding at the Site. Doug Lipton and Roger Leventhal also discussed the option of adding a screened intake to pump water out of Montezuma Slough in order to keep sediment cells ponded more efficiently.
 - Bruce Herbold questioned if early breaching would require aquatic monitoring and how these expenses would be covered, and commented that it would be unlikely that the project could get permits to pump from the Slough.
 - Joe DiDonato and Bruce Herbold commented that they don't see a down-side to early breaching and that it could provide significant habitat advantages sooner.
 - Josh Collins commented that the breaches were designed with a much higher prism, and suggested exploring the possibility of using Clank Hollow to avoid having to redesign the breaches.
 - Bob Batha indicated that Solano County might require another Environmental Impact Report for early breaching, but discussion ensued that this would probably not be necessary and, regardless, is a decision outside of the TRT scope.
 - **Action Item #15:** The Project Team will provide the TRT with a proposal to review for the early breaching of cells 1-4.
- Howard Shellhammer discussed that a paper will be published soon that redefines salt marsh harvest mouse habitat in the Bay Area.
 - **Action Item #16:** Howard Shellhammer will distribute this paper to the TRT, and the High Marsh Subteam will review the paper in terms of changing the Project's design. Doug Lipton asked if Howard Shellhammer thought the project could eliminate the diked pickleweed marsh on the basis of re-defined habitat. Howard Shellhammer suggests keeping the mouse farm for now but it could be eliminated if good habitat forms in the high marsh areas.
- Josh Collins questioned that now that this is a water management project, is there enough surface water to change the biota monitoring design. Joe DiDonato added that with the anticipated change in bird use and increased flooding, these shallow water habitats could be used as another measurement of contamination. Doug Lipton noted that the project currently conducts significant water quality monitoring but that the Project Team will address the new shallow water habitat.

Agenda Item: Overarching Comments and TRT Tasks for Year 3

- Several reports will need to be reviewed by the TRT in the upcoming year, including the 3rd and 4th quarter contaminant monitoring results, year-end construction reports, and biological survey reports.
- **Action Item #17:** Doug Lipton will send a list of expected reports to be reviewed by the TRT by March.
- **Action Item #18:** The High Marsh Design and Contaminants Subteams will meet more frequently, and a schedule of subteam meetings should be posted on the website.
- **Action Item #19:** The High Marsh Design Subteam should schedule to meet in early Spring.
- **Action Item #20:** The next TRT meeting will be held in June or July to review the Project's Team proposal for monitoring and breaching modifications.

Meeting adjourned at 3pm.

May 12, 2005: High Marsh Design Subteam Meeting Minutes

Montezuma Wetlands Project Technical Review Team High Marsh Subteam Meeting Minutes Thursday, May 12, 2005 -- 10:30am to 2:00pm Montezuma Project Site

Attendees: Vic Baracosa (SCMAD), Josh Collins (SFEI), Carol Evkhanian (SCMAD), Letitia Grenier (SFEI), Cristina Grosso (SFEI), Karl Malamud-Roam (CCMVCD), Howard Shellhammer

Project Team: Rachel Bonnefil, Tom Kucera, Roger Leventhal, Doug Lipton, Cindy Smith

Documents Distributed: 1) Figure of Potential Early Breach Site Plan
2) Figure of Clank Hollow Detail at Construction Completion

Objectives: 1) To consider returning tides to completed portions of Phase I prior to the entire phase being completed

2) To consider most appropriate high marsh designs for SMHM (i.e., target elevations and reassessing the importance of the managed “mouse farm”)

Discussion Items:

Overview of 2005 Activities

- The Project Team discussed Phase I restoration activities completed to-date, delays and uncertainties regarding the USACOE dredging and placement contracts, and construction and restoration activities scheduled for 2005.
- The next delivery of sediment from the Port of Oakland is scheduled for June 2005 and will be used in Cells 1, 3/4, and 8/9; the priority is to first cover recently placed noncover sediment.
- **Action Item #1:** Josh Collins suggested that the Project Team prepare an interim memo for the TRT to review discussing how delays in sediment delivery affects the Project Team’s adaptive management of the Project, and the ability to meet its performance criteria (e.g., time requirements for covering noncover sediment, keeping sediment cells ponded). The memo should address all aspects of the Project’s adaptive management approaches that have responded to various conditions of the Project since accepting sediment in late 2003.

Conceptual Overview of Early Breaching Idea

- The Project Team explained several reasons for early breaching (e.g., water needs, habitat benefits, delays in sediment delivery that are extending the time-frame for completing Phase I) to return tides to Cells 1, 2, and 3/4, the potential connection with Clank Hollow, and future tidal return to the remaining Phase I cells.
- Karl Malamud-Roam commented that early installation of low marsh is better from a mosquito control perspective. Creating high marsh that is intermittently flooded is more of a concern for controlling mosquitoes.

- Karl Malamud-Roam commented that there could be scale issues if only part of Phase I was restored, e.g., the channels may be oversized for breaching only a few cells. There was consensus that additional hydraulic analysis would be warranted before any early partial tidal restoration design was finalized.

Design Thoughts on High Marsh and “Mouse Farm”

- The group discussed habitat objectives, marsh elevations, and the need for a “mouse farm”.
- Howard Shellhammer commented that ongoing research by Patty Quickert (DWR) and Laureen Barthman-Thompson (CDFG) would provide vegetation recommendations for mouse habitat. Data are expected to be available this Fall, at which time he urges the Project Team to renegotiate with the agencies on what constitutes mouse habitat.
- Howard Shellhammer and Tom Kucera think natural colonization of Phase I high marsh by SMHM may occur from nearby populations in Phase III. Howard Shellhammer expressed concerns with translocation of SMHM if the area has already been colonized naturally.
- Rachel Bonnefil commented that if natural colonization occurs, then the opportunity for translocating animals to that area is lost, since SMHM tend not to do well when moved into an area where mice already exist. This is of concern, since trapping mice out of unfilled Phases is one of the ways the project can minimize “take” in Phases II through IV.
- **Action Item #2:** Josh Collins suggested inviting Patty Quickert and Laureen Barthman-Thompson to present their results at the next TRT meeting.
- **Action Item #3:** Josh Collins requested copies of aerial photographs of the Project Site from Roger Leventhal.

Phase I Site Visits

Site #1 – Elevated Peat Area (future low marsh cell)

- Josh Collins questioned how the Project was documenting the area’s topography. The group discussed using photographs and elevation maps.
- **Action Item #4:** Roger Leventhal will work with Josh Collins and Karl Malamud-Roam to develop a photogeometric basemap for tracking future progress.

Site #2 – Proposed Early Breach Area

- The group discussed the size of the breach and the issues with different scenarios (e.g., erosion, creating predator corridors, pickleweed on levee edges, grading).
- The TRT suggested that maintaining (versus grading down) the existing Cell 3/4 interior cell levee for a couple hundred feet nearest the proposed breach would help prohibit unwanted deep channel cutting into Cell 3/4 that contains noncover sediment.
- Karl Malamud-Roam suggested to begin discussions with the agencies about early breaching and to include a contingency provision for incidental maintenance dredging within the first large constructed channel in the new permit.
- **Action Item #5:** The Project Team will submit a proposal for early breaching for TRT review. During its review, the TRT should comment on the natural levee heights and levee vegetation cover.
- **Action Item #6:** The group requested that future Project figures/drawings distributed to the TRT also include a box indicating 10 acres and a distance bar.

Site #3 - Future High Marsh/"Mouse Farm" Area

- There was lengthy discussion on the appropriate elevations for high marsh and how the density of channels affects salinity.
- Karl Malamud-Roam recommended having a contingency plan in case the high marsh does not become successful mouse habitat. He expressed concerns about mosquito control if insufficient small channels form in the high marsh and suggested considering possible dredging of small channels in high marsh cells and adding a channel system in Clank Hollow to assist the area's natural drainage and improve mosquito control.
- Howard Shellhammer suggested contacting Quickert and Barthman-Thompson to discuss what kinds of vegetation communities they have found mice in and to review their vegetation data from their trapping sites, and Josh Collins recommended trapping at the center marsh of Brown's Island that has no channels.
- **Action Item #7:** Due to lack of time, the group will continue the discussion of the high marsh through email and phone correspondence.

Site #4 – Vernal Pools

Meeting adjourned at 3:00 pm.

July 5, 2005: High Marsh Design Subteam Meeting Minutes

**Montezuma Wetlands Project
Technical Review Team
High Marsh Subteam Minutes
July 5, 2005, 10am – 11:30am
Conference Call**

Attendees: Josh Collins, Letitia Grenier, Cristina Grosso, Howard Shellhammer

Project Team: Rachel Bonnefil, Roger Leventhal, Doug Lipton

Discussion Items:

Review of Meeting Minutes

- **Action Item #1:** Subteam approved minutes from May 12, 2005 site visit.

Review new CDFG/DWR vegetation data from SMHM monitoring sites

- Rachel Bonnefil provided a brief overview of her discussions with Lauren Barthman-Thompson and Patty Quickert, who suggested a 20-25% cover of pickleweed. They recommended that Rachel Bonnefil join them in the field to observe the vegetation communities at the trapping sites.
- Howard Shellhammer expressed concern that the data summaries they are generating may not be useable to the Montezuma Project. Therefore, he emphasized the importance of going into the field with them to help formulate their analysis questions and presentation of data. Howard Shellhammer also suggested bringing a GPS unit into the field to record coordinates.
- Josh Collins recommended incorporating drainage system information with their data, since plant community composition in high marshes depends on distance from marsh channels.
- **Action Item #2:** A map showing trap locations, vegetation, and channels is needed.

Clarify key questions that need to be answered to determine appropriate target elevation for the Project's high marsh

- Josh Collins presented a series of photographic transects showing changes in plant species composition with distance from channel and upland edge in natural high brackish marshes at Rush Ranch and Denverton Slough.
- Howard Shellhammer suggested that based on his experience, we will need to create a mixture of vegetation, including mixed halophytes without pickleweed. He also recommended visiting the trap sites and reviewing the data on response to organisms to answer questions.
- Josh Collins suggested that an elevation of 1.5 feet above MHHW with few channels might provide the mix of plant species that Howard Shellhammer envisions. Josh Collins suggested that we need not fret about the lack of channels in such a design because brackish marshes have less channel density than salt marshes anyway, and that channels in brackish marshes contribute to the invasion by *Lepidium*. Any mosquito problem caused by the naturalistic high brackish marsh could be addressed separately.

- Howard Shellhammer suggested it would be very useful to show agency staff photos of vegetation assemblages along one transect and at sites where high populations of mice were trapped. Rachel Bonnefil commented that elevations should also be included with the photos in order to address Bob Batha's concerns. She added that the agency staff are basing their opinion on the Project's criteria that were provided to them, so the Project needs to provide them with new data.
- Josh Collins and Rachel Bonnefil proposed that issues with soil and subsidence might also have an influence on marsh development in the first five years.
- Josh Collins noted that distance from the channel is probably more important than elevation and recommended contacting Steve Culberson at DWR, since his dissertation was on vegetation and sedimentation across marsh plains and along channels in brackish marshes.
- **Action Item #3:** Doug Lipton suggested including the slide show in the TRT Annual Report.

Next steps to answer key questions

- Organize a field visit of 3-4 trapping sites with the objective to fill data gaps. The High Marsh Subteam, CDFG and DWR staff, and Steve Culberson should participate. Lauren and Patty should help decide on which sites to visit.
- With guidance from Howard Shellhammer and Josh Collins, Rachel Bonnefil will work with CDFG/DWR to overlay their SMHM data with photos and maps of the high marsh trap grid locations. She will inform the subteam of progress through email.
- The Project Team will gather elevation data from existing sources. Data gaps can be filled with additional surveys where necessary.
- For 1-2 sites, create a map of the representative drainage system (only channels that can be mapped with the 1-m pixel resolution aerial imaging for the region, e.g., Brown's Island or eastern Rush Ranch), plant zones, and trap locations.
- Determine SMHM support functions for each zone from CDFG to extrapolate information to sites.
- Obtain spot elevations at trap sites, relative to NAVD 88.
- **Action Item #4:** The next subteam conference call is tentatively scheduled for August.

Meeting adjourned at 11:30am.

December 12, 2005: Annual TRT Meeting Minutes

**Montezuma Wetlands Project
Technical Review Team
Annual Meeting Minutes
December 12, 2005
9:00 am – 3:00 pm
Birds Landing Hunting Reserve**

TRT Participants: Bob Batha, Josh Collins, Letitia Grenier, Cristina Grosso, Paul Jones, Eric Polson, Howard Shellhammer, Don Yee

Montezuma Project Team: Rachel Bonnefil, Roger Leventhal, Doug Lipton, Ryan Reeves

Agency Guests: Beth Dyer (USACOE), Misty Kaltreider (Solano County)

TRT Members not present: Andree Breaux, Jay Davis, Joe DiDonato, Ben Greenfield, Bruce Herbold, Demetrious Koutsoftas, Karl Malamud-Roam

Materials Distributed:

- Updated Site Restoration Figure (“Created Habitat”)
- “Adaptive Management Items and Actions” (3 page summary)
- “Summary of Montezuma Reference Site Work” (1 page summary)
- “Tidal Restoration Sequencing Plan – Phase I” (5 figures)

Agenda Item: Field trip to Montezuma Project Site

- The group visited several areas at Cells 1-4 and the proposed early breach site.
- Doug Lipton provided a brief overview of the Project’s status and completed construction.
- **Action Item #1:** The group recommended producing an aerial map of the major soil types (e.g., peat, silt, oyster hash, etc.) at the Project site, since soil type will have an effect on the variation in future vegetation colonization. In the future, this map should be created after the completion of filling a cell.

Agenda Item: TRT Progress Update

- Josh Collins provided a brief update on the progress of the subteams and the TRT Annual Report.
- *High Marsh Subteam:*
 - The group agreed that typical San Francisco Bay pickleweed densities are not an appropriate model for this site. Therefore, the Project Team will continue its ongoing effort to evaluate Suisun Marsh vegetation and SMHM data with the goal of generating recommendations for optimal high marsh vegetation parameters and target ground elevations. SFEI has mapped the CDFG trap locations on a vegetation map and is working to obtain SMHM trapping data.

- There was discussion of the likelihood that the centers of the sediment cells will be lower in elevation, at least initially, since the cell centers are farther from the sediment pipe outlet. The feasibility of placing sediment directly into the center of the cell was discussed, with the general conclusion that engineering constraints and regulatory requirements would preclude this option.
 - The possibility of creating higher elevation refugial “islands” within the low marsh was discussed. Howard Shellhammer observed that high tide refugia would need a connection to uplands.
 - **Action Item #2:** A map of SMHM trapping data from CDFG with vegetation data is needed in order for the subteam to determine the range of brackish flora, how this might be achieved on the site, and the design elevations that would promote viable SMHM habitat.
- *Contaminants Subteam:*
- This subteam provided monitoring recommendations that were not in the Project’s permits, but focused on reducing costs and coordinating with other monitoring efforts in the region.
- *Tidal Hydrology Subteam:*
- **Action Item #3:** Roger Leventhal is waiting for responses from Karl Malamud-Roam, Jim Hubbard, and Josh Collins to the Project Team’s comments on the tidal datum reckoning report.
- *TRT Subteam Reporting:*
- **Action Item #4:** In order to be timelier and to highlight recommendations for the Project Team to use in policy discussions with the agencies, the group proposed changing the subteams’ reporting requirements to produce more brief interim recommendations (1-2 pages in length). A schedule for the adaptive reporting on key issues by the subteams needs to be developed.
- *2nd TRT Annual Report:*
- Josh Collins reviewed the draft table of contents for the Annual Report.
 - **Action Item #5:** The Project Team will send responses to the TRT’s review comments by the end of December/early January. A draft report will be sent to the TRT for review in early February, and the final report will be issued in March.
 - **Action Item #6:** The group discussed the logistical difficulties in producing a timely Annual Report and suggested changing the format of the report to not include subteam reports. Instead, the subteams will produce separate interim recommendations that can be prepared on a timelier basis on key issues as needed. While the Annual Report will be reported every year, some years the report may be shorter due to sediment delivery schedules and associated delays that impact monitoring and reporting schedules, etc.
 - **Action Item #7:** The TRT Charter language needs to be revised to reflect the reporting changes of issuing separate subteam reports.
 - **Action Item #8:** Paul Jones questioned what processes are in place for responding to the TRT and its subteams, and how proposed changes are advanced to the regulatory agencies. The group agreed that in these instances, the Project Team would work with the TRT and submit a formal proposal to the agencies.

Agenda Item: Project Adaptive Management Activities

- Doug Lipton summarized several adaptive management items that occurred during the year and the Project's associated actions.
- *Slower than expected rate of sediment delivery from Corps contracts* has increased the period of time required for monitoring and water management activities in many sediment cells left uncompleted due to the Corps contract and dredging delays out of the control of the Project. The absence of sediment delivery in the drier months has strained the ability of the Project to keep water ponded in the cells. In the absence of sediment barges, water cannot be pumped to the cells using the Liberty offloader and must instead be pumped via smaller portable pumps that cannot keep up with summer evaporation rates. This has resulted in the accumulation of salts and elevation of some COCs in the cell water. This water management issue has led to the development of a tidal sequencing design to restore tidal waters (and thus habitat) to completed cells sooner. Due to the slower delivery rate of sediment (and thus slower influx of dollars) to the Project, the Project Team is also exploring other possible revenue generating streams to support the project and monitoring requirements. Some mitigation banking possibilities exist for habitat the project has already created and preserved beyond its own self-mitigating needs; for example, the vernal pool preservation/creation area and SMHM habitat in the northern Phase III area immediately adjacent to the new DWR Mein's Landing restoration project.
- *Expansion of fine-grained sediment* has led to developing a sediment cell design that combined cells into larger areas to obtain better sediment settling and minimize suspended sediment in decant water from the cover-only weirs into the return water channel.
- *The need for more water* has led to the redesign of existing wells and adding new wells to increase water supply to the Project site. This issue also helped inspire the tidal sequencing idea to restore tides to completed portions of Phase I before the entire Phase is completed.
- *The presence of extremely soft underlying peats* in certain regions of Phase I caused the Project Team to reassess the original Phase I tidal breach location and to build levees at a slower rate than originally planned. Historical tidal marshes and channel morphology were reviewed with SFEI, resulting in the selection of a new breach location that better reflected main channel locations found in historical marshes. The interior levees are being built with the lighter weight existing surface soil material (that is higher in peat content than the mineral soil derived from the borrow pits), and often constructed over a period of 2 to 3 years.
- **Action Item #9:** The group thought the "Adaptive Management Items and Actions" summary was very useful and suggested adding an additional column to note any changes in the monitoring schedule.

Agenda Item: Project Monitoring

Biology Monitoring (Rachel Bonnefil)

- *Salt marsh harvest mice (SMHM):*
 - Due to the longer length of time between phases and the accumulation of more monitoring data, SMHM will be monitored in existing habitat every other year instead of annually and prior to any restoration. This revision was supported by TRT review. The next monitoring event is scheduled for Summer 2006.

- Data since 2002 show that more house mice than SMHM are being captured in all three Phases of the Project site. As reported in the last three annual Biological Monitoring Reports, the reasons for the increase in house mice and the effect, if any, on SMHM populations are unclear.
- The Project Team continues to monitor seasonal ponding in Phases II, III, and IV as part of the Project's "interim habitat enhancement" requirements. As reported in the last annual Biological Survey Report, the addition of more water to the site from sediment placement and the inability to discharge water from the site (due to persistent clogging of the discharge pipe) has increased the extent and duration of ponding in portions of Phase IV. Rachel Bonnefil reported that in 2004, the ponding in these areas lasted until late May and in 2005 until early July. To date, SMHM and vegetation monitoring in these areas (conducted during the dry season) have not shown effects on pickleweed density or SMHM capture efficiencies. However, the Project Team is seeking alternatives to increase the capacity to pump water out of Phase IV in order to maintain flexibility in habitat management. Howard Shellhammer agreed that continued SMHM and vegetation monitoring is an appropriate approach.
- The group discussed that enhancing the ability to pump water off the site could also reduce salt accumulation and COC water concentrations in the Phase I sediment cells.
- **Action Item #10:** The group recommended including the clogged discharge pipe in the "Adaptive Management Items and Actions" summary.
- *Burrowing owl:* There has been no colonization of mitigation burrows by owls. The Project has raised the elevations of the burrows to make them drier, has built new burrows near areas of high ground squirrel activity, and is coordinating with grazers to develop a grazing management plan to optimize conditions for both burrowing owls and nearby vernal pools.
- *Vernal pools:*
 - Several species of native vernal pool plants, including one rare species (*Downingia pusilla*) have appeared in the created vernal pools. The created pools are meeting expectations in terms of hydrology and are exceeding expectations in terms of vegetation.
 - The Project Team has waited two seasons for natural colonization of native shrimp, and now is proposing to inoculate the pools per the MMRP and an informal agreement with FWS made in 2003. Paul Jones does not suggest this approach and recommends letting the birds do the work. He noted that there is probably something else going on, since natural colonization of the pools should occur. There was discussion that it is not unusual for created pools to take some time before they are colonized by native shrimp, and that their absence at this early stage does not change the conclusion (based on hydrology and vegetation) that the pools are doing well.
- *Pond turtles* continue to inhabit the return channel near the make-up pond. The Project Team is controlling salinity in this area by introducing fresher water from the makeup water pond when salinities exceed the 15 ppt upper limit that was agreed on with CDFG as described in the 2000/2001 annual Biological Survey Report.

- *Birds/Invertebrates:*
 - Birds are foraging at the Project site, and there are nesting avocets, stilts, and killdeer. A raptor survey has not been conducted.
 - No invertebrate studies have been performed. Paul Jones suggested a presence or absence study for macroinvertebrates, and Letitia Grenier recommended studying the eggs instead. The group did not know of any egg monitoring being conducted in Suisun Bay, but results could be compared to screening levels.
 - Howard Shellhammer recommended performing a literature search for designs that would answer the Project's questions on tissue food web monitoring (e.g., presence and absence of macroinvertebrates, using target species to examine heavy metals in the food chain). He cautioned that graduate student studies are limited to a short amount of time.

Water and Sediment Chemistry Monitoring (Doug Lipton)

- *Confirmation sediment data:*
 - In general, the Project is receiving what they were expecting from the Corps, except for one batch of sediment the DMMO agencies approved for use as cover material that they knew contained mercury concentrations above the 1992 criterion of 0.35 mg/kg. As a result, the Project Team prepared an additional confirmation testing plan for that material and in consultation with the RWQCB assessed the data and placed the sediment into certain deep areas of open cells.
 - **Action Item #11:** The group suggested adding this sediment batch and the actions taken to the "Adaptive Management Items and Actions" summary.
- *Barge sampling:* While sampling of the barges will continue at a rate of 1 per 20 barges as required by Project permits, the Project Team plans to eliminate barge sampling for some analytes (organics, dioxins, radiation and grain size) and instead sample for these analytes in the sediment cells.
- *Water monitoring:* The Project is monitoring groundwater well data and reported one well in Phase I that yields fluctuating dissolved COCs concentrations from season to season. Josh Collins questioned if there any other data that can be plotted against these data (e.g., another well) to help explain the fluctuations; the Project team is looking into explanations.
- *Reference site:* Doug Lipton provided an overview of the reference site work performed in the Montezuma Slough and Suisun tidal marshes, where invertebrate and fish data were collected. The Project Team is planning to go out with MEC in winter 2006 to collect more reference site data. In response to past TRT suggestions, that effort will focus on areas adjacent to the site and the Phase I breach location. Howard Shellhammer cautioned to limit the species and data collected, since it may not answer the questions of most concern, and you may discover an issue that only a massive research study could resolve.
- *Monitoring modifications:* The Project Team has been working with RWQCB to modify the monitoring plan to focus more on COCs and medium that are of greatest import (e.g., reduce repeated testing for organics that are almost never detected in water, and enhance testing for bioaccumulative COCs known to be an issue in the Bay-Delta, like mercury and

selenium). Doug Lipton noted that many modifications are in line with recommendations from the TRT.

- *Makeup water pond discharge pipe:* Project team discussed that the existing outfall diffuser is clogged with sediment and unable to discharge water from the makeup pond to the River/Bay. The inability to discharge has resulted in a buildup of salts and elevated dissolved concentrations for some COCs in Phase I sediment cells. The Project Team is currently conducting hydraulic modeling and design review (in consultation with RWQCB) for modifying the outfall pipeline by removing the diffuser and raising it slightly above the river bottom to avoid blockage by river sediment.
- **Engineering Monitoring** (Roger Leventhal)
 - The report is due in a few weeks. Roger Leventhal presented results of surveying of dredged sediment elevations in Cell 2. Some highlights include: cover and non-cover dredged mud elevations in Cell 2 (the most completed cell to-date) are below target elevations due to settlement of dredged sediment and subsidence of the underlying peats. Surveying is conducted at settlement markers that are installed in cells to measure elevations of the cover sediment surface and the underlying substrate (i.e., the existing site soils). For cells that contain both noncover and cover sediment, plywood boards are installed on top of the non-cover sediment layer to allow for measurement of the non-cover sediment elevation following placement of cover sediments on top. This allows future elevation monitoring to confirm that non-cover sediments settle to below their final target elevation.
 - **Action Item #12:** The group recommended converting datum from NGVD 29 to NADD. Since NOAA no longer uses NGVD 29, the Project has no reference data. Roger Leventhal noted that the base maps also need to be converted. This transition will happen over time, possibly with the next site topographic survey.
 - **Action Item #13:** The group suggested also adding to the “Adaptive Management Items and Actions” summary that the Project Team modified the approach to geotechnical monitoring to include daily measurement of settling poles in active construction areas that has allowed them to make more effective modifications to the rate of levee construction in the field. By controlling the rate of construction, the levees are less likely to experience failures.

Agenda Item: Proposed Restoration of Tides to Portions of Phase I

- Roger Leventhal presented the Project Team’s conceptual plan for sequencing the returning of tides to completed portions of Phase I. Tides are proposed to be returned to Cells 1-4 by 2007.
- Josh Collins noted that sediment in the major channel between Cell 6/7 and Cell 10 could be trapped at the existing crossing across the main tidal channel. Roger Leventhal commented that they are trying to use the existing crossing to prevent flows from going to Clank Hollow during the first phase of a multi-phase plan to restore tides to Phase I, but recognizes the concern of trapping sediment where you do not want it, which might require removal at a later date. The Project Team is working on a tidal sequencing design to provide tides to Cells 1-4 first, and then to Clank Hollow in subsequent years when the interior levees of other cells that form the channel leading into Clank Hollow are completed.

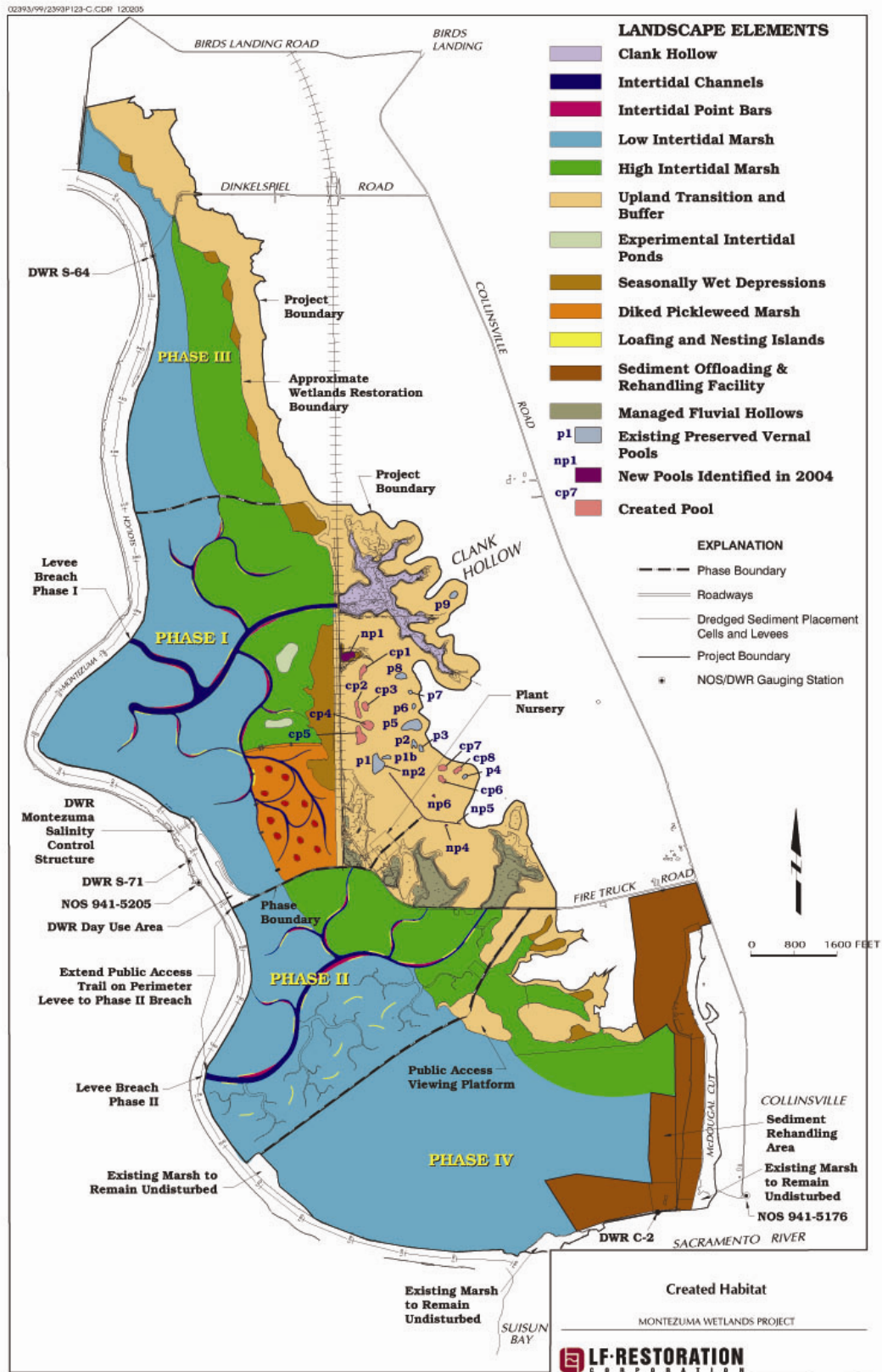
- Roger Leventhal explained that the Project is proposing to leave up some interior levees (instead of grading them down) along Cell 3/4 near the breach location to direct channel development further from the breach, as suggested by the TRT. This is consistent with the original project design that includes leaving segments of interior levees as bird islands.
- The group discussed that as the Project takes down the interior levees, they will sidecast the dirt and grade it within one foot of the marsh surface, instead of removing the sediment from the site.
- Howard Shellhammer commented that grading might change the vegetation characterization and that the TRT should consider this issue. Since little is known of plant and soil relationships (what will grow on peat v. oyster hash, etc.), Josh Collins suggested creating a soil map for the Project site (see Action Item #1) and using LIDAR to map the site. The group agreed that it would be interesting to note for future phases any vegetation patterns discovered after the first phase of cells has been completed.
- Josh Collins questioned if they have seen any wave-induced erosional problems. Roger Leventhal commented that while there was some wave-induced erosion in the make-up pond that required erosion-control measures, there were no serious on-going problems in the Phase I sediment cells.
- **Action Item #14:** Due to strong seasonal signal/freshwater flows, Roger Leventhal suggested that the discrepancy in the tidal reckoning analysis may be due to this freshwater inflow. The TRT suggested that the Project Team should conduct the tidal reckoning over the course of one year for better data analysis. The Project Team agreed to evaluate this suggestion and discuss further with the TRT. Josh Collins strongly recommended installing a tide gauge near the proposed area of breach and at the mouth of Montezuma Slough.
- **Action Item #15:** The TRT and High Marsh Subteam should respond to the proposed sequencing of restoring the tides to portions of Phase I, addressing the general approach and opportunities to learn from the exercise. The Project Team will provide the TRT with the rationale for the sequencing order.
- The estimated timetable is 1-2 years between sequencing phases, however this is dependent on sediment availability: Sequence 1 by 2007, Sequence 2 by 2009, Sequence 3 by 2010, and Sequence 4 in 2011.

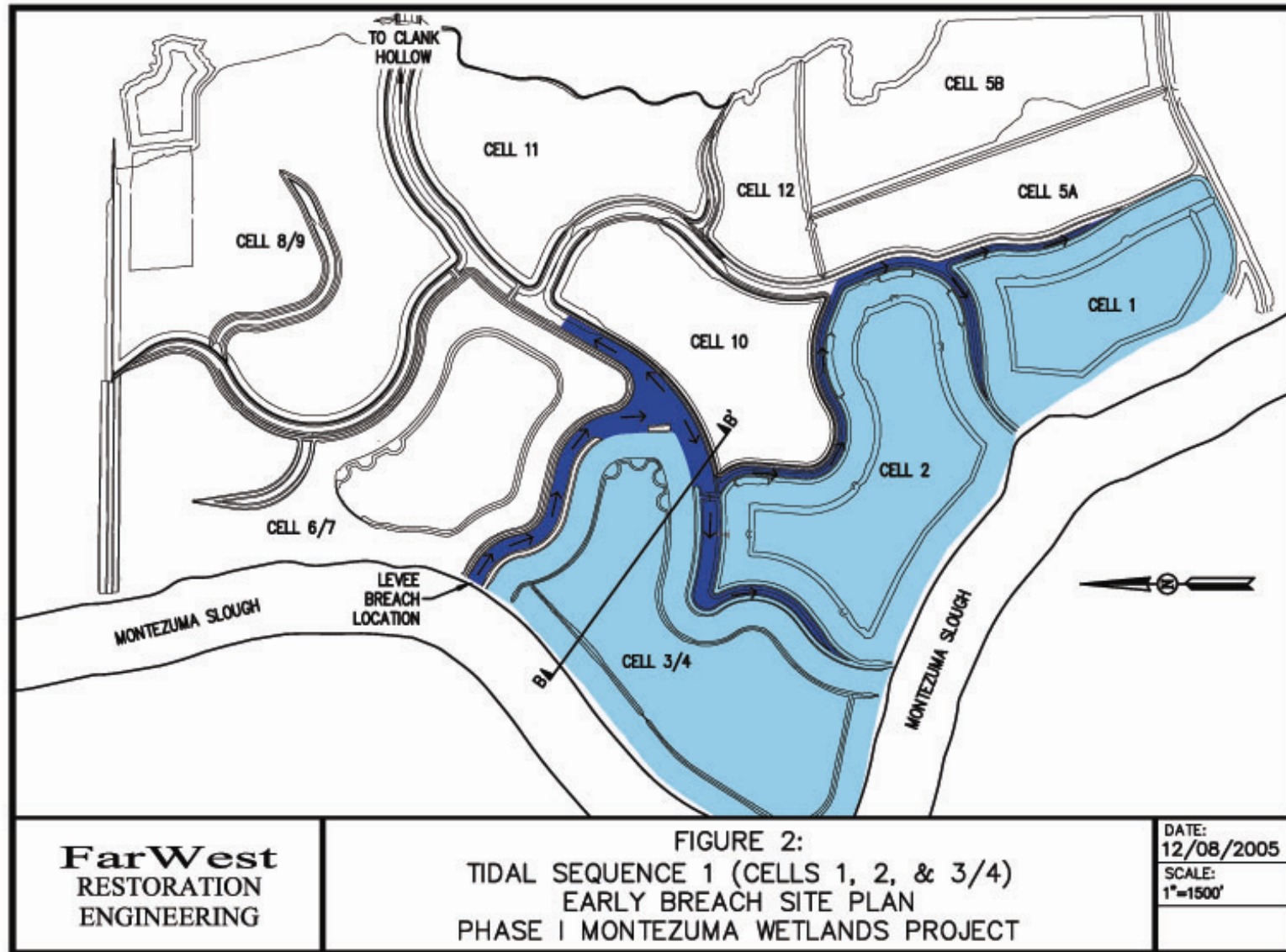
Agenda Item: TRT Tasks for Upcoming Year

- *Areas of future focus*
 - Complete 2nd Annual Report, which will include Contaminant and High Marsh Subteam summaries.
 - Project review comments to SFEI – early January
 - Draft report to TRT for review – end of January/early February
 - Final report – March

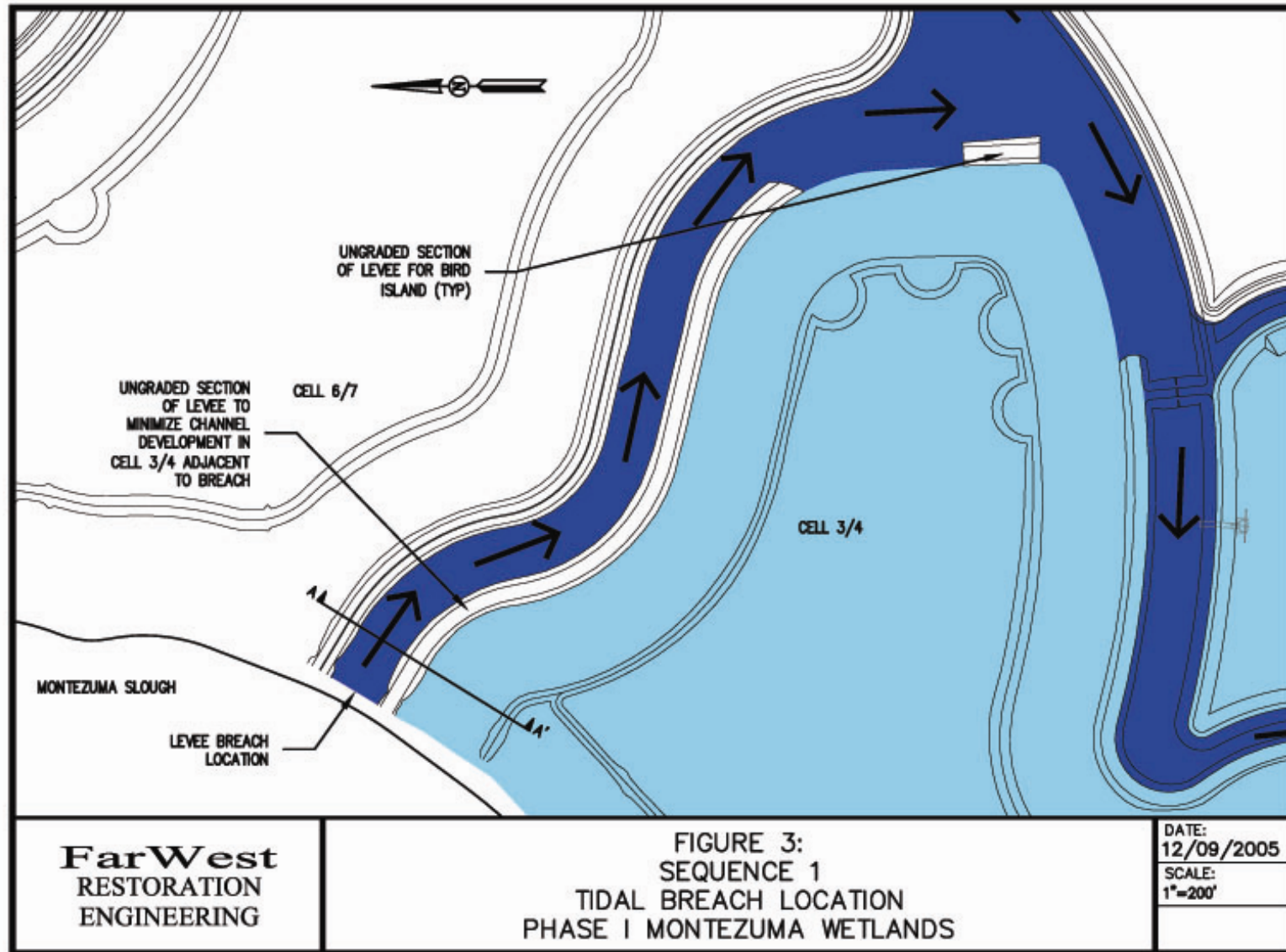
- Draft schedule for subteams
 - *Contaminants Subteam*: meet in winter 2006 to discuss future reference work. A report for work to be conducted in February 2006 will be completed in May 2006 and will include tissue monitoring and sediment sampling. The subteam's review comments should also be included in the next Annual Report, so it reflects the state of knowledge to date.
 - *High Marsh Subteam* – review vegetation and trap data in late January 2006. Howard Shellhammer to visit SFEI to review maps before subteam meets.
 - *Hydrology Subteam* – issue recommendation to install two tide gauges on the Project site in January/February 2006.
 - *Biology Subteam* – comment on proposal to agencies to populate vernal pools with native shrimp.
- *TRT individual assignments*: There are no individual TRT assignments at this time.

Meeting adjourned at 3 pm.

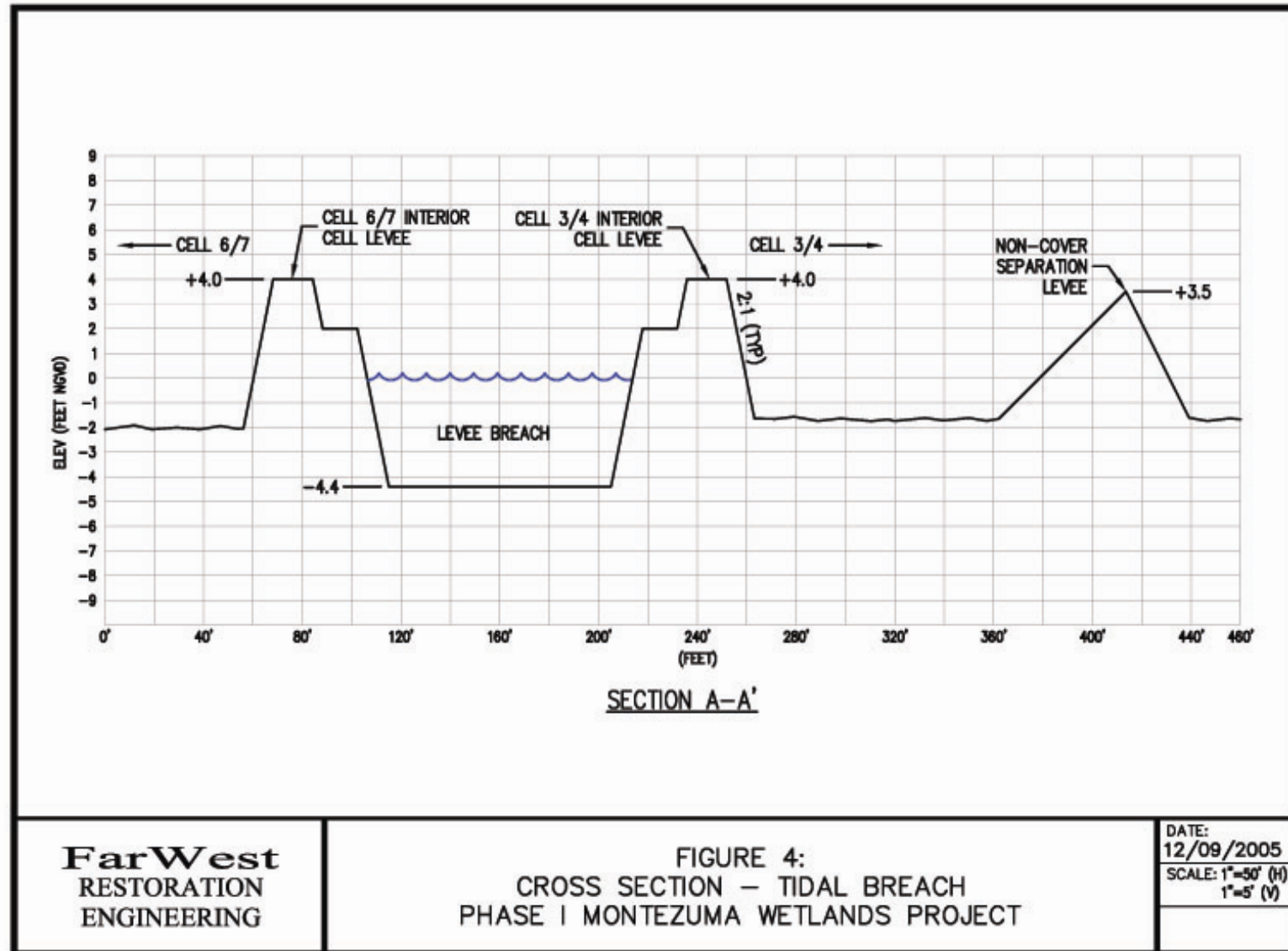




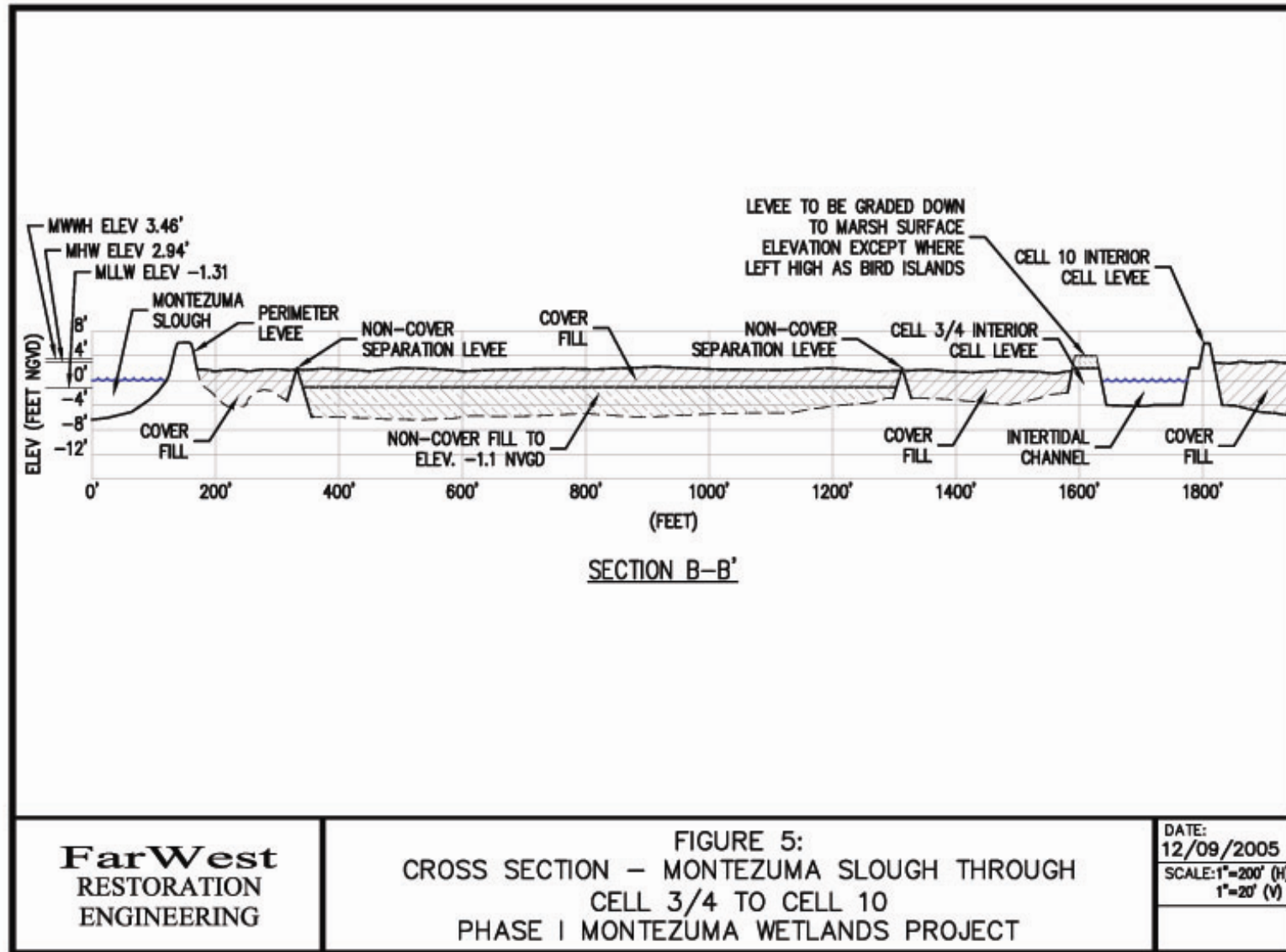
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March 14, 2006: Contaminants Subteam Meeting Minutes

**Montezuma Wetlands Project
Technical Review Team
Contaminants Subteam Meeting Minutes
March 14, 2006 (10:30 – 2:30)**

TRT Participants: Josh Collins, Ben Greenfield, Letitia Grenier, Cristina Grosso, Don Yee

Montezuma Project Team: Rachel Bonnefil, Doug Lipton

Agency Guest: Beth Christian, RWQCB

Subteam Member Not Present: Jay Davis

Materials Distributed and Presented:

- Project Team comments on recommendations on (a) contaminant and reference site monitoring and (b) the *Report on Sediment and Water Quality Monitoring - Quarters 1 and 2, 2004*
- Adaptive Management Items and Actions
- December 2005 Annual TRT Meeting Minutes
- Reference Site Work Summary and Approach for Future Work
- 2005 Water and Sediment Data Summary Tables and Graphs
- Summary of Revisions to Monitoring Program (related to sediment and water quality)

Agenda Items: Project Status and Early Breach Proposal

- Doug Lipton provided a brief summary of the project's current status and current issues:
 - Approximately 1.5 million cubic yards (mcy) of sediment has been placed in Cells 1, 2, 3/4, 10, and 8/9, which comprise about 200 acres of Phase I
 - Cells 1, 2, and 3/4 (approximately 150 acres) are near completion, and expected to be finished under the current Corps 50' contract by summer '06
 - Ongoing uncertainty in sediment delivery from the Corps/Port, including redirection of the final Port 50' dredging contract to other sites (including the Ocean), compromises ability to complete Phase I and cover noncover sediment
 - Water shortages in 2005 resulted in concentration of salts and inorganic COCs in the surface water in the sediment cells during summer and fall '06. He also noted that salt and inorganic COC concentrations fell after rains and sediment offloading started in fall '06
 - In light of slow and uncertain sediment delivery and water shortages, the project plans to seek approval for early tidal restoration to Cells 1, 2, and 3/4 in fall '06 or spring '07
- Ben Greenfield noted that wetting/drying cycles in the cells raise concerns about mercury methylation.
- Ben Greenfield asked if there are any technical reasons not to do an early breach; Doug Lipton noted that regulatory requirements are the only real constraints.
- Beth Christian noted that target sediment elevations need to be reached prior to breaching.

- Josh Collins noted that site elevations can be lower than the target elevation as long as they are within the elevation ranges of low marsh vegetation. He suggested collecting elevation data at the upper and lower range of low marsh vegetation in the outboard marsh and channel banks in Montezuma Slough.
- Josh Collins also noted that monitoring will need to be conducted in breached cells to determine if water retention in low areas increases mosquito production, fish entrapment, and/or undesirable water quality conditions. Ditching of low spots would be an appropriate contingency measure if these problems arise.
- Doug Lipton said that depending on the amount of sediment delivered over the next months and what proportion of that sediment is mud vs. sands, some noncover areas in Cell 3/4 may not be covered by 3 feet of cover sediment, although the noncover will still be in the anaerobic zone (at or below -1' NGVD). He also noted that mud contracted and destined for Montezuma was diverted by the Corps to Middle Harbor (which ironically, needed sand not mud).
- Josh Collins and Beth Christian both remarked that the 3 feet of cover is a somewhat arbitrary number, and she also noted that CAD facilities often have an 18" cap. Doug Lipton noted that if not enough mud was available from the Corps/Port to achieve the 3-foot cover, then a number of adaptive management actions could be implemented, including additional monitoring for channel development and potential for bioaccumulation.
- In response to questions raised by Letitia Grenier regarding erosion by wind waves if sediment elevations are too low, Ben Greenfield advised that the hydrology subteam should weigh in on the early breach proposal.

Action Items:

- Prepare early breach proposal
- Discuss noncover elevation and cover depth in the early breach proposal and show the noncover elevation in a cross-section along with low marsh vegetation elevation ranges.
- Review of the early breach proposal by the Hydrology Subteam

Agenda Item: Adaptive Management

- Doug Lipton presented the Adaptive Management Memo, which describes the main operational challenges faced by the project to date and the actions taken to address them. These include:
 - Expansion of fine-grained sediments that resulted in excessive suspended sediment in decant water, prompting a redesign to make cells larger and increase settling time.
 - Water shortages that prompted construction of additional supply wells and pursuit of the early breach option.
 - Slow delivery of sediment that also prompted pursuit of the early breach option.
 - Soft soils that made construction of levees in the original main channel location infeasible; in response an alternate channel layout was developed in conjunction with SFEI and was reviewed by the TRT.
 - Inability to discharge water from the site due to the clogged outfall, prompting the project to re-evaluate outfall design and seek approval from the agencies to remove the diffuser and raise the pipe off the river bed.

- Delivery of sediment from the Port of Oakland's Cells 3 through 6 that exceeded cover criteria for mercury, DDT, and PCBs although it was classified as cover sediment by the DMMO; in response the testing frequency was increased and the sediment was placed in a noncover Cell (3/4) and in the lowest portion of a cover only Cell (8/9) where it will not exceed the -1' NGVD target for noncover sediment (the elevation where sediment is ensured to remain anaerobic) so that it can be topped by at least 3 feet of cover material.
- Josh Collins was interested in hearing how the TRT has influenced the adaptive management decisions. Doug Lipton noted that TRT input was central to decisions made regarding the cell and channel redesign and that the early breach would not have been pursued without the initial positive reaction from the TRT.

Agenda Item: 2005 Sediment and Water Quality Results

- Doug Lipton presented the results of water and sediment monitoring conducted in 2005:
 - Graphs of sampling results from the Port's Cell 3 through 6 material that contained mercury above the cover criterion and discussion of the additional monitoring that was conducted during placement of that material in Cells 3/4 and 8/9.
 - Graphs of water quality data from the sediment cells showing elevation of inorganics (especially arsenic, nickel, selenium, and zinc) during summer and fall in response to high evaporation rates and water shortages, and then lower concentrations in fall/winter '05-'06 after sediment offloading and winter rains began.
- The group discussed whether increased monitoring of the restored marsh should be conducted in the area where sediment with higher mercury was placed in the bottom of Cell 8/9. The general consensus was that the monitoring should not be changed in response to a limited area with higher concentrations. Josh Collins noted that direct measurement of contaminant loading in tissues is of primary interest and biota integrate contaminants over a larger area. Letitia Grenier commented that the difference between 0.35 and 0.5 mg/kg in the sediment may not be significant (because so many factors besides total Hg in sediment affect MeHg production), but that the high marsh is likely to produce more MeHg and should be a focus of monitoring. Ben Greenfield and Josh Collins both advised that the monitoring program should characterize contaminants across the site rather than tracking effects of small variations.
- Ben Greenfield suggested focusing in tissue monitoring to assess whether biotic exposure is problematic. The group discussed what thresholds would be appropriate for the site prior to tidal breaching. Comparison to nontidal reference sites such as Grizzly Island was discussed; Rachel Bonnefil questioned whether ambient conditions are a reasonable "action level" for the site prior to breaching since elevated water concentrations are a relatively short-term condition. Josh Collins suggested that biotic action levels should be decided over time as trends become clearer through monitoring.
- Don Yee and Ben Greenfield suggested performing a regression of EC and inorganics and using EC as surrogate measurement, instead of spending so much time and money on measuring COCs in water.
- Rachel Bonnefil suggested monitoring inorganics in cell water seasonally during the dry months when concentrations are likely to be higher. She noted that since the cell water drains to the makeup water pond, monitoring in the cells is useful in predicting future water quality in the makeup water pond.

Agenda Item: Monitoring Modifications (associated with sediment and water quality)

- Doug Lipton briefly presented the changes to the monitoring program that have been implemented to date, primarily reductions in monitoring for organic COCs which have been detected few times and at low levels. Sediment sampling has also been increased in the sediment cells relative to incoming barges since cell samples best reflect sediment chemical conditions at the site.
- The project has proposed further changes to the monitoring program to eliminate radiation and dioxin monitoring in sediment; instead focusing on tissue sampling to assess potential impacts associated with dioxins.
- Ben Greenfield suggested annual monitoring for dioxins and radiation in sediment. He recommended that some dioxin and radiation data be collected from new dredged sediment sources and compared to reference sites and regional monitoring data. After some initial confirmation samples the monitoring can revert to annual.

Action Item:

- Per Josh Collins' request, add to the adaptive management table the reduction of sampling for organics in response to few and low detections of those COCs.

Agenda Item: Reference Site Monitoring

- Doug Lipton summarized the reference site work conducted to date at Rush Ranch, Hill Slough, and Montezuma Slough between 2001 and 2006. He also described the proposed approach for future work, focusing more heavily on tissue but also continuing sediment sampling to increase the reference data set.
- Doug Lipton noted that the primary objective of the reference site monitoring (as defined by the permits and MMRP) is to determine whether COC concentrations at the restored site are significantly different than background tidal marshes in Suisun Marsh.
- Letitia Grenier and Ben Greenfield expressed the need for before/after measurements to determine whether the project increases bioavailability locally, and for replication over time to distinguish temporal from spatial variability. They commented that it would be useful to collect background data for several years.
- Letitia Grenier recommended comparison of SMHM tissue (hair) in unfilled phases of the project site with the restored site; Rachel Bonnefil suggested using CDFG's hair samples from Suisun Marsh tidal sites (if available) as background data instead.
- Doug Lipton emphasized that the overarching purpose of project reference monitoring is to compare the **restored** on-site wetlands (after placement of sediment) to **off-site** reference sites (e.g., Montezuma Slough and Suisun tidal marshes), not to pre-existing on-site conditions before sediment was placed.
- Josh Collins suggested defining reference habitat types as more than vegetated tidal marsh. For example, sloughs (fish tissue) as a reference site for tidal channels; unvegetated mudflats (invertebrate tissue) as a reference site for the early restored marsh plain before vegetation develops. Josh Collins also suggested prioritization of monitoring based on what parameters are likely to be affected by the project.
- Letitia Grenier recommended collection of "before" tissue data from all strata at reference sites, e.g. song sparrow feathers, amphipods, crabs, and/or SMHM hair to represent the high marsh; shorebird eggs to represent the low marsh. She noted that the high marsh, low marsh, and tidal channel food webs may be totally separate.

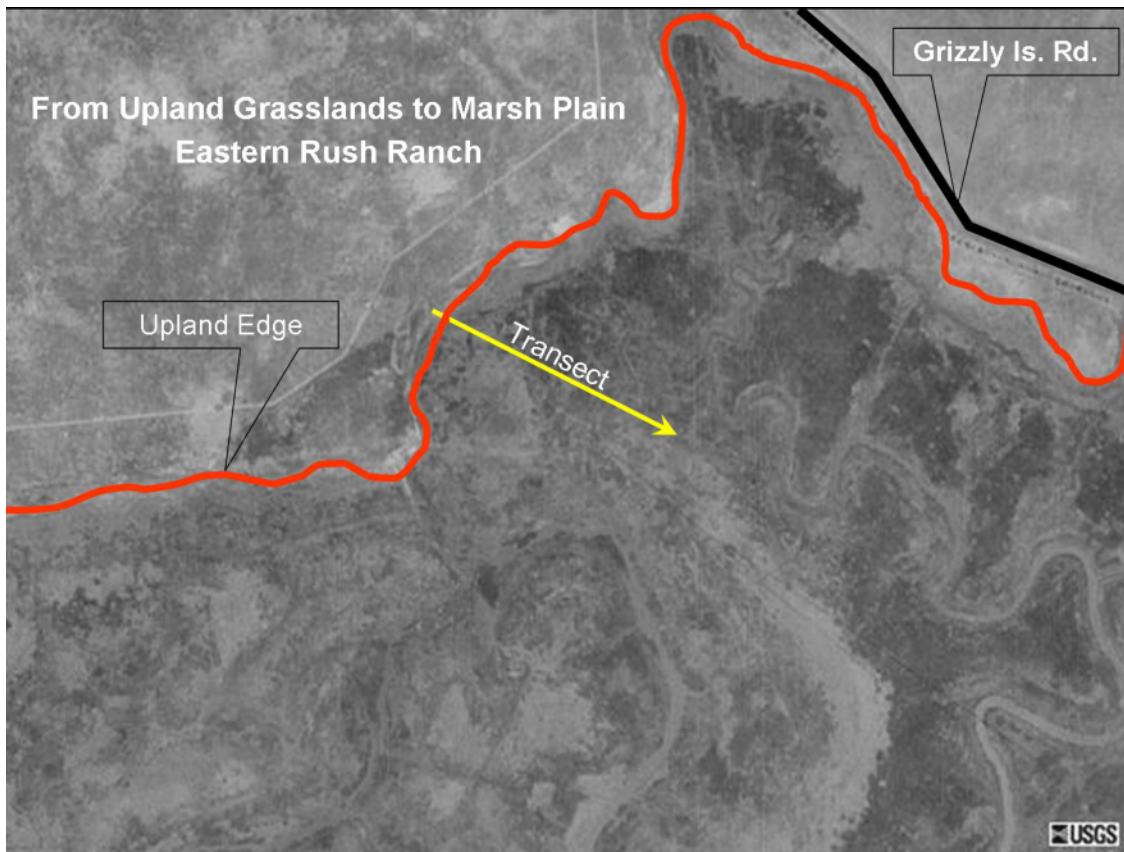
- Ben Greenfield recommended identifying a list of all possible reference sites for each habitat type with a similar hydrologic regime and randomly selecting sites for sampling; sites could also be subdivided into stations and the stations randomly selected for sampling.
- Letitia Grenier agreed with collecting before/after data for each habitat type and suggested picking resident species to monitor. Doug Lipton noted that we should try taking advantage of what has already been collected by the agencies (e.g., CDFG's archived hair samples).
- Don Yee explained that it is not possible to distinguish temporal or spatial variability in composite samples. Therefore, he suggested taking replicate samples to help address the reason for any variability.
- Letitia Grenier expressed her priorities for the reference site sampling as follows:
 1. randomization
 2. increasing sample size
 3. time series data
 4. sampling all habitat types that need to be characterized
 5. focus on species that are appropriate for measuring bioaccumulation
- Ben Greenfield noted that sample size will increase over time so that is less of a concern for him
- Ben Greenfield suggested scaling back onsite monitoring of water and sediment and increasing tissue monitoring.
- Specific observations about reference site sampling details:
 - Letitia Grenier recommended analyzing about 10% of sediment samples for methylmercury.
 - Ben Greenfield commented that the reporting limits for Aroclors were high in the 2004 sampling; Doug Lipton noted that congener analysis was being performed in 2006.
 - Letitia Grenier said that bag bivalves are appropriate for organics but not good for quantifying mercury. Beth Christian noted that bag bivalves are not required in the RWQCB Order.
 - Don Yee explained that feathers and hair can be used for analyzing for mercury, but eggs are needed for trace organics.

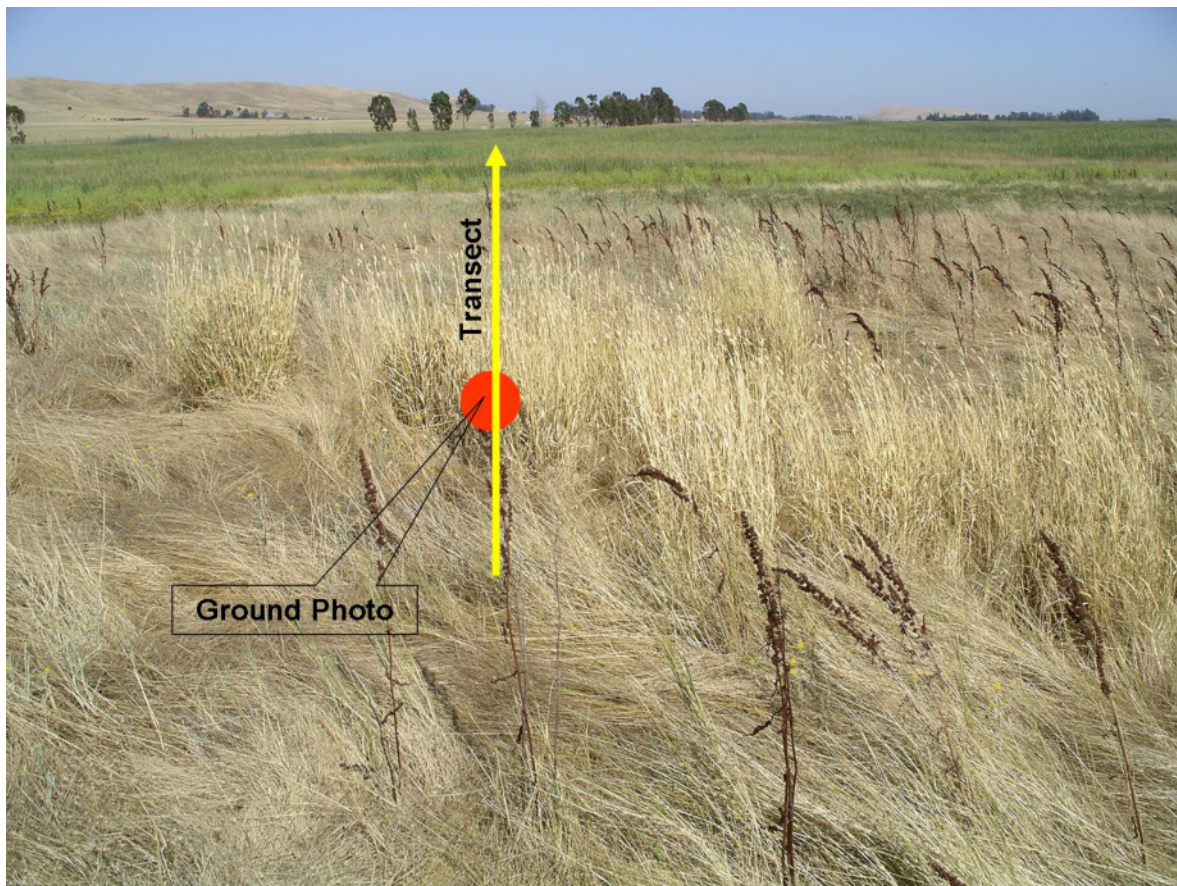
Action Items:

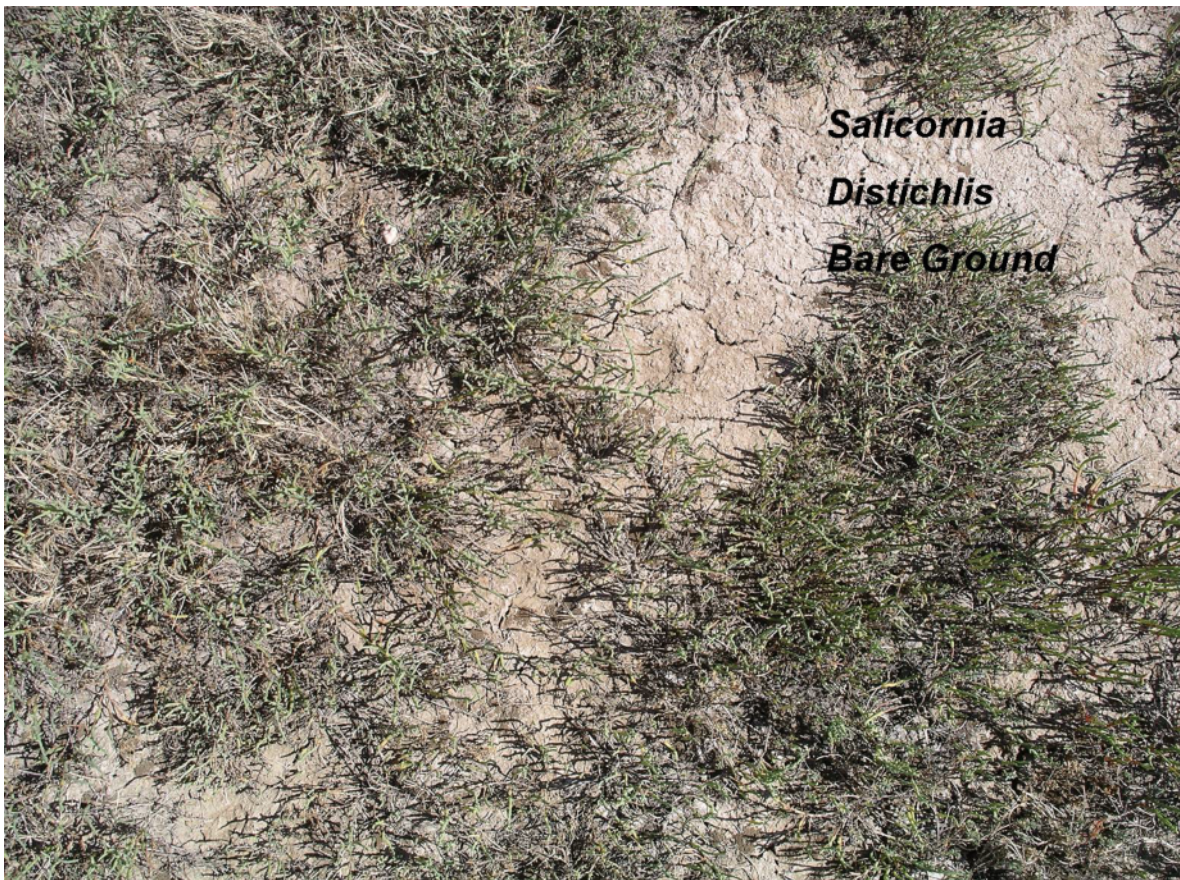
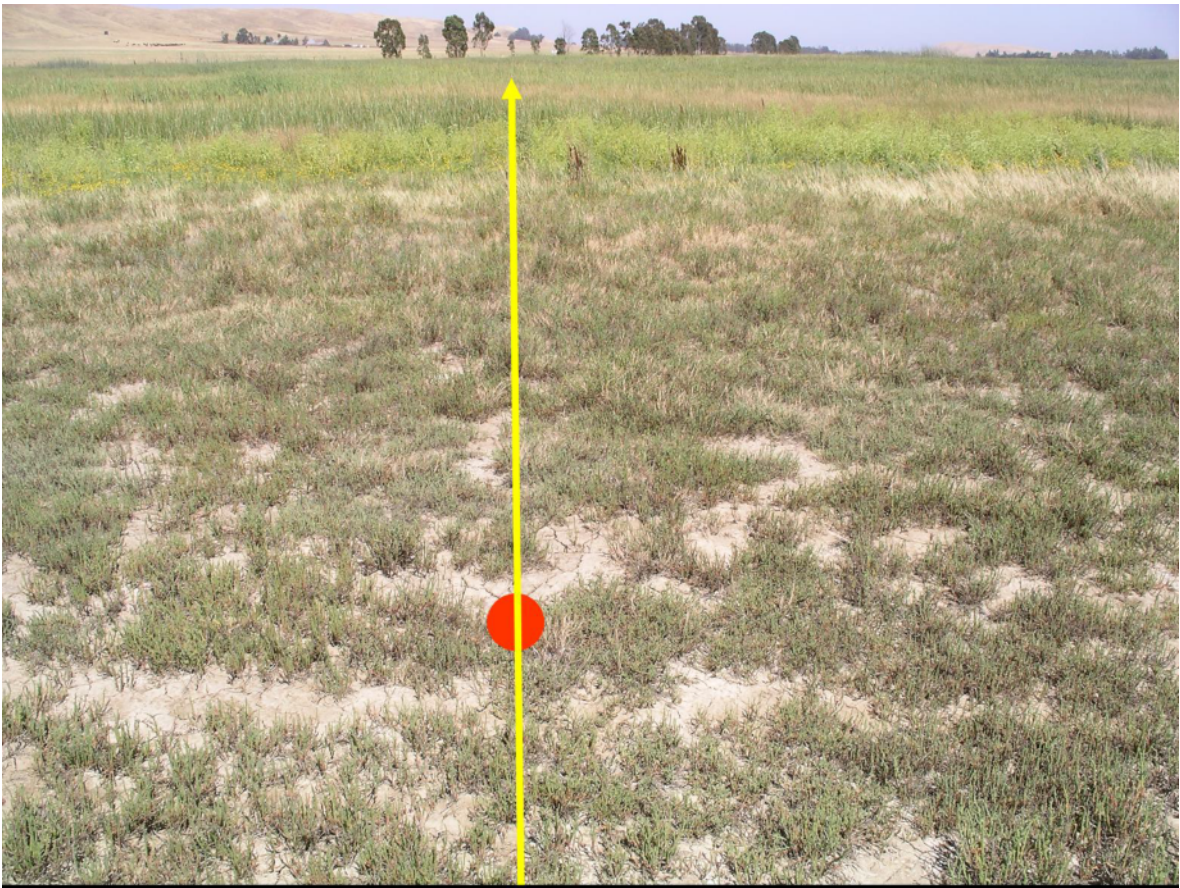
- Letitia Grenier requested a table showing proposed monitoring sites, sample matrices, and analytes for future monitoring years. This type of matrix can be used to help interpret the data and identify data gaps.
- The Montezuma Project Team will prepare a reference monitoring report that will summarize all past reference site work and results and present the approach for future reference site work.

Appendix 4: Photographs of Vegetation Communities Along Transects Taken at Rush Ranch and Denverton Slough

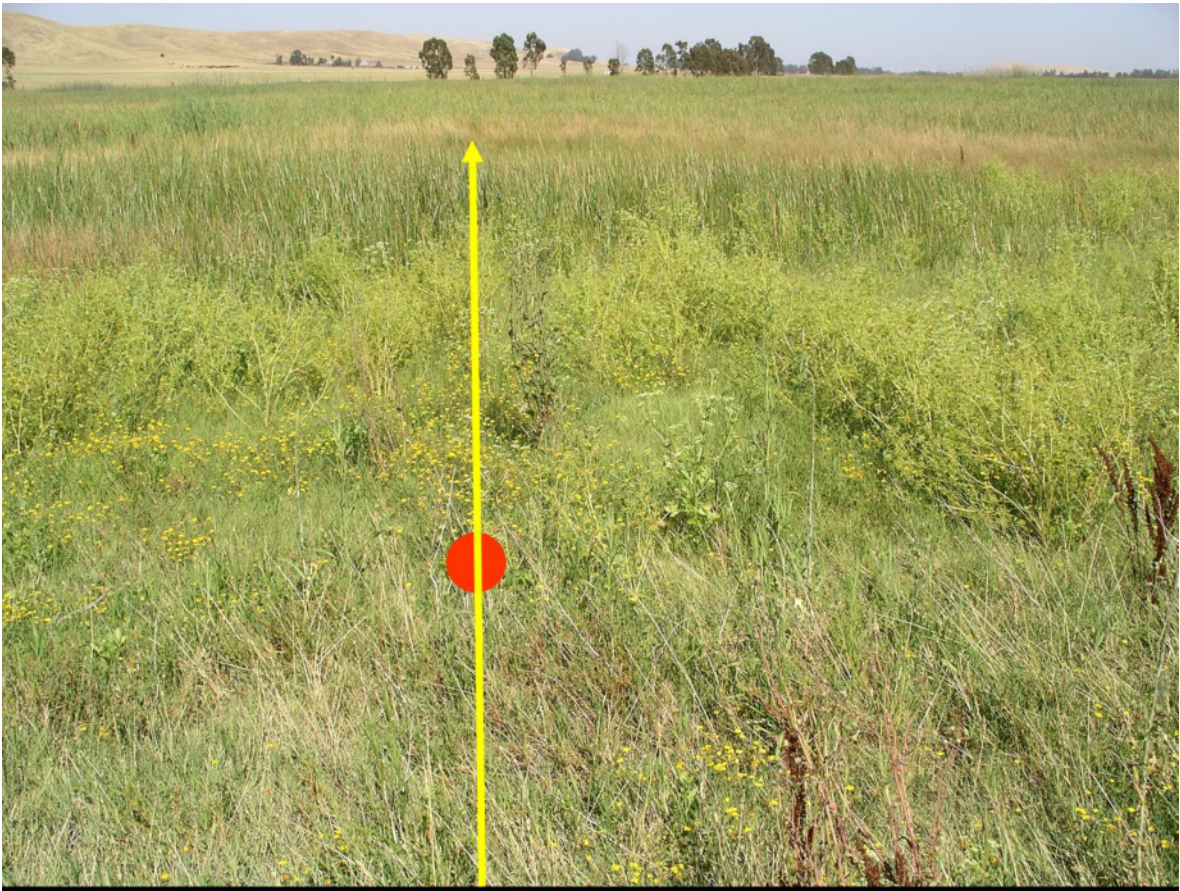
To help in determining the appropriate target elevation for the Project's high marsh, the High Marsh Subteam prepared the following series of photographic transects to illustrate changes in the composition of plant species at different distances from the channel and upland edge in natural high brackish marshes. Transects were taken from the upland grasslands to the marsh plain at eastern Rush Ranch and upper Denverton Slough, which are located north of the Project site. In addition, photographs of the plant species' composition in the drainage divide between channels at Rush Ranch are included.

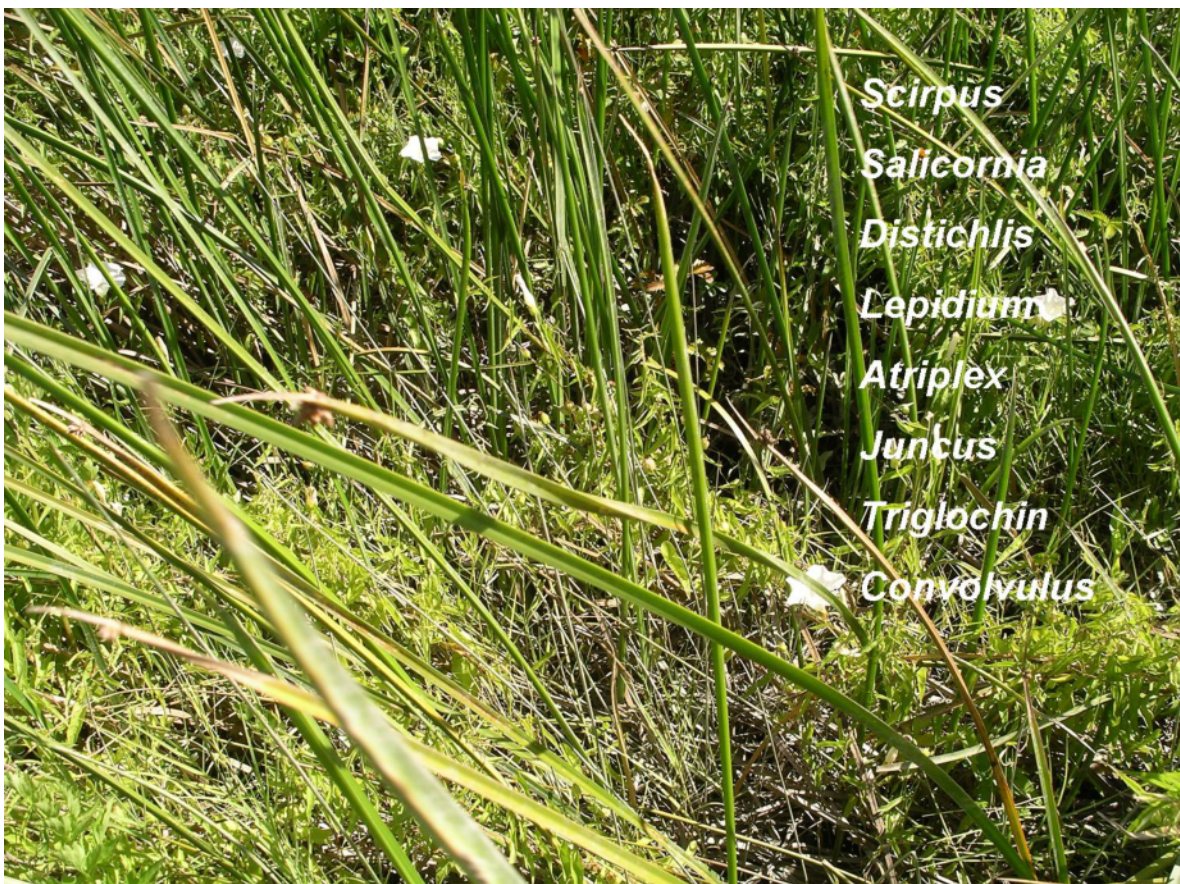


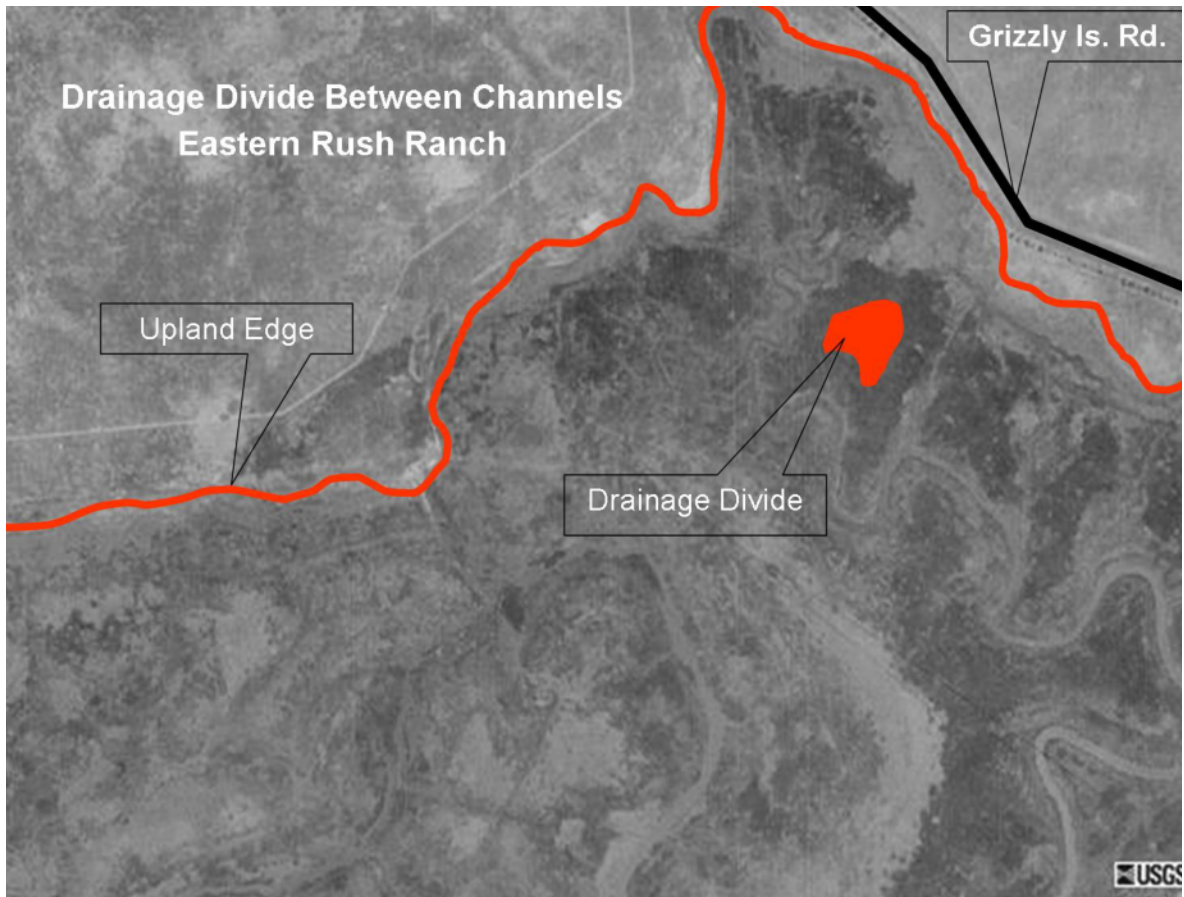


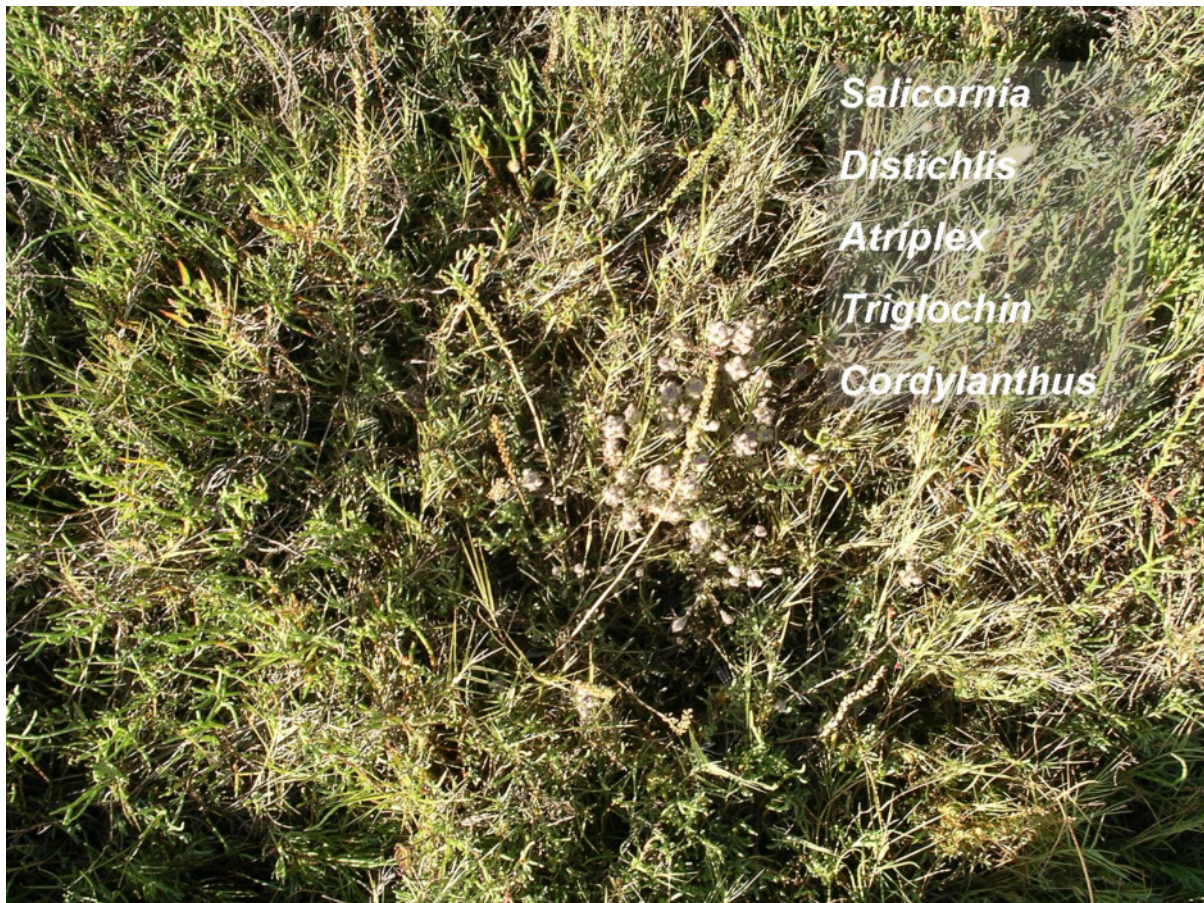
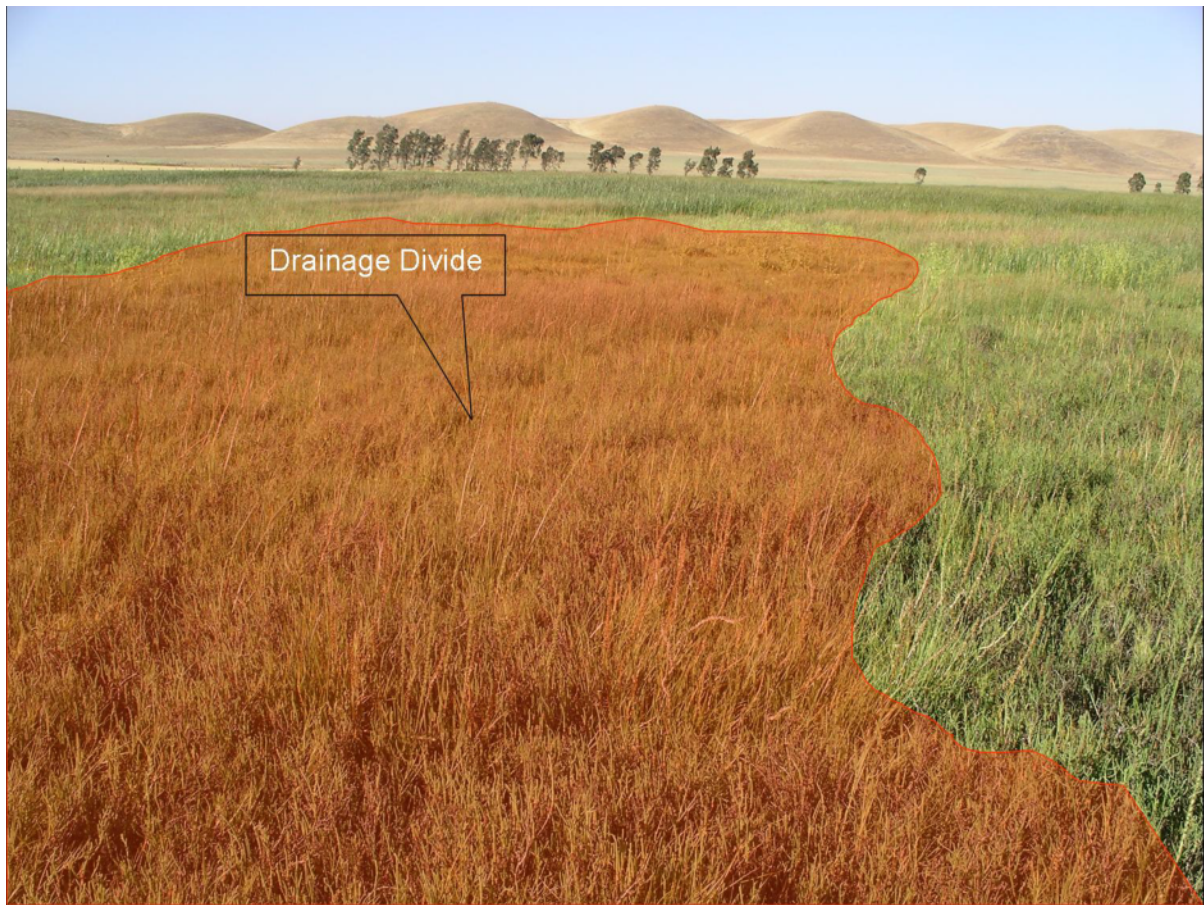


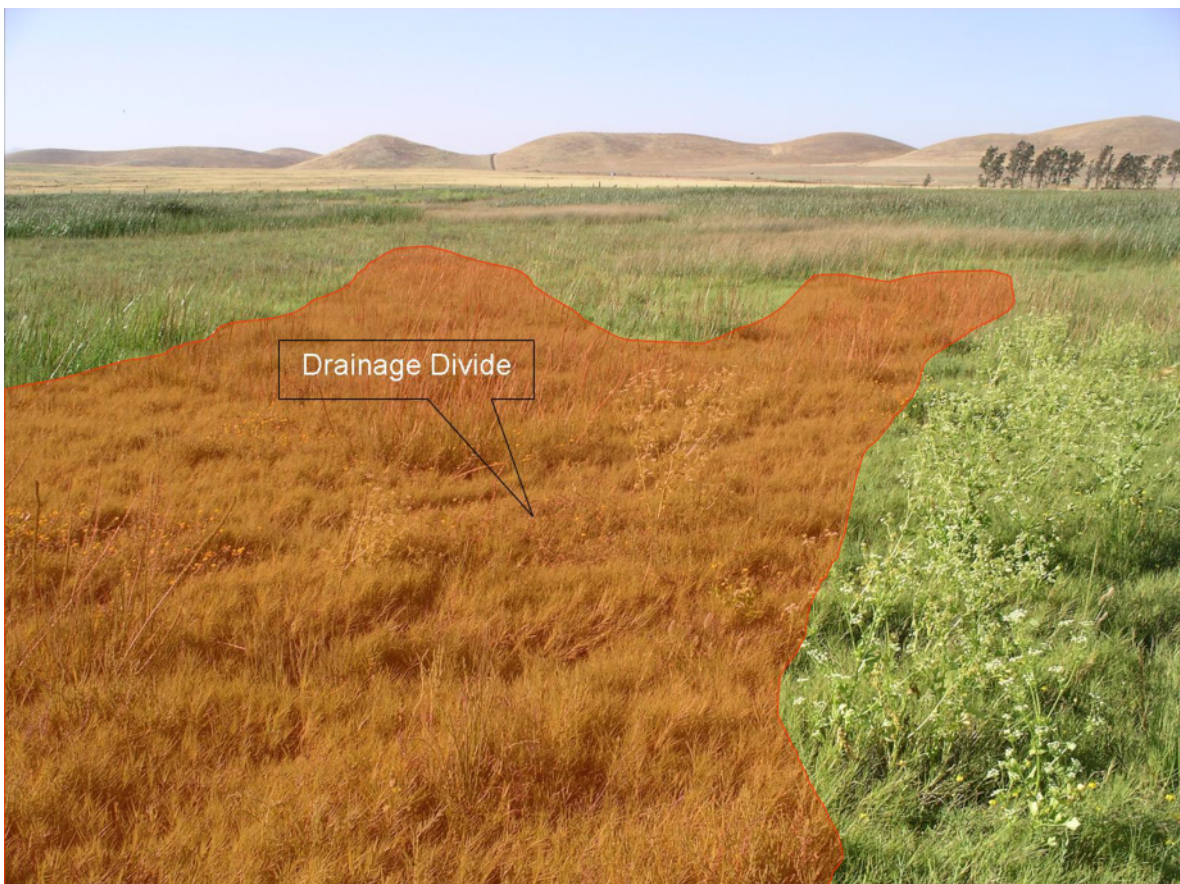




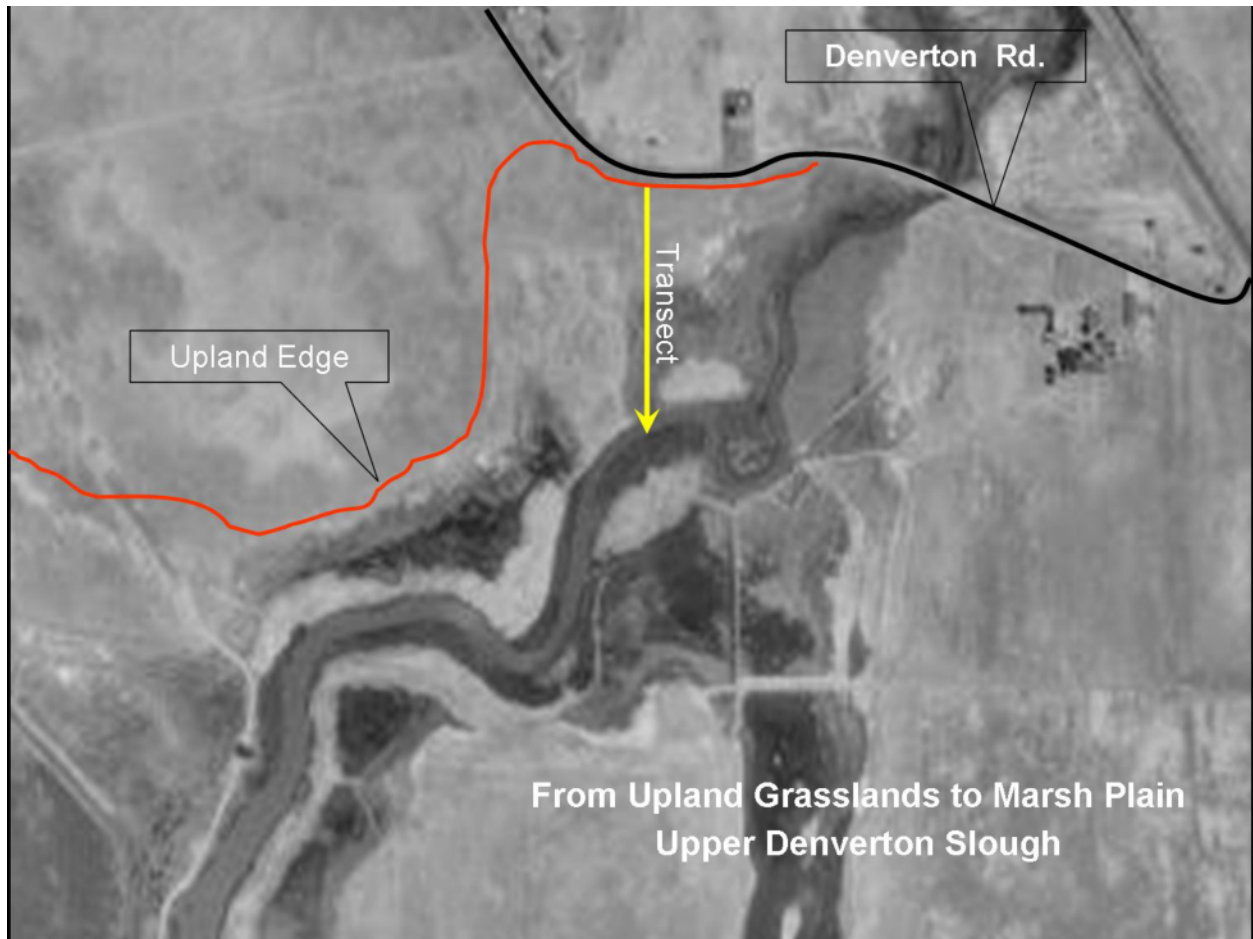


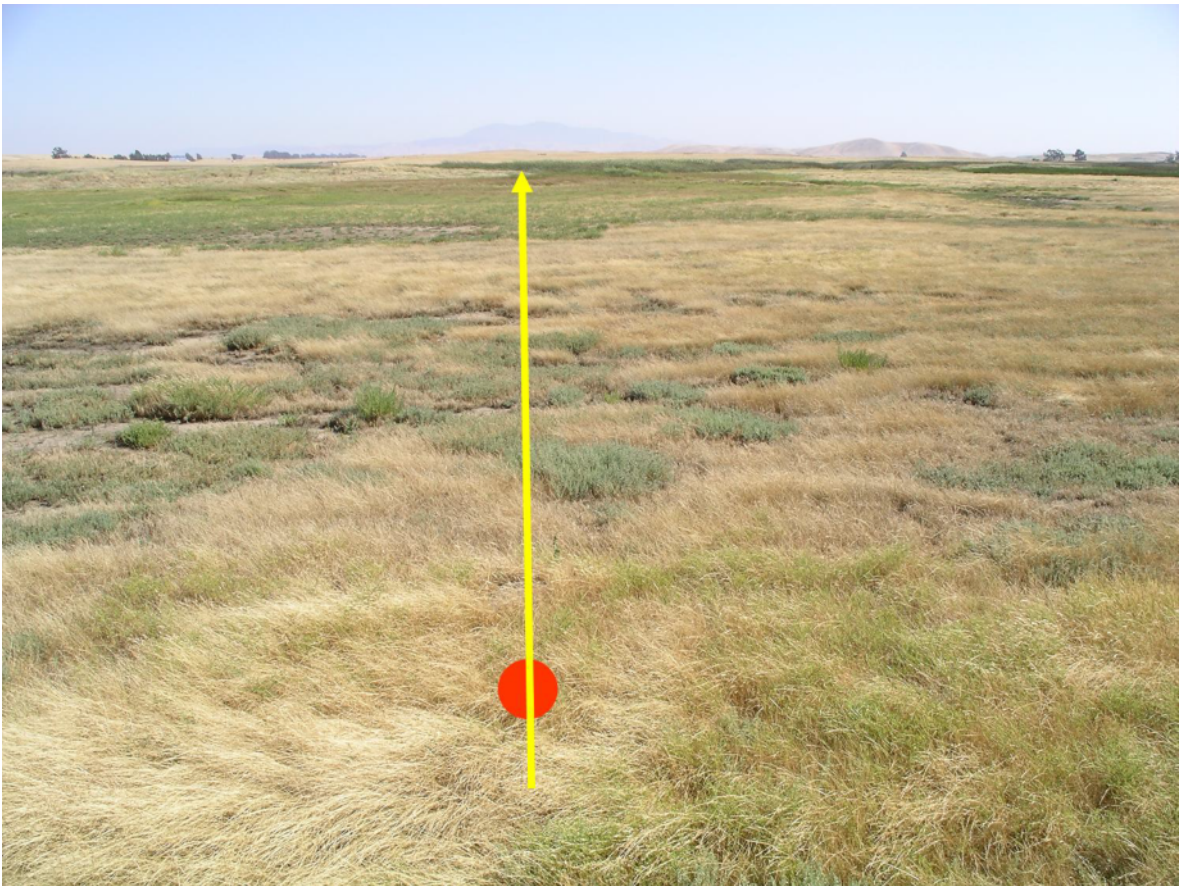


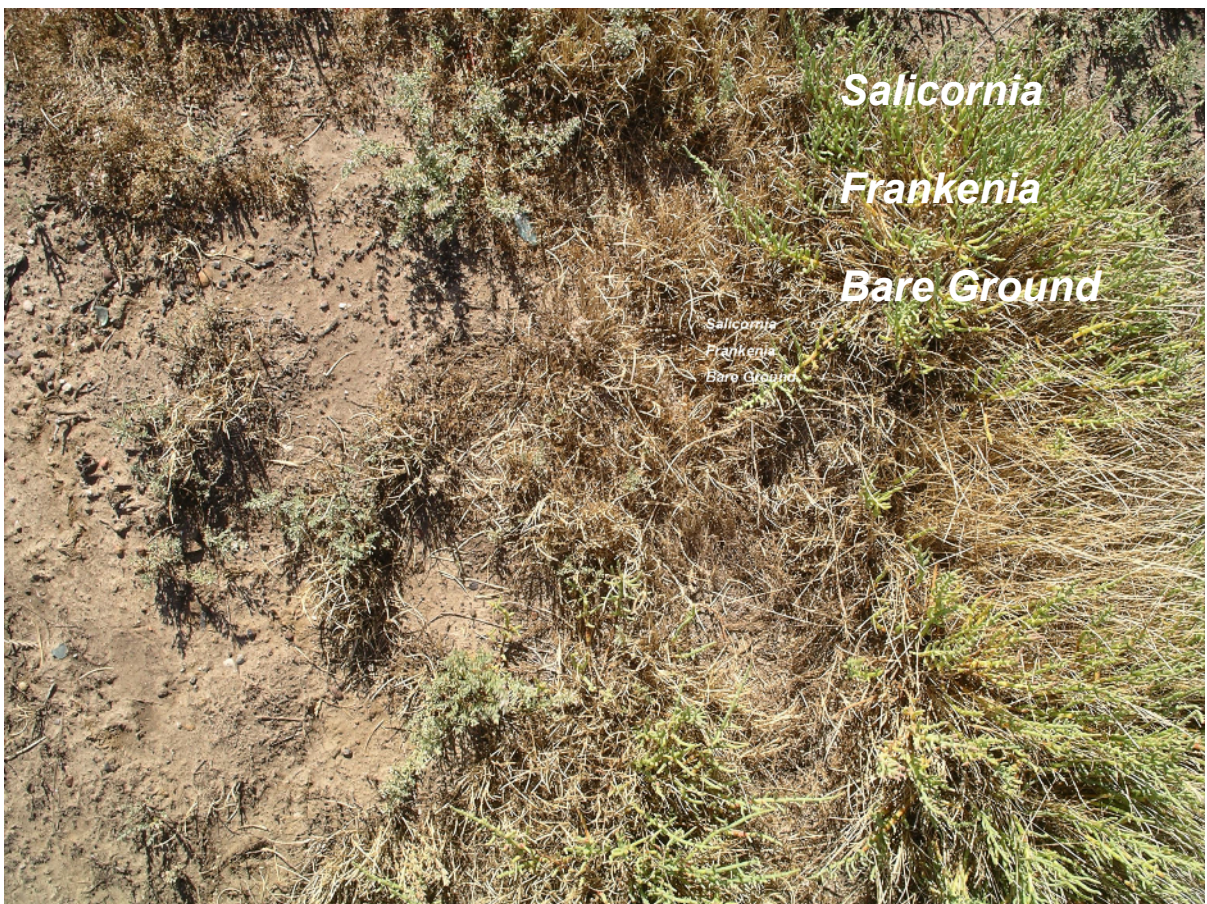














Salicornia

Distichlis

Lotus

Triglochin

