URS

Memorandum

Date: October 20, 2008

To: Craig Freeman and Jill Blanchard, SFPUC Bureau of Environmental Management

From: Steve Leach and Galen Peracca, URS

Subject: Evaluation of Wetlands Associated with Reservoir Operations
Calaveras Dam Replacement Project (CUW 37401)

1.0 INTRODUCTION

Wetlands within the traditional inundation area[1] of the Calaveras Reservoir (Figure 1) would be re-inundated upon completion of the replacement dam project. This memo evaluates regulatory considerations associated with re-inundation of wetlands given that the wetlands are only present as a result of reservoir operations and therefore the current extent of wetlands is dynamically related to the elevation of the reservoir surface.

This memorandum presents the results of two, related studies completed by URS biologists in support of the Calaveras Dam Replacement Project:

- Wetland inundation considerations at other restricted reservoirs in California.
- Variations of the current and former extent of seasonal wetlands along the margins of Calaveras Reservoir.

Section 2 reviews the mitigation requirements associated with re-inundation of wetlands at other California reservoirs as well as the regulatory considerations. URS reviewed a list of restricted and formerly restricted reservoirs in California and interviewed the managers responsible for evaluating the environmental effects of re-inundation. This memo characterizes the applicable regulatory considerations for to this type of situation.

Section 3 presents the results of field studies and aerial photo interpretation undertaken to evaluate historic variations in the extent of seasonal wetlands along the margins of Calaveras Reservoir. Information from these studies is used to evaluate the potential extent of seasonal wetlands along the restored reservoir margin.

References are presented in Section 4 followed by tables, figures, and photographs. Attachment A summarizes the data points that were documented during the 2008 field surveys.

[1] The traditional or historic inundation area includes the area between the current target maximum lake level as identified by the California Divisions of Safety of Dams (705 feet elevation [NGVD 1929 datum]) and the traditional normal maximum water surface elevation (756 feet). The proposed project would restore the traditional lake level by replacing the existing dam with one that meets all seismic safety requirements.

2.0 RESTRICTED RESERVOIRS, A REVIEW

URS reviewed a list of dams with reservoir restrictions and interviewed operators of dams regarding mitigation requirements associated with inundation impacts. The purpose of this review was to identify other reservoirs, like Calaveras Reservoir, that have had reduced water surface elevations and to determine whether mitigation was required to address inundation of wetlands caused by restoring the original water surface elevation.

2.1 Methods

Approximately 50 dams with reservoir restrictions were reviewed. Reservoirs from this list were selected for further consideration if they had been restricted for at least four years and the surface elevation had been reduced by approximately 20 feet or more. A restriction of 20 feet or more was selected for this evaluation because it would substantially change the hydrology of wetlands that might occur along the margins of a reservoir. Sixteen reservoirs managed by seven different operators met the selection criteria and were contacted. Five reservoir operators responded to our phone calls and provided information, including:

- Los Angeles County Dept. of Public Works (six dams, including Big Tujunga Dam)
- San Luis Obispo County Dept. of Public Works (Lopez Dam)
- East Bay Municipal Utility District (San Pablo Dam)
- Santa Clara Valley Water District (Coyote Creek Dam)
- Paradise Irrigation District (Magalia Dam)

These operators are responsible for ten of the sixteen identified reservoirs.

2.2 Results

Table 1 summarizes the operators that were contacted and the information that they provided. The Los Angeles County Department of Public Works and the San Luis Obispo County Department of Public Works have recently completed projects (Big Tujunga and Lopez Dam, respectively) that restored the original reservoir surface elevations. Neither of these projects was required to provide mitigation for the inundation of wetlands. Big Tujunga Reservoir had been restricted to a water surface elevation that was 77 feet below the dam spillway and Lopez Lake had been restricted to approximately 20 feet below the dam spillway. Unlike the Calaveras Dam Replacement Project, the resource agencies did not require a delineation of wetlands along the margins of the Big Tujunga Reservoir and Lopez Lake and the affected features were not formally delineated or evaluated during the respective environmental reviews.

The East Bay Municipal Utility District (EBMUD) has recently completed the environmental review for proposed repairs to the San Pablo Dam. No mitigation for inundation effects was required in the Environmental Impact Report; however, the Water Quality Certification (WQC) issued by the Regional Water Quality Control Board (RWQCB) in May 2008 will require mitigation if there is a net reduction in wetlands around the perimeter of the reservoir once the reservoir level is restored. EBMUD has initiated a formal delineation of the wetlands along the reservoir margin to establish the baseline condition[2].

[2] Note: the RWQCB issued a WQC prior to the wetland delineation and required a baseline assessment after project approval.

Magalia Dam, operated by the Paradise Irrigation District, and Coyote Creek Dam, operated by the Santa Clara Valley Water District, have not initiated efforts to evaluate in-reservoir wetlands as part of their work to restore the original reservoir surface elevations.

2.3 Regulatory Considerations

The US Army Corps of Engineers (USACE) does not regulate the inundation of wetlands because water is not considered "fill" under Section 404 of the Clean Water Act. (33 CFR 323.2 (e)(f); 67 FR 31129). Likewise, the USACE would not require a formal wetland delineation to be completed for an area that will not be considered in a Section 404 Permit application, such as an area that is subject to inundation only, not fill. Accordingly, many of the restricted reservoirs studied (Big Tujunga Reservoir, Lopez Lake and San Pablo Reservoir) were not required to complete federal wetland delineations or address impacts to such wetlands from inundation at the federal level.

The State and Regional Water Quality Control Boards (RWQCB) regulate impacts to "waters of the State" defined as " any surface water or groundwater, including saline waters, within the boundaries of the state. (Cal Water Code S. 13050). Fringe wetlands around the Calaveras reservoir would be included in this definition.

The RWQCB is under a general mandate to implement a "No Net Loss" policy for wetlands which could potentially include impacts associated with inundation (Executive Order W-59-93, California Wetlands Conservation Policy, August 23, 1993 [CWCP])[3]. However, it is unclear under which regulatory process this analysis should fall. The Water Quality Certification process is meant to address impacts to federal waters pursuant to Section 401 of the Clean Water Act. Since the 404 Permit with the USACE would not include inundation impacts, the 401 Water Quality Certification would not necessarily need to address these impacts to certify compliance with State Water Quality standards. The California Porter-Cologne Act allows for a broader review of potential impacts to wetlands through a request for Waste Discharge Requirements, but this process is meant to primarily address potential impacts to water quality associated with the addition of a waste or "pollutant" to waters, not by inundation for municipal drinking water storage (Cal Water Code S. 13260 et. seq.).

Assuming that the RWQCB does have regulatory authority to address inundation impacts to wetlands, the “No Net Loss” policy may be applicable in the case of water supply reservoirs. Specifically, the CWCP provides for specific flexibility to signatory state agencies (which includes the San Francisco Bay RWQCB) to analyze the wetland impacts resulting from water supply reservoirs differently from other types of projects. The CWCP includes the following provision:

> *III. G. Encourage regulatory flexibility to allow public agencies and water districts to create wetlands but later remove them if the wetlands are found to conflict with the primary purpose to which the property is devoted.*
> *Participating entities: Cal/EPA, SWRCB, RWQCB, Fish and Game, Office of Permit Assistance, BT&H, T&C, CDFA, Resources Agency, CCC, BCDC, SLC.* CWCP, p. 4

[3] Source for CWCP information: http://ceres.ca.gov/wetlands/policies/governor.html

Provision III. G. notes that many large public and private land owners, such as flood control agencies and water districts, can often integrate substantial wetland habitat into the operation of their lands. This habitat, however, may need to be removed or modified periodically for the agency to achieve the primary purpose to which the land is devoted, e.g., water storage or flood management. Many agencies with the potential of creating temporary wetland habitat would do so if they had assurances of regulatory flexibility.

It appears that Section III. G of the CWCP is applicable to existing reservoirs like Calaveras (and the others studied) to grant water districts the ability to impound water and create wetlands without penalty for purposes of municipal water supply. This regulatory flexibility not only recognizes the higher function of the property (i.e., for water supply, a designated beneficial use under the Basin Plan), but also encourages water agencies to create wetlands whenever possible during operations by removing the future liability for inundation impacts. If such a policy were not implemented, water agencies would be more likely to manage and prevent the growth of sensitive habitats simply to maintain their ability to freely operate facilities to meet the demands of customers in accordance with water supplies. It is not known how the San Francisco Bay RWQCB will apply this flexibility to allow for the management of Calaveras reservoir to support the municipal water supply.

The California Environmental Quality Act (CEQA) has a slightly more expansive definition of wetland impacts. Per the "Environmental Checklist" within the CEQA guidelines, a project is considered to have a significant impact to wetlands if it would "*have a substantial adverse effect on federally protected wetlands as defined by Section 404 of the Clean Water Act (including, but not limited to, marsh, vernal pool, coastal, etc.) through direct removal, filling, hydrological interruption, or other me*ans" (CELSOC 2008). Inundation of wetlands could be considered an effect as defined by this threshold, but determining whether the effect is adverse and substantial would depend on whether inundation results in a substantial net change in the extent of wetlands compared to baseline conditions.

Net effects to wetlands were not evaluated in the CEQA documents for Big Tujunga Dam, Lopez Dam, or San Pablo Dam. The only identified case where inundation was considered is the San Pablo Dam Seismic Upgrade project. A condition specified in the WQC issued by the SF RWQCB for the San Pablo Dam project would require mitigation based on the net effect of inundation on wetlands rather than the total effect (RWQCB 2008). As referenced above, the delineation and subsequent monitoring for the net effect was required *after* issuance of the WQC, not beforehand. Absent this one, wetland-related condition for a reservoir restoration project, no records were identified of resource agencies regulating wetlands associated with reservoir operations.

The CEQA document generally provides the baseline for the RWQCB's initial assessment of impacts and this baseline is usually determined at the Notice of Preparation (NOP) stage. However, the CEQA guidelines were revised in 1998 to allow for lead agency flexibility to consider the environmental baseline in context with existing conditions which may include water utility operations (CERES 2008). The analysis below (Section 3.0) highlights the dynamic nature of the Calaveras Reservoir, indicating that a "snapshot" picture of conditions on the NOP date (or, as it happened, the wetland delineation date) would not necessarily provide an accurate picture of the current status of wetlands around the reservoir. And, that a more accurate

presentation would necessarily include the dynamism of the presence of wetlands over the past several years while the reservoir was operating in restricted conditions.

2.4 Conclusions

Impacts have not been assessed, nor has mitigation been consistently required for inundation effects to wetlands among the reviewed projects, likely as a result of the somewhat conflicting regulatory requirements on the state versus federal level, the uniqueness of these types of situations, and the importance of preserving municipal water supply. When balancing the importance of preserving a "No Net Loss" wetland policy with the need for water purveyors to control operations to maintain a reliable municipal water supply, the analysis applied to the EBMUD San Pablo Dam repairs provides one possible solution. Specifically, the impacts analysis would rely on the estimated net effect of inundation on wetlands rather than the total effect (RWQCB 2008). The following section provides an evaluation of wetlands along the margins of Calaveras Reservoir to help understand the post-project net effect on wetlands due to inundation.

3.0 EVALUATION OF WETLANDS ALONG THE MARGINS OF CALAVERAS RESERVOIR

This section evaluates the distribution of seasonal wetlands along the southern margin of Calaveras Reservoir. Two alternate hypotheses are considered:

1. The distribution of seasonal wetlands are dynamic and variable depending on the water surface elevation; or
2. The distribution of seasonal wetlands is relatively static (i.e., not responsive to water surface elevation).

In 2000, the SFPUC began restricting the volume of water stored in Calaveras Reservoir. The normal maximum water surface elevation of 756 feet was reduced to approximately 705 feet. Prior to this reduction, the water surface of Calaveras Reservoir had a fairly regular pattern of seasonal fluctuations: higher during the winter and lower during the late summer. The currently reduced reservoir storage has exposed a large area of the lake bed at the southern margin of the reservoir, thereby changing the distribution of seasonal wetlands along the reservoir's southern margin. This section evaluates the wetland distribution along the southern margin of the reservoir based on a review of publicly available historic aerial photos from 1993 to 2007 and field surveys conducted in April 2008 to ground-truth the aerial photos.

3.1 Methods

URS biologists reviewed a time-sequence of aerial imagery that illustrates fluctuations in the reservoir margins and associated saturated soils (Figure 2). Field work was conducted to compare the existing conditions with the locations of potential wetland features identified in aerial photos from 1993 to 2007. Existing conditions were then compared with the patterns of vegetation identified in the aerial imagery.

Aerial Photo Review. Five aerial images from 1993, 1996, 2000, 2006 and 2007 were compared. Four of these images (1996-2007) are shown in Figure 2[4]. Previous wetlands were identified and estimated based on a preliminary analysis of the aerial imagery. The southern margin of the reservoir was targeted as a location of interest in this study due to the preponderance of previous and current wetlands in the area. The preliminary analysis of the images clearly illustrates a distinct band of green vegetation that appears to follow the changing shoreline margins. These types of locations with a high probability of past wetland occurrence were selected for field verification.

Field Verification. The aerial photo interpretation was field verified on April 17, 2008. Several standard variables were evaluated in the field including plant species composition, hydrology and soils of potential wetland and upland areas visible in the aerial photos. URS biologists visited six new locations of interest in the areas targeted by the imagery analysis and one seep and four seasonal wetlands that had been mapped by May and Associates in 2006. Soil characteristics, hydrologic patterns, and vegetation were recorded at each sample site location to determine the extent and character of potential historic wetland areas adjacent to the historic inundation levels of the reservoir. The sample point locations are shown on Figure 2 and the sample points are described in Attachment A. Photographs included in Attachment B were taken during the 2008 field verification. The photographs illustrate wetland conditions along the southern edge of reservoir in 2008 and also document evidence of former wetlands associated with pre-restriction conditions (prior to 2001).

3.2 Results

In addition to the reduction in water surface elevation after 2000, the water level of the reservoir also fluctuates seasonally. Figure 3 illustrates the seasonal variations of the water surface elevation. The amount of seasonal variation also varies between years. For example, the water surface elevation in April 2008 was higher than the water surface in April 2007 (Figure 2).

The five aerial photos in Figure 2 illustrate variations in water surface elevation from approximately 756 feet in 1993 to 705 feet in April 2007. A light green band of vegetation along the margin of the reservoir is visible in all of the color aerial photos. This band appears to correspond to the zone of saturation and/or inundation. Surveys in February 2006 (May and Associates) and in April 2008 (Attachment A) documented that the saturated areas along the margins of the reservoir are dominated by a mix of wetland (hydrophytic) and non-wetland plants. Wetland plants observed in 2006 and 2008 surveys include curly dock (*Rumex crispus*) (FACW-), cudweed (*Gnaphalium luteoalbum*) (FACW-), spiny cocklebur (*Xanthium spinosum*) (FAC+), Canadian horseweed (*Conyza canadensis*) (FAC), clustered dock (*Rumex conglomeratus*) (FACW), and rabbitsfoot grass (*Polypogon monspeliensis*) (FACW+). Non-wetland plants in the saturated zone along the reservoir margin include black mustard (*Brassica nigra*) (NL), burclover (*Medicago polymorpha*) (NL), and milk thistle (*Silybum marianum*)(NL). In the 2008 survey, much of the vegetation along the reservoir margin was dead and appeared to have been recently inundated (the reservoir water level was decreasing) (See photo 8)

[4] The 1993 aerial photo is not included on Figure 2 because it is black and white and was only used to compare the extent of inundation relative to the normal maximum water surface elevation (756 feet).

The light green band of vegetation in the aerial photos appears to be consistent with the occurrences of seasonal wetland plants observed by URS in April 2008 and by May and Associates in 2006. The URS April 2008 field investigation documented that the soil at all sample points below the normal water surface elevation (756 feet) exhibited redoximorphic features that are typical of wetland (hydric) soils even if wetland vegetation or hydrology were absent (see photo 7). Upland areas above 756 feet were also sampled and showed no evidence of wetland soils.

Several observations during the April 2008 field surveys support the conclusion that seasonal wetland vegetation has quickly responded to changes in inundation at Calaveras Reservoir:

- Clumps of spreading rush (*Juncus patens*) scattered among upland grasses near the former inundation limits (Photos 1, 3, and 4);
- Stands of mulefat (*Baccharis viminea*) that parallel a rack line deposited during a previous high water period (Photo 5);
- The prevalence of ruderal, non-native herbaceous wetland plants along the current reservoir margins (Photo 6 and Photo 8). These species produce large numbers of seeds that are readily dispersed by water and air.
- Vegetation and soil information displayed on photos and field data taken around a former shoreline, near the 756 feet contour, document the presence of more persistent seasonal and riparian wetlands (Photos 1-9)

3.3 CONCLUSIONS

The U.S. Army Corps of Engineers (2006) defines wetlands by the overlapping presence of three attributes:

1. wetland hydrology,
2. hydrophytic (wetland) vegetation, and
3. hydric soils.

Based on our review of the available data and our field observations, we conclude that the location and extent of wetlands along the margins of Calaveras Reservoir is variable. The features that were delineated along the reservoir margins in 2006 had been previously inundated as evident in aerial photos from 1993 and 1996.

Observations in April 2008 support the conclusion that wetland vegetation (the first wetland attribute) has quickly responded to the changing extent of inundation and saturation (wetland hydrology) along the reservoir margins since 2000. The second wetland attribute, hydric soils, appears to be widespread in the former inundation area: our field surveys documented the presence of hydric soil characteristics throughout the former inundation area. The third wetland attribute, wetland hydrology is dynamic due to seasonal changes in inflow, outflow and evaporation that affect the surface elevation of the reservoir (Figure 2). The aerial photos presented in Figure 2 display the dynamic variations in water levels and associated changes in the extent of seasonal vegetation along the reservoir margin.

URS biologists documented existing and former wetlands along the southern margin of Calaveras Reservoir that would be likely to expand if the normal maximum water surface elevation was re-established. Most of the existing wetlands along the current reservoir margins

are dominated by non-native, seasonal wetland species that are responsive to changes in the reservoir water surface elevation. Photos and field data from the former shoreline near the 756 feet contour, document the presence of more persistent seasonal and riparian wetlands (Photos 1-9). One of the more interesting features is a large stand of arroyo willow (*Salix lasiolepis*) (FACW) near the former confluence of Calaveras Creek and Calaveras Reservoir (Photo 1). This stand was not delineated as a wetland in 2006 but adventitious roots on the trunks of the willows indicate that the site was previously inundated (Photo 2). This observation is consistent with the 1993 aerial photo. Although wetlands develop more rapidly with receding waterlines owing to the retained moisture of previously inundated soils, the presence of established stands of hydrophytic trees, shrubs, and perennial herbaceous species (e.g. spreading rush) support our conclusion that wetlands would quickly re-establish along the periphery of the reservoir's former inundation line, following the re-inundation of the reservoir to the 756 contour (Normal Maximum Water Surface Elevation).

Where underlying geologic and soil conditions support appropriate hydrology, wetlands can be highly responsive to changes in hydrology (e.g. changes in reservoir inundation). The extent and type of wetlands along the southern margin of Calaveras Reservoir have been highly variable and wetland features have re-established quickly in response to changes in water level. Evidence of some wetland features that were associated with the former inundation limits is still evident. Based on these observations, it is likely that wetlands would re-establish at the former normal maximum water surface elevation (756 feet) as shown in the 1996 and 2000 aerial photographs following completion of the proposed project.

4.0 REFERENCES

CELSOC. 2006. California Environmental Quality Act: CEQA Guidelines. Appendix G. Consulting Engineers and Land Surveyors of California (CELSOC). Sacramento, CA.

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U.S. Army Corps of Engineers. 2006. Interim regional supplement to the Corps of Engineers Wetland Delineation Manual: Arid West Region. Ed. J.S. Wakeley, R.W. Lichvar, and C.V. Noble. ERDC/EL TR-06-16. Vicksburg, MS: U.S. Army Engineer Research and Development Center.

TABLE 1

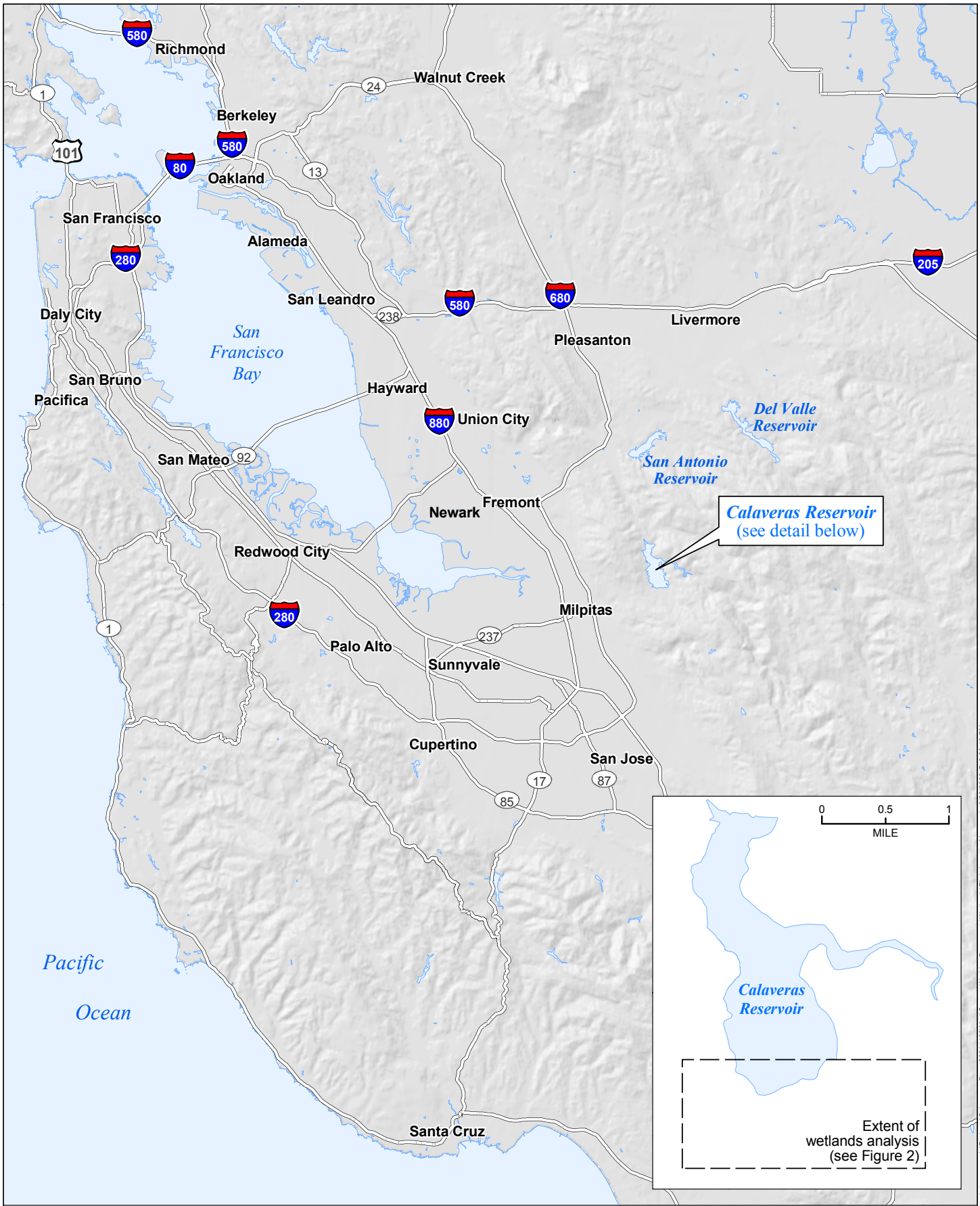
SUMMARY OF DSOD RESTRICTED DAMS AND ENVIRONMENTAL REVIEW OF WETLANDS ASSOCIATED WITH RESERVOIR OPERATIONS

Dam Name	Location	Owner/Contacts	DSOD Restriction	Mitigation Requirements for Inundation of Wetlands
Big Tujunga Dam Max. capacity approximately 4,123 AF	Los Angeles County, California	Los Angeles County Dept. of Public Works Contact: Keith Lilley (626-458-6104)	DSOD restricted level was 77 feet below spillway crest.	No study or mitigation was required for inundation of wetlands associated with reservoir operations. Resource agencies considered dam repairs a benefit to wetlands because of improved downstream habitat associated with better ability to manage releases.
Coyote Creek Dam Max. capacity approximately 24,000 AF	Santa Clara County, California	Santa Clara Valley Water District Contact: Terry Neudorf (408-265-2607 ext. 2695)	DSOD restricted level is 19.2 feet below spillway crest. Dam is located on the Hayward Fault.	Calls not returned.
Lopez Dam Max. capacity approximately 50,000 AF.	San Luis Obispo County, California	SLO County Dept. of Public Works Contacts: Mark Hutchinson (805) 781-5458, Douglas Bird (805) 781-5252	Reservoir was about 20 feet below spillway for 3-4 years.	No requirement to study or mitigate for wetlands that were re-inundated within the original extent of the reservoir.

TABLE 1

SUMMARY OF DSOD RESTRICTED DAMS AND ENVIRONMENTAL REVIEW OF WETLANDS ASSOCIATED WITH RESERVOIR OPERATIONS

Dam Name	Location	Owner/Contacts	DSOD Restriction	Mitigation Requirements for Inundation of Wetlands
Magalia Dam Max. capacity approximately 2,900 AF	Butte County, California	Paradise Irrigation District Contact: John Roadifer, Project Engineer, URS	DSOD restricted level is 25 feet below spillway crest.	URS is currently working with the District. The strategy for repairing the dam to eliminate the restriction has not been determined. No permitting activity.
San Pablo Dam Max. capacity approximately 38,600 AF.	Alameda County, California	East Bay Municipal Utility District Contact: David Katzev (510) 287-2050	Reservoir lowered to 35 feet below spillway crest for 4 years (since 2004).	SFB RWQCB will require mitigation if there is a net reduction in wetlands around the perimeter of the Reservoir. Reservoir was restricted 3- 4 years so not as much time for new wetlands to become established*



N

SCALE 1:500,000

0 2.5 5 10 Miles

URS

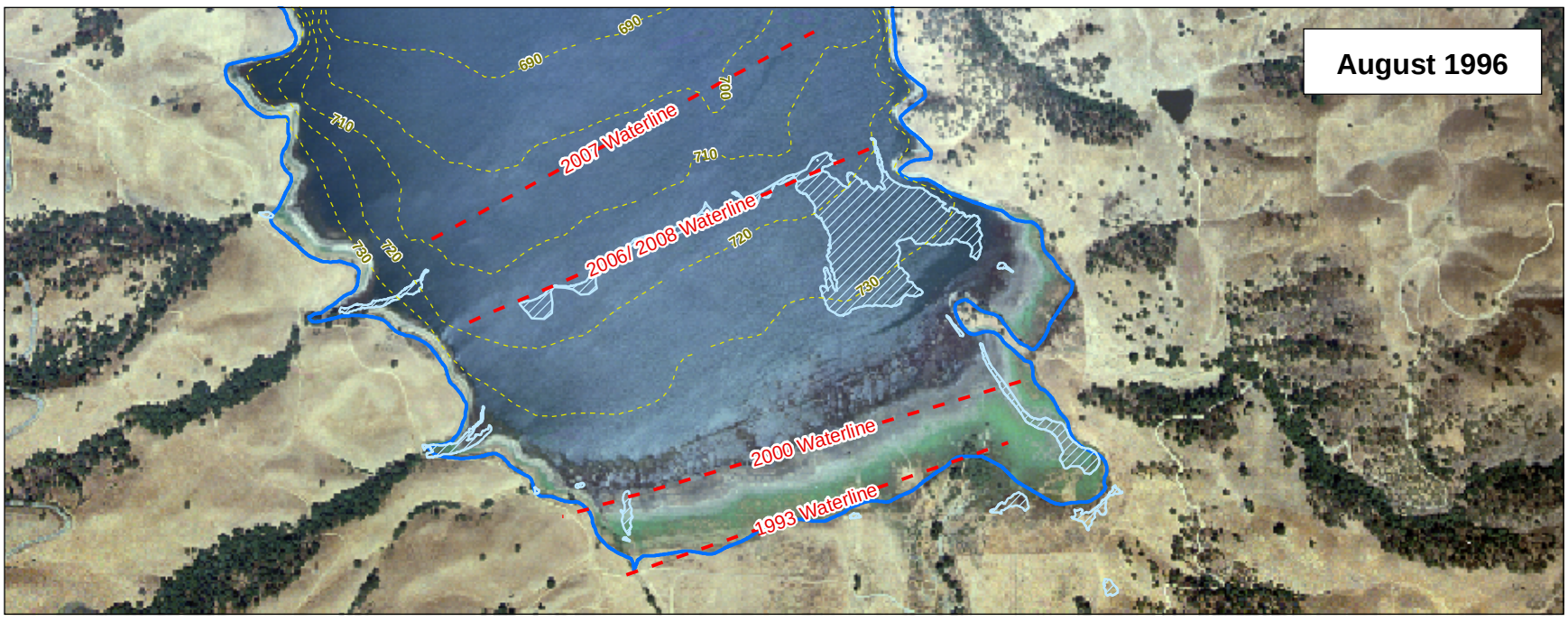
SFPUC
CALAVERAS DAM
REPLACEMENT PROJECT

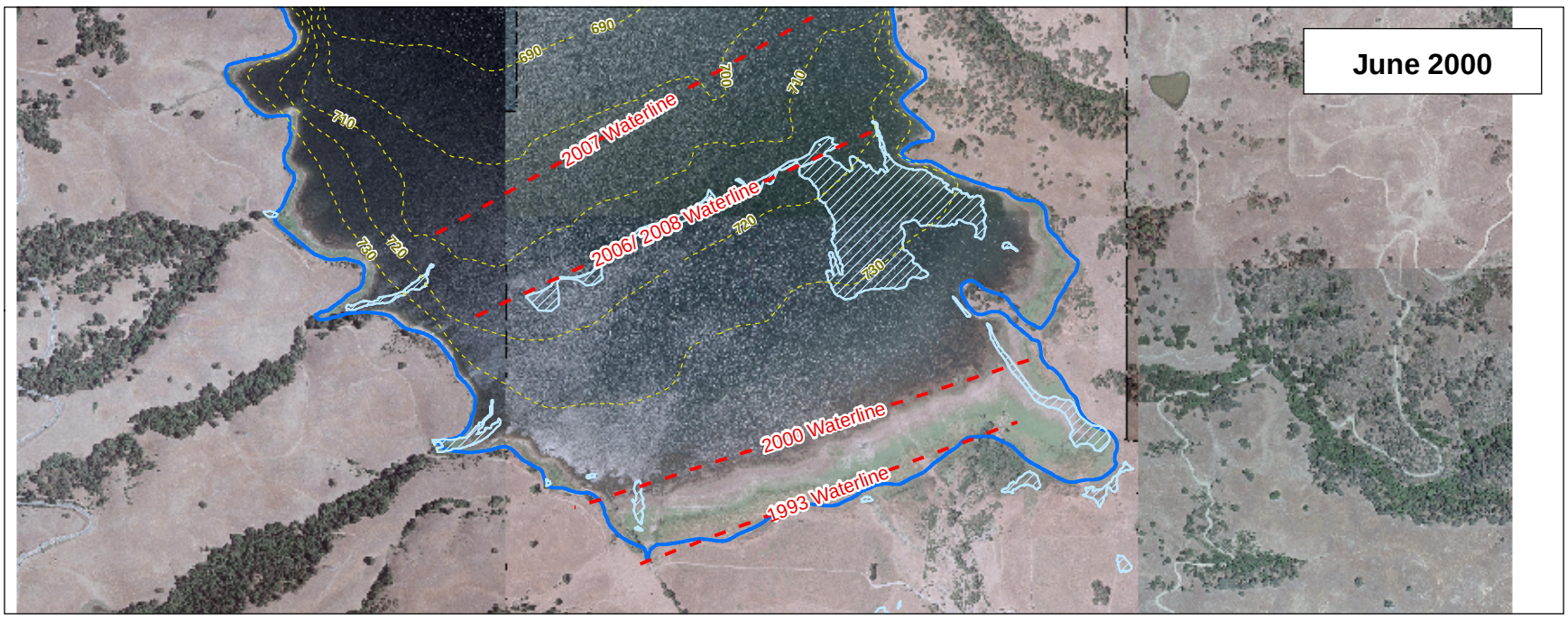
PROJECT NO. 26815610

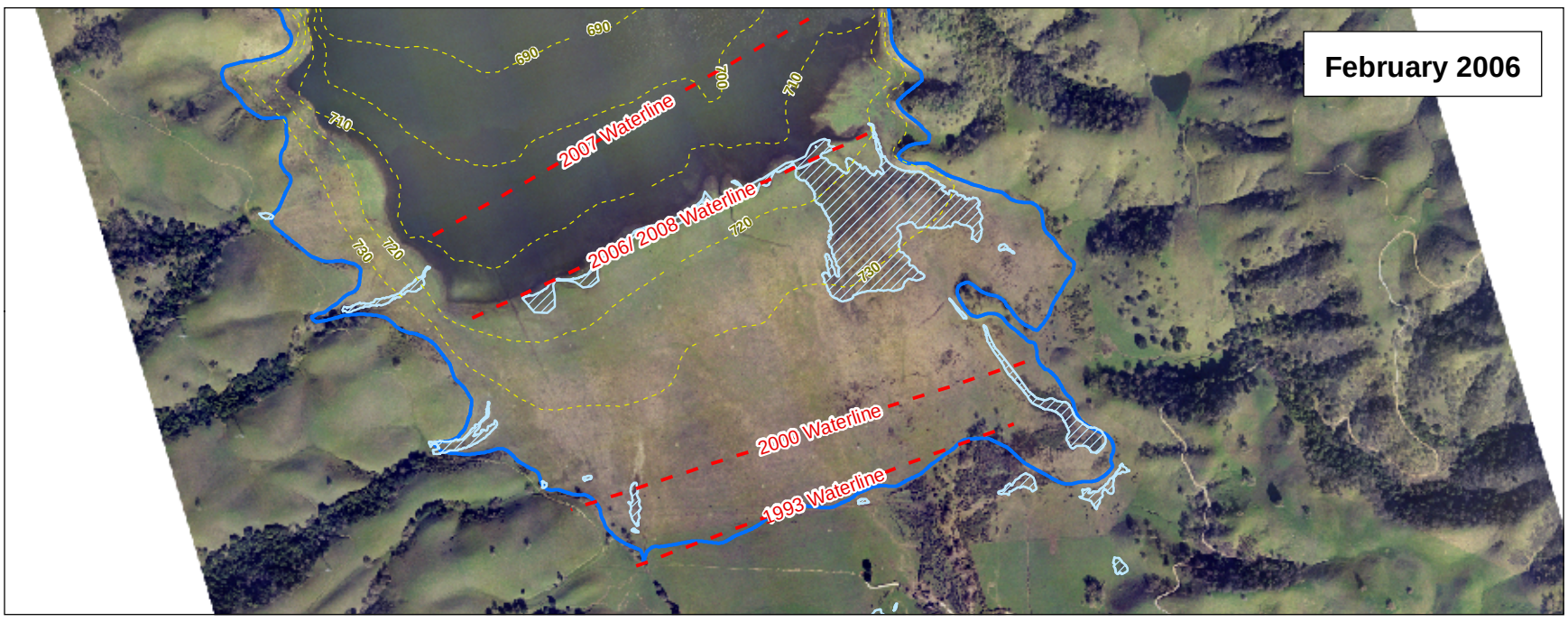
PROJECT LOCATION

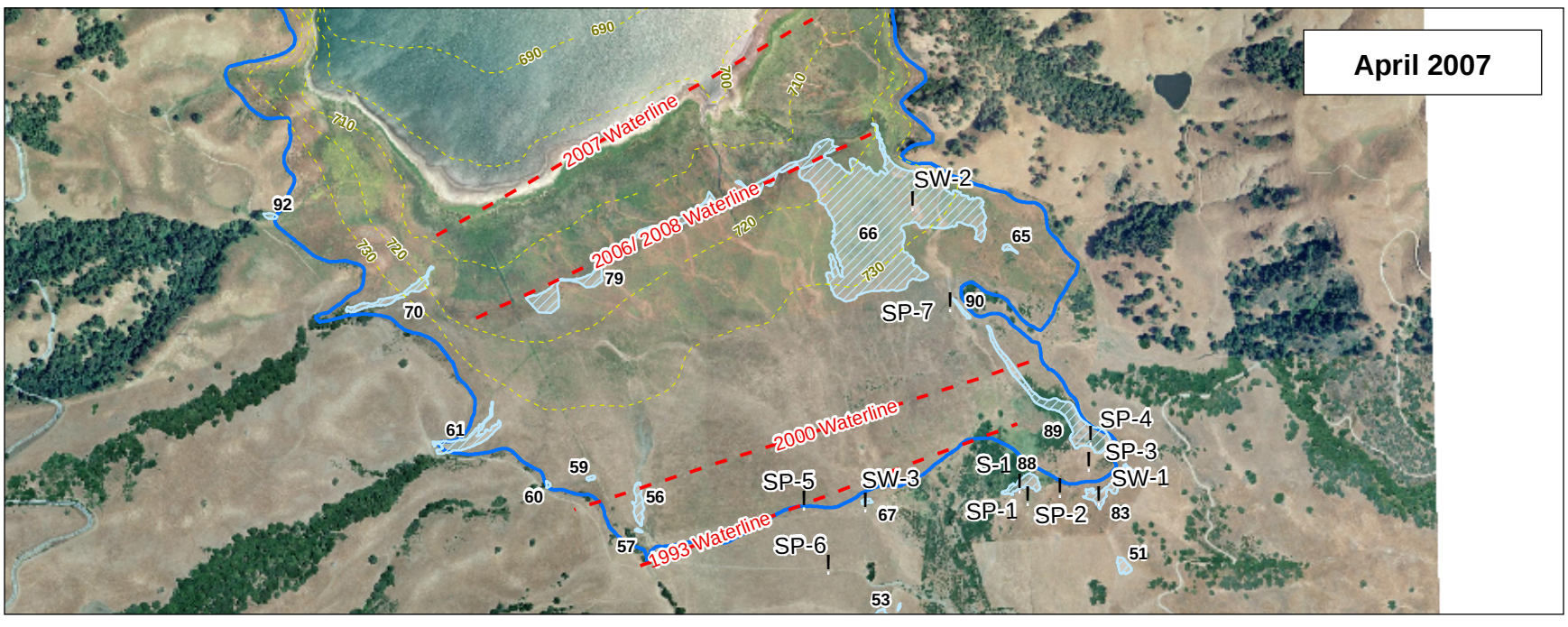
Figure 1

URS Corporation - Oakland CA - C.Raumann L:\Projects\Calaveras_Dam_26814408\Mxd\Current Working Documents\Wetlands\Fig1_LocationMap.mxd - 9/23/2008 @ 2:26:48 PM









SP-1 April 2008 sample points (shown only on 2007 imagery)

Recent inundation limits

70 2006 wetland delineation with ID

Normal maximum water surface elevation (756 ft)

0 1,000 2,000
FEET

WATERLINE COMPARISON FROM 1996-2007 IN RELATION TO 2006 WETLANDS

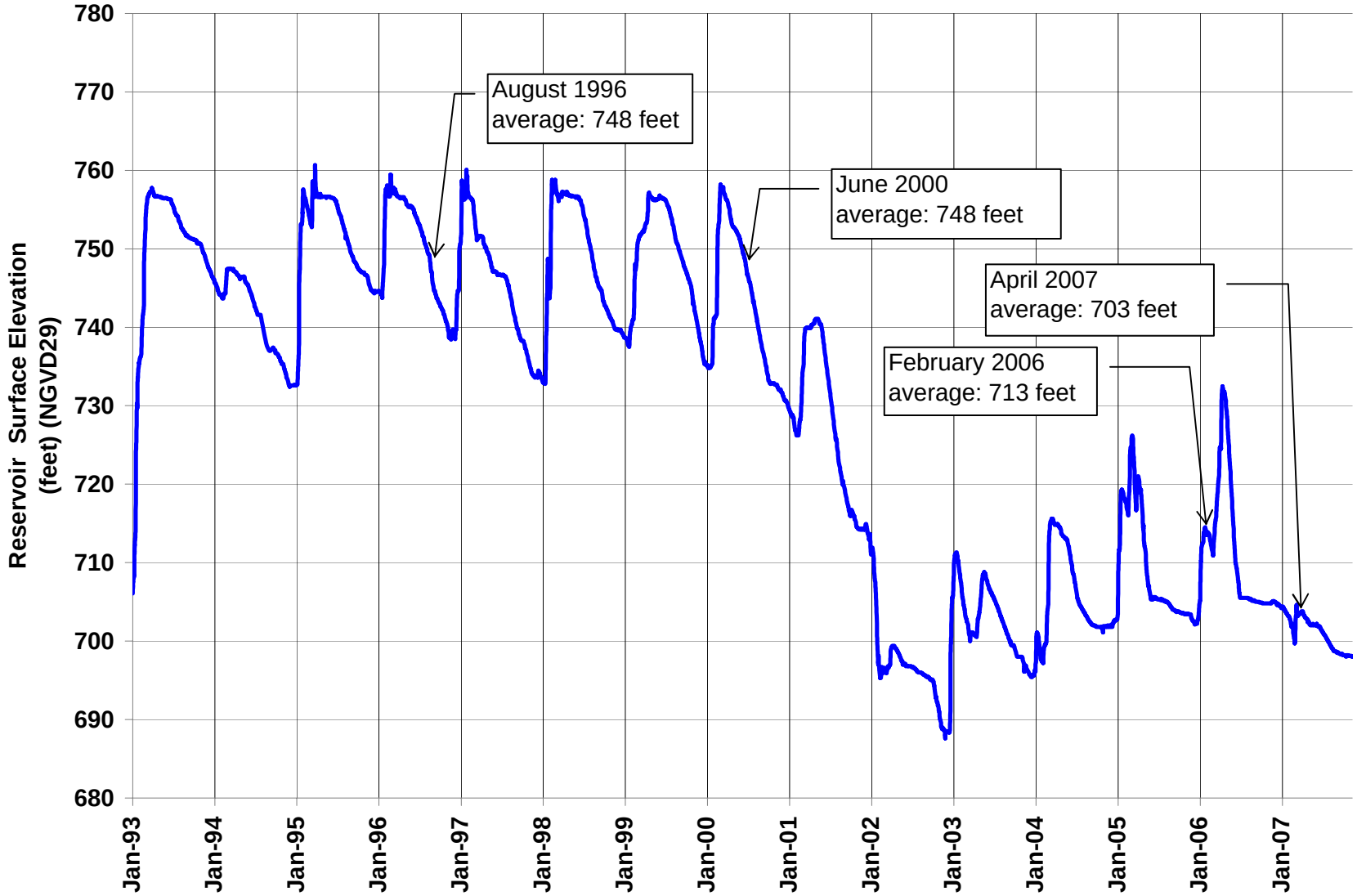
Calaveras Dam Replacement Project

Project no. 26814408
September 2008

URS

FIGURE 2

Figure 3. Daily Surface Elevation of Calaveras Reservoir



ATTACHMENT A

SUMMARY OF APRIL 2008 SAMPLE POINTS

The sample point locations are shown on Figure 2 and observations at each sample point are briefly described below:

S-1 (Wetland #88). Sample point S-1 is located in a seasonal seep wetland that was delineated in 2006 by May and Associates. The 2006 delineation identifies the seasonal seep as feature #88. This feature is located where Calaveras Creek drains into the south end of the reservoir. Hydrophytic vegetation, hydric soil, and wetland hydrology were confirmed by observations in April 2008. The seep area was dominated by common rush (*Juncus patens*) and Mediterranean barley (*Hordeum marinum*) with scattered coyote brush (*Baccharis pilularis*). Soil was sampled to a depth of 12 inches. The soil is a silty-loam with Redox Depressions (redox concentrations in the pore linings) that shows evidence of old oxidized root channels in the top 6 inches. The soil matrix color is 10YR 3/2 and redox features are 5YR 4/6 and occupy 10 percent of the matrix.

SP-1. Sample point SP-1 is located south of Wetland #88 in an upland area above the normal maximum water surface elevation. This location is dominated by poison hemlock (*Conium maculatum*), an upland species. The area is not currently a wetland.

SP-2. Sample point is SP-2 is located between Wetland #88 and Wetland #83. The area was not mapped as a wetland by May and Associates in 2006, however there are some indicators that this site may have been a former wetland prior to the current reservoir restriction. These indicators include hydric soil and the presence of common rush (*Juncus patens*). The soil is a silty-loam with redox depressions. The soil matrix color is 10YR 5/3, and the redox features are 5YR 4/6 and occupy 5 percent of the matrix.

SW-1. Sample point SW-1 is located in a seasonal wetland feature (Wetland #83) that was delineated in 2006 by May and Associates. This feature is located southeast of the confluence of Calaveras Creek and the reservoir. Although hydric soil was present, hydrophytic vegetation and wetland hydrology were not present; therefore the area is not presently a wetland. The area contains 70 percent *Bromus hordeaceus*, 10 percent *Juncus patens*, 5 percent *Bromus diandrus* and 5 percent *Carex sp*. Soil was measured to a depth of 8 inches. The soil is a silty-loam with redox depressions. The soil matrix color is 10YR 3/2, and the redox features are 5YR 10/8 and occupy 10 percent of matrix.

SP-3. Sample point SP-3 is located directly northwest of Wetland #83 and within the former reservoir inundation area. Although hydric soil was present, hydrophytic vegetation and wetland hydrology were not present. The area currently supports upland grasses, including 50 percent soft brome (*Bromus hordeaceus*), 30 percent long-beaked filaree (*Erodium botrys*), 15 percent Mediterranean barley (*Hordeum marinum*), and 1 percent Italian ryegrass (*Lolium multiflorum*). Soil was examined to a depth of 12 inches. The soil is a silty-loam with redox depressions. The soil matrix color is 10YR 2/2, and the redox features are 5YR 4/6 and occupy 25 percent of the matrix.

SP-4. Sample point SP-4 is located directly northwest of sample point SP-3 within the former reservoir inundation area. Although mapped as a seasonal wetland (Wetland #89) by May and Associates in 2006, wetland (hydrophytic) vegetation was not dominant in 2008. Hydric soil and wetland hydrology were present. The area is currently dominated (80 percent cover) by coyote brush (*Baccharis pilularis*). The herbaceous layer had low cover (10 percent) of curly dock (*Rumex crispus*). The biotic crust was subtle and not uniform across the entire area. There were also some soil cracks, but these were not uniform across the area. Soil was evaluated to a depth of 12 inches. The soil is a silty-clay loam with Redox Depressions. The soil matrix color is 2.5YR 3/2, and the redox features are 7.5YR 4/6 and occupy 25 percent of the matrix.

SW-2. May and Associates delineated a large seasonal wetland (Wetland #66) immediately south of the reservoir margin in 2006 (Figure 2). In 2008, hydric soil and wetland hydrology were present at this location but hydrophytic vegetation was not dominant. The area is dominated by upland and facultative wetland plant species that include 50 percent cover of Italian ryegrass (*Lolium multiflorum*), 20 percent dead milk thistle (*Silybum marianum*), 20 percent toad rush (*Juncus bufonius*) and 5 percent long-beaked filaree (*Erodium botrys*). Soil was evaluated to a depth of 14 inches. The soil is a sandy-loam with Redox Depressions. The soil matrix color is 2.5YR 4/1 and the redox features are 5YR 4/6 and occupy 10 percent of the matrix

SW-3. This sample point is located in a seasonal wetland (Wetland #67) that was mapped by May and Associates in 2006 that is located west of Calaveras Creek. Although hydric soil was present, hydrophytic vegetation and wetland hydrology were absent therefore the area is not currently a wetland. There is, however, a dry channel east of the feature that may contribute to the hydrology in the vicinity of this feature. The area contains 25 percent *Bromus diandrus*, 25 percent *Juncus patens*, 20 percent *Carduus pycnocephalus*, 10 percent burclover (*Medicago polymorpha*), 10 percent *Erodium botrys*, 10 percent *Hordeum marinum*, and 5 percent *Vicia villosa*. Soil was evaluated to a depth of 6 inches. The soil is a loam with redox depressions. The soil matrix color is 10YR 3/2, and the redox features are 5YR 5/6 and occupy 5 percent of the matrix.

SP-5. This sample point is located towards the southern most area of land formerly inundated by the reservoir. The area is currently dominated by 50 percent *Bromus hordeaceus*, but also supports 15 percent *Hordeum marinum*, 15 percent *Carduus pycnocephalus* and 10 percent *Bromus diandrus*. Due to the areas former inundation, hydric soils are present. However hydrophytic vegetation and wetland hydrology were not present. There were Soil was measured to a depth of 6 inches. The soil is a sandy loam with the slight presence of Redox Depressions. The soil matrix color is 10YR 3/2, and the redox features are 2.5YR 5/8 and occupy 10 percent of the matrix.

SP-6. Sample point SP-6 is the southernmost sample point and located in a known upland. The area is currently dominated by 50 percent *Hordeum marinum* and 45 percent *Bromus hordeaceus*. Soil was measured to a depth of 4 inches. The color of the soil matrix is 10YR 3/2 and has no visible redoximorphic features.

SP-7. Sample point SP-7 is located southeast of SW-2 along the former margin of the reservoir. A steep slope is located immediately east of this point. From SP-7 a line of mule fat, (*Baccharis salicifolia*), a FACW woody species, extends east to west and parallel to the water line for

approximately 30 to 40 feet (Photo 5). Mule fat displayed similar linear growth patterns elsewhere in the former-inundation zone, and at different elevations.

Photo 1– Looking north from Wetland #88 (SP-1). Riparian vegetation adjacent to the seep in the background is dominated by arroyo willow at the former confluence of Calaveras Creek and the reservoir inundation line.

Photo 2– Close-up of arroyo willow trunk with adventitious roots at the former confluence of Calaveras Creek and Calaveras Reservoir (elevation approximately 756 feet). These roots occur in response to inundation or soil saturation. This site is not currently a wetland but appears to have been inundated or saturated in the past. Arroyo willows are a FACW species.

Photo 3 –View of mule fat shrubs (FACW-) and clumps of spreading rush (FAC) near SP-3 at the former normal maximum water surface elevation (756 feet) illustrating historic wetland extent.

Photo 5 –View northwest from Wetland #83. Coyote brush and willows in the background are associated with the former confluence of Calaveras Creek and the inundation line of the reservoir along the former normal maximum water surface elevation.

Photo 6 - View toward the west from SP-7. Mule fat (FACW) grows in linear patterns that appear to correspond to former shorelines.

Photo 7 –View northwest from SW-2 toward the current waterline. Foreground species included hydrophytic plants such as spiny cocklebur (FAC+) and toad rush (*Juncus bufonius*) (FACW+) that indicate the presence of seasonal wetlands adjacent to the current inundation level of the reservoir.

Photo 8 – Wetland #66. Redox depressions in soil sample at SW-2 demonstrate the presence of wetland soils in existing seasonal wetlands along the margins of the reservoir.

Photo 9 – Canadian horseweed (FAC) and spiny cocklebur (FAC+) near the margin of the reservoir in January 2008 are wetland plant species that commonly occur along the margins of inundated areas. These warm season species are probably associated with the strong green color evident in the aerial photos taken in late summer.

Photo 9 –Wetland #67 looking northeast from SW-3. This seasonal wetland is located approximately along the former normal maximum water surface limit at the southern margin of the reservoir as demonstrated by the presence of wetland plants, soils and hydrology.