Prepared for

California American Water

April, 2013

LOS PADRES DAM
SEDIMENT REMOVAL FEASIBILITY STUDY

REPORT

MWH
BUILDING A BETTER WORLD

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1 INTRODUCTION

California American Water Company (Cal-Am) is the owner and operator of the Los Padres Dam and Reservoir located on the Carmel River in Monterey County, California with an original reservoir storage capacity of 3,070 af. The storage capacity has been reduced by over 1,284 acre-feet (af), or about 40 percent, as a result of sediment deposition over its 60 years of operation. Cal-Am has retained MWH Global (MWH) to perform a study on the feasibility of removing an estimated 2 million cubic yards of sediments from the Los Padres Reservoir in order to restore the original storage capacity. MWH's study and findings are described in this report.

The scope of this study is intended to provide an initial conceptual assessment on the general feasibility of sediment removal at Los Padres Dam and Reservoir in order to facilitate the long-term planning for management of the reservoir and sediments. This study is limited to information provided by Cal-Am and generally available published information based on MWH's literature search associated with this project, which are cited in the references section 7 of this report. With the exception of two reconnaissance field visits by MWH project team and Cal-Am's representatives, no field investigation, field survey, or field study was performed in association with this study. The scope of work for this study includes the following.

1. Assessment of existing reservoir conditions and data;
2. Conceptual evaluation of methods for reservoir sediment removal, transport and disposal;
3. Identification of potential commercial use and preliminary selection of disposal sites for the removed sediment
4. Identification of potential environmental issues and permitting requirements for removal and disposal of the sediment;
5. Description and cost estimate for three conceptual alternatives based on feasible methods removal, transportation and disposal of the sediment.

2 EXECUTIVE SUMMARY

Los Padres Dam and Reservoir is situated in a region with steep terrain and soil conditions that are susceptible to erosion. The watershed above the reservoir has experienced several extreme and unusual wildfire and heavy rainfall events that caused significant erosion and transported large volumes of sediment into the reservoir. The 1978 Marble-Cone Fire is the most notable event where the fire caused severe burn damage to an extensive area in the basin and followed immediately by a season of heavy above normal rainfall. It is estimated that about 950,000 cubic yards of sediment were mobilized and deposited in the reservoir during the season following the Marble-Cone fire. This deposition accounts for 46 percent of the total accumulated sediment in the reservoir when last measured in 2008.

The Los Padres Reservoir had an original storage capacity of 3,070 af when initially constructed in 1947. The most recent bathymetric and topographic survey performed in 2008 by the Watershed Institute (Watershed Institute, 2009) indicated that the reservoir capacity has been reduced by 1,284 acre-feet (af) over its 60 years of operation, which is equivalent to approximately 2.1 million cubic yards of sediment deposition in the reservoir. Based on MWH's evaluation, an average annual sediment deposition rate is estimated to be between 10 and 21 af per year, the reservoir is estimated to be completely filled within a range of about 80 to 170 years. However, because of practical consideration for maintaining the reservoir for downstream minimum flow releases or limiting inundation of low level outlets, the reservoir useful life is estimated to range from as low as 26 years up to 140 years.

This study researched the recommended reservoir sediment management practices by the USBR, USSD and Heinz Center. The sedimentation filling of Los Padres reservoir is common for the sites with similar geologic and hydrologic conditions, but also sediment accumulation is further compounded by the impact from the severe fire events during its 60 years of operation. The recommended and typically applied sediment management strategies, such as sediment re-routing, drawdown flushing, reservoir emptying, and siphoning, are not practical at Los Padres because of the dam configuration and design, and the reservoir operation constraints. The mechanical removal methods evaluated and discussed in this study provide the only feasible sediment management strategy for restoring the reservoir capacity. As a result, the following three alternative sediment removal alternatives were investigated and developed for evaluation:

- Alternative 1 would remove about 1.8 million cubic yards, or an equivalent of 1,134 af, of sediment to almost restore full original reservoir capacity. This alternative would involve removing about 810,000 cubic yards of material in the upper reach of the reservoir in the dry using conventional earth moving methods as the reservoir is lowered during the construction season. In addition, approximately 1 million cubic yards of sediment below the reservoir pool would be removed using a wet dredging method. The removed material would be placed in a proposed disposal site located in the upstream watershed beyond the southwest end of the reservoir within Cal-Am's property. Construction of this alternative would take 7 years at an approximate cost of $90 million. The cost range of recovered water supply would be $53,000 - $94,000 per af and would restore reservoir capacity to a total of 2920 af.

- Alternative 2 would remove portion of the sediment in the upper reach of the reservoir using conventional earth moving methods in the dry as the reservoir is drawn down to an established minimum level. This alternative would remove approximately 810,000 cubic yards, or an equivalent of 502 af of sediment. The removed material would be placed in a proposed disposal site located in the upstream watershed beyond the southwest end of the reservoir in Cal-Am's property. Construction of this alternative would take 6 years at an approximate cost of $47 million. The cost of recovered water supply would be $62,000 – $112,000 per af and would restore reservoir capacity to a total of 2288 af.

- Alternative 3 would remove a portion of the sediment in the lower reach of the reservoir using wet dredging method from a barge. This alternative would remove approximately 900,000 cubic yards, or an equivalent of 558 af of sediment. The removed material would be placed in a disposal site on a flat terrace area immediately downstream of the dam. Construction of this alternative would take 7 years at an approximate cost of $50 million. The cost of recovered water supply would be $59,000 - $108,000 per af and would restore reservoir capacity to a total of 2344 af.

Evaluation of the sediment removal alternatives found that providing any meaningful increase to the reservoir storage capacity would be very challenging in constructability due to steep terrain, lack of developed vehicle and equipment access to the upstream portion of the reservoir, limited feasible sediment disposal sites, inability to drain reservoir for construction, and a very short construction window. In addition, all alternatives would be difficult to implement due to notable environmental impacts (e.g. steelhead trout and red legged frog habitat) and very high cost relative to the gained benefit. Given the identified challenges, any selected sediment removal concept will require additional detailed study and careful planning that weighs the environmental impacts and project costs against the gained benefits of additional storage.

3 BACKGROUND

3.1 Dam

The Los Padres Reservoir was built in 1949 about 6 miles upstream of San Clemente Dam and stores surface water flowing from the upper watershed of the Carmel River in Monterey County. The drainage area of the reservoir is 45 square miles. It is an earth embankment dam owned and operated by California American Water (Cal-Am). The purpose of the reservoir is to store water during the wet season for release into the downstream Carmel River to meet downstream water supply demand and fishwater release requirements. The Los Padres Reservoir had an original capacity of 3070 acre-feet (af) at the spillway crest elevation of 1040 feet National Geodetic Vertical Datum (NGVD) when it was first completed in 1949. The reservoir capacity has substantially reduced as a result of heavy upstream sediment transport and deposit. The 2008 bathymetric and topographic survey by the Watershed Institute showed a reservoir capacity of 1786 af, a 42 percent reduction of the original capacity. The San Clemente Dam downstream of the Los Padres Dam also has the same issue with sediment accumulation in the reservoir, which has nearly completely filled with sediment since it was built in 1921. The current plan for San Clemente Dam is for dam removal, stabilization of sediment in-place, and re-routing a portion of the Carmel River around the reservoir.

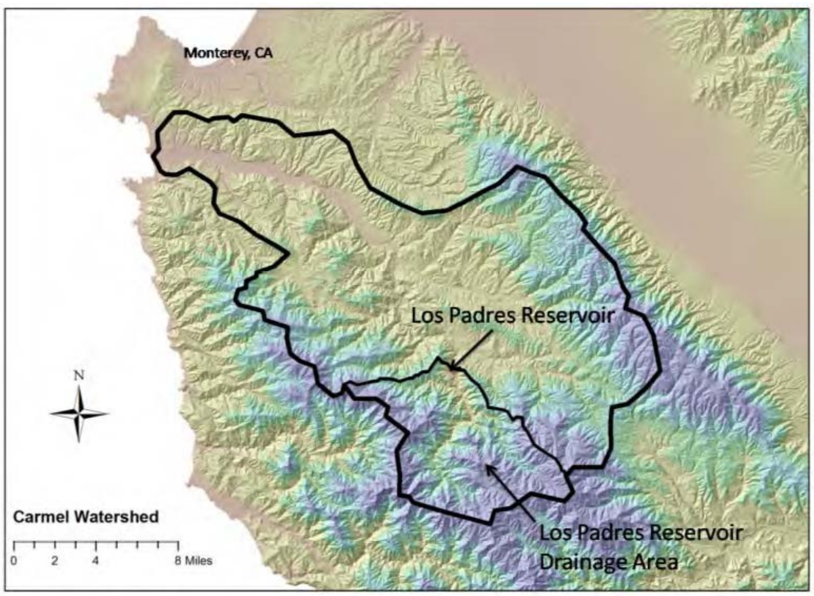

Figure 1: Los Padres Dam and drainage area 1

3.2 Water Rights

The State Water Resources Control Board (SWRCB) issued permit 7130A for Los Padres Dam in 1948 and Cal-Am was licensed in 1985 (License 11866) to divert up to 3,030 af per annum between October 1 of each year through

[1] The Watershed Institute, 2009. Fall 2008 Stage-Volume Relationship for Los Padres Reservoir, Carmel Valley, California: Prepared for the Monterey Peninsula Water Management District. California State University Monterey Bay, Publication no. WI-2009-2, 28 pp.

May 31 of the following year. The SWRCB Order 95-10 re-evaluated the water rights and reduced the right to divert to 2,179 af based on the estimated storage capacity at that time.

The Order 95-10 defined not only the storage rights at Los Padres Reservoir, but defined the current legal water rights for Cal-Am on the Carmel River. These consist of riparian and appropriative rights, with the appropriative rights divided between pre-1914 rights that do not require a permit and post-1914 rights that require a permit. The current legal water rights are 3,376 af per annum, consisting of 60 af from riparian rights, 1,137 af from pre-1914 appropriative rights and 2,179 af from license 11866. The order 95-10 analyzed and concluded the water rights as follows:

- "Cal-Am's riparian claims are limited to the use of water on only those parcels which adjoin the surface water course of the river or which overlie water flowing in the subterranean channel. Clearly, Cal-Am wells extract water flowing in the subterranean channel. Cal-Am also presented testimony indicating that 60 af were used to irrigate riparian habitat along the river. Nevertheless, Cal-Am did not identify any specific parcels for which riparian claims were asserted. In summary, although Cal-Am did not submit testimony or exhibits in support of any specific riparian claim, it appears that Cal-Am has riparian rights and it is not unlikely that such rights are being exercised to divert 60 af to irrigate riparian vegetation along the Carmel River."

- "…In addition to the actual quantity of water used by Cal-Am's predecessors prior to 1914, Cal-Am might have been entitled to an additional quantity of water under the progressive use and development doctrine. However, Cal-Am neither asserted such a claim nor presented evidence which might support findings that it is entitled to additional water under the doctrine. In addition, the diversion of a large amount of the water currently taken from the river or its underflow was not initiated until rapid growth occurred on the Monterey Peninsula, which commenced after 1960. Cal-Am drilled 18 of its 21 wells after 1960. Thus, Cal-Am is not entitled to additional water under the progressive use and development doctrine. Cal-Am's pre-1914 rights, therefore, should be limited to the estimated actual use by Cal-Am's predecessors in 1913, an amount which does not exceed 1,137 af."

- "On February 14, 1986, Cal-Am was issued License 11866 (Application 11674A) to divert 3,030 af to storage from October 1 to May 31 from the Carmel River for industrial, and recreational uses. …The above analysis of appropriative, riparian, and prescriptive rights does not affect the rights exercised under License 11866."

- "The actual diversion is limited to 2,179 af due to siltation."

In addition, the 1948 decision and permit 7130 requires, in general, that Cal-Am maintain a flow of not less than 5 cfs in the channel of the Carmel River directly below the outlet structure of the Los Padres Dam at all times during which water is being stored under this permit. Cal-Am currently releases a minimum of 5 cfs at all times.

Order 95-10 also included several conditions that Cal-Am should comply with. Conditions 1 and 2 state:

1. "Cal-Am shall forthwith cease and desist from diverting any water in excess of 14,106 af from the Carmel River, until unlawful diversions from the Carmel River are ended."
2. "Cal-Am shalt diligently implement one or more of the following actions to terminate its unlawful diversions from the Carmel River: (1) obtain appropriative permits for water being unlawfully diverted from the Carmel River, (2) obtain water from other sources of supply and make one-for-one reductions in unlawful diversions from the Carmel River, provided that water pumped from the Seaside aquifer shall be

governed by condition 4 of this Order not this condition, and/or (3) contract with another agency having appropriative rights to divert and use water from the Carmel River."

On October 20, 2009 the State Water Resources Control Board (SWRCB) adopted Water Rights Order 09-60, a Cease and Desist Order (CDO) against Cal-Am, as a follow-up and modification of Order 95-10. It states that Cal-Am shall cease and desist from the unauthorized diversion of water from the Carmel River in accordance with several conditions. Conditions 1 to 3 state that:

1. "Cal-Am shall diligently implement actions to terminate its unlawful diversions from the Carmel River and shall terminate all unlawful diversions from the river no later than December 31, 2016."

2. "Cal-Am shall not divert water from the Carmel River for new service connections or for any increased use of water at existing service addresses resulting from a change in zoning or use…"

3. Cal-Am shall adjust its diversions from the Carmel River in accordance with the outlined minimal reductions.

As this order states, Cal-Am has to reduce its diversion to 3,376 af per year under its legal water no later than December 31, 2016. The diversion for storage at Los Padres Reservoir will be limited to 2,179 af. Cal-Am's water rights after a sediment removal project at Los Padres Reservoir will be modified to the increased capacity, depending on the quantity of sediment removed. Removal quantities are provided in section 5.

3.3 Geology

The Carmel watershed is the northernmost of a series of northwest-southeast trending valleys dissecting the rugged Santa Lucia Mountains of the California Coast Ranges. The Sierra de Salinas forms the northeastern divide of the watershed and the northern terminus of the Santa Lucia Mountains forms the southwestern divide. Like the neighboring Salinas River and most other watersheds near the California Coast Ranges, the Carmel watershed owes its overall geometry and physical orientation to its bedrock framework, myriad faults, and climate and river erosion.

The geology is a complex quilt of igneous, metamorphic and sedimentary rocks in part stitched together by faults of varying ages and other kinds of contacts. A major source of bedload which fills the Los Padres and San Clemente Reservoir is the fractured granitic rocks in the steep headwaters. Bedrock landslides, shallow soil slips, rock fall, stream incision and widening and slope gullying are the main erosive processes.[2]

The watershed divides rise to approximately 4500 feet along the Sierra de Salinas and continue to 4800 feet along the Santa Lucia Range with Ventana Double Cone providing the maximum elevation of 4853 feet. Water drains 256 square miles of land, following both overland and subterranean routes to reach the coastal Carmel lagoon and eventually the Pacific Ocean.

3.4 Fire

Wildfire is a significant part of the Carmel Watershed natural history and a major contributing factor to the sedimentation problem at Los Padres Reservoir. Prior to the 20th century, fire in the Santa Lucia Range occurred at

[2] The Watershed Institute, 2004. Physical and Hydrologic Assessment of the Carmel River Watershed, California. California State University Monterey Bay. Publication No. WI-2004-05/2, 88 pp.

a frequency of 21 years (MPWMD, 1989). There have been three 3 major fires that affected the area since the Los Padres Dam was built.

1977 Marble-Cone Fire - The fire burned for 3 weeks in August 1977 and destroyed 90 percent of the vegetation in the watershed. Post fire habitat study[3] in 1981 indicated that habitat in the affected area were recovered quickly and restored after three years. The Marble-Cone Fire is estimated to have an estimated return interval of 22 years based on fire data between 1911 and 1991[4].

1999 Kirk Complex Fire - This fired burned for nearly 2 months in September and October 1999. Approximately 16,000 acres (or near 57 percent) of the Los Padres watershed was within the fire burn boundary. This fire has an estimated return interval of 19 years.

2008 Basin Complex Fire - This fire burned for 5 weeks in June and July 2008. Approximately 48 percent of the watershed experienced moderate and high burn severity. This fire has an estimated return interval of 19 years.

Fire burn severity is a measurement of how much of the forest floor is consumed by the fire. The effects of fire on the forest floor can range from removing just the litter to total consumption of the forest floor and alteration of the mineral soil structure. Fire suppression in recent decades has generally made fires more infrequent, but more intense as more fuel from vegetation is allowed to accumulate. High severity burn areas experience higher rates of soil loss from erosion until vegetation is recovered. For the Marble-Cone Fire, about 42 percent of the watershed experienced 90 percent severe burn down of vegetation. For the Basin Complex Fire, only 11 percent of the area suffered a high burn severity. The much higher burn severity is a key factor for the higher erosion in the basin area and sediment deposition in the Los Padres Reservoir following the Marble-Cone Fire.

3.5 Hydrology

Hydrology in the Monterey and Carmel River area is influenced by the Coriolis Effect where the storms from the Pacific spin counterclockwise and make landfall in the Santa Lucia Mountains approaching from the southwest. Therefore, the southwestern area of the watershed typically has higher precipitation than the Carmel Valley which is in the rain shadow of the mountains[2].

There is no rainfall and stream flow record above Los Padres Reservoir. Stream flow records are limited to data collected from a stream gage below Los Padres since October 2004. Because of the limited available hydrological data for Los Padres Dam, data from the San Clemente Dam metrological station is used as a proxy for the hydrological conditions at Los Padres area in this study. The precipitation for water year 1949 to 2010 is listed in Table 1 and presented in Figure 2 below. The water year, a term used by USGS, runs from October 1st through September 30th the following year and is designated by the calendar year in which it ends.

[3] Hecht, B.,1981, sequential changes in bed habitat conditions in the upper Carmel River following the Marble-Cone Fire of August 1977, California Riparian System Conference, University of California, Davis, September 1981

[4] Moritz, M.A., 1997. Analyzing extreme disturbance events: Fire in Los Padres National Forest. Ecological Applications.

Table 1: Total precipitation per water year for San Clemente Dam station from the National Climatic Data Center

Calendar year	Total annual precipitation (in)	Calendar year	Total annual precipitation (in)	Calendar year	Total annual precipitation (in)
1949	18.79	1970	18.28	1991	16.87
1950	16.42	1971	17.2	1992	20.26
1951	22.59	1972	10.43	1993	30.78
1952	34.5	1973	30.19	1994	15.57
1953	19.25	1974	23.79	1995	36.29
1954	16.27	1975	23.99	1996	22.4
1955	16.3	1976	9.62	1997	21.67
1956	28.8	1977	10.4	1998	46.29
1957	17.04	1978	35.42	1999	17.41
1958	38.6	1979	16.59	2000	20.37
1959	17.2	1980	29.94	2001	20.96
1960	15.52	1981	16.64	2002	13.22
1961	10.49	1982	31.19	2003	24.29
1962	20.79	1983	44.74	2004	18.16
1963	22.88	1984	15.67	2005	30.67
1964	15.87	1985	14.19	2006	28.02
1965	19.28	1986	31.37	2007	11.81
1966	16.12	1987	10.96	2008	19.61
1967	30.15	1988	11.06	2009	18.14
1968	12.79	1989	12.8	2010	27.46
1969	36.85	1990	13.09		

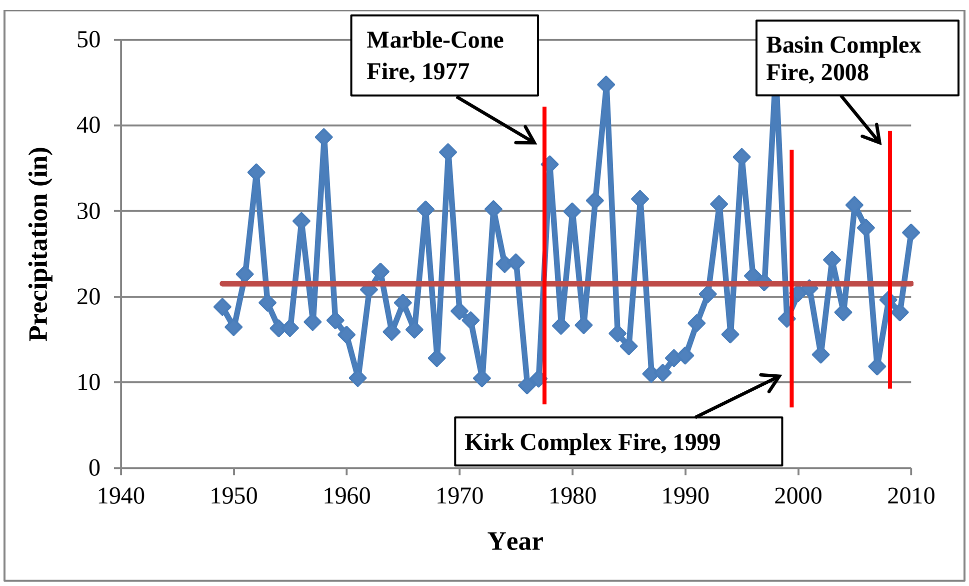

Figure 2: Total precipitation per water year (blue line) for San Clemente Dam station 1949 to 2010 and the mean annual precipitation (red line) of 21.5 in.

Heavy rainfall occurs in Carmel Valley between October and April of the following year. Figure 3 below displays the average monthly total precipitation 1949 to 2010 from the National Climatic Data Center for water years from October to September of the following year.

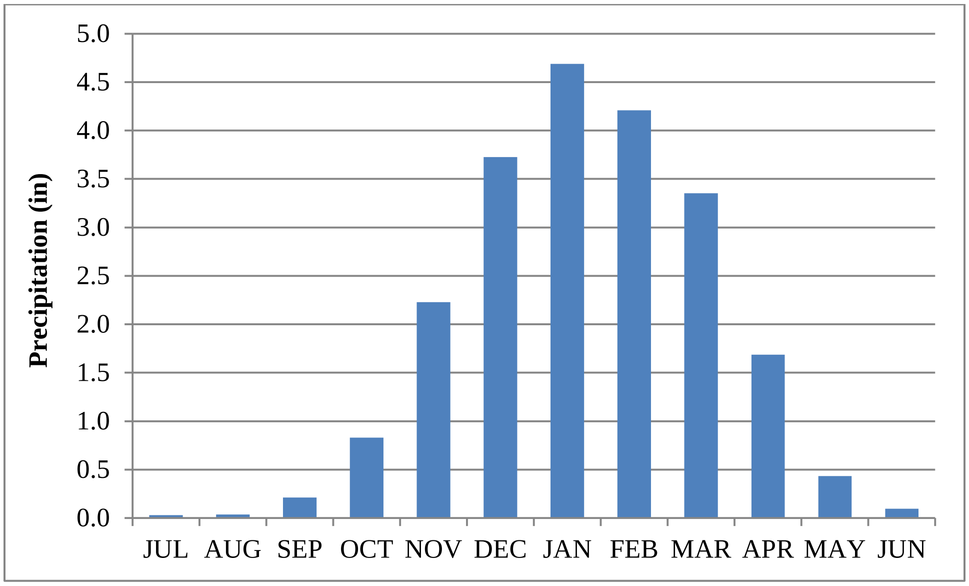

Figure 3: Average monthly total precipitation at the San Clemente Dam station 1949 to 2010.

The return period for the precipitation was calculated using the total water year precipitation at San Clemente Dam 1949 to 2010 using Log-Pearson Type III Analysis method and the result is shown in Figure 4.

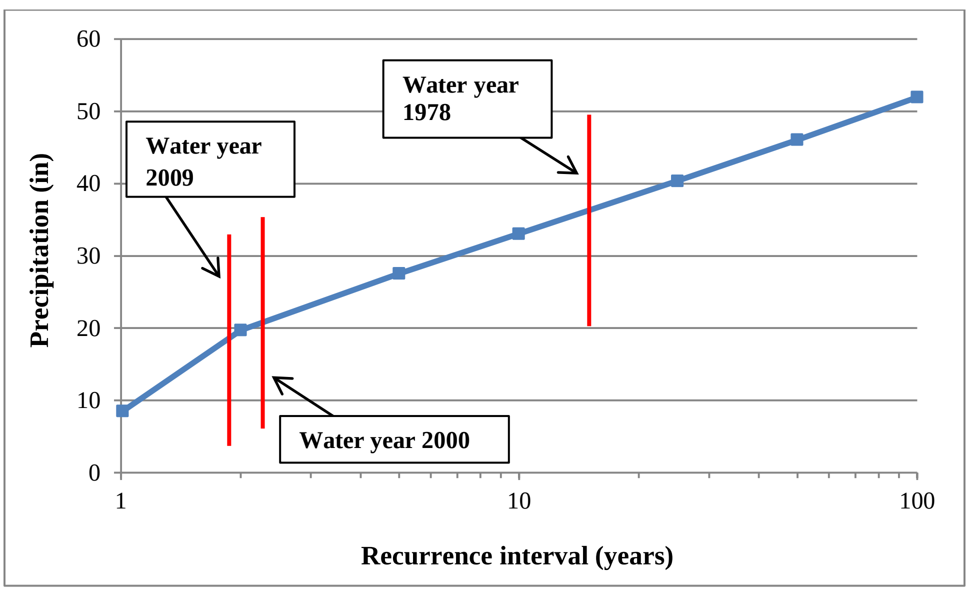

Figure 4: Return period for the total water year precipitation at San Clemente Dam station 1949 to 2010 using Log-Pearson Type III analysis.

The mean precipitation for 62 years of rainfall records is 21.5 inches and corresponds to a return period of about 2.4 years.

1977 Marble-Cone Fire - The total precipitation in the winter following the Fire was about 165 percent of the annual average total precipitation. This corresponds to a return period of about 13.4 years with the Log-Pearson Type III Analysis.

1999 Kirk Complex Fire - The total precipitation in the winter following the Fire was 95 percent of the annual average total precipitation. Using the Log-Pearson analysis, the total precipitation has a return period of about 2.1 years.

2008 Basin Complex Fire - The total precipitation in the winter following the Fire was 85 percent of the annual average total precipitation. The return period of this wet season is about 1.8 years.

3.6 Sediment Deposition

Sediment deposition in the Los Padres Reservoir is directly correlated to the soil erosion that occurs in the upstream watershed, which is characterized by steep terrain, alluvial and colluvial soil, and dense vegetation. The steep slopes in the watershed have a higher likelihood of slope failure or erosion than in a flatter terrain, and are more likely to fail when there is no vegetation to bind the soil. The amount and rate of slope failures and soil erosion in the watershed are shown to be correlated to significant fire and rainfall events. Wildfires that occur in the watershed expose soils, which become susceptible to higher surface runoff and erosion due to loss of vegetation. Combined with storms of higher rainfall intensity, a fire-burned watershed produces in a higher erosion rates and leads to significant quantities of soil erosion and sediment deposition in the reservoir. Documented cases of significant sediment deposition and projected sediment deposition trends are discussed below.

3.6.1 Significant Sediment Deposition

1977 Marble-Cone Fire - The largest recorded sediment deposition event since completion of the Los Padres Dam occurred in the winter of 1977/1978 following the Marble-Cone Fire. This event was attributed to the Marble-Cone Fire, which consumed 90 percent of the vegetation and exposed the underlying soil for erosion. The intense rainfall and runoff in the Los Padres basin in the winter following the fire with was about 1.65 times higher than the mean total annual precipitation. The 1977-1979 study by the US Geological Survey (USGS) using the “lead-line” bathymetry surveys found a loss of 590 af in reservoir capacity in 1978 following the 1977 fire and 1978 intense rainfall sequence[5]. This is equivalent to approximately 952,000 cubic yards of sediment deposition from this single episode. The 2012 Geological Society of America study[6] on the effects of wildfire on sediment yield found that the occurrence of a severe fire such as the 1977 Marble-Cone Fire combined with the intense rainfall of the 1977/1978 rain season is rare with a recurrence interval of greater than 1000 years.

The 1977-1979 USGS study also monitored the sedimentation and ground erosion conditions at Los Padres and found that siltation and sediment transport during the 1978 and 1979 winter, with rainfall intensity close to the average annual level, was minimal and vegetation were re-established quickly at the damaged burned slopes. The rapid reduction in sediment yield in 1979 suggested that majority of the burned debris and erodible soil material was

[5] USGS, 1979, Sedimentation Study of Los Padres Dam – 1979 Update: Report for Monterey Peninsula Water Management District, April, 1979
[6] Warrick, J.A., Hatten, J.A., Pasternack, G.B., Gray, A.B., Goni, M.A. and Wheatcroft, R.A., 2012. The effects of wildfire on the sediment yield of a coastal California watershed. Geological Society of America Bulletin 124: 1130-1146

likely removed from the intense rain and runoff following the 1977 Marble-Cone fire. The remaining slopes in the affected areas were less susceptible to erosion particularly with help of new vegetation growth.

1999 Kirk Complex Fire - The effect of the Kirk Complex Fire on the Los Padres Reservoir sediment deposition was not documented with any measurement in the reservoir. A study by Entrix in 2000[7] observed that the fire did not markedly influence the rate of reservoir infilling despite the significant acreage of burned areas within the watershed.

2008 Basin Complex Fire - The impact of the Basin Complex Fire on the reservoir capacity is uncertain. A detailed bathymetric and LiDAR topographic survey of the Los Padres Reservoir was performed by the Watershed Institute in November 2008. However, no subsequent bathymetric survey was performed to verify the change in sediment deposition trend and storage capacity. Cross section surveys[8,9] at selected sections in the upper reach of the reservoir were performed in 2009 and again in 2011. The cross section surveys did not find sign of abnormal sediment built-up associated with the Basin Complex Fire.

A study[9] suggests that the recurrence period between wildfires can be a contributor to the lower amount of sediment deposition in the upper reach of the reservoir after the Kirk Complex Fire and the Basin Complex Fire. The Marble-Cone Fire occurred after a 61-year period without fire. In comparison, the Kirk Complex Fire and the Basin Complex Fire each re-occurred in about 20-year intervals. Frequent fires reduce fuel loads as well as hillslope sediment storage. Studies[10] also showed the Carmel River watershed generated less dry ravel following the Basin Complex Fire than the Marble-Cone as a result of less hillslope sediment storage and thus less total sediment was mobilized following the Basin Complex Fire.

3.6.2 Sediment Deposition Trend

Using the recorded sediment surveys and initial capacity estimates, a sediment deposition trend has been developed to estimate average future deposition into the reservoir. The following items provide a summary of the capacity measurement data used in developing the deposition trend:

- The reservoir capacity was initially calculated when the dam was built in 1947. The 1947 to 1977 period had no recorded occurrence of wildfires within the watershed, but experienced several years with rainfall totals significantly below the average annual precipitation. Reservoir capacity estimates were performed by the USGS in 1977 using lead-line measurements at selected sections along the reservoir in the fall immediately after the Marble-Cone Fire. The available data showed 530 af of loss in reservoir storage between 1947 and 1977. Due to the lack of observed fires in this time period, a reservoir capacity loss of about 17.7 af per year can be assumed to be the result of continuous sediment deposition in undisturbed years.

- As noted in section 3.5.1 above, the USGS repeated the reservoir survey in 1978 after a heavy rainy season that followed the Marble-Cone Fire and found an additional loss of 590 af of storage capacity from 1977 to

[7] Entrix, 2000. Order 95-10 Condition 7, Study or Feasibility of Bypassing Early Stream Runoff through Los Padres Dam and San Clemente Dam, for Cal-Am, pp.72

[8] Richmond, S., 2009. Post-fire channel response: A comparison between the 1977 Marble Cone Fire and 2008 Basin Complex Fire on the upper Carmel River. Unpublished Master's Thesis. University of California, Berkeley

[9] Kelly, S.A., 2012. Geomorphic Change in the Upper Carmel River, CA: Effects of the 2008 Basin Complex Fire. California State University, Monterey Bay. 2012

[10] Florsheim, J.L., Keller E.A., Best D.W., 1991. Fluvial sediment transport in response to moderate storm flows following chaparral wildfire, Ventura County, southern California. Geological Society of America Bulletin 103 (4): 504-511.

1978, which indicates that about 952,000 cubic yards of sediment were transported and deposited into the reservoir from this single event.

- The 2009 Watershed Institute report indicated an increase in reservoir capacity from 1950 af to 2179 af in 1984. However, research and inquires with Cal-Am and MPWMD did not find record of sediment removal during 1985.

- A detailed bathymetric and LiDAR topographic survey was performed by the Watershed Institute in November 2008 following the Basin Complex Fire. The 2008 survey found that the reservoir storage capacity was further reduced to 1786 af. The 2008 survey also concluded that the reservoir capacity estimate from a 1998 survey, which indicated a lower capacity of 1569 af, was incorrect.

The long-term average capacity loss rate or sediment deposition rate over the sixty-one years of operation at Los Padres Reservoir are about 21 af or 34,000 cubic yards, respectively, using the 1947 and 2008 survey results. Figure 5 plots the reservoir survey data and include a fitted trend line to estimate and project deposition and reservoir filling rates.

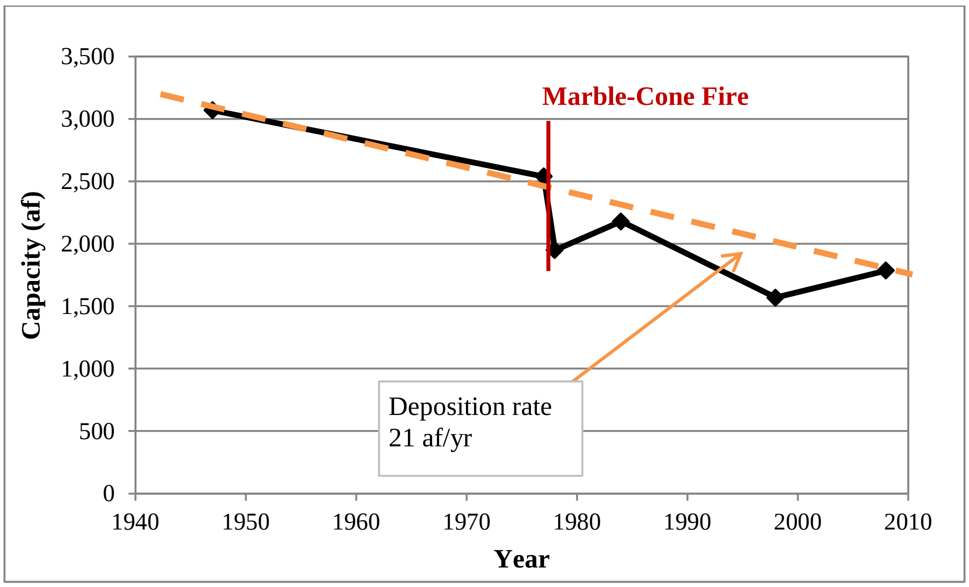

Figure 5: Sediment deposition rates based on historic data (The Watershed Institute, 2009) for the Los Padres reservoir capacity from 1947 to 2008

Using the data developed above, a range of deposition rates can be calculated depending on the selected time interval. For example, the Monterey Peninsula Water Management District (MPWMD, 1994) estimated a sediment inflow of 42,000 tons per year into the reservoir. Using the estimated sediment density of 134.6 lb/ft^3 for the San Clemente Dam from MPWMD (1989), this estimated inflow volume results in about 14.3 af annually. Similarly, if the capacity estimates are used between 1947 and 1977, the deposition trend is estimated at 17.7 af without impacts from major fires, but would likely underestimate a future deposition trend, as fires and extreme rainfall events are expected to continue to occur. Thus, a more conservative estimate would be to use volume estimates that incorporate measured deposition from fire events and measurements that are less susceptible to errors than the lead-line surveys. The suggested deposition trend estimate utilizes the initial reservoir capacity, derived from the elevation contour lines, and the capacity estimated from the 2008 sonar bathymetry survey. Using the estimated 21 af/year deposition rate, complete reservoir siltation will occur in approximately 2093, as shown in Figure 6.

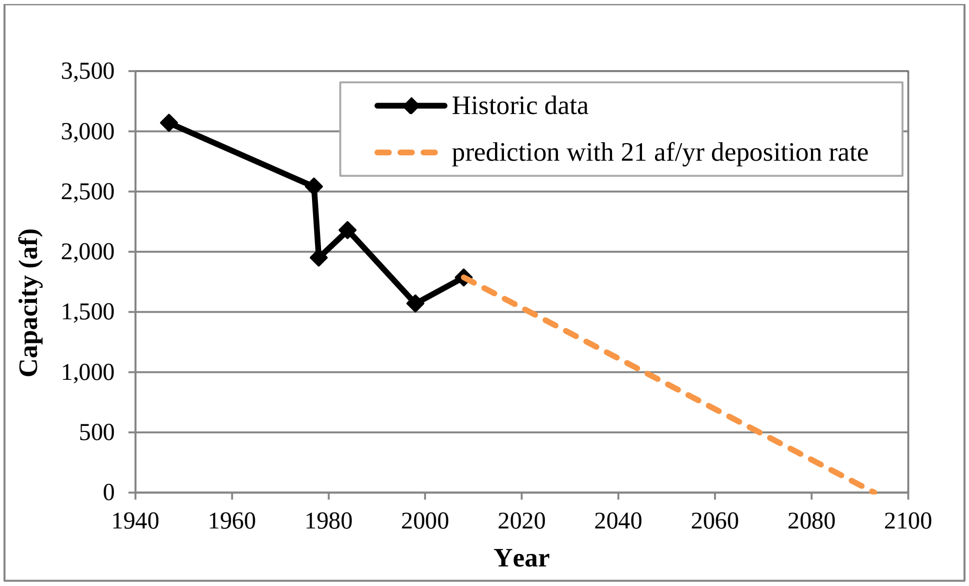

Figure 6: Los Padres Reservoir capacity trend based on historic sediment deposition rate

The time of complete reservoir siltation is usually not equivalent to the end of useful service life. Practically, the end of service life occurs when the accumulation of sediment, or "sediment front", begins to obstruct the bottom outlet at the dam, which would cause a high concentration of fine sediments to be discharged downstream with every release or spill. The reservoir capacity would be about 300 af for this definition, termed "spilling sediment". With a deposition rate of 21 af per year, the end of useful service life would be reached in approximately 2079.

Alternatively, the end of useful reservoir service life can be defined as when the minimum downstream release of 5 cfs can no longer be supplied, termed the "water supply" approach. The historic pattern for the reservoir's low water level in the Fall over the past 26 years shows a median low level elevation of 1011.4 ft (MPWMD, 2011). With a current reservoir capacity at this level of about 650 af, the required supply is about 1140 af per summer. With a deposition rate of 21 af per year, the end of useful service life for this approach would be reached in approximately 2039. Table 4 shows an overview of complete reservoir siltation and the two end of useful reservoir service life approaches.

3.6.3 Reservoir Service Life based on Trap Efficiency

Using the annual sediment inflow rate of 14.3 af/year from MPWMD (1994), an evaluation of reservoir trap efficiency and remaining reservoir service life was performed using established computational methods. The trap efficiency of a reservoir can either be calculated using the method developed by Brune or Churchill (USBR, 2006). The general guideline issued by USBR (2006) recommends using Brune's method for large storage or normal ponded reservoirs and Churchill's curve for settling basins, small reservoirs, flood retarding structures and continuously sluiced reservoirs. The Los Padres Reservoir capacity is medium according to the John Heinz Center (Heinz Center, 2002), which defines medium storage at 100 – 10,000 af.

Water inflow, a key input into trap efficiency computations, into the reservoir is obtained by multiplying the drainage area with the precipitation. The drainage area above the Los Padres dam is 28,800 acres and the total annual mean precipitation at San Clemente Dam is 21.5 in, which results in a water inflow of about 51,500 af/year.

The amount of trapped sediment is estimated by multiplying the trap efficiency by the sediment inflow. The remaining reservoir service life until complete siltation is then calculated by dividing the reservoir capacity by the yearly trapped sediment.

For both methods, these calculations were applied once to the data from 1947 and once to the 2008 data. The predicted service life is based on these two years' respective trap efficiency and is not the result of a continuous application of the dynamic formula every year. As the trap efficiency decreases with a decreasing reservoir capacity, both methods approach but mathematically never reach zero. Therefore, the remaining service life calculated utilizing the trapped sediment estimate in 1947 and 2008 represent the conservative lower end estimate of complete reservoir siltation. Below are the reservoir service life calculations using Brune's and Churchill's method.

Trap efficiency by Brune –The trap efficiency is based on an empirical formula using the ratio of reservoir capacity to mean annual inflow, which is equal to the retention period in the reservoir. The computed complete reservoir siltation is reached in 2184 as shown in Table 2.

Table 2: Los Padres Reservoir service life calculation using trap efficiency by Brune

Year	**Reservoir Capacity (af)**	**Ratio Capacity/ Inflow**	**Trap efficiency (%)**	**Sediment inflow (af/yr)**	**Sediment trapped (af/yr)**	**Complete reservoir siltation (year)**
1947	3070	0.06	79	14	11	2218
2008	1786	0.03	71	14	10	2184

With a trapped sediment rate of 10 af per year, the end of useful service life (which is prior to complete siltation) would be reached in approximately 2072 for the "water supply" approach and approximately 2154 for the "spilling sediment" approach (see section 3.6.2 and Table 4). Table 4 summarizes the estimates for both complete reservoir siltation and end of useful reservoir service life.

Trap efficiency by Churchill – Churchill's formula or diagram for the trap efficiency is based on the sedimentation index of a reservoir, defined as the period of retention divided by the reservoir mean velocity. Because the retention time is unknown, the approximation of using the reservoir capacity to inflow ratio can be assumed. The capacity is calculated at the mean operating pool elevation, using elevation 1040 for Los Padres Reservoir. The velocity can be calculated by dividing the inflow rate by the average cross-sectional area, which is obtained by dividing the capacity by reservoir length. The sedimentation index can be obtained by dividing the capacity to inflow ratio by the reservoir length. The length is taken at the mean operating pool elevation. Using the reservoir profiles in Exhibit 1 and elevation 1040, the estimated length is 7300 feet for full capacity in 1947 and 3600 feet for the capacity in 2008. The computed trap efficiency and resulting complete reservoir siltation are presented in Table 3.

Table 3: Los Padres Reservoir service life calculation using trap efficiency by Churchill

Year	**Reservoir Capacity (af)**	**Sedimentation Index (s^2/ft)**	**Trap efficiency (%)**	**Sediment inflow (af/yr)**	**Sediment trapped (af/yr)**	**Complete reservoir siltation (year)**
1947	3070	4.8E+08	97	14	14	2167
2008	1786	3.3E+08	96	14	14	2138

With a trapped sediment rate of 14 af per year, the end of useful service life would be reached in approximately 2055 for the "water supply" approach and approximately 2116 for the "spilling sediment" approach (see section 3.6.2 and Table 4). Table 4 summarizes the estimates for both complete reservoir siltation and end of useful reservoir service life.

The trap efficiency calculations using Brune's method are much lower than computations using Churchill's method, resulting in a difference of about 50 years in computed remaining reservoir service life between the two methods. The difference would be about 20 years for the end of useful service life with the water supply approach and about 40 years for the end of useful service life with the spilling sediment approach. Considering that the operation of Los Padres reservoir typically allows for capture and slowing of river inflow, promoting settling of sediment, the reservoir could be considered similar to a settling basin. As such, Churchill's method would be a more appropriate and reasonably conservative method to use to compute trap efficiency. Compared to the trend developed from the historic measurements of reservoir capacity in section 3.6.2, Churchill's method provides an estimate of an additional 45 reservoir service life years when computing forward from the most recent reservoir capacity measurement in 2008. Given that the sediment inflow rate estimated by MPWMD in 1994 is smaller than the sediment deposition rates derived from historic data, the computation using Churchill's method provides the upper range estimate of possible reservoir service life.

Table 4 summarizes the predicted year of complete reservoir siltation and end of useful reservoir service life for the different calculation methods described above.

Table 4: Los Padres Reservoir end of useful service life and complete reservoir siltation

Method	Sediment deposition rate (af/yr)	End of useful reservoir life – "water supply" approach (year)	End of useful reservoir life – "spilling sediment" approach (year)	Complete reservoir siltation (year)
Historic Trend	21 [1]	2039	2079	2093
Trap Efficiency (Brune)	10 [2]	2072	2154	2184
Trap Efficiency (Churchill)	14 [3]	2055	2116	2138

Notes:
1. Based on long-term average capacity loss rate over the sixty-one years of operation as described in section 3.6.2 and shown in Figure 5& projected in Figure 6.
2. Based on 14 af/yr sediment inflow per MPWMD and Brune's trap efficiency computation method for 2008 reservoir capacity as described in this section and shown in Table 2.
3. Based on 14 af/yr sediment inflow per MPWMD and Churchill's trap efficiency computation method for 2008 reservoir capacity as described in this section and shown in Table 3.

4 INDUSTRY GUIDELINES AND RESERVOIR MANAGEMENT STRATEGIES

4.1 Industry Guidelines and Practices

Rivers throughout the world are either establishing or already in a state of morphological equilibrium. This means that the sediment inflow on average balances the sediment outflow. If a river carries more sediment than its transport capacity, then the sediment will be deposited. The sediment capacity decreases when the flow velocity decreases. Due to this reason sediment depositions occur when the rivers enters the impounded area of a reservoir. Most reservoirs are long enough so that the deposited sediment at the tail does not influence the water release at the dam. With most dams this is even the preferred alternative because sediment grains would cause abrasive wear at the turbine blades.

All impounded reservoirs in the world face the challenge of sedimentation to some extent. Mahmood (1987) has estimated that the worldwide reservoir sedimentation rate is 1 percent per year. In case of a new dam, the sediment yield has to be considered, where its effects on reservoir capacity are incorporated into long term operation plans. For a lot of older dams, environmental and economic aspects of long-term reservoir management were not considered in the original project design. For sedimentation, the dead-storage concept has been applied to store sediment during a dam's planned service life. Given that many reservoirs were constructed in the first part of the 20^{th} century, the lack of consideration for long-term management and the approach of allowing for dead-storage are not currently consistent with the need for sustainable use as established by the World Commission on Environment and Development in 1987 (WCED, 1987).

In recent decades, a number of dams in the U.S. have either reached the end of their service life or will soon. A need for more and new dams due to an increasing population and a limited availability of suitable new dam sites requires engineers to design dams and reservoirs in a more sustainable way. General sediment control strategies such as sediment inflow reduction, rerouting or removal have been implemented to achieve sustainable long-term use. Recently, agencies such as USBR and USSD have written guidelines on how to cope with sedimentation and what to consider in case of a dam decommissioning. These guidelines can be adopted for sediment management plans of operating reservoirs and are outlined in the subsections below. Section 4.2 provides an evaluation of the guidelines, as they are applied to sediment removal alternatives at Los Padres Reservoir.

4.1.1 Suggested Approach for Assessing Sediment Effects

The U.S. Society on Dams (USSD) has issued guidelines for assessing sediment-related effects of dam removal (Randle, 2011). The preliminary steps of the procedure are the following:

1) Reconnaissance of dam history, watershed context and sediment concerns
2) Characterize the reservoir sediment deposit
3) Assess possible sediment contamination
4) Determine the scale of the coarse and fine reservoir sediment volumes
5) Select initial dam removal and sediment management plan
6) Evaluate reservoir and downstream sediment impacts
7) Assess confidence, impact probability and risk
8) Determine if sediment impacts are tolerable

9) Develop monitoring and adaptive management plan

Similarly, the Aspen Institute has issued a report about Dam Removal – A New Option For a New Century (Aspen Institute, 2002). Even though the report aims to give guidelines and recommendations about dam removal, the guidelines addressing sedimentation closely resemble USSD's guidelines above. These are used to assess sediment removal alternatives in a similar approach as USSD's guidelines prescribe. As is applicable to this study, the Aspen Institute outlines the assembly of background information, sediment sampling, assessing possible contaminants, estimating the reservoir sediment volume, calculating trap efficiency and therewith the reservoir service life. Once this information is gathered, appropriate alternatives are selected.

Several of the steps defined by USBR can be applied to this sediment removal study, even though dam removal is not considered in the scope of sediment removal. Steps 1 through 4 are generally considered as determining site background information, which is mostly addressed in section 3 of this study. For Step 3, contaminant concerns, Greg Pepping, executive director of the Coastal Watershed Council, says "The water quality in the Carmel River is generally quite good" (Abraham, 2012); thus for the purposes of this study it is assumed no notable contaminants exist. The scale of the coarse and fine reservoir sediment (Step 4) has been gathered from the Kleinfelder Sediment Characterization Study on San Clemente Dam (Kleinfelder, 2002). Steps 5 through 8 are generally addressed for the different removal alternatives and disposal options discussed in this report. The environmental issues identification and cost estimates are also generated within those steps. Steps 6 through 9 would be developed further upon more detailed evaluation of sediment removal alternatives in future studies.

4.1.2 Sediment Management for Sustainable Use of Reservoir

The U.S. Bureau of Reclamation (USBR) has issued an Erosion and Sedimentation Manual (USBR, 2006) in which the topic of sediment management for small reservoirs is elaborated upon. Some of the measures commonly used to reduce reservoir sedimentation are summarized as follows:

- **Soil conservation in the watershed** –Three basic patterns of soil conservation measures are commonly taken in the watershed to reduce the sediment load entering the reservoir: structural or vegetative measures or tillage practice. Structural measures include terraced farmlands, flood interception and diversion works, bank protection works, check dams and silt trapping dams. Vegetative measures include growing soil, water conservation forests and reforestation. Tillage practice includes different farming practices.
- **Warping** – Warping is the practice of filling low agricultural land with turbid river water so that the suspended sediment can cover poor soils with fertile fine silt (or warp).
- **Joint operation of reservoirs** – This is a scheme to fully use a river's water resources with cascade development, which can be beneficial to mitigate reservoir sedimentation. One way is to use the upper reservoir to impound floods and trap sediment and to use the lower reservoir to impound clear water for water supply. Another idea is to use the upper reservoir for flood detention and the lower reservoir for flood impoundment. Irrigation water in the lower reservoir is used first; when it is exhausted, the water in the upper reservoir is used. The released water from the upper reservoir may not only erode the deposits in the lower reservoir, but also cause warping.
- **Bypass of incoming sediment** – Bypassing heavily sediment-laden flows during the flood season through a channel or tunnel may avoid serious reservoir sedimentation. A combination with warping may bring about high efficiency in sediment management. Bypassing alleviates reservoir sedimentation to some extent, but construction cost of such a facility is high in most cases. A facility can be practical when a unique topography results in a construction cost reduction.

- **Drawdown flushing –** This includes the lowering of the reservoir table so that a riverine flow establishes along the impounded reach. The river erodes a channel through the deposited sediment and the flushing transports the sediment through the outlet to the downstream river section
- **Reservoir emptying with sediment flushing –** In comparison with the drawdown flushing, the reservoir emptying loses the whole water storage. The sediment is also transported to the downstream river through a lower gate.
- **Lateral erosion –** The technique of lateral erosion is to break the flood plain deposits and flush them out by the combined actions of scouring and gravitational erosion caused by the great transverse gradient of the flood plains. In so doing, it is necessary to build a low dam at the upstream end of a reservoir to divert water into diversion canals along the perimeter of the reservoir. The flow is collected in trenches on the flood plains.
- **Siphoning dredging –** Siphon dredging uses the head difference between the upstream and downstream level of a dam as the source of power. At the end of the pipe, the sediment deposits are either released directly into the downstream river section or need further processing to separate the sediment and water.
- **Suction Dredging –** Suction dredging requires conventional energy sources (diesel fuel) to run the dredger that physically evacuates sediments from the bottom of the reservoir. This method requires a minimum amount of water cover above the sediment and a certain water to sediment ratio
- **Venting density current –** A density current is a sediment-laden reservoir inflow which will flow along the bottom and retain unmixed with the rest of the water body because of a difference in density. It can be vented by opening bottom outlets and letting the density current flow out of the reservoir.

The feasibility of the above listed measures for managing sediments in Los Padres Reservoir are discussed and evaluated in section 4.2 and summarized in Table 5.

4.1.3 Sediment Management Guidelines

The American Society of Civil Engineers (ASCE) has issued a guideline for retirements of dams and hydroelectric facilities (ASCE, 1997), which have also been incorporated into the USBR (2006) Manual. Sediment management considerations are not only applicable for planning dam decommissioning projects, but also are considered during evaluation of reservoir service life. The alleviation or prevention of significant changes and impacts on downstream channels require planning for sediment management as well as risk assessments and considerations. The USBR Manual and ASCE guideline offer four different sediment management approaches:

1. **No action** - The sediment is left in place and the future sedimentation is either allowed to continue at current rates or is reduced to enhance the life of the reservoir.
2. **River erosion** - The river will naturally erode the deposited sediment and transport them to the downstream area. It is only applicable, if the impact on aquatic species and water quality in the downstream area can be accepted or mitigated. This is an unacceptable method if the sediment is contaminated.
3. **Mechanized removal** - This includes a partial or full removal of the reservoir sediment and storage at an appropriate disposal site. Removal methods include conventional excavation and hydraulic or mechanical dredging while conveyance methods include transport by sediment slurry pipeline, truck or conveyor belt.
4. **Stabilization –** Modifications on project facilities such as river channel construction through the reservoir and erosion protection to stabilize sediments over the long term.

The above approaches have been considered for the Los Padres Reservoir sedimentation issue and are discussed in detail in Section 4.2, assuming continued operation. In summary, the no action approach would imply that no sediment is removed from Los Padres Reservoir and that over time it would continue to fill with sediment until a plan for dam decommissioning or change in project operation is determined. The approach of sediment removal by natural river erosion is nominally achievable by opening the existing low level outlet at Los Padres Dam in order to pass and flush sediment; however, this alternative does not consider significant environmental impacts and the inability to flush all sediments from Los Padres Reservoir through the relatively small outlet. The mechanized removal approach could be achieved by dredging or conventional excavation and is discussed in further detail below. The stabilization approach is not applicable since the sediments are already considered stable behind the existing dam, which is assumed to be left in place.

4.2 Reservoir Management Strategies

Following the outlined industry guidelines discussed in section 4.1, reservoir management strategies and specific removal methods as they could be applied to the Los Padres Reservoir sediments are discussed in detail below. Each alternative is listed to provide discussion on potential applicability and explain the constraints that impact the implementation of each method. Thus, the listed alternatives do not necessarily imply that the methods are feasible for management or removal of the Los Padres Reservoir sediments. Also, management strategies from the guidelines that clearly do not apply due to the physical constraints at Los Padres Reservoir, such as joint operation of reservoirs and warping, are not discussed. The feasibility of applying each sediment management alternative is summarized in Table 4.

1. **No Action**
   This management strategy would require no sediment removal and therefore no effort would be expended to maintain or increase the current reservoir capacity. The accumulated sediment will be left in place and additional sediment will continue to flow and deposit into the reservoir. The reservoir will eventually fill with sediment and require future planning to change the operation of the dam. This alternative is typically provided as a baseline for comparison against other removal methods.

2. **Soil Conservation / Reduce Sediment Inflow**
   The measures defined for this strategy are generally difficult to implement and are impractical due to the expanded environmental impact. For example, structural measures for limiting sediment movement into the reservoir, such as a dam or series of smaller retention structures, are unfeasible because of difficult access and impacts to steelhead spawning habitat in the watershed above Los Padres Dam. Implementing additional vegetative measures are impractical because of the large percentage of steep and inaccessible terrain in the watershed. Also, additional vegetative measures would impact pristine nature in the portion of the watershed in the Los Padres National Forest Wilderness Area. The watershed above the reservoir is not farmland and therefore tillage practice would not be applicable. Reforestation and other accelerated re-vegetation programs after big fires would be feasible, but would only work to reduce, not eliminate, the average rate of sediment inflow. Moreover, since both accelerated and natural re-vegetation require time to establish, these measures would not fully protect from soil erosion from rainfall events in the winter season following a fire.

3. **Bypass of Incoming Sediment / Sediment Routing**
   The strategy of bypassing sediments past Los Padres Dam is difficult due to the sediment deposition characteristics in the reservoir and is compounded by the fact that no natural or easily constructed bypass areas exist in the steep canyons in the vicinity of the dam. Unlike a lot of rivers throughout the world that carry most of their annual sediment load during the flood season or in flood events, the Carmel River has a

wet season but no flood season. The sediment is continuously transported into the reservoir throughout the wet season and usually not just in a few single events that could be predicted and subsequently bypassed during planned operation. Thus, any possibility of sediment diversion or bypass would require near continuous bypass of flows during the wet season to prevent sediment deposition into the reservoir. A constant diversion would not only bypass sediment, but also the water required to fill the reservoir for dry season storage. Additionally, given the steep topography, a restrictively expensive bypass tunnel capable of carrying large volumes of water with adequate flow velocities would need to be constructed through one of the dam abutments.

4. **Density Current Venting**
This strategy requires passing highly sediment-laden inflows through the reservoir by opening the bottom outlet. The difficulty in implementing this method is similar to the bypass method in 3. above, where it would be difficult or nearly impossible to plan operations to vent a density current, since the sediment is transported continuously transported into Los Padres Reservoir. Also, the venting of a possible density current would release high sediment concentrations downstream, which would provide an unacceptable impact to the environment, especially the endangered steelhead trout.

5. **Drawdown Flushing / Lateral Erosion**
This strategy requires drawdown of the reservoir to flush a portion of accumulated sediments through the existing low level outlets. This method would not completely empty the reservoir, nor much of the total sediment accumulation. In addition, normal reservoir operation (e.g., downstream minimum flow release) and a substantial yearly water storage yield would be lost for each drawdown flushing event. Furthermore, flushing events would release a significant sediment concentration into the downstream section of the river, which would impact river morphology as well as sensitive steelhead trout. This method was actually implemented inadvertently in 1980 during a sluicing event, resulting in significant turbidity downstream and a resulting fish kill.

6. **Reservoir Emptying with Sediment Flushing**
Reservoir emptying is similar to the drawdown flushing strategy for managing sediment accumulation, and therefore has similar issues in implementation when the reservoir is drained.

7. **Siphon and/or Suction Dredging**
This method removes sediments by suction of sediment slurry and deposit into a disposal facility. Due to the high demand of water required to mobilize sediments into a slurry, suction dredging could only be operated at the beginning of the dry season at Los Padres Reservoir, when sufficient amounts of reservoir water is available. Barges could be used dredge different areas in the reservoir following the natural reservoir level decrease in the dry season. The sediment would be removed as slurry and processed into dry sediment before transport and permanent disposal, requiring a large staging and processing area. Once processed, sediments would be transported via a conveyance system at an appropriate disposal site. Given the high water demand to produce slurry, implementation of this removal alternative would require an extended period of construction in order to be feasible.

8. **Mechanical Removal**
This alternative includes several different options of sediment removal such as use of conventional excavation equipment or mechanical dredging. Conventional excavation equipment use requires reservoir elevation lowering and sediment dewatering to access and excavate the sediment with scrapers and loaders. A drained reservoir in the areas of targeted sediment removal is a prerequisite for sediment removal with this method. Sediments close to the dam will consist of very fine silts that will be difficult to dewater and

thus will not permit use of conventional excavation equipment. This option would therefore not be feasible for a complete sediment removal without combination with other methods such as mechanical dredging. Because mechanical dredging is operated with a barge-mounted clamshell or dragline, no major reservoir elevation decrease is necessary and thus no water is lost in sediment removal operations. Requirements would include a processing site for the dredged materials and a disposal site for both options.

Table 5 provides a comparison of the above sediment management alternatives for Los Padres Reservoir.

Table 5: Summary of sediment management strategies at Los Padres Reservoir

Sediment Management Alternative	**Issues**	**Applicability to Los Padres Reservoir**
No action	No action will result in decreasing storage capacity and require planning for future change in operation.	Possible alternative if long term action is agreed upon.
Inflow reduction	Impractical given impacts to wilderness areas by revegatative measures or additional storage structures, lack of farmland for tillage practice, and overall difficulty in implementation in steep terrain.	Not practical due to economic and environmental constraints.
Bypass	Difficult to implement given sediment transport characteristics of watershed and high cost of developing bypass (includes notable environmental impact as well).	Not practical due to economic and environmental constraints.
Density Current Venting	Difficult to implement given sediment transport characteristics of watershed. Also results in release of high sediment concentration into downstream river that significantly impacts habitat & species.	Not practical due to economic and environmental constraints.
Drawdown Flushing	Results in release of high sediment concentration into downstream river that significantly impacts habitat & species. Also, removal of notable quantities in reservoir not achievable given reservoir configuration and outlet size.	Not practical due to environmental constraints and poor effectiveness.
Reservoir Emptying	Results in release of high sediment concentration into downstream river that significantly impacts habitat & species.	Not practical due to environmental constraints.
Dredging	Requires significant supply of water for removal of sediments as slurry. Option could be implemented if utilized in wetter months (i.e., construction *not* restricted to summer months) and if water from slurry could be treated efficiently and released back into reservoir. Current analysis revealed difficulty in implementing efficient slurry dewatering and water recycling.	Currently not practical given limited construction window and lack of availability of water.
Mechanical Removal	Requires combination of methods for practical application. Clamshell dredging would be utilized in lower areas of reservoir and dry excavation with scrapers would be used in upper reservoirs. Depending on alternative configuration, requires access in upstream river for construction and development of nearby disposal areas.	Feasible option

5 SEDIMENT REMOVAL ALTERNATIVES

Based on the nature of sediment accumulation in Los Padres Reservoir, sediment removal alternatives have been developed using feasible removal methods and disposal locations. This section also outlines environmental impacts, and provides cost and schedule estimates for each alternative.

The basis for the removal methods and alternatives selection assumes that the initial reservoir capacity of 3070 af has decreased to 1786 af as measured in 2008. Given that selection of removal methods is determined partially by the dryness or saturation of the sediments at higher & lower elevations in the reservoir, a differentiation is made for sediment below and above elevation 1000 with Table 6 listing the deposited sediment volumes. Elevation 1000 feet is also the lower limit of reservoir drawdown in any given year, due to downstream release requirements.

Table 6: Sediment deposited in Los Padres Reservoir between 1947 and 2008

Elevation (ft)	**Deposited sediment (million cy)**
Beneath EL 1000	1.2
Between EL 1000 and EL1040	0.9
Total	2.1

5.1 Sediment Removal Methods

Given the type of sediments, reservoir accessibility, and water availability, the feasible sediment excavation methods considered for this analysis include

(1) mechanical excavation using conventional earthmoving equipment
(2) hydraulic dredging using a suction dredge
(3) barge-mounted clamshell or long-arm excavator

Detailed descriptions of each method are described in the subsections below.

5.1.1 Mechanical Excavation using Conventional Earthmoving Equipment

Excavation of sediment above the water table would be performed using conventional self-loading scrapers or similar self-propelled excavating equipment. The scrapers would transport the material to a centralized surge stockpile area within the reservoir area, where the material would be allowed to drain further. The exact location of the centralized stockpile area would depend on the final destination of the sediment. After local dewatering, the material would be either loaded onto trucks for transport to the final upstream disposal site.

Prior to excavation of the upstream sediments, a series of dewatering wells would be installed to promote drainage of the sediments before commencing earthmoving operations during the summer construction season. The number, sizing and depth of the pre-construction dewatering wells would be designed to ensure that the sediments could be excavated with conventional earthmoving equipment. Moisture content of the dewatered sediments is expected to remain above optimum (i.e., +5%), but such that free water content would be significantly reduced. It is expected that the dewatering wells would be installed several months ahead of earthmoving operations after the annual rainy season ends in early spring.

The Carmel River would be diverted around the active areas of excavation during the construction season. It is assumed that either a cofferdam or a sheet pile cutoff with a culvert penetration would be used to divert the river at an upstream location adjacent to the disposal site. The Carmel River would be diverted via an 18-inch pipeline with capacity for about 5 cfs. The river diversion pipeline would discharge into the lower reservoir area near the dam to facilitate marine dredging operations. Mandated downstream river flows would be maintained by pumping required water volumes over the existing Los Padres Dam, likely routed through the spillway. Prior to commencing conventional excavation operations, the reservoir water surface would be drawn down by gravity to elevation 1000 ft. As established by the 2008 bathymetry, the reservoir capacity is 1786 af at elevation 1040 ft and about 400 af at elevation 1000 ft, respectively. The median reservoir inflow in July, resulting from monthly flow patterns for the last 23 years (MPWMD, 2012), exceeds the minimum downstream release. The necessary reservoir lowering from elevation 1040 ft by July 1st to 1000 ft by August 1st results in an additional discharge of about 1400 af. Due to a limited low-level outflow capacity, additional pumping might be needed depending on the reservoir inflow. Alternatively, an earlier start for reservoir level lowering can be considered.

Water originating from local precipitation, springs, and/or seepage through the river diversion structures would be an anticipated source of seepage water into the construction area, bound on the upstream end by the diversion structures and on the downstream end by the dam. Excavation operations would be managed to promote pre-drainage of the sediments ahead of the excavation with dewatering wells installed throughout the construction area. Water within the construction area would be turbid due to the earthmoving operations. The reservoir itself would be used as a desilting basin during the construction season. Excess water from within the reservoir would need to be treated to remove turbidity and would be discharged to the river.

All the material above reservoir elevation 1000 is assumed to be either sand or coarser material which can be drained effectively. Due to minimum downstream flow release into the Carmel River during construction season and reservoir elevation limitation therefrom, the silt deposits below elevation 1000 feet would need to be removed using suction dredging or barge-mounted excavation.

The excavated material would be transported by truck to the upstream disposal site. A 25 feet wide roadway for two-way traffic would be established during the first construction year using the excavated sand and gravel. The road would be alongside the edge of the reservoir on top of deposited sediment and along the Carmel River further upstream. At the sediment disposal site location, a cut and fill road with switchbacks at 10% grade up alongside disposal site for access to site every 40 feet of height would be constructed. The road would need repair in the mobilization phase in summer in case of damages from the winter season. The road would be removed in the last year of the project and the natural surroundings restored.

5.1.2 Hydraulic Excavation using a Suction Dredge

Hydraulic dredging could be accomplished using a portable dredge similar to an Ellicott 1170 Series “Dragon” model (see Ellicott product information at www.dredge.com), discharging to an 18-inch-diameter slurry pipeline. Portability of the dredge is necessary due to the constrained site access conditions, which limit the size of the dredge that can be used. The dredge would be mounted on a barge, with a cutter head and a dredge pump powered by a diesel motor. For this dredge size, total diesel power requirements at the barge are about 1,800 HP. The barge would move around the reservoir by using winches and anchors. A minimum operating draft of 4 feet of water would be needed.

A typical hydraulic dredge operation produces slurry with about 20 percent of solids by weight. In order to achieve reasonable sediment removal rates, this solids concentration implies an average water demand for sediment transport of over 20 cfs, which would not be available during the majority of the construction season. Therefore, water recycling is assumed to be required in order to make slurry transport a technically feasible option. Water recycling would involve (1) lining the sediment disposal site with a membrane to minimize water losses, (2) decanting water from the slurry at disposal processing site by appropriate design and operation of the processing cell, (3) installing and operating a water return pump station and pipeline from the processing site to the reservoir, and (4) possibly using a desilting basin or packaged water treatment system immediately adjacent to the reservoir to reduce the turbidity of the recycled water prior to returning it to the reservoir.

The slurry would require decanting prior to deposition and would be transported in a pipeline to the processing area. The pipe would follow along the spillway and then cross over the riverbed to the other slope. The slurry would need relatively high flow velocities to avoid particle settling, which would result in high head losses and power demand. The decanted water would be recycled and returned to the reservoir via a separate pipeline. After decanting, the excavated material would be trucked to the disposal site along the existing dam access road which would need improvements to facilitate two-way traffic.

Prior to commencing excavation operations, the reservoir water surface would be drawn down by gravity to a depth that allows for optimal dredging operations. The dredge would then be launched from a staging area near the dam. Dredging would progress downstream towards the dam. Maximum suction dredging depth would be in the order of 40 feet. Based on the developed reservoir profile, the barge would work to remove sediments below elevation 1000 in the downstream half of reservoir.

The removal of sediment from the reservoir would gradually increase the reservoir capacity and tend to gradually lower the reservoir level as the construction season proceeds. The volumes to be dredged each season would need to be carefully planned based in part on the anticipated trend in reservoir water level during the construction season. Water within the construction area would be turbid due to the dredging and water recycling operations. The reservoir itself would be used as a desilting basin during the construction season. Excess water from the reservoir would need to be treated to remove turbidity and would be discharged to the river to sustain a minimum flow in the downstream Carmel River.

At the end of the first construction season, the initial storms that exceed the diversion capacity would fill the reservoir, after which time the diversion pipe would be disconnected and the river flow through the reservoir re-established.

5.1.3 Barge Mounted Mechanical Excavation

Similar to the hydraulic dredging excavation method, mechanical excavation in the dewatered reservoir could be performed via a barge mounted crane with a clamshell bucket. The crane excavation equipment will sit atop a Flexi-Float marine platform and would excavate and convey the underlying sediments to a secondary materials transport barge. The clamshell operation would be supported with a 3D GPS positioning system, capable of a 30mm tolerance on land or under water to effectively locate and manage the sediment excavation in a grid type pattern.

A long-arm excavator could also be used to excavate the underwater sediments via a Flex-float system. However, commercially available excavators (i.e., CAT 385) are limited to a 50’ working depth. While the long-arm excavator method offers production advantages over the slower clamshell method, the restricted working depth requirement might preclude use of long-arm excavators on the Los Padres Reservoir where a 60’+ excavator would be required to excavate all of the bottom sediments. Alternatively, a long-arm excavator could be used for the shallower first season and followed by a clamshell operation for subsequent deeper removal in the follow-on years. Finally, the two types of equipment (e.g., excavator, clamshell) could be used concurrently to focus operations on both the high and low removal zones.

The Flexi-Float marine platforms would be towed to the excavation areas via a small work or tug boat. When not positioning the fixed barges the work boat would be used to ferry men and fuel to the working platforms plus tow the material barges to the on-shore unloading facility, located near the spillway ramp, The barged materials would be off-loaded to the on-shore loading area by either a dozer staged on the Flexi-Float or by means of a shore based excavator or via a floating conveyor system. The excavated material would either be re-loaded onto trucks to transport the material to a processing area or the conveyor would follow the spillway to its end and across the Carmel River bed into the decanting cells. Trucks would transport the material to the disposal site on the existing dam access road and the new extended decanting area access road from the dam. The roads would be improved for two-way traffic and the spillway bridge to allow for trucks and construction vehicles.

5.2 Sediment Disposal

5.2.1 Disposal Sites

Several disposal sites have been studied and two sites in the vicinity of the Los Padres Reservoir within the Cal-Am property boundary have been chosen as feasible options. These result from disposal site volume calculations as well as observations from two MWH site visits. Pictures of the reservoir and its surroundings from the site visits are shown in Appendix D. Both sites would need preparation prior to sediment disposal, including the clearing and grubbing of trees and vegetation from the sediment pile footprint. The stripped organic soils would have to be stockpiled of for use in subsequent restoration and revegetation of the site once sediment placement has been completed.

Upstream Disposal
The upstream disposal site is located in a relatively steep, undeveloped, forested ravine about 1.6 miles south of the Los Padres Dam, on the west side of the Carmel River (see Exhibit 2). The toe of the sediment pile would be located at approximately elevation 1120 feet. The 1.8 million cubic yards of removed sediment from Alternative 1 would result in a top elevation and height of 1440 feet and 320 feet, respectively (see Exhibit 4). The planned sediment removal of 0.8 million cubic yards in Alternative 2 would result in a top elevation of 1360 feet, corresponding to a height of 240 feet (see Exhibit 6).

Current access to the ravine is via jeep trail several thousand feet beyond the dam crest and continues via a hiking trail along the reservoir into the upstream watershed. The steepness of the terrain along the reservoir renders the building of an access road from the dam to the tail of the reservoir along the shore unfeasible. Transporting equipment to the tail of the reservoir for site preparation and sediment disposal would require barging across the reservoir or lifting by helicopters. Transport of sediment for disposal at this site would require construction of an access roadway from the tail of the reservoir to the site. This 25 foot wide access road would be generally constructed alongside the river banks from the tail of the reservoir to the disposal site and consist of the coarser material excavated from the reservoir.

Access from the river to the disposal area would require construction of 10 percent grade switchbacks up the slope adjacent to the sediment disposal face (see Exhibit 3 and 5). The area along the river at the entrance to the disposal area ravine is relatively level and would be used as a staging area. As described for mechanical excavation methods above, the river would be rerouted to avoid flooding of the staging area and excavation at the tail of the reservoir. A cofferdam or sheet pile cutoff in the river upstream of the disposal site would mark the beginning of the bypass.

The disposal site would need to be cleared of trees prior to the beginning of disposal and the soil would be excavated to properly found the stabilized sediment disposal slope face on rock. The bottom portion of the stabilized sediment would be built as a soil-cement block with a 1:1 slope to ensure the stability of the site. The upper portion would be constructed with staged berms using a 3:1 slope to control erosion (see Exhibit 4 and 6). Additionally, culvert pipes would be placed at the bottom of the ravine to lower the water table in the disposed sediments in order to enhance stability. The deposited material would be compacted while being placed. The footprint of the disposal site filled with the complete reservoir sediment volume would be about 18 acres.

Downstream

The downstream disposal site is located about 1300 feet downstream of the Los Padres Dam on the east side of the Carmel River (see Exhibit 7). The site is bound by the Carmel River and continues up along the slope of the valley. The bottom of the site would be about 40 feet above the river at elevation 960 feet. Sediment deposition of 0.9 million cubic yards would result in a top elevation and height of 1040 feet and 80 feet, respectively (see Exhibit 9).

The site would be cleared of trees prior to the beginning of disposal and the soil removed down to the bedrock. The face of the site would consist of a 1:1 sloped soil-cement mix founded on the bedrock or stabilized soils to ensure stability. Culvert pipe would be placed at the bottom of the compacted material to ensure drainage of the materials and slope stability. With proper foundation preparation, the volume of the site could be increased in the future to remove and store additional sediment from the reservoir. The footprint of the disposal site filled with the sediment below reservoir elevation 1000 feet would be about 14 acres.

The site is alongside the existing access to Los Padres Dam, which would be impacted by sediment disposal once disposal volumes increase above the road elevation. The access road would require planning for rerouting further up the slope as the disposal site elevation increases.

Sites Considered and Eliminated

Several other disposal sites were considered during the preliminary evaluation. These include:

- A possible disposal site was initially identified 1500 feet upstream and across the Carmel River from the upstream disposal site described above, based on existing topographical information. However, upon further examination during the MWH site visit and observation in the upstream area, it was discovered that the topography was in fact very steep and provided only narrow access, making this location unfeasible.
- On the MWH site visit in October 2012, a second ravine across the Carmel River from the disposal site was selected, but located about 1600 feet downstream of the upstream disposal site. The base of the ravine has a wide bottom area, providing for good accessibility and storage capacity. However, due to the fact that the upper location of the ravine extended beyond Cal-Am property, showed evidence of an ephemeral stream (possible habitat), and otherwise did not provide advantages over the selected upstream disposal site, this site was deemed unnecessary and likely unfeasible due to property acquisition and increased environmental impact.
- Across the Carmel River from selected downstream disposal site, another possible sediment disposal location was identified. However, disposal site volume calculations showed limited capacity, making this possible location unfeasible.
- Disposal locations beyond the vicinity reservoir were considered but dismissed due to similar concerns and constraints identified for the disposal site study results for San Clemente Reservoir. These included substantially increased transport costs, noise & traffic impacts from high-volume truck traffic through local neighborhoods, air quality impacts, disposal site permitting, and land acquisition cost.

5.2.2 Marketability

A review and update of MWH's memorandum evaluating the commercial value of the sediment at San Clemente Dam, which is a few miles downstream of Los Padres Dam, was performed in context of the current sediment removal feasibility evaluation for Los Padres Reservoir.

Given that no detailed investigations of Los Padres Reservoir sediments have been performed and the fact that Los Padres is in the same watershed as San Clemente Dam, the sediment profile developed for the San Clemente Reservoir was used to estimate the amount and type of marketable materials in the Los Padres Reservoir. Review of the assumed sediment profile shows that a majority of the usable sandy and gravelly material is most likely located in the upper reach of the reservoir. In order to make the sediment accessible for commercial usage or for downstream release into the Carmel River, these sediments would require processing and transport through the reservoir and over Los Padres Dam.

Sufficient space for a processing facility does not exist within the reservoir area due to the steep terrain in the entire area surrounding the reservoir. Therefore, a processing facility would be developed downstream of the reservoir. For sediment removal and disposal alternatives (disposal of non-commercially viable sediments) that utilize downstream areas for disposal, the additional processing facility would restrict disposal operations and increase the disposal alternative schedule and cost. For alternatives that utilize areas upstream of the reservoir for disposal, the additional transport & processing of materials downstream increase disposal schedule and cost as well.

MWH performed a follow up phone call to Graniterock to review MWH's previous inquiry regarding marketability of sediments at San Clemente. Don Barrett at Graniterock confirmed that the demand and the price range for concrete sand is still similar to the study conducted for San Clemente Dam. In the case the sand could only be used as fill, the price would be considerably lower. Notwithstanding the additional challenges and costs imposed by a sediment drying, delivery, screening & processing operation added to any sediment removal alternative, the evaluation of commercial use of sediment from Los Padres Reservoir shows that it would be uneconomical due to the high processing and transportation costs involved in accessing the remote site. Also, the issues identified in MWH's previous evaluation (e.g., multi-year staffing & operation of a processing facility, permitting of a facility, mitigation costs, local opposition, increased traffic on undersized and poorly developed site access roads through the local community, etc.) of the San Clemente Reservoir sediments, as outlined in Appendix C, are very similar to the issues expected at Los Padres Reservoir and thus render commercial use of sediments unfeasible.

5.3 Scope/Alternatives

Based on the evaluation of the removal methods in section 5.1 and disposal site options in section 5.2.1, three feasible sediment removal alternatives were developed. Suction dredging was excluded due to limited water and processing area availability. Similarly, unfeasible disposal sites from the preliminary evaluation were eliminated as well. The following three alternatives were considered for further evaluation:

1. Alternative 1: Complete removal with upstream disposal
2. Alternative 2: Partial removal with upstream disposal
3. Alternative 3: Partial removal with downstream disposal

In addition to the above alternatives, a no-action alternative is considered as a reference for comparison of all alternatives. Under the alternative no action, the sediment would be left in place would and would result in no further action and cost for any activities other than the current reservoir operation. The reservoir would continue to accumulate sediment at an average rate of 17.4 af per year. A new sediment removal or dam decommissioning study would be required in the future, at the latest when the reservoir is completely filled with sediment.

Key assumptions made in development of each alternative:

- The wet season for the Carmel River begins at the end of October and continues into the spring. The steelhead's smolt outmigration takes place during April and May and is protected by flow requirements. Therefore, the construction season begins in July and ends in mid-October.

- It is assumed that the sediment deposited in Los Padres Reservoir has a similar gradation as the sediment in the San Clemente Reservoir. The sediment gradations presented by MEI (MEI, 2003) were used to characterize the sediments in development of key assumptions in construction methodology for sediment removal.

- For dry excavation methods, the water surface elevation will be drawn down to El. 1000 by August 1st. Water at this elevation would provide enough capacity for minimum downstream releases assuming that the reservoir inflow is about half of the required discharge.

5.3.1 Alternative 1: Complete Removal with Upstream Disposal

This alternative would remove about 90 percent or 1.8 million cubic yards of the deposited sediment and place it in the upstream disposal site described in section 5.2.1. After completion of the sediment removal, the reservoir capacity would be restored to near full capacity. An overview and plan and section views of the disposal site are shown in Exhibit 2 and Exhibit 3 and 4, respectively.

The sediment removal methods would consist of clamshell excavation for the lower reach and mechanical excavation for the upper reach of the reservoir. Excavation would be performed concurrently and vary in location in the reservoir as the water table and reservoir level is decreased.

The paths leading further than the dam are only jeep roads or even hiking trails. The steepness of the terrain above the reservoir makes the building of an access road from the dam to the tail of the reservoir along the shore unfeasible. The equipment would be transported on the improved jeep trail down onto the roadway in the reservoir and along the Carmel River. The road from the Cal-Am property entrance to the dam and the access to the reservoir through the dam ramp would need to be improved prior to dredging. The staging area would be located near Cal-Am entrance and at the toe of the disposal site near the river.

In the upper reach, starting about 0.57 miles upstream of the dam, mechanical excavation using self-loading scrapers or similar self-propelled excavating equipment would be performed to remove the sediment which lies above the water table. This corresponds with the sediment between elevation 1000 and 1040. With the reservoir level lowered to elevation 1000 by August 1st, the excavators are not limited by a high water table and can access the whole deposited material. The reservoir level lowering would results in a total discharge to the Carmel River of about 1400 af from July 1st to August 1st. In order to accelerate sediment drainage, dewatering wells would be set to lower and maintain the water surface at the targeted final excavation elevation. The scrapers would transport the material to a central stockpile area at the reservoir tail, where the material would be allowed to drain further. During the first year of construction, the access between the reservoir and the disposal site would be established using sand and gravel from the excavated material to build a 25 feet wide roadway along the river. The road would be removed in the last year of the project to reinstate the natural surroundings. Where high winter flows damage parts of the access road, it would be repaired the following season. The excavated material would be loaded onto trucks and transported to the upstream disposal site along the temporary access road, as shown in Exhibit 2.

In the lower half of the reservoir, the sediment would be excavated mechanically using a barge mounted clamshell. The material would be transported to the upstream end of the water body with a Flexi-Float supported floating conveyor system and unloaded on the existing sediment to drain. There the material would be loaded onto trucks and brought to the upstream disposal site.

In order to manage water in the reservoir excavation area, the Carmel River would be routed through piping to bypass the reservoir. A diversion facility, consisting of an interlocking sheet pile cofferdam, would be installed upstream of the upstream disposal site to divert incoming flows from the Carmel River through an 18-inch-diameter bypass pipeline. The sheet piles would be driven down through the sediment to bedrock. The upper end of the sheet piles would extend about five feet above the existing streambed to develop sufficient head at the bypass pipe intake. A removable section would be provided that can be disassembled to allow stream and fish passage during non-construction periods. The bypass would run along the reservoir shore and be discharged downstream of the dam. At the end of each construction season the diversion pipe would be disconnected from the sheet pile cutoff and the river flow would be re-established through the reservoir.

The Carmel River downstream of Los Padres Dam requires a minimum discharge during the dry season which would be sustained with water from the reservoir. In case of turbidity due to sediment excavation, water would only be discharged to the River after passing a temporary treatment facility downstream of the dam. Given the river bypass and accelerated reservoir drawdown to El. 1000, this alternative would somewhat affect water storage operations, but would not materially impact the water supply function of the reservoir during construction.

The sediment would be deposited in the upstream disposal site, located in a relatively steep, undeveloped, forested ravine approximately 1.6 miles south of the Los Padres Dam on the west side of the Carmel River. With a strengthened soil-cement mix with a 1:1 slope at the bottom and staged berms with a 3:1 slope at the top, the site would be about 320 feet high. With sediment pile toe located at approximately elevation 1120, the top would be at elevation 1440. This would facilitate the capacity needed to dispose 90 percent of the reservoir's sediment.

Site preparation prior to sediment disposal in the first year of construction would include the clearing and grubbing of trees and vegetation from the sediment pile footprint and the stripping and stockpiling of organic soils for use in subsequent restoration and revegetation of the site once sediment placement has been completed. A key would need to be built for proper site foundations on the bedrock. In addition, a culvert pipe would be placed along the ravine bottom of the site to reduce the water table in the disposed sediments and minimize erosion during construction operations. The staged berms on the 3:1 slope would be constructed using the granular material from the excavated material. Upon delivery of sediment to the site, the sediment would be spread by means of bulldozers into thin, nearly horizontal lifts. Each lift would be compacted using the same bulldozers or vibratory compactors.

At the conclusion of each construction season, the site would need to be winterized. This would involve providing interim drainage and diversion of ravine flows, stabilizing sloping sediment surfaces and other disturbed areas by installing erosion protection features such as erosion control mats or straw mulch and wattles.

Once placement of sediment has been completed, the topsoil from the temporary topsoil stockpile developed during site stripping would be spread over the sediment pile. The graded surface would again be stabilized with erosion control measures as described above and would be re-vegetated with native plants and trees obtained from the site vicinity.

5.3.2 Alternative 2: Partial Removal with Upstream Disposal

This alternative would consist of the conventional removal in the upper reservoir reach and disposal in the upstream disposal site. In this alternative the sediment in the lower reach would not be excavated. The amount of removed sediment above elevation 1000 would be 0.81 million cubic yard or about 40 percent of the total sediment deposited in the reservoir. Plan and section views of the disposal site are shown in Exhibit 5 and Exhibit 6.

Due to the infeasibility of building an access road along the reservoir slope, the equipment would be transported on the improved jeep trail down onto the roadway in the reservoir and along the Carmel River. The road from the Cal-Am property entrance to the dam and the access to the reservoir through the dam ramp would need to be improved prior to dredging. The staging area would be located near Cal-Am entrance and at the toe of the disposal site near the river.

In the upper reach, starting about 0.57 miles upstream of the dam, mechanical excavation using self-loading scrapers or similar self-propelled excavating equipment would be performed to remove the sediment which above elevation 1000. With the reservoir level lowered to this elevation by August 1st, the excavators would not be limited by a high water table and thus would access the pre-drained material. The reservoir level lowering would result in a total discharge to the Carmel River of about 1400 af from July 1st to August 1st. In order to accelerate sediment drainage, dewatering wells would be set to lower and maintain the water surface at the targeted final excavation elevation. The scrapers would transport the material to a central stockpile area at the reservoir tail, where the material would be allowed to drain further. During the first year of construction, the access between the reservoir and the disposal site would be established using sand and gravel from the excavated material to build a 25 feet wide roadway along the river. The road would be removed in the last year of the project to reinstate the natural surroundings. In case of a flood destroying parts of the access road, it would have to be repaired. The excavated material would be loaded onto trucks and transported to the upstream disposal site along the access road, as shown in Exhibit 2.

In order to manage water in the reservoir excavation area, the Carmel River would be routed through piping to bypass the reservoir. A diversion facility, consisting of an interlocking sheet pile cofferdam, would be installed upstream of the upstream disposal site to divert incoming flows from the Carmel River through an 18-inch-diameter bypass pipeline. The sheet piles would be driven down through the sediment to bedrock. The upper end of the sheet piles would extend about five feet above the existing streambed to develop sufficient head at the bypass pipe intake. A removable section would be provided that can be disassembled to allow stream and fish passage during non-construction periods. The bypass would run along the reservoir shore and be discharged downstream of the dam. At the end of each construction season the diversion pipe would be disconnected from the sheet pile cutoff and the river flow would be re-established through the reservoir.

The Carmel River downstream of Los Padres Dam requires a minimum discharge during the dry season which would be sustained with water from the reservoir. In case of turbidity due to sediment excavation, water would only be discharged to the River after passing a temporary treatment facility downstream of the dam. Given the river bypass and accelerated reservoir drawdown to El. 1000, this alternative would somewhat affect water storage operations, but would not materially impact the water supply function of the reservoir during construction.

The sediment would be deposited in the upstream disposal site as described in section 5.2.1. The site is located in a relatively steep, undeveloped, forested ravine approximately 1.6 miles south of the Los Padres Dam, on the west side of the Carmel River. With a strengthened soil-cement mix with a 1:1 slope at the bottom and staged berms with a 3:1 slope at the top, the site would be about 240 feet high. With sediment pile toe located at approximately elevation 1120, the top would be at elevation 1360. This would facilitate the capacity needed to dispose 40 percent of the reservoir's sediment.

Site preparation prior to sediment disposal in the first year of construction would include the clearing and grubbing of trees and vegetation from the sediment pile footprint and the stripping and stockpiling of organic soils for use in subsequent restoration and revegetation of the site once sediment placement has been completed. A key would need to be built for proper site foundations on the bedrock. In addition, a culvert pipe would be placed along the ravine bottom of the site to reduce the water table in the disposed sediments and minimize erosion during construction operations. The staged berms on the 3:1 slope would be constructed using the granular material from the excavated material. Upon delivery of sediment to the site, the sediment would be spread by means of bulldozers into thin, nearly horizontal lifts. Each lift would be compacted using the same bulldozers or vibratory compactors.

At the conclusion of each construction season, the site would need to be winterized. This would involve providing interim drainage and diversion of ravine flows, stabilizing sloping sediment surfaces and other disturbed areas by installing erosion protection features such as erosion control mats or straw mulch and wattles.

Once placement of sediment has been completed, the topsoil from the temporary topsoil stockpile developed during site stripping would be spread over the sediment pile. The graded surface would again be stabilized with erosion control measures as described above and would be re-vegetated with native plants and trees obtained from the site vicinity.

5.3.3 Alternative 3: Partial Removal with Downstream Disposal

This alternative would remove the sediment from the lower reach of the reservoir with a barge-mounted clamshell and deposit it in the downstream disposal site as described in section 5.2.1. The sediment in the upper reach would not be removed. The volume of the removed sediment would be about 0.9 million cubic yards or to about 44 percent of the accumulated volume. An overview and plan and section views of the disposal site are shown in Exhibit 7 and Exhibit 8 and 9, respectively. This alternative allows for remobilization, placing the excavated material behind staged berms on top of the soil-cement block.

The river would not be rerouted during the construction season but kept flowing into the reservoir. To protect the fish and reduce turbidity in the reservoir, a silt curtain would be installed. The reservoir wouldn't need to be significantly lowered for this alternative because wet material would be excavated. To sustain the minimum downstream release, water from the reservoir would be pumped out of the reservoir, possibly treated at the facility next to the processing site and released to the Carmel River to meet the minimum release criteria. As the reservoir decreases throughout the season would not affect the dredging. In general, this alternative would minimally affect water storage and the normal water supply function of the reservoir during construction.

During the first year of construction, the existing access roads to the processing area, the dam ramp for reservoir access and the spillway bridge would be improved to facilitate two-way trucking traffic. Additionally, the staging and decanting area would be constructed with a cut and fill approach and set up for operation. Separately, the disposal site access would need to be reconfigured and built. The staging area would be near the entrance to the Cal-Am property.

Site preparation prior to sediment disposal in the first year of construction would include the clearing and grubbing of trees and vegetation from the sediment pile footprint and the stripping and stockpiling of organic soils for use in subsequent restoration and revegetation of the site once sediment placement has been completed. A key would need to be built for proper site foundations on the bedrock. In addition, a culvert pipe would be placed along the ravine bottom of the site to help manage storm waters and minimize erosion during construction operations. Upon delivery of sediment to the site, the sediment would be spread by means of bulldozers into thin, nearly horizontal lifts. Each lift would be compacted using the same bulldozers or vibratory compactors.

The sediment would be removed with a barge-mounted clamshell in the lower reach of the reservoir and transported to the processing site opposite of the disposal site on a conveyor system. The excessive water from the decanting would be recycled and rerouted back into the reservoir. The dried material would be trucked on the improved access road and deposited into the downstream disposal site as described in section 5.2.1. At the disposal site, the sediment would be spread across the disposal area in preparation for compaction.

The sediment would be deposited in the downstream disposal site, located about 1300 feet downstream of the Los Padres Dam on the east side of the Carmel River. The site is bound by the Carmel River and continues up along the slope of the valley. The bottom of the site would be about 40 feet above the river at elevation 960. Sediment deposition of 0.9 million cubic yards would result in a top elevation at 1040. The 80 feet height would have a 1:1 slope strengthened soil-cement mix at the face.

At the conclusion of each construction season, the site would need to be winterized. This would involve providing interim drainage and diversion of ravine flows, stabilizing sloping sediment surfaces and other disturbed areas by installing erosion protection features such as erosion control mats or straw mulch and wattles.

Once placement of sediment has been completed, the topsoil from the temporary topsoil stockpile developed during site stripping would be spread over the sediment pile. The graded surface would again be stabilized with erosion control measures as described above and would be re-vegetated with native plants and trees obtained from the site vicinity.

Table 7: Overview of sediment removal alternatives

	1 **Complete Removal (90%) – Upstream Disposal**	2 **Partial Removal (40%) – Upstream Disposal**	3 **Partial Removal (44%) – Downstream Disposal**
Method	- Conventional - Clamshell dredging	- Conventional	- Clamshell dredging
Season	July 1st to October 1st (August 1st start for dry sediment removal)	July 1st to October 1st (August 1st start for sediment removal)	July 1st to October 1st
Total length of construction	7 years (5 years for sediment removal)	6 years (4 years for sediment removal)	7 years (5 years for sediment removal)
Disposal Site	Upstream (1:1 bottom slope, 3:1 top slope)	Upstream (1:1 bottom slope, 3:1 top slope)	Downstream (1:1 slope)
Disposal Area	- Site preparations (clearing, access, etc.) - Berm: local material, soil cement	- Site preparations (clearing, access, etc.) - Berm: local material, soil cement	- Site preparations (clearing, access, etc.) - Berm: local material, soil cement
Water	- River bypass • Upstream cofferdam • Pipe along reservoir - Accommodate minimum downstream release	- River bypass • Upstream cofferdam • Pipe along reservoir - Accommodate minimum downstream release	- No River bypass, but silt curtains - Accommodate minimum downstream release
Processing Area	Decanting on top of the existing sediment deposition in the reservoir	None	Below dam (opposite of disposal site)
Staging Area	Near Cal-Am entrance and at toe of disposal site	Near Cal-Am entrance and at toe of disposal site	Near Cal-Am entrance and below dam (adjacent to processing site)
Access	- Reservoir • Improve ramp at dam - Upstream disposal site • Road through reservoir & Carmel River to disposal site • Material from reservoir for road fill • Build first year, remove & restore last year	- Reservoir • Improve ramp on dam - Upstream disposal site • Road through reservoir & Carmel River to disposal site • Material from reservoir for road fill • Build first year, remove & restore last year	- Reservoir • Improve ramp on dam - Downstream disposal site • Reconfigure existing access

5.4 Environmental Issues and Permitting

Environmental impact assessment, documentation and review process, and acquisition of required environmental permits could be critical path schedule activities for the sediment removal project (project). Because of known resources presence in the project area, the environmental compliance and permitting process can be a complicated process and will require multiple approvals/permits from multiple agencies in a specific order. For example, a United States Army Corps of Engineers' (USACE) Clean Water Act (CWA) permit for dredge and fill operations requires several other authorizations (or permits) from other Federal agencies, including an Endangered Species Act Section 7 Consultation from United States Fish and Wildlife Service (USFWS) and National Marine Fisheries Service (NMFS). In addition the USACE permit requires authorizations from State agencies, including the State Historic Preservation Officer (SHPO) and the Regional Water Quality Control Board (RWQCB). However, State agencies cannot issue authorizations (or permits) without verification of compliance with California Environmental Quality Act (CEQA). Therefore all these pieces require careful consideration during project planning in order to meet the construction schedule.

To assist with project planning, an environmental compliance and permitting technical memorandum (TM) was developed which provides Cal-Am with an overview of the possible environmental and permitting requirements, challenges, and strategies associated with the project (see Appendix A "Environmental Compliance and Permitting Technical Memorandum"). As one component of a successful project implementation approach, the TM provides a blueprint to guide the acquisition of these permits, agreements and authorizations, minimize permitting surprises and delays, and maximize the timeliness of permit acquisition with acceptable permit terms.

The project will be subject to the requirements of the California Environmental Quality Act (CEQA) and the National Environmental Policy Act (NEPA). CEQA Guidelines Section 15367 defines the lead agency as the "…public agency which has the principle responsibility for carrying out or approving a project which may have a significant effect upon the environment." Several state and local approvals will be required as part of the project, including certification and permits from the State and/or Regional Water Resources Control Board (SWRCB/RWQCB), the Department of Fish and Game (DFG), California Public Utilities Commission, Monterey Peninsula Water Management District (MPWMD), and Monterey County Planning. Therefore, it is expected one of these agencies would be the lead agency for CEQA compliance. In the event of a dispute over State lead agency status, the California State Clearinghouse Handbook 2012 contains a protocol to submit a request to the Office of Planning and Research for a lead agency determination. See http://opr.ca.gov/docs/SCH_Handbook_2012.pdf for information about this process.

The project will require work within the Waters of the United States which will trigger the need for a CWA Section 404 permit from the USACE. Therefore, it is anticipated that the USACE will be the lead agency for NEPA compliance. In addition, Cal-Am will need to obtain various permits and authorizations with the assistance of the CEQA lead agency and USACE before beginning any project construction

Table 8 below summarizes the major Federal, state and local environmental regulations and related permits discussed in the TM in Appendix A.

Table 8: Major federal, state and local environmental regulations and related permits addressed in the TM in Appendix A

Resource	**Applicable Laws/Regulations/Permits**	**Regulating Agency/Agencies**
Multiple	National Environmental Policy Act and California Environmental Quality Act	U.S Army Corps of Engineers (NEPA), To Be Determined (CEQA)
Wetlands, Waters of the United States	Section 404 of the Clean Water Act	U.S. Army Corps of Engineers
	Section 10 of the Rivers and Harbors Act	U.S. Army Corps of Engineers
	Section 401 of the Clean Water Act – Water Quality Certification or Waiver	Regional Water Quality Control Board
	Section 402 of the Clean Water Act – National Pollutant Discharge Elimination System permit(s)	State Water Resources Control Board and Central Coast Regional Water Quality Control Board
	Sections 1600 through 1607 of the California Fish and Game Code – Streambed Alteration Agreement	California Department of Fish and Game
Federally Listed Species	Section 7 of the Federal Endangered Species Act – Section 7 Consultation	U.S. Fish and Wildlife Service and National Marine Fisheries Service
Essential Fish Habitat	Magnuson-Stevens Fishery Conservation and Management Act	National Marine Fisheries Service
Fish and Wildlife Resources	Fish and Wildlife Coordination Act report	U.S. Fish and Wildlife Service
Cultural Resources	National Historic Preservation Act – Section 106 Consultation	State Historic Preservation Officer
State-Listed Species/State Special-Status Species	Section 2081 of the California Endangered Species Act – Incidental Take Permit/Consistency Determination	California Department of Fish and Game
	California Native Plant Protection Act	California Department of Fish and Game
Air Quality	Authority to Construct	Monterey Bay Unified Air Pollution Control District

Electrical (Temporary Construction Power)	Application for temporary power connection	California Public Utility Commission and/or local utility (e.g., PG&E)
Water Distribution System	Monterey Peninsula Water Management District Rules and Regulations 20(B) ""Permits to Connect or Modify a Connection to a Water Distribution System"	Monterey Peninsula Water Management District
Trees	Title 16, Chapter 16.60 Monterey County Code	Monterey County
Water flow rates and schedules	Defined in previous State Water Resources Control Board (SWRCB) water rights permits (permit 7130A), but not defined in recent order 95-10.	CDFG & Monterey Peninsula Water Management District
Various	Monterey County Comprehensive Plan and Local Area Plans (tree removal, Use Permits, encroachment permits, grading permits)	Monterey County Planning Department

The TM in Appendix A addresses the key environmental issues and includes the California Natural Diversity Data Base species map and the potential wetlands maps in its attachments. Based on that information, possible impacts related to the alternative's construction activities are described in Table 9.

Table 9: Possible impacts of alternatives on key environmental issues

Key Environmental Issue	Possible impacts of Alternative 1	Possible impacts of Alternative 2	Possible impacts of Alternative 3
Water Quality	• temporary road construction to the upstream disposal site • accidental leaks • stream diversion • reservoir lowering • sediment excavation	• temporary road construction to the upstream disposal site • accidental leaks • stream diversion • reservoir lowering • sediment excavation in upper reach	• accidental leaks • reservoir lowering • sediment excavation in lower reach
Fisheries	• access road improvements for upstream disposal site • reservoir lowering • stream diversion • river channel dewatering	• access road improvements for upstream disposal site • reservoir lowering • stream diversion • river channel dewatering	• access road improvements for processing site • reservoir lowering
Terrestrial Biology	• at dam ramp • in the reservoir tail • at staging/ decanting area • at disposal site due to loss of vegetation and species	• at dam ramp • in the reservoir tail • at staging/ decanting area • at disposal site due to loss of vegetation and species	• at dam ramp • at staging/ decanting area • at disposal site due to loss of vegetation and species
Cultural and Paleontological Resources	None documented	None documented	None documented
Air Quality	• dam access road improvements • construction site access traffic	• dam access road improvements • construction site access traffic	• dam access road improvements • construction site access traffic • sediment deposition
Noise and Traffic	• dam access road improvements • construction site access traffic	• dam access road improvements • construction site access traffic	• dam access road improvements • construction site access traffic • sediment deposition

5.5 Opinion of Probable Program Cost (OPPC) & Schedule (OPPS)

5.5.1 Program Schedule

A conceptual schedule outlined for each alternative described in section 5.3 is summarized in Table 10 and presented in detail in Appendix B. For purposes of developing the conceptual schedules, engineering studies are assumed to be performed in 2013, including geotechnical investigations for the sediment site and access roads; design of the access roads and conveyor system; design of the sediment disposal site including stability and hydrologic analyses and planning and design of stream bypass and dewatering facilities. The development and review of the environmental permitting activities are assumed to extend until the end of 2014, followed by a permit gathering period extending until mid-2016. A simultaneous contract document preparation task would lead to construction bids solicited in mid-2016 and award of contract in late 2016.

Construction would occur in three distinct phases for all alternatives. Phase 1, in 2017, would include mobilization, construction of the new access road to the water treatment plant, spillway bridge improvements, improvements to existing access roads (e.g., Nason Road, dam crest road, ramp into reservoir, jeep trail if necessary) and construction of a new access road from the reservoir to the sediment disposal site. The sediment disposal site would be cleared of vegetation and prepared for delivery of the radial stacker equipment. For Alternative 3, the conveyor system to the decanting area would be installed and fastened to the supports after the new road is completed. The work this first year may also possibly include construction of some of the stream diversion features and dewatering wells and would conclude with demobilization for the winter.

Phase 2, in years 2018 to 2021/22, would include the construction of temporary roads across the upper reservoir sediment surface to allow access of excavating equipment (Alternatives 1 and 2), the installation of Flexi-Float supported floating conveyor system in the reservoir (Alternatives 1 and 3) and the removal of sediment. This would include seasonal mobilization, stream diversion and reservoir dewatering if applicable, and demobilization for winter in October.

Phase 3, in 2022 or 2023, depending on the alternative, would conclude the construction project with restoration work and re-vegetation of the sediment disposal area and reservoir area. Temporary construction facilities removal would be performed as well, such as roads, staging areas, treatment facilities and processing sites.

The majority of the work in Phase 1 is planned to take approximately six months between April and September of the first year of construction. Phase 2 is planned to take 5 years for the wet sediment removal and 4 years for the dry sediment removal respectively. During each of these years, mobilization, fish trap and field work in the reservoir area would occur during the month of June. Installation of diversion and dewatering facilities as well as fish rescue and reservoir drawdown would take about one month. Actual sediment removal operations would take place during a three-month period starting July 1 for the wet removal and during a two-month period starting August 1 for the dry removal. Removal of cofferdams and demobilization of in-stream construction operations would occur in early October. Allowing for holidays and a few days of bad weather, it was assumed that each season would have approximately 50-75 working days of actual sediment-removal production operations.

Sediment excavation, transport and placement operations would be conducted in two 10-hour shifts, six days per week. For computation of actual production, it was assumed that each hour would have ten unproductive minutes, that is, the 10-hour shifts would have a bit more than eight hours of actual production.

The equipment for clamshell sediment excavation and transport was sized to be able to sustain an average rate of 165 cubic yards per hour during the day and 125 cubic yards per hour at night. This results in an estimated sediment removal rate of about 217,500 cubic yards per season and a five-season sediment removal program for the wet sediment (Alternative 1 and 3). Including the first year of construction with preparation work and the last year with restoration, this results in a seven-season construction program as presented in Table 10.

The equipment for mechanical sediment excavation and transport was sized to be able to sustain an average rate of 250 cubic yards per hour during the day and 200 cubic yards per hour at night. This results in an estimated sediment removal rate of about 225,000 cubic yards per season and a four-season sediment removal program for the dry sediment (Alternative 2). Including the first year of construction with preparation work and the last year with restoration, this results in a six-season construction program.

Table 10: Alternative time comparison

Alternative	Pre-construction Planning & Permitting (years)	Field Construction Work (years)	Total (years)
Alt. No. 1	4	7	11
Alt. No. 2	4	6	10
Alt. No. 3	4	7	11

5.5.2 Program Cost

Class 4 opinions of probable program costs (OPPC) compatible with Association for the Advancement of Cost Engineering (AACE) cost estimating classification system have been developed for the sediment removal alternatives described above.

Class 4 estimates are generally prepared based on limited information and subsequently have fairly wide accuracy ranges. Typically, engineering is 10% to 40% complete. They are typically used for project screening, determination of feasibility, concept evaluation, and preliminary budget approval. Virtually all Class 4 estimates use stochastic estimating methods such as cost curves, capacity factors, and other parametric and modeling techniques. Expected accuracy ranges are from -15% to -30% on the low side and +20% to 50% on the high side, depending on the technological complexity of the project, appropriate reference information, and the inclusion of an appropriate contingency determination. Ranges could exceed those shown in unusual circumstances. As little as 20 hours or less to perhaps more than 300 hours may be spent preparing the estimate depending on the project and estimating methodology (AACE International Recommended Practices and Standards).

The estimated costs are summarized in Table 11 and presented in detail in Appendix B. The OPPC is based on the sediment removal and disposal concepts described in this memorandum, the volume of sediment to be removed estimated as presented in Table 6, and MWH's evaluation of the major construction items appropriate to complete the work. Quantity estimates for the stream diversion facilities, access roads, and disposal site preparation were developed from the layouts included herein and from experience with similar projects.

For purposes of comparing alternatives in this study, it was assumed that construction work in Los Padres Reservoir would only occur in low-flow months when the Carmel River could be diverted around the active construction area and outside of the high winter flows and steelhead adult migration season. The mobilization and re-establishing of temporary works would start on or about June 1 and take about one month. Actual sediment removal operations in the reservoir would take place during a three-month period from July through September for the wet sediment in the lower reach and a two-month period from August through September for the dry sediment in the upper reach. Removal of cofferdams and demobilization of in-stream construction operations would occur in the first half of

October. It is assumed that there would be about 75 working days of actual production operations for the wet removal and 50 working days for the dry removal. Estimated costs are also based on the following:

- Labor rates and fringes are from January 2013 Davis-Bacon rates for Monterey County. Labor costs are based on 5 days per week, 10 hours per shift. Payroll tax and workers compensation insurance are set at 38%. No allowance has been included for additional shift work or weekend work.
- Equipment rates are drawn from estimator's equipment history information.
- Material costs are based on typical costs for similar work. Construction water is assumed to be available on site.
- The crews developed for use in these estimates are derived from experience for similar work.
- An assumed royalty has been included for land use/land easement costs related to the disposal site and access roads at an assumed rate of $0.25 per ton.
- Direct construction costs are based on 1st-quarter 2013 dollars. Escalation from the date of this report to the project's Notice-to-Proceed (NTP) has been excluded as the time period is unknown. However, escalation during the life-span of the multi-year project is included at the rate of 3% per year.
- Project financing costs are excluded.
- No costs have been added for damage or lost time due to the potential for overtopping of the stream diversion system and work site.
- No costs have been added for facility O&M or permanent access roads or bridges.
- If further restrictions on the construction schedule are imposed based on environmental issues not described above, the construction schedule may need to be extended. This would result in additional mobilization, dewatering and winterization costs that are not included in the current estimate.
- Weather conditions could also impact the construction schedule. If the construction program occurs during a wet part of the hydrologic cycle and spring flows remain high for an extended period at the beginning of the construction season, or if significant storms occur in early fall, construction delays could occur that would increase the number of construction seasons. This would result in additional mobilization, dewatering and winterization costs that are not included in the current estimate.
- The average unit weight of the sand/gravel sediments is assumed to be 105 pounds per cubic foot. In-situ moisture content at the time of transport is assumed to be on the order of 20%.
- The sediment will not be processed for commercial uses and the "dry" sediment will decant rapidly to support continuous operations.
- Work hours were assumed to be as follows (assuming any sediment transportation mode): Two 10-hour shifts, six days per week. For computation of actual production, it was assumed that each hour would have 10 unproductive minutes.

- Excavation and transport rates were assumed to be as follows:
  - Clamshell dredging: An average sustained rate of 165 cubic yards per hour during the day and 125 cubic yards per hour at night is assumed for purposes of calculating seasonal production.
  - Excavators: An average production of 250 cubic yards per hour during the day and 200 cubic yards per hour at night is assumed for mechanical excavators.

Additional assumptions and details are presented in Appendix B.

The OPPC presented in Table 11 includes a contingency of 25 percent to account for pricing variations, to incorporate additional potential construction costs related to design development, and to cover approximations in estimating. Also included are allowances for "non-construction" project costs, including land use easements, permitting, environmental compliance and mitigation, design engineering, Owner's administrative costs, and construction engineering and administration.

Table 11: Sediment Removal Alternative Cost Comparison

Alternative	Mid-range Construction Costs ($USD)	Mid-range Total Program Costs ($USD)	Range Total Program Costs ($USD)	Estimated Removal Quantity (af)	Range Parametric Unit Price ($/af)
1	$62M	$90M	$60M - $107M	1134	$53,000 - $94,000
2	$32M	$47M	$31M - $56M	502	$62,000 - $112,000
3	$34M	$50M	$33M - $60M	558	$59,000 - $108,000

It should be emphasized that the opinions of probable program cost that have been prepared at a conceptual level. The actual cost will change up or down as the design is defined in more detail and as it evolves in response to the evolving needs of the project's stakeholders. Furthermore, the estimate of costs shown and any resulting conclusions on the project financial, economic feasibility, or funding requirements, have been prepared from guidance in the project evaluation and implementation from the information available at the time the estimate was prepared. The final costs of the project and resulting feasibility will depend on actual labor and material costs, competitive market conditions, and other variable factors. Accordingly, the final project costs may vary from the estimate. Project feasibility, benefit/cost analysis, risk and funding must be carefully reviewed prior to making specific funding decisions and establishment of the project budget.

5.6 Alternatives Comparison

For use in qualitative evaluation of each alternative, a summary comparison matrix of the sediment removal alternatives is presented in Table 12 below. The major categories that influence cost and overall feasibility of each alternative are used in the comparison table and are summarized as follows:

- Access – The existing access road leads to the dam and some distance upstream on the left abutment at the dam crest height. All sediment removal alternatives will require development of access into and across the reservoir. The steepness of the terrain around the reservoir and the wilderness boundary near the tail of the reservoir limit the ability to develop access to the upstream. Also, alternatives that utilize downstream areas would require development and improvement of the downstream access roads.

- Impact to existing dam – In order to facilitate equipment and material transport into the reservoir, the access road on the downstream side of the dam as well as the dam crest road and the ramp into the reservoir would require improvements. Also, the spillway bridge would have to be enlarged to allow for truck transport. Sediment transportation vehicle access for downstream disposal site alternatives would necessitate an improved and enlarged area at the bottom of the ramp for barge loading/unloading.

- Reservoir level limitation – The lack of sufficient reservoir inflow during the summer season results in a decreasing reservoir elevation as minimum downstream flow releases are made into the Carmel River. Additional lowering of the reservoir needed for construction activities would be limited, since a minimum volume is required for downstream releases prior to the following wet season.

- Disposal sites – The Los Padres National Forest wilderness area and Cal-Am property boundaries have been selected to restrict the location and size of any proposed disposal sites in order to avoid land exchanges or property acquisitions. Preliminary site selections consider minimizing extensive access road improvements and development, and constrained work conditions. Disposal site selection also considers the amount of vegetation removal prior to sediment disposal, as well as the overall environmental impacts and possible mitigation measures.

- Environmental impacts – Key environmental issues include water quality, fisheries, terrestrial biology and air quality. Possible river diversion or reservoir dewatering will need to consider effect on fisheries, especially the endangered steelhead trout. Disposal site area clearing, and construction of access roads and staging areas will impact terrestrial biology, which would require mitigations such as relocation or restoration. Construction traffic for the project will have an impact on air quality, which would need to be addressed.

- Water quality – Water quality will be impacted by road construction, instream construction activities, stream diversions, reservoir drawdown, reservoir sediment excavation, and sediment disposal. Depending on the sediment removal alternative, various measures will be taken to prevent increased turbidity, sediment discharges to the watercourse, increased water temperature, and maintaining dissolved oxygen during return of bypassed flows or rewatering after stream diversions. Typical measures will require water treatment prior to release into the river.

- Land impacts – Conflicts with existing zoning, land use, or recreation due to clearing, traffic, noise or change in visual landscape will result in what is generally termed as land impacts. Examples include use of access to the project site via Nason and Chachagua Road, which would lead to increased traffic that impacts local communities.

- Diversion – Alternatives that include upstream sediment removal and disposal would require diversion of the Carmel River to ensure unobstructed work. Impacts on fisheries need to be accounted for in the design of the diversion and rerouting back into the reservoir.

- Constructability – Includes feasibility of construction methods used to complete the objectives of proposed alternatives. Issues with productivity limitations, potential conflicts with existing developments, constraints due to topographic features, problematic geotechnical conditions, sufficient construction access and maintenance of traffic during construction are highlighted.

- Technical issues – The design of the alternative must consider constructability, excavation and disposal site stability, feasibility of long term sediment storage, dewatering, water management and site maintenance. The flexibility for future adjustments and disposal are considered when developing disposal alternatives.

- Risks – Identification of risks primarily considers construction risks, but also considers long-term feasibility of disposal alternatives. Construction risks are associated with uncertain site conditions, geology, diversion, complexity of work and safety risks relate to potential personal, fall, slope instability, and excavation safety. Long-term risks include feasibility of design, which could consider items such as requirements to maintain stability of disposed sediments and ability to actively maintain disposal areas.

- Schedule – The construction window for in stream work is limited from July 1st to October 15th due to the steelhead's spawning and migration periods in the Carmel River. Mobilization, general preparation, remobilization at the beginning of each season, removal, winterization at the end of each season, and restoration are considered for each alternative.. A four year pre-construction period for planning, design, and permitting is required regardless of alternative.

- Cost – The total program costs include the construction costs and contingency for project administration & management work. The total costs are divided by the total removed sediment, providing a unit price to allow for comparison between alternatives.

- Reservoir capacity – The bathymetry performed in 2008 (The Watershed Institute, 2009) determined the reservoir capacity at 1786 af totaling in about 2.1 million cubic yards of accumulated sediment. The removed sediment quantity for each alternative is listed and compared to the total accumulated sediment in 2008. Additionally, the restored capacity after completion of construction is noted and compared to the original capacity of 3070 af.

- Long-term sediment maintenance – Continued sediment accumulation in the reservoir post-removal will necessitate consideration for future sediment removal(s). The flexibility of the alternative design for future sediment removal(s) is compared.

Table 12: Summary comparison of alternatives

Issues	Alternative No.1 Complete Removal	Alternative No.2 Partial Dry Removal	Alternative No.3 Partial Dredging Removal
Access	• New roadway along reservoir and through Carmel River between reservoir & disposal site • Improvements to access road leading to dam	• New roadway along reservoir and through Carmel River between reservoir & disposal site • Improvements to access road leading to dam	• Reconfigure access downstream of dam to decanting area and disposal site • Improvements to access road leading to dam
Impacts to dam	Improvement of ramp into reservoir	Some improvement of ramp into reservoir	Improvement of ramp into reservoir
Reservoir level limitation	Needs to be below 1020 ft to facilitate access and wet removal operations and below 1000 ft to support access and dry removal operations	Needs to be below 1000 ft to support access and dry removal operations	Needs to be below 1020 ft to facilitate access and wet removal operations
Disposal sites	• Upstream disposal site in ravine, maximum disposal height 320 ft • Requires significant soil stabilization	• Upstream disposal site in ravine, maximum disposal height 240 ft • Requires significant soil stabilization	• Downstream disposal site on the right slope of the Carmel River Valley, 80 ft high • Requires soil stabilization
Environmental	Terrestrial biology impacts and necessary mitigation measures in the reservoir tail area, around the dam ramp, both disposal site areas and the staging/decanting areas. Potential fisheries impacts.	Terrestrial biology impacts and necessary mitigation measures in the reservoir tail, disposal site and staging area. Potential fisheries impacts.	Terrestrial biology impacts and necessary mitigation measures around the dam ramp, the disposal site and staging/decanting areas. Potential fisheries impacts.
Water quality	• Turbidity from wet sediment removal activities. • Construction activities during dry removal may increase turbidity in bypassed reservoir • Discharge of decanted water and reservoir water may require treatment.	• Possible turbidity from return of bypassed flows into the reservoir. • Construction activities during dry removal may increase turbidity in bypassed reservoir • Discharge of reservoir water may require treatment.	• Silt curtain to minimize turbidity. • Discharge of decanted water from wet excavated silts may require treatment

Discharge due to reservoir lowering	Lowering to elevation 1000 ft results in discharge of about 1400 af in July	Lowering to elevation 1000 ft results in discharge of about 1400 af in July	Nominal to no reservoir lowering.
Land use impacts	• Construction activities constrained to Cal-Am property • Access through residential areas. • Will limit recreational activities from dam to disposal area upstream during construction season.	• Construction activities constrained to Cal-Am property • Access through residential areas. • Will limit recreational activities from dam to disposal area upstream during construction season.	• Construction activities constrained to Cal-Am property • Access through residential areas. • Will limit recreational activities in reservoir area and disposal area downstream of dam during construction season
Diversion	Diversion cut-off upstream of upstream disposal site and along reservoir to dam.	Diversion cut-off upstream of upstream disposal site and along reservoir to dam.	No diversion.
Constructability	Possible complications: • access to disposal site due to terrain steepness and narrow valley • proper disposal area foundation and soil-cement mix placement. • construction access	Possible complications: • access to disposal site due to terrain steepness and narrow valley • proper disposal area foundation and soil-cement mix placement. • construction access	Possible complications: • existing dam access road • dewatering of sediment • poor sediment for soil-cement mix • proper disposal area foundation • construction access
Technical issues	• Relatively high disposal site • Drainage and compaction fundamental for consolidation • Proper foundation for stability of site • Future adjustments would need to be included in planning	• Relatively high disposal site • Drainage and compaction fundamental for consolidation • Proper foundation for stability of site • Future adjustments would need to be included in planning	• Drainage and compaction fundamental for consolidation • Proper foundation for stability of site • Ensuring sufficient slope stability • Flexible for future adjustments
Risks	• Unknown geology and soil conditions at disposal site • Unknown sediment composition • Slope instabilities	• Unknown geology and soil conditions at disposal site • Unknown sediment composition • Slope instabilities	• Unknown geology and soil conditions • Unknown sediment composition • Fine sediment gradation could impact constructability of berms
Schedule – Construction window	Wet removal: July 1st to October 1st Dry Removal: August 1st to October 1st	Dry Removal: August 1st to October 1st	Wet removal: July 1st to October 1st
Schedule – Total duration	4 years of planning and 7 years of field construction work	4 years of planning and 6 years of field construction work	4 years of planning and 7 years of field construction work

Reservoir Capacity	• Removal: 1,830,000 cy (90% of accumulated sediment) • Subsequent capacity: 2920 af (95% of total capacity)	• Removal: 810,000 cy (40% of accumulated sediment) • Subsequent capacity: 2288 af (75% of total capacity)	• Removal: 900,000 cy (44% of accumulated sediment) • Subsequent capacity: 2344 af (76% of total capacity)
Long term Maintenance	• Disposal site could potentially be increased, but with limited additional capacity. • Planned as one-time activity; future one year “maintenance removal & disposal” of sediment unfeasible.	• Disposal site could potentially be increased • Future one year “maintenance removal & disposal” of sediment unfeasible. Only implemented with complete remobilization.	• Disposal site could be increased to twice the capacity. • One-season “maintenance removal & disposal” activity feasible.
Complexity	• Remoteness and space limitations at upstream disposal site complicate construction.	• Remoteness and space limitations at upstream disposal site complicate construction.	• Relatively straightforward, typical dredging operation. • Some difficulty & unknowns in developing disposal site and dewatering sediments.
Cost	• $60M - $107M • $33 - $58 unit price per cy • $53,000 - $94,000 unit price per af	• $31M - $56M • $38 - $69 unit price per cy • $62,000 - $112,000 unit price per af	• $33M - $60M • $37 - $67 unit price per cy • $59,000 - $108,000 unit price per af

6 FINDINGS AND CONCLUSIONS

The scope of this study developed sediment removal alternatives to mitigate the ongoing sediment accumulation at Los Padres Reservoir, achieved through evaluation of the reservoir and watershed history, current conditions, and industry standard practices. It was determined that, in addition to a natural inflow rate of approximately 21 af per year, significant sediment inflow events, which occurred after extreme natural fire and rain events, have contributed to the ongoing reduction in reservoir capacity. Based on review of standard reservoir management practices, limited sediment management strategies were found exist at Los Padres Reservoir due to the highly inaccessible nature of the watershed and sensitive environment. Established sediment management practices cannot be applied on ongoing basis without development of significant infrastructure; thus, it was determined that discrete sediment removal project alternatives must be developed in order to address the sediment accumulation in the reservoir.

In order to develop feasible sediment removal alternatives, industry standard reservoir management strategies and sediment removal methods were researched and applied to the specific site conditions at Los Padres Reservoir. Upon identification of sediment management strategies that could be combined with feasible disposal sites, three distinct sediment removal alternatives were developed and evaluated, including a high level estimation of construction cost. A qualitative evaluation of each alternative identified the major factors on cost and overall feasibility, demonstrating that steep terrain, the need for disposal site access road development, limitations in feasible disposal sites, and restrictions on reservoir level operation and short construction window affect and complicate constructability. Additionally, environmental impacts (e.g. steelhead trout and red legged frog habitats) and very high costs for the incremental increase in reservoir capacity further challenge the overall feasibility of each alternative. While overall cost-benefit of the evaluated alternatives is considered high, additional detailed study and planning is recommended in order to further refine sediment removal alternatives and fully quantify long-term benefits (e.g, storage and environmental restoration) and balance those against the cost of project implementation.

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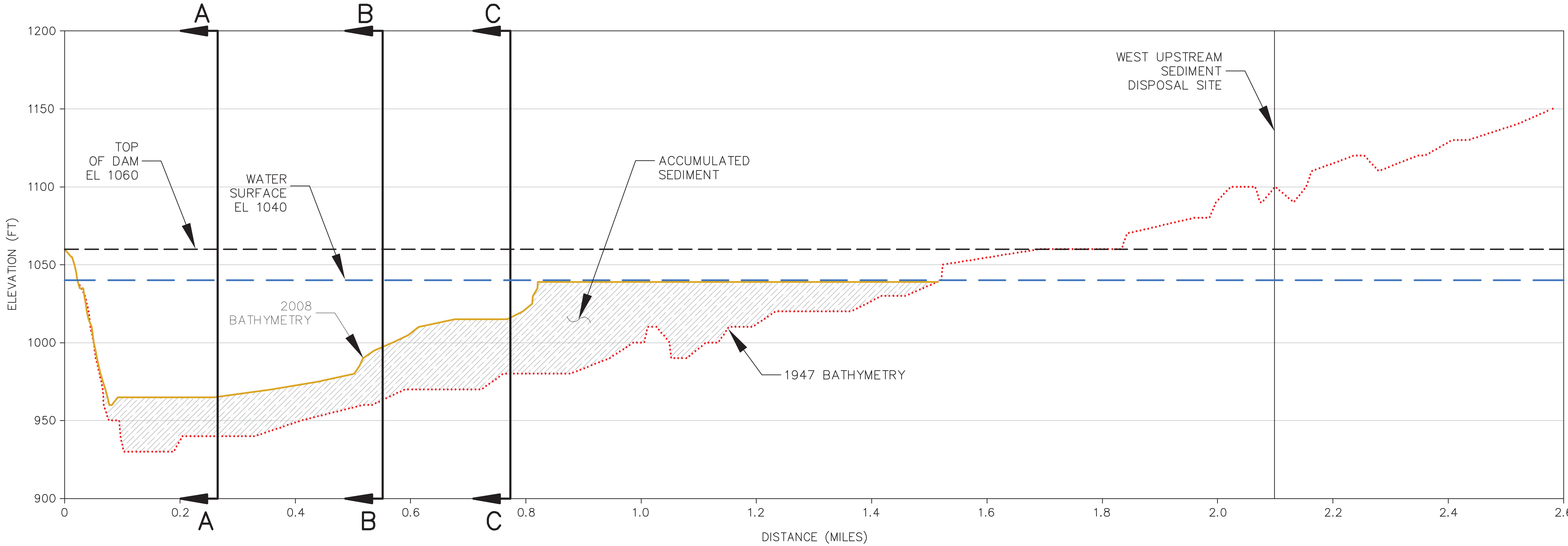
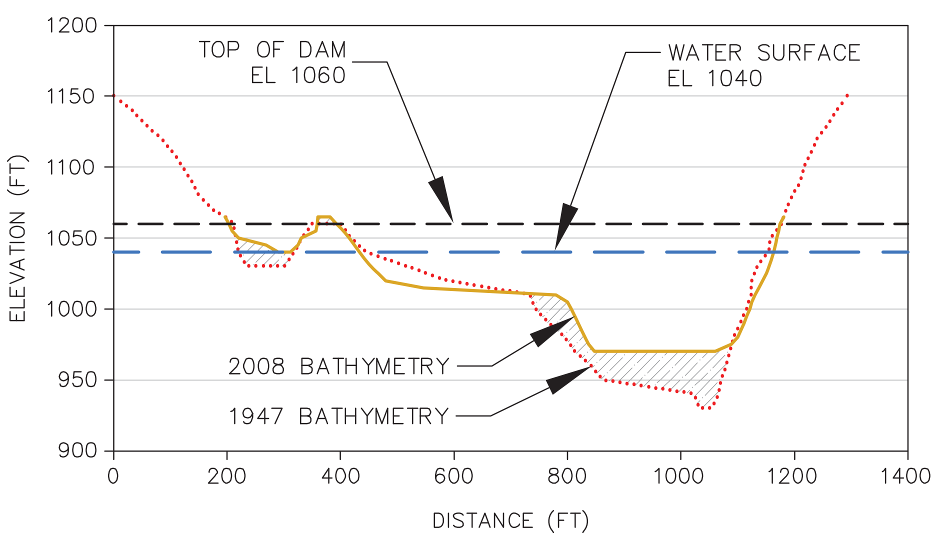
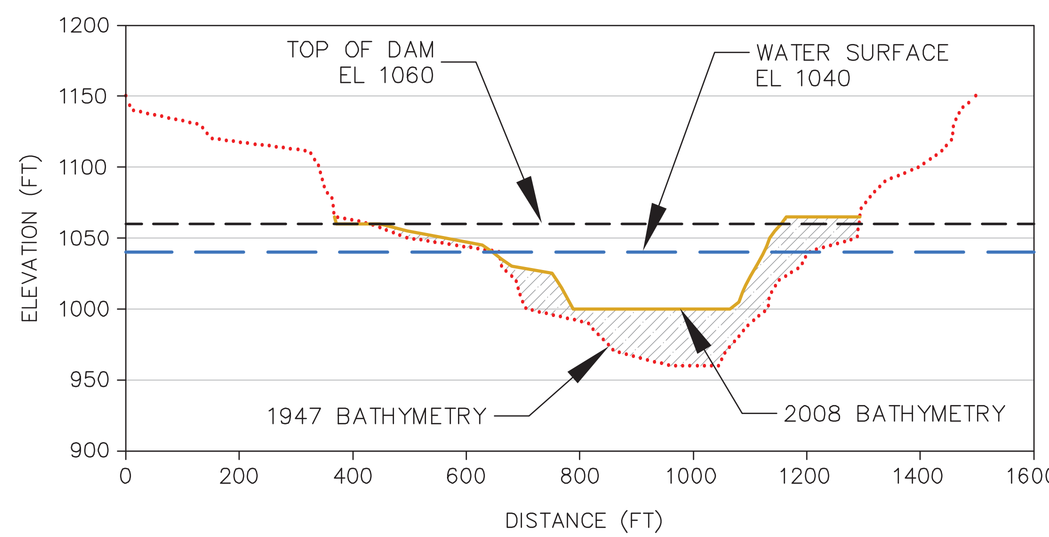
Exhibits



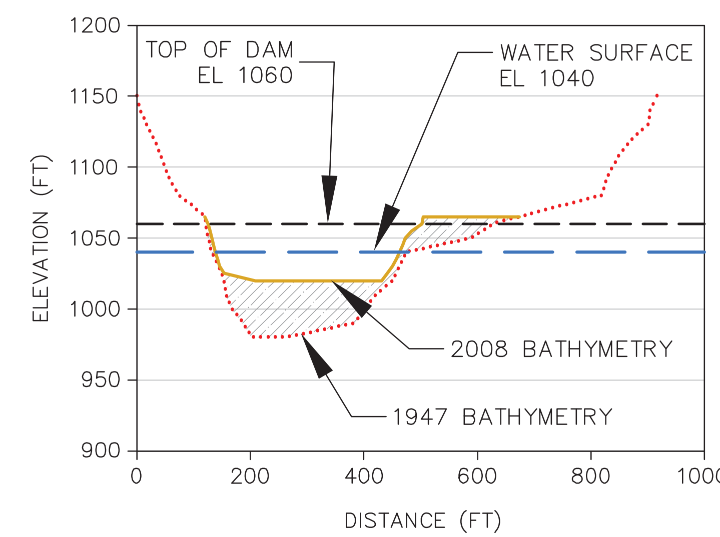
RESERVOIR PROFILE



SECTION A–A



SECTION B–B



SECTION C–C

REV	DATE	BY	DESCRIPTION

SCALE

WARNING 0 1/2 1 IF THIS BAR DOES NOT MEASURE 1" THEN DRAWING IS NOT TO SCALE

DESIGNED
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MWH
Walnut Creek California

CALIFORNIA AMERICAN WATER
LOS PADRES DAM
SEDIMENT REMOVAL STUDY
RESERVOIR PROFILE AND SECTIONS

EXHIBIT 1

XREF: BDR
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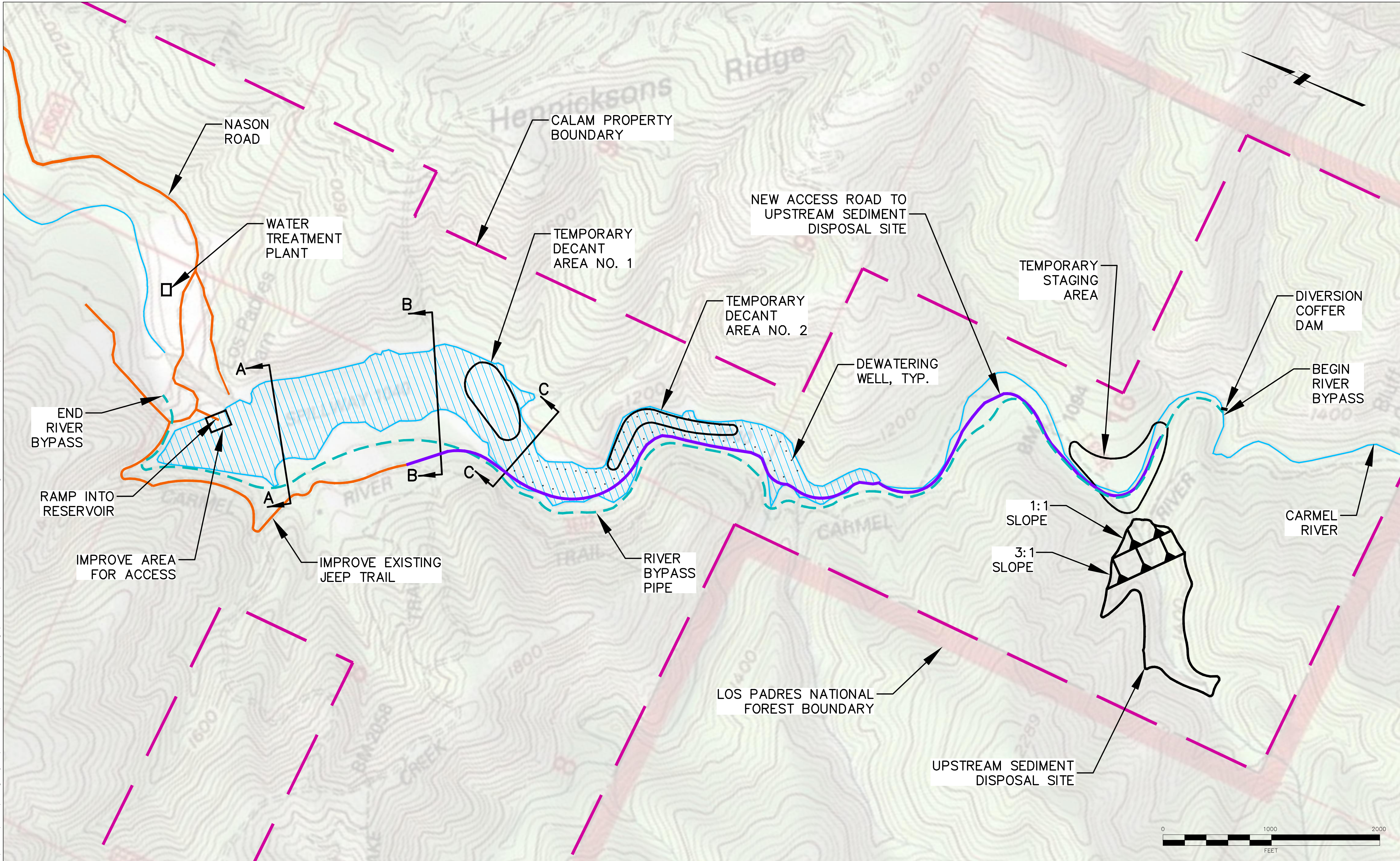

REV	DATE	BY	DESCRIPTION

SCALE

WARNING
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DESIGNED
DRAWN
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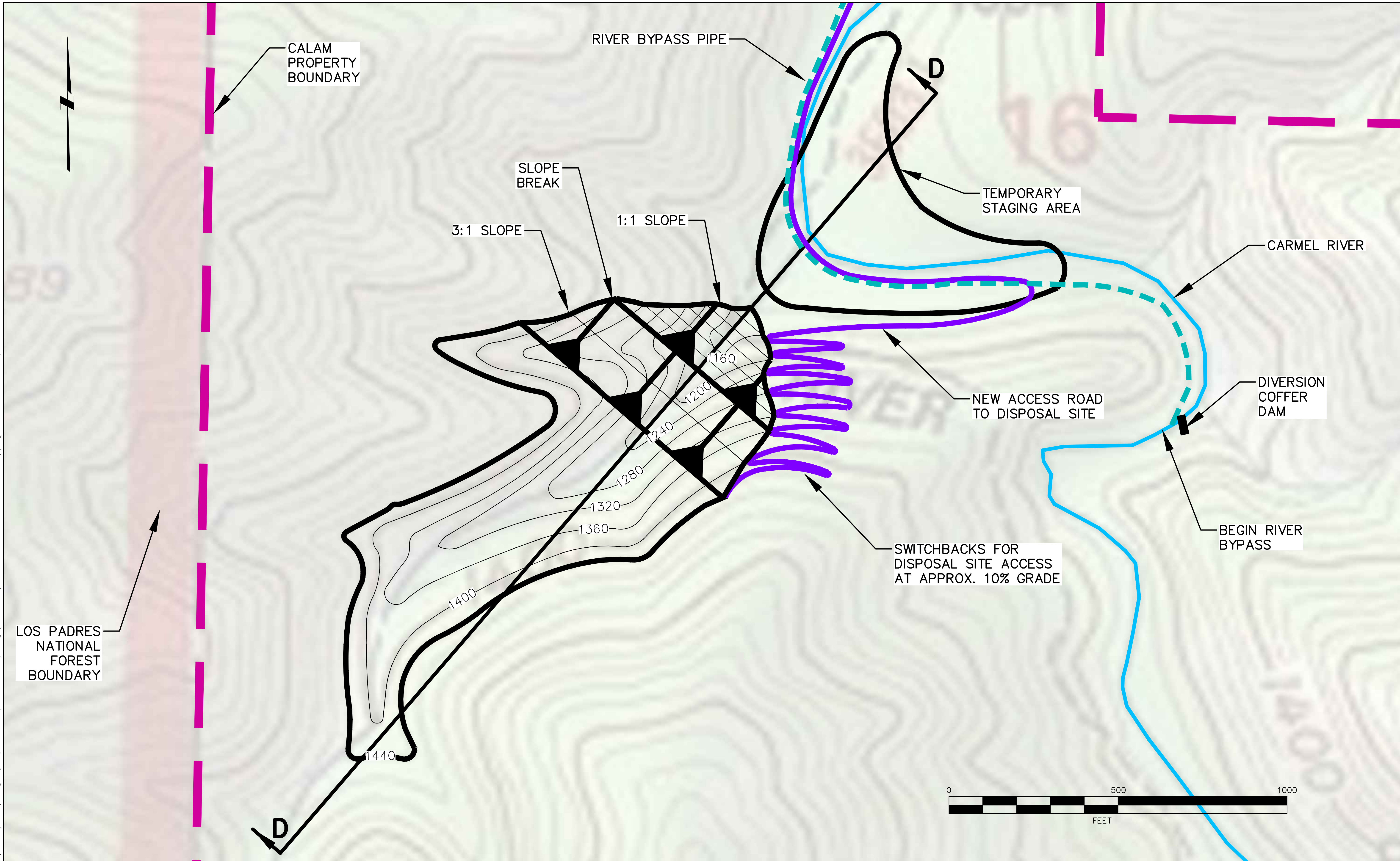
MWH
Walnut Creek
California

CALIFORNIA AMERICAN WATER
LOS PADRES DAM
SEDIMENT REMOVAL STUDY
PLAN OF SEDIMENT DISPOSAL SITE – ALTERNATIVE 1

EXHIBIT 2



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MWH
Walnut Creek California

CALIFORNIA AMERICAN WATER
LOS PADRES DAM
SEDIMENT REMOVAL STUDY
PLAN OF SEDIMENT DISPOSAL SITE – ALTERNATIVE 1

EXHIBIT 3

XREF: BDR
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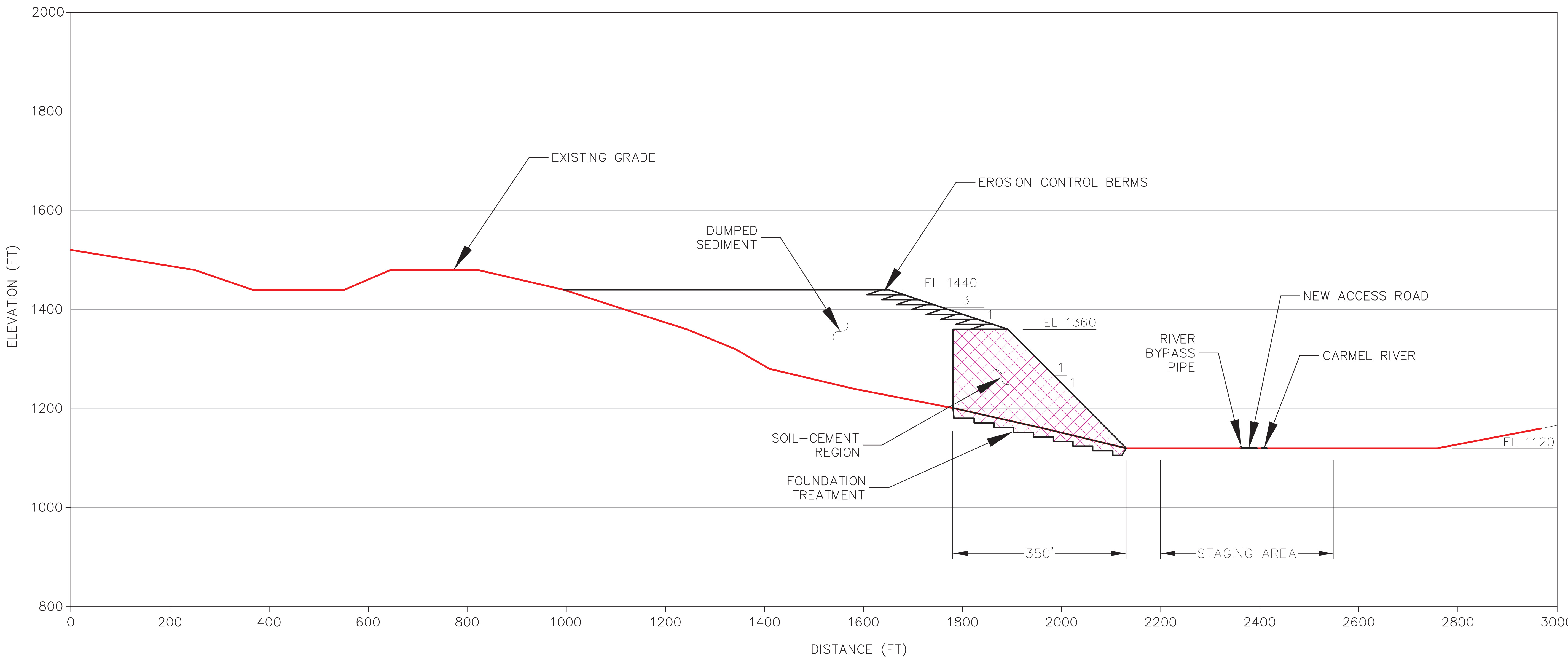

SEDIMENT DISPOSAL SITE, SECTION D-D

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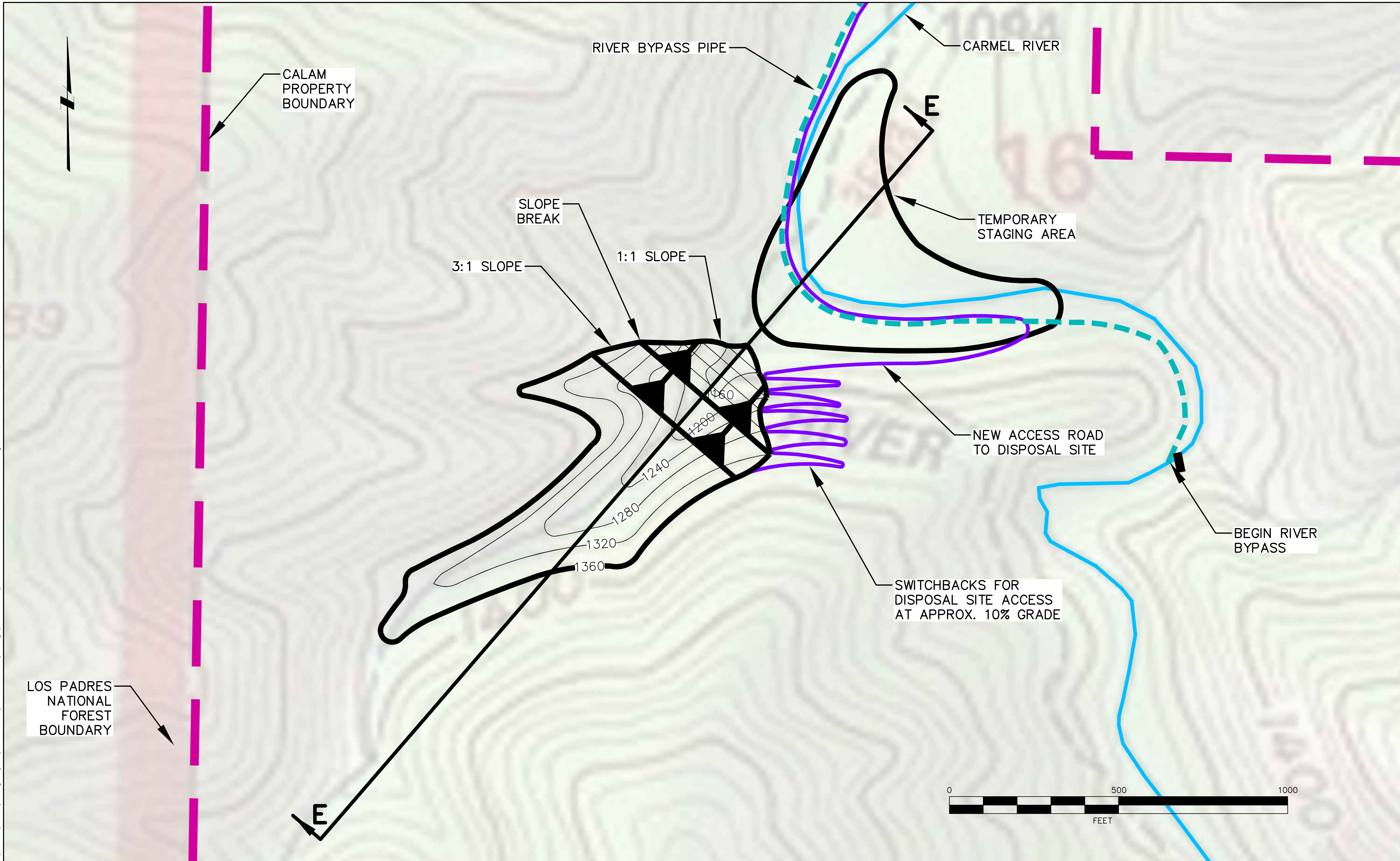
CALIFORNIA AMERICAN WATER
LOS PADRES DAM
SEDIMENT REMOVAL STUDY
SEDIMENT DISPOSAL SITE SECTION - ALTERNATIVE 1

EXHIBIT 4



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Walnut Creek
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CALIFORNIA AMERICAN WATER
LOS PADRES DAM
SEDIMENT REMOVAL STUDY
PLAN OF SEDIMENT DISPOSAL SITE – ALTERNATIVE 2

EXHIBIT 5

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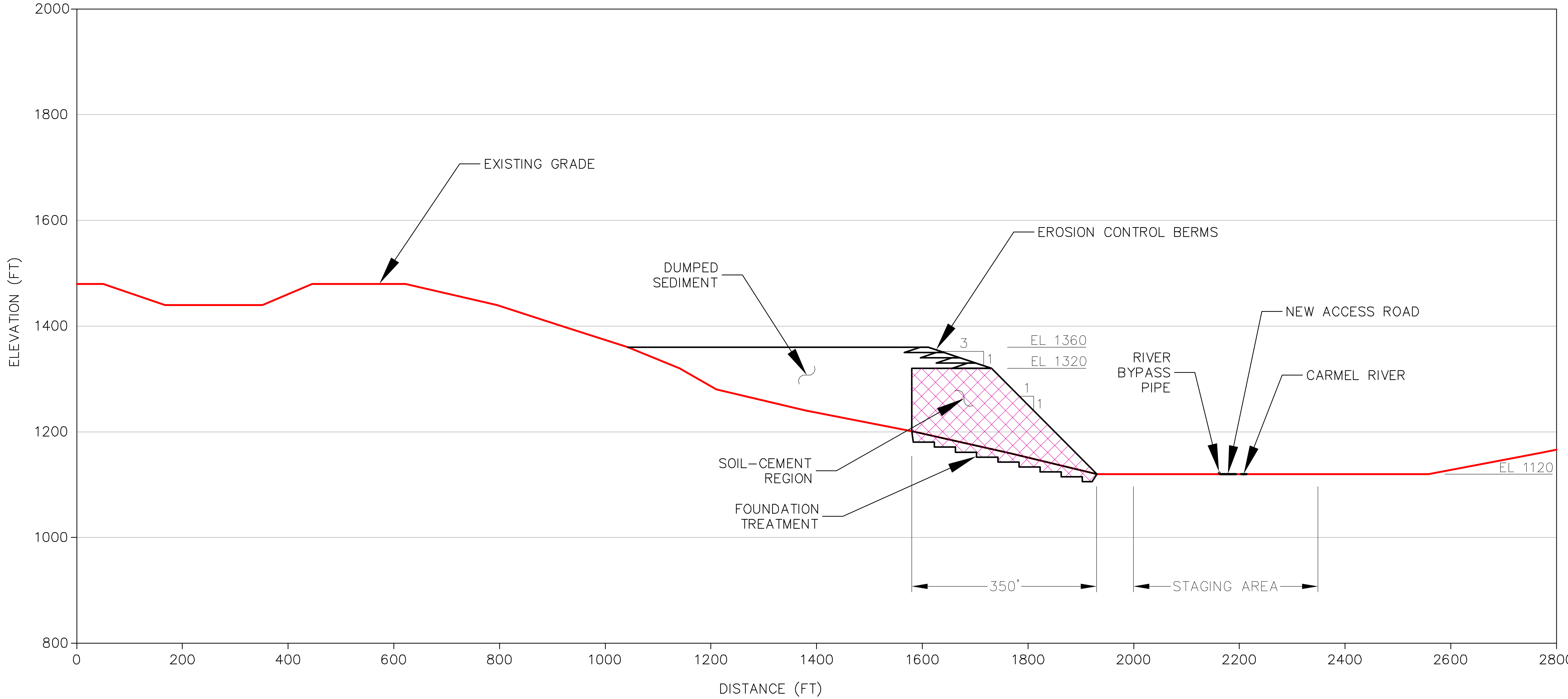

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CALIFORNIA AMERICAN WATER
LOS PADRES DAM
SEDIMENT REMOVAL STUDY
SEDIMENT DISPOSAL SITE SECTION – ALTERNATIVE 2

EXHIBIT 6

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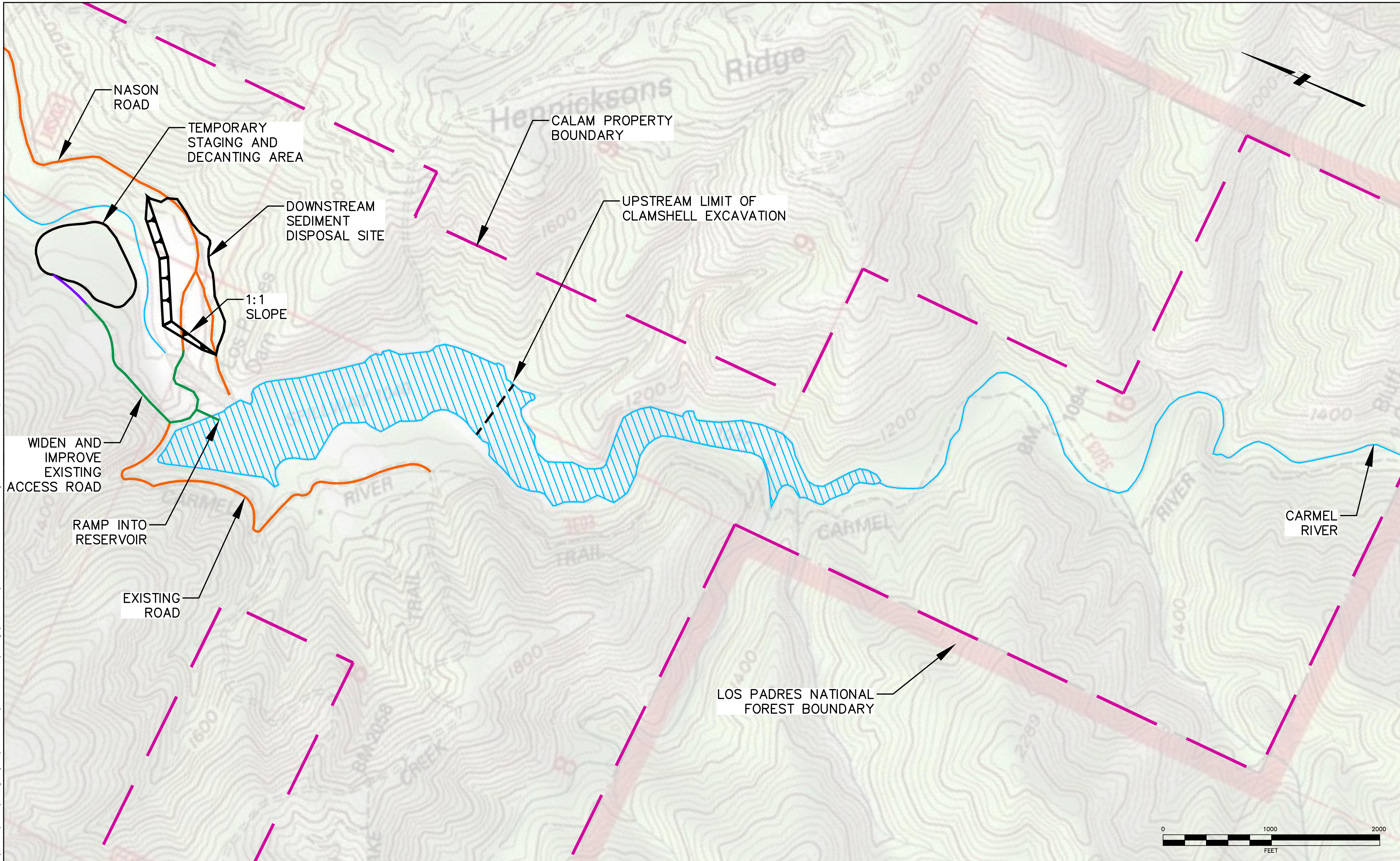

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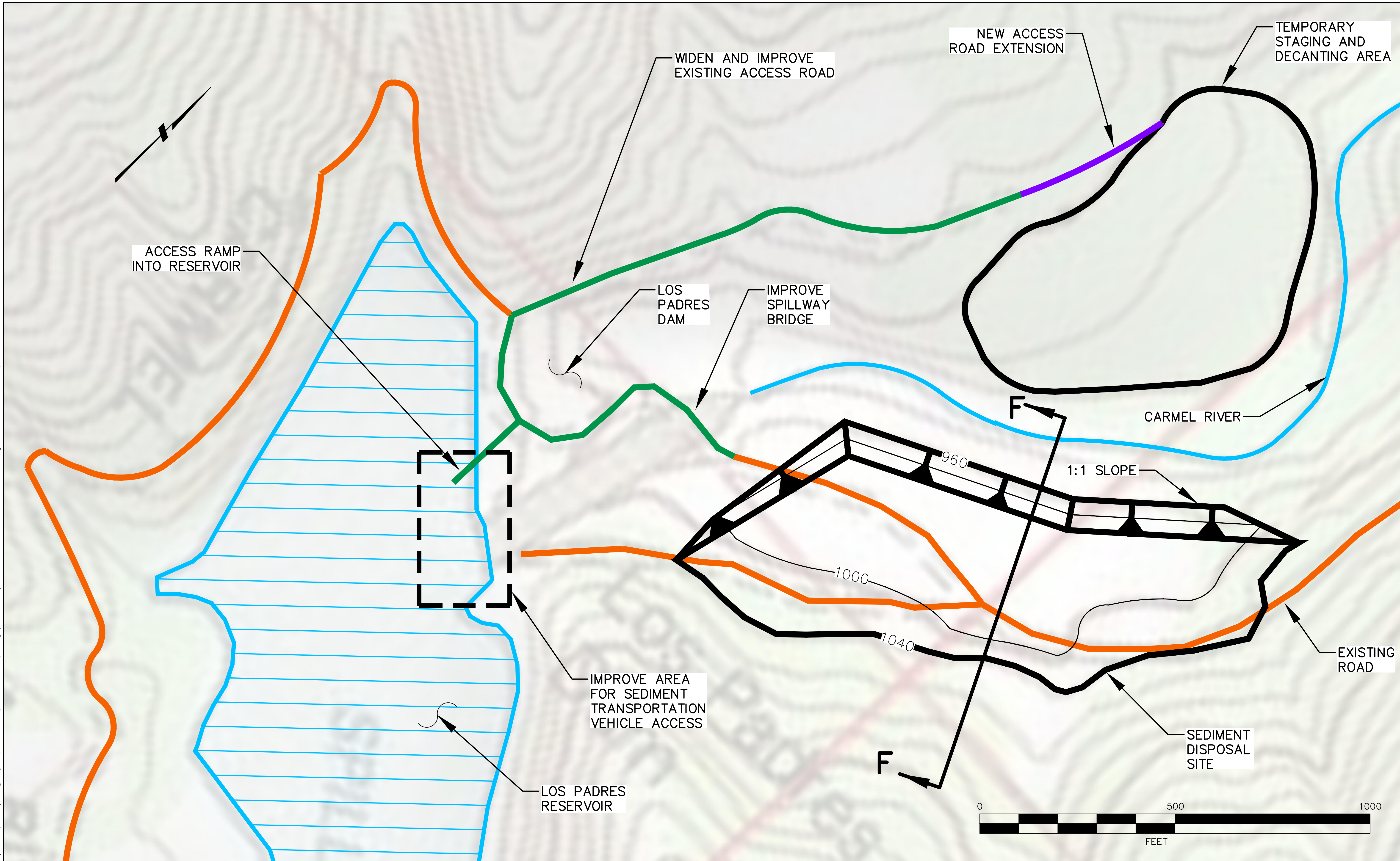
CALIFORNIA AMERICAN WATER
LOS PADRES DAM
SEDIMENT REMOVAL STUDY
PLAN OF SEDIMENT DISPOSAL SITE – ALTERNATIVE 3

EXHIBIT 7



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CALIFORNIA AMERICAN WATER
LOS PADRES DAM
SEDIMENT REMOVAL STUDY
PLAN OF SEDIMENT DISPOSAL SITE – ALTERNATIVE 3

EXHIBIT 8

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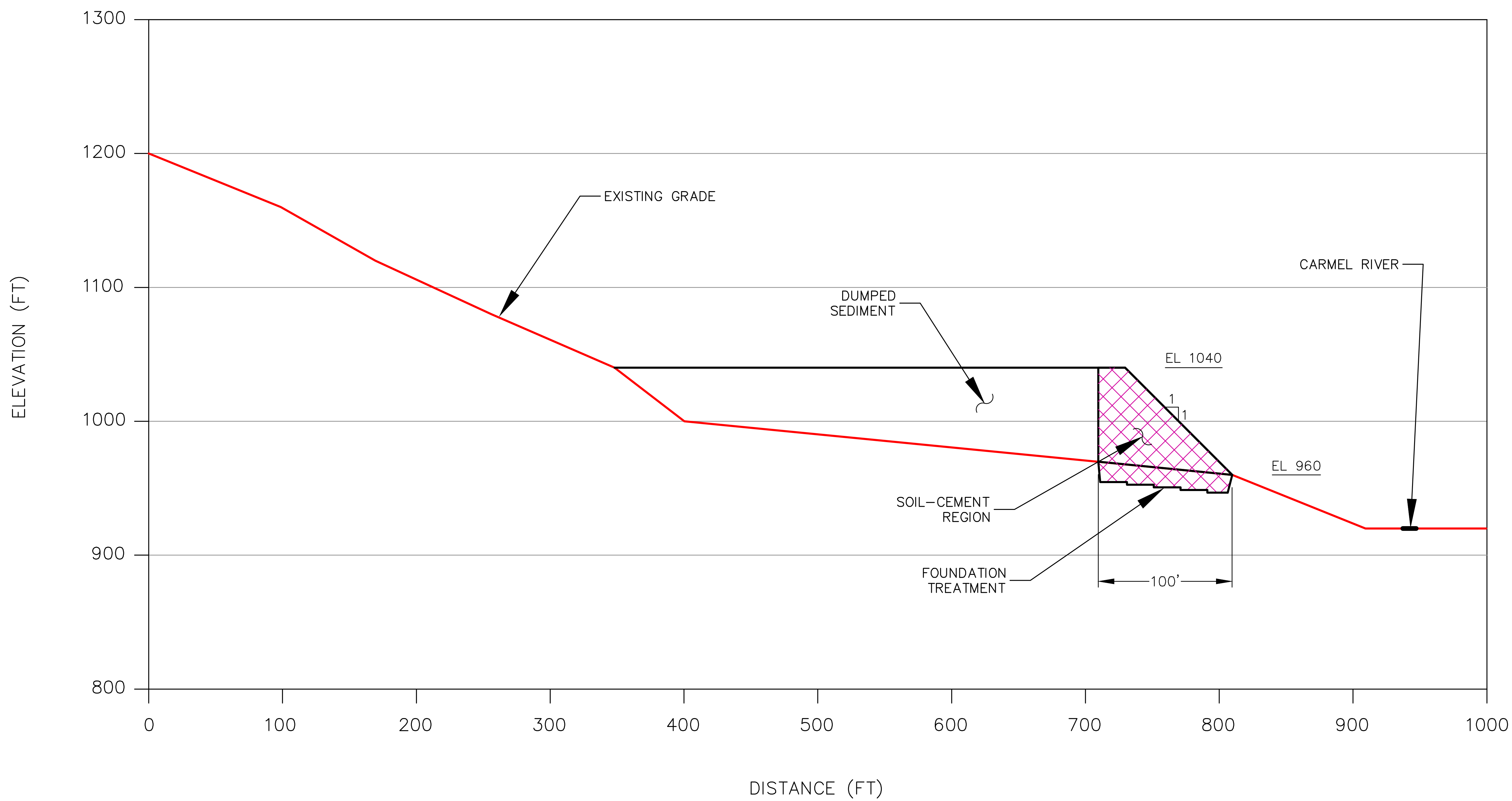

SEDIMENT DISPOSAL SITE, SECTION F–F

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CALIFORNIA AMERICAN WATER
LOS PADRES DAM
SEDIMENT REMOVAL STUDY
SEDIMENT DISPOSAL SITE SECTION – ALTERNATIVE 3

EXHIBIT 9

Appendix A

Environmental Compliance and Permitting Technical Memorandum

Table of Contents

List of Tables

Abbreviations and Acronyms

ACHP	Advisory Council on Historic Preservation
BMP	Best Management Practices
CAL-AM	California American Water
CCRWQCB	Central Coast Regional Water Quality Control Board
CDFG	California Department of Fish and Game
CESA	California Endangered Species Act
CEQA	California Environmental Quality Act
CNPS	California Native Plant Society
CRLF	California red-legged frog
CVMP	Carmel Valley Master Plan
CWA	Clean Water Act
ESA	Federal Endangered Species Act
FWCA	Fish and Wildlife Coordination Act
MBTA	Migratory Bird Treaty Act
MBUAPCD	Monterey Bay Unified Air Pollution Control District
MPWMD	Monterey Peninsula Water Management District
NEPA	National Environmental Policy Act
NHPA	National Historic Preservation Act
NMFS	National Marine Fisheries Service
NRHP	National Register of Historic Places
OHWM	Ordinary High Water Mark
RWQCB	Regional Water Quality Control Board
SAA	Streambed Alteration Agreement
SHPO	State Historic Preservation Officer
SWPPP	Storm Water Pollution Prevention Plan
SWRCB	State Water Resources Control Board
USACE	United States Army Corps of Engineers

1 Introduction

The Los Padres Reservoir was constructed in 1949 about 6 miles upstream of San Clemente Dam and stores surface water flowing from the upper watershed of the Carmel River in Monterey County. The drainage are of the reservoir is 45 square miles. It is an earth embankment dam owned and operated by California American Water (Cal-Am), a privately-held water company. The purpose of the reservoir is to store water during the wet season for release to the Carmel River during the dry season. It is then diverted from the San Clemente Dam for treatment and distribution to Cal-Am customers. Initially the reservoir had a capacity of 3070 acre feet at a spillway elevation of 1040 feet above mean sea level. Due to sediments being transported into the reservoir, the capacity has been reduced. A survey carried out in 2008 resulted in a capacity of about 1800 acre feet. Cal-Am is preparing a feasibly study to assess possible alternatives to remove sediments from the Los Padres Reservoir to restore capacity.

This environmental compliance and permitting technical memorandum (TM) provides Cal-Am with an overview of the possible environmental and permitting requirements, challenges, and strategies associated with sediment removal from the Los Padres Reservoir. This TM is written to provide general strategic guidance and permit information for environmental compliance of potential alternatives that may be included in the future environmental documents. As one component of a successful project implementation approach, this TM provides a blueprint to guide the acquisition of these permits, agreements and authorizations, minimize permitting surprises and delays, and maximize the timeliness of permit acquisition with acceptable permit terms. Periodic updates to this plan may be necessary to keep the plan current as the project proceeds; this TM represents potential permit conditions and strategies based on information available as of December 2012 when the project feasibility analysis was just underway.

Information from various documents were used to develop this strategy including, but not limited to, the Monterey Peninsula Water Supply Project Final Environmental Impact Report (EIR)/Environmental Impact Statement (EIS) (March 1994), Carmel River Dam and Reservoir Project Draft Supplemental EIR for the Carmel River Dam and Reservoir Project (November 1998), and the San Clemente Dam Seismic Safety Project Final EIS/EIR (July 2012).

Sediment removal from the Los Padres Reservoir (which will now be referred to as the "project" for the remainder of the document) will be subject to the requirements of the California Environmental Quality Act (CEQA) and the National Environmental Policy Act (NEPA). CEQA Guidelines Section 15367 defines the lead agency as the "…public agency which has the principle responsibility for carrying out or approving a project which may have a significant effect upon the environment." Several state and local approvals will be required as part of the project, including certification and permits from the State and/or Regional Water Resources Control Board (SWRCB/RWQCB), the Department of Fish and Game (DFG), California Public Utilities Commission, Monterey Peninsula Water Management District (MPWMD), and Monterey County Planning and/or Building Departments. Therefore, it is expected one of these agencies would be the lead agency for CEQA compliance. In the event of a dispute over State lead agency status, the California State Clearinghouse Handbook 2012 contains a protocol to submit a request to the Office of Planning and Research for a lead agency determination. See http://opr.ca.gov/docs/SCH_Handbook_2012.pdf for information about this process.

The project will require work within the Waters of the United States which will trigger the need for a Clean Water Act (CWA) Section 404 permit from the United States Army Corps of Engineers (USACE). Therefore, it is anticipated that the USACE will be the lead agency for NEPA compliance.

Cal-Am will need to obtain various permits and authorizations with the assistance of the CEQA lead agency and USACE before beginning any project construction.

See Table 1 for the major federal, state and local environmental regulations and related permits addressed by this TM.

Table 1: Major federal, state and local environmental regulations and related permits addressed by this TM

Resource	**Applicable Laws/Regulations/Permits**	**Regulating Agency/Agencies**
Multiple	National Environmental Policy Act and California Environmental Quality Act	U.S Army Corps of Engineers (NEPA), To Be Determined (CEQA)
Wetlands, Waters of the United States	Section 404 of the Clean Water Act	U.S. Army Corps of Engineers
	Section 10 of the Rivers and Harbors Act	U.S. Army Corps of Engineers
	Section 401 of the Clean Water Act – Water Quality Certification or Waiver	Regional Water Quality Control Board
	Section 402 of the Clean Water Act – National Pollutant Discharge Elimination System permit(s)	State Water Resources Control Board and Central Coast Regional Water Quality Control Board
	Sections 1600 through 1607 of the California Fish and Game Code – Streambed Alteration Agreement	California Department of Fish and Game
Federally Listed Species	Section 7 of the Federal Endangered Species Act – Section 7 Consultation	U.S. Fish and Wildlife Service and National Marine Fisheries Service
Essential Fish Habitat	Magnuson-Stevens Fishery Conservation and Management Act	National Marine Fisheries Service
Fish and Wildlife Resources	Fish and Wildlife Coordination Act report	U.S. Fish and Wildlife Service
Cultural Resources	National Historic Preservation Act – Section 106 Consultation	State Historic Preservation Officer

State-Listed Species/State Special-Status Species	Section 2081 of the California Endangered Species Act – Incidental Take Permit/Consistency Determination	California Department of Fish and Game
	California Native Plant Protection Act	California Department of Fish and Game
Air Quality	Authority to Construct	Monterey Bay Unified Air Pollution Control District
Electrical	[To be provided by Cal-Am]	California Public Utility Commission
Water Distribution System	Monterey Peninsula Water Management District Rules and Regulations 20(B) ““Permits to Connect or Modify a Connection to a Water Distribution System”	Monterey Peninsula Water Management District
Trees	Title 16, Chapter 16.60 Monterey County Code	Monterey County
Water flow rates and schedules	[To be provided by Cal-Am]	CDFG/ Cal-Am?
Various	Monterey County Comprehensive Plan and Local Area Plans (tree removal, Use Permits, encroachment permits, grading permits)	Monterey County Planning Department

The TM is arranged by the following topics: project overview; regulatory compliance and permitting strategy; NEPA and CEQA compliance, federal, state, regional and local compliance and permitting requirements; requirements for project alternatives; and a summary.

2 Project Overview

The purpose of the project is to restore the water storage capacity of Los Padres Dam and reservoir. Sediment removal would allow for recovery of water storage capacity in the reservoir impounded by Los Padres Dam. Approximately 2.1 million cubic yards of sediment has accumulated behind the dam. During the active construction seasons, the Carmel River would be diverted along the reservoir and dam site, and the reservoir would be drawn down to elevation 1000 by August 1st. Accumulated sediment would be removed from behind the dam over several seasons depending on the removal alternative by excavation with heavy earthmoving equipment or barge-mounted clamshell dredging. The sediment would be transported to a disposal area upstream or downstream of the reservoir. Road access to Los Padres Reservoir and the sediment disposal area would be improved and established, including new temporary access road between the sediment disposal site and the reservoir. The overall schedule could be affected by the amount of yearly rainfall and its effects on river flow conditions in the spring. Construction activities necessary to complete the project are summarized below. Improvements to and/or new roads proposed as part of the project is also conceptually described.

2.1 Sediment Removal

The reservoir behind the dam has been estimated to contain approximately 2.1 million cubic yards of sediment. The sediment has been estimated to consist of sandy gravel, gravelly sand, sand, silty sand, and sandy silt. The finer-grained sediment is located in the reservoir area nearest to the dam. The coarser (more gravelly and cobbly) materials are encountered in the upper reach of the reservoir. Sediments would be removed by either conventional excavation methods using scrapers and excavators, or by clamshell dredging and would be transported to a disposal site by trucks.

2.2 Sediment Disposal Site

One of the most difficult challenges in implementing the sediment removal alternative is to find a feasible site for permanent disposal of the sediment to be excavated from the reservoir. In order for the project to be economically feasible, the site has to have enough capacity to contain the sediment, has to be located in the immediate vicinity of the reservoir and be easily accessible from it, and has to be remote enough so that the sediment transport activities can be conducted with a minimum of impact to the surrounding communities.

MWH considered several sites in the reservoir vicinity and evaluated several potential sediment excavation and transport methods. Two preferred sites were selected based on proximity to the reservoir, engineering feasibility, and Cal-Am property boundary. While one site is higher in elevation than the reservoir, transport costs and energy consumption associated with sediment disposal operations would still be lowest for this site versus some other sites considered. Both sites are relatively remote and therefore the interface between construction operations and the public would be reduced. Because of their remoteness, sediment removal could proceed in two daily shifts without disturbing neighboring communities, thus resulting in a shorter schedule than for some of the other sites considered.

One site is located in a relatively steep, undeveloped, forested ravine approximately 1.6 miles south of Los Padres Dam. The ravine does not support a stream other than local runoff during storm events. Access to the ravine has not been developed, but is near the upstream end of the reservoir, which is accessed is via a jeep trail that begins at Los Padres Dam and eventually narrows to a walking trail. Construction access would need to be established along the river bed to enable the mobilization of construction equipment to the disposal site and the reservoir. The hiking trail cannot be improved due the steepness of the terrain above the reservoir.

A plan of the disposal site for the complete accumulated sediment is shown in Exhibit 2 through 4 of the main sedimentation study report. The toe of the sediment pile would be located at approximately elevation 1120 feet. The top of the sediment pile would be at about elevation 1440 feet in order to contain all of the sediment accumulated in the reservoir. The footprint area of the sediment pile would be approximately 18 acres. The watershed area tributary to the sediment pile site is approximately 280 acres.

The other site is located about 1300 feet downstream of the Los Padres Dam on the east side of the Carmel River. Access to the site is established with existing dam access through Nason Road. As the site will become higher, the road will have to be rerouted. A plan of the disposal site is shown in Exhibit 7 to 9. This site is only intended for deposition of the finer material below reservoir elevation 1000 feet. The maximum capacity of the site is undetermined but is well in excess of the required volume. The toe of the sediment pile would be located at approximate elevation 960 feet. The footprint area of the sediment pile would be approximately 15 acres.

The property where the site is located is owned by Cal-Am and has been confirmed as an acceptable site to use for disposal. The access roads to both disposal sites would be within Cal-Am property.

2.3 Stream Diversion and Reservoir Drawdown and Dewatering

The Carmel River would be diverted around the active areas of excavation during the construction season for sediment removal alternatives 1 and 2. Stream flows would be passed downstream to maintain the flow and habitat in the Carmel River during construction. Within the reservoir area, the reservoir level would be drawn down, and the sediment deposits in the upper reach of the reservoir would be pre-drained to keep the active excavation area as dewatered and drained as possible to enable operation of scrapers and similar self-propelled earthmoving equipment. Dewatering wells would be positioned to drain the water table to the target final elevation of excavation. No additional drainage would be required for the clamshell dredging in the lower reach.

Prior to commencing excavation operations, the reservoir water level would be drawn down by gravity to elevation 1000 feet by August 1st. The reservoir level will decrease further as the minimum downstream release is sustained with water from the reservoir.

Water within the construction area would be turbid due to the earthmoving operations. At some point the turbidity of the water in the reservoir may be too high for direct downstream release. Excess water from within the reservoir would then need to be treated using a filtration system to remove turbidity and excess iron compounds. The treated water would be discharged to the river.

At the end of each sediment excavation season, the diversion pipe would be disconnected from the sheet pile cutoff and the river flow would be re-established through the reservoir.

2.4 Project Access and Improvements

Currently, the dam and reservoir are accessed via existing public roads from Carmel Valley Road to Cachagua Road, then to Nason Road, which leads to the dam past gated access on Nason Road. All access beyond gates on Nason road and into the reservoir are on Cal-Am property. Access beyond the dam and into the reservoir area is via a jeep trail that eventually narrows to a walking trail. Portions of Nason road beyond the gates would require improvement and a new access roadway would need to be built between the reservoir and the upstream disposal site to enable the mobilization of construction equipment to the dam, disposal site, and reservoir.

2.5 Project Alternatives

See Table 2 for a summary of the alternatives to be considered in the Los Padres Dam Feasibility Study. For more information, please refer to the Los Padres Dam Feasibility Study.

Table 2: Summary of sediment removal alternatives

	1 **<u>Complete Removal (90%) – Upstream Disposal</u>**	2 **<u>Partial Removal (40%) – Upstream Disposal</u>**	3 **<u>Partial Removal (44%) – Downstream Disposal</u>**
Method	- Conventional - Clamshell dredging	Conventional	Clamshell dredging
Season	July 1st to October 1st (August 1st start for dry sediment removal)	July 1st to October 1st (August 1st start for sediment removal)	July 1st to October 1st
Total length of construction	7 years (5 years for sediment removal)	6 years (4 years for sediment removal)	7 years (5 years for sediment removal)
Disposal Site	Upstream (1:1 bottom slope, 3:1 top slope)	Upstream (1:1 bottom slope, 3:1 top slope)	Downstream (1:1 slope)
Disposal Area	- Site preparations (clearing, access, etc.) - Berm: local material, soil cement	- Site preparations (clearing, access, etc) - Berm: local material, soil cement	- Site preparations (clearing, access, etc) - Berm: local material, soil cement
Water	- River bypass • Upstream cofferdam • Pipe along reservoir - Accommodate minimum downstream release	- River bypass • Upstream cofferdam • Pipe along reservoir - Accommodate minimum downstream release	- No River bypass, but silt curtains - Accommodate minimum downstream release
Processing Area	Decanting on top of the existing sediment deposition in the reservoir	None	Below dam (opposite of disposal site)
Staging Area	Near Cal-Am entrance and at toe of disposal site	Near Cal-Am entrance and at toe of disposal site	Near Cal-Am entrance and below dam (adjacent to processing site)
Access	- Reservoir • Improve ramp at dam - Upstream disposal site • Road through reservoir & Carmel River to disposal site • Material from reservoir for road fill • Build first year, remove & restore last year	- Reservoir • Improve ramp at dam - Upstream disposal site • Road through reservoir & Carmel River to disposal site • Material from reservoir for road fill • Build first year, remove & restore last year	- Reservoir • Improve ramp on dam - Downstream disposal site • Reconfigure existing access

3 Regulatory Compliance and Permitting Strategy

Regulatory compliance strategies are presented below as "general strategies". General strategies apply to all permits and approval processes, and implementing these strategies during permit acquisition will improve the success of acquiring each permit. For those permits which can be difficult or take a long time to obtain, specific strategies for the CEQA/NEPA document or permits are summarized within the respective sections (e.g. CEQA/NEPA compliance, CWA Section 404 permit, etc.). As more engineering and environmental information is developed for each project alternative, the regulatory compliance and permitting strategy can be fine-tuned.

3.1 General Strategies

Below are general strategies to be considered:

- Plan for environmental compliance early in the project development and coordinate with regulatory agencies early to verify lists of permits/approvals that will need to be obtained prior to project implementation.
- Determine CEQA and NEPA lead agency, responsible agency, trustee agency and cooperating agency status.
- Carefully determine the project's CEQA objectives, baseline and No Project description.
- Carefully determine the project's NEPA statement of purpose and need with consideration of future environmental compliance, and conduct a logical, factual, and comprehensive step-wise alternative analysis with defensible screening criteria to consider the widest range of possible alternatives and properly focus in on a reasonable range of alternatives.
- Prepare a detailed and thorough description of all alternatives carried forward into the CEQA/NEPA document, but include sufficient flexibility such that typical changes in project design at later stages do not conflict with the project description.
- Cover permitting needs for resource specific information, resource impacts and mitigation measures in the CEQA/NEPA documents and engineering work products to the extent possible to allow for the earliest possible formal input from agencies.
- Maintain regular communication between the design team and the environmental team as biological mitigation is being developed to minimize the conflicts between construction and resources needs, and to provide for flexibility for during construction under certain cases.

3.2 General Informational Needs

General compliance and permitting informational needs, primarily related to the project description information are as follows:

- Project description
- Project purpose and objectives
- Project location
- Project area and site boundaries
- Project size (acres)
- Site plan (including project layout, offsite components, construction staging areas and access
- Verified delineation of jurisdictional Waters of the US
- Field verification of species occurrence/non-occurrence
- Cultural Resources survey

- Base map with aerial photograph
- Design drawings (with % completed indicated)

4 CEQA and NEPA Compliance

Sediment removal from the Los Padres dam will require discretionary approvals by state and local governmental agencies; therefore the project will be subject to CEQA. As stated above, several state and local permits will be required as part of the project, including permits from the SWRCB, CCRWQCB, CPUC, MPWMD, and Monterey County. Therefore, one of these agencies is anticipated to be the CEQA lead agency.

In addition, the proposed project will require work within the Waters of the United States which will trigger the need for a CWA Section 404 permit from the USACE. In order to issue the Section 404 permit, USACE must comply with NEPA. Therefore, it is assumed that USACE will be the NEPA lead agency for the sediment removal.

There is insufficient information to make a determination of the appropriate level of documentation for CEQA/NEPA compliance for the project at this time.

4.1 Relevant Environmental Issues

Potential impact mechanisms related to construction activities and key environmental issues will need to be addressed in the CEQA/NEPA document. Below is a brief summary of the potential impact mechanisms and key environmental issues.

4.1.1 Potential Impact Mechanisms

Potential impact mechanisms related to construction activities include:

- The presence of workers, equipment, machinery, and supplies within and along the active channel of Carmel River and along portions of the access roads;
- Increased traffic on local roads in the vicinity of the project;
- Dewatering and/or rerouting portions of the live channel and reservoir during construction;
- Release of drawdown water and bypassed water;
- Clearing of vegetation and construction activities within the disposal areas; and
- Excavation and relocation of sediment from the reservoir to a nearby canyon site
- Interfering with recreational use of the area
- Long-term impacts of sediment disposal area and changes in Land Use

4.1.2 Key Environmental Issues

When developing the CEQA/NEPA document, all resource areas will need to be evaluated, but particular attention will need to be paid to the following key environmental issues:

Water Quality

Potential impacts to water quality could occur during:

- Road construction and improvement activities during construction
- Instream, stream bank and/or stream margin construction activities

- Accidental leaks and spills of toxic substances
- Stream diversions, sheet pile cutoff walls, and cofferdams
- Reservoir drawdown
- Reservoir sediment excavation
- Sediment disposal

For those short-term construction impacts which could result in sediment discharges to watercourses, resulting in increased turbidity, mitigation could include erosion control and water quality monitoring methods which will be detailed in the Storm Water Pollution Prevention Plan (SWPPP).

For those impacts resulting in localized scour, sedimentation, release of toxins, increase temperature or decreased dissolved oxygen from return of bypassed flows or rewatering after stream diversions, mitigation could include energy dissipation structures, erosion control and other water quality protection methods.

Reservoir drawdown and sediment extraction could result in increased turbidity. Mitigation could include slow drawdown to minimize effects and/or erosion control and water quality methods. Disposal of sediment removed from Los Padres dam will need to be placed in a location that will not allow the sediment to return to the river/reservoirs.

Fisheries

Potential impacts to fisheries could occur during:

- Access route improvements
- Dewatering river channels for construction purposes
- Diversion of Carmel River around Los Padres reservoir for construction purposes
- Reservoir dewatering

For those activities resulting in short-term loss of aquatic habitat or other affects to in-reservoir or downstream fisheries, possible mitigation measures could include fish rescue and relocation, erosion control and water quality protection plan, and stream channel restoration.

Terrestrial biology

Potential impacts to terrestrial biology could include:

- Loss of protected oak woodland
- Loss of native vegetation
- Indirect effects on native vegetation
- Impacts to California red-legged frog habitat or western pond turtles
- Effects on special-status bird species and other birds protected by the Migratory Bird Treaty Act

For those construction activities that could adversely affect or result in the loss of protected special-status species, habitat, and/or native vegetation, mitigation could include erosion control measures, rescue/relocate special status species, predator control, minimize construction footprints, and/or minimize tree removal. See the "Federal Endangered Species Act", "California Endangered Species Act" and "Monterey County Policies and Regulations" sections for more information on the process for federal and state agency consultation with regards to special-status species and local policies on removal of protected oak woodland.

Cultural and Paleontological Resources

Damages to pre-historic or historic cultural resources or paleontological resources could occur during project construction. Actions to minimize potential adverse effects on prehistoric and historic-era archaeological resources are discussed extensively in the Section 106 process (see the "Federal Agency Environmental Permitting") section below. There are no permit requirements related to paleontological resources, but impacts on these resources are described, including mitigation, in the NEPA and CEQA documents.

Air Quality

Potential impacts to air quality could occur

- During access road upgrades
- Construction- and project-generated traffic

Mitigation to help lessen these potential short-term dust and other emissions impacts, could include Best Management Practices (BMP), including but not limited to watering, chemical stabilization, and dust suppression. Use of low emission construction vehicles can be considered. For more information on air quality requirements see the "Monterey Bay Unified Air Pollution Control District" section below.

Noise and Traffic

Potential short-term noise and/or traffic impacts could include occur during construction activities. Noise from construction of the roads, sediment removal activities and additional traffic from construction-related travel could be mitigated with use of quiet-design construction equipment, mufflers, etc., and/or a construction management plan to reduce the number of vehicles and their interaction with other vehicles to promote safety. Possible increased traffic on residential neighborhoods, including those neighborhoods along Nason or Chachagua Road, could also be mitigated coordinating with landowners, by implementing a construction management plan, and/or repairing damage to affected roads, if applicable. It will be important to work with the County and local residents on traffic management issues.

5 Federal Agency Environmental Permitting

The section below discusses the general needs related to federal agency environmental compliance and permitting.

5.1 Clean Water Act and Rivers and Harbors Act

The CWA establishes the basic structure for regulating discharges of pollutants into the waters of the United States and regulating quality standards for surface waters. There are several sections of the CWA that apply to the proposed project. Section 404 authorizes a special permit program to control dredge and fill operations. As authorized by Section 402 of the CWA, the National Pollutant Discharge Elimination System (NPDES) permit program controls water pollution by regulating point sources that discharge pollutants into waters of the United States. Section 401 of the CWA requires that an applicant for a federal license or permit provide a certification that any discharges from the facility will comply with the act, including water quality standard requirements. Certain responsibilities within sections 402 and 401 are delegated to the states and are discussed further in “State Agency Environmental Permitting” located below.

Section 10 of the Rivers and Harbors Act regulates the construction of structures in, over, or under, excavation of material from, or deposition of material into navigable waters. The boundaries would be similar to or the same as under Section 404 of the CWA.

5.1.1 Section 404 Permit

Section 404 of the CWA requires approval prior to discharging dredged or fill material into the waters of the United States. Placement of dredge or fill material in waters of the United States, must first obtain a permit from the USACE. Water of the United States includes essentially all surface water such as all navigable waters and their tributaries, all interstate waters and their tributaries, all wetland adjacent to these waters, and all impoundments of these waters. The landward regulatory limit for non-tidal waters (in the absence of adjunct wetlands) is the ordinary high water mark (OHWM). The OHWM is the line on the shores established by fluctuations of water and indicated by physical characteristics.

Typically Section 404 permits issued by the USACE are either individual permits or nationwide permits. Individual permits are issued for projects which generally affect greater than 0.5 acres of wetlands or waters of the United States or for those activities that do not fall within the nationwide permit program. A nationwide permit is a form of general permit which authorizes a category of activities throughout the nation for projects which affect 0.5 acres or less of wetlands or waters of the United States. These permits are valid only if the conditions applicable to the permits are met. If the conditions cannot be met, an individual permit will be required. Additionally, in California, the SWRCB must certify each Nationwide Permit. Currently, not all of the NW permits have been certified and therefore, not all are available for compliance needs.

General information needed for the Section 404 application:

- Wetland delineation and determination of the OHWM
- Amount (cubic yards and/or length, width, height) of material being placed within jurisdictional waters
- Acreage of material dredged
- Replacement quantities of native and imported material, and net permanent change (cubic yards)

- Type of material placed within jurisdictional waters (i.e., clean fill dirt, rock, clay, concrete, etc.)
- Identification and dimensions of structures and materials to be used in construction
- Construction equipment and methods by which work will be done
- Adjacent landowners

If an individual permit is required, an applicant must show that the project is in compliance with the CWA Section 404(b)(1) Guidelines. These include:

- Avoiding wetland impacts where practicable,
- Minimizing potential impacts to wetlands,
- Providing compensation for any remaining unavoidable impacts through activities to restore or create wetlands, and
- Mandating that USACE can only issue a permit for the least environmentally damaging practicable alternative (LEDPA).

The project could include filling portions of the Carmel River for truck access to the reservoir, sediment disposal sites upstream and downstream of the reservoir, and installation of a cofferdam. These activities could require a Section 404 permit. It is assumed that all sediment removed from behind the dam will be placed upland of the OHWM and will not require a Section 404 permit, but, until a wetland delineation/OHWM determination can be completed, it is not known if a Section 404 permit will fall within a Nationwide Permit or will require an individual permit.

5.1.2 Section 10 Permit

Section 10 of Rivers and Harbors Act (RHA) (33 U.S.C. 401 et seq.) requires authorization from USACE for the construction of any structure over, in, and under navigable waters of the United States. In addition, authorization is required for excavation/dredging or deposition of material or any obstruction or alteration in navigable water. Navigable waters are those subject to the ebb and flow of the tide and those that are presently used, have been used in the past, or may be susceptible to use to transport interstate or foreign commerce (55 CFR 329.4). They include coastal and inland waters, lakes, rivers and streams that are navigable, and the territorial seas. Structures or work outside the limits defined for navigable waters would require a Section10 permit if the structure or work affects the course, location, condition, or capacity of the water body.

According to the San Clemente Dam wetland delineation, the Carmel River is a waterway is “navigable-in-fact”, based on recreational usage by kayakers. Therefore, it is assumed that a Section 10 permit would be required for the project.

General information needed for the Section 10 permit is similar to the Section 404 permit application requirements as stated above.

5.1.3 Specific Strategies for Section 404 and Section 10 permitting

Specific strategies for obtaining permits associated with Section 404/10 CWA permits include:

Focus early on the content required for the NEPA/CEQA documents, particularly the “purpose and need”, and federal and state listed species concerns to:

- Facilitate compliance with Section 404 at later stages,

- Fulfill NEPA and CEQA requirements,
- Address listed species requirements,
- Provide a strong nexus between the project purpose and alternatives to meet the project purpose, and
- Develop a strong suite of alternatives including proposed actions.

Submit a wetland delineation to USACE as soon as a project footprint can be defined to expedite the Section 404/10 project and related Federal actions by:

- Triggering early USACE involvement,
- Establishing USACE limits of jurisdiction,
- Minimizing the substantial costs that would be necessary to delineate wetlands for a large number of alternatives early in the alternatives evaluation stage,
- Providing information for a productive pre-application meeting.

In addition, it is recommended submitting the Section 404 and Section 10 permit packages to USACE as soon as the proposed action's footprint is determined and the wetland delineations are completed, to initiate USACE's review, as review time can be lengthy.

See Attachment A1 for a map of potential wetlands of the project area and the USACE "Approved Jurisdictional Determination Form" for the Carmel River Reroute and San Clemente Removal Project.

5.2 Other Federal Requirements

Below are other federal permits/requirements that could be needed for the project.

5.2.1 USACE Regulatory Guidance Letter No. 05-04

The USACE has published Regulatory Guidance Letter No. 05-04, providing guidance on the discharge of sediments from or through a dam and the breaching of dams, for purposes of Section 404/10 of the CWA. The letter addresses releases of sediments from or through dams that require USACE permits. The guidance is not intended to require a USACE permit for routine high water flow dam operations that allow sediment-laden waters to flow from or through a dam; however deviations from normal dam operations resulting in the discharge of bottom sediment may require a USACE permit.

Discharges from or through Los Padres dam is not expected for the project. If release of sediments through Los Padres dam is required as part of the project, then the project will need to meet the requirements of the USACE guidance letter.

5.2.2 Section 106 of the National Historic Preservation Act

Section 106 of the NHPA requires Federal agencies to evaluate the effects of Federal undertakings on historical, archaeological, and cultural resources. During the evaluation, an agency is required to coordinate with State Historic Preservation Officer (SHPO) and the Advisory Council on Historic Preservation (ACHP), an independent Federal council responsible for advising the president and Congress on historic preservation matters and reviewing and commenting on agency actions that may affect historic properties. NHPA establishes responsibilities of each SHPO for developing a statewide plan for preservation, surveying, and assessing surveys to:

- Identify historic properties,
- Nominate properties for listing on the National Register of Historic Places (NRHP),
- Provide technical assistance to government agencies and the public, and
- Participate in the review of Federal undertakings and permit actions that affect historic properties.

The Section 106 process will consist of the following five basic steps.

1. **Identify and Evaluate Historic Properties.** An archaeologist will review all available information that could help determine whether there may be historic properties in the Area of Potential Effect (APE) and will identify all NRHP-listed properties and those that may be eligible for listing. The APE is the geographic area within which an undertaking may directly or indirectly cause changes in the character or use of historic properties, if such properties exist. The area of potential effects is influenced by the scale and nature of the undertaking and may be different for different kinds of effects caused by the undertaking. Generally, an area broader than the project footprint must be considered.

   As part of the process, archaeologists will prepare a cultural resources survey report for the lead agency consideration, processing and transmittal to SHPO.

2. **Assess Effects.** If historic properties have been identified within the APE and found to meet NRHP criteria, the archaeologists will determine whether the proposed action will affect the properties in any way. There are three possible findings:

   - *No effect.* If there will be no effect of any kind on the historic properties, SHPO and interested parties are notified of this determination, and SHPO does not object, the project may proceed.
   - *No adverse effect.* If there could be an effect, but the effect would not harm the historic property, the concurrence of SHPO is obtained and a determination of no adverse effect is submitted to ACHP. If it prefers, the lead agency can submit its determination of no adverse effect directly to ACHP for review and notify SHPO of this action. Unless ACHP objects, the agency proceeds with its project or activity.
   - *Adverse effect.* If there could be a harmful effect on a historic property, the lead agency begins the consultation process. The survey report prepared by qualified archaeologists and/or historians will report the findings of the effect of the action on any properties listed or eligible for listing on NRHP. If the survey and report are found to be adequate, SHPO will submit an approval letter to the lead agency, thereby allowing the project to proceed. Typical steps for completing a cultural resources survey that would meet Section 106 requirements are as follows:
     - define the APE,
     - notify any concerned or potentially interested Native American persons or groups,
     - conduct a records search to determine whether the APE has already been surveyed and whether there are any recorded sites in the APE,
     - conduct a site survey of the APE if one has not already been conducted, or to reconfirm results
     - document any artifacts found during the survey,

- develop recommendations for additional survey or preservation work if cultural resources are found during surveys, and
- redesign the project to avoid or minimize effects on cultural resources.

3. **Complete Consultation.** During this step, an effort is made to find acceptable ways to reduce any adverse effect of the proposed action on a historic property. The consulting parties are the Federal lead agency and SHPO and may include ACHP and other interested parties. When the consulting parties agree on steps to reduce or avoid harm to historic property, they may sign an MOA.

4. **Receive Comments from ACHP.** Unless ACHP has already signed the MOA as a consulting party, the lead agency would submit the MOA to ACHP for review. ACHP can accept the MOA, request changes to it, or issue written comments on the proposal.

5. **Proceed.** If the Section 106 review process has resulted in an MOA accepted by ACHP, the lead agency would proceed with the project according to the terms of the MOA. After the process is complete, SHPO files the report with one of the regional information centers of the California Historical Resources File System.

As a result of the NHPA and as part of the Section 404/10 process, the USACE must consult with SHPO to ensure compliance with Section 106. According to the Monterey Peninsula Water Supply Project Final EIR/EIS, 13 known and other possible unknown prehistoric archaeological sites were found near or in Los Padres Reservoir during the Phase II Archaeological Report. Therefore, it could be assumed that some of the known and possible unknown prehistoric archaeological sites could be located in the project's footprint.

5.2.3 Federal Endangered Species Act

The Federal ESA of 1973, as amended (16 USC 1531 et seq.), is a mechanism for the protection and recovery of species threatened with extinction and includes, but is not limited to, the following:

- a process to list species in danger of becoming extinct (Section 4);
- a prohibition on "take" of threatened and endangered species (Section 9); and
- processes for exemption from Section 9 take prohibitions when take is incidental to, and not the purpose of, otherwise lawful activities (Section 7 and Section 10).

ESA is administered by United States Fish and Wildlife Service (USFWS) and National Marine Fisheries Service (NMFS). USFWS is responsible for protection of birds, terrestrial, and resident (non-anadromous) freshwater species. NMFS is responsible for protection of anadromous fish.

Section 7 Consultation

Section 7 of ESA outlines procedures for Federal interagency cooperation to conserve Federally listed species and designated critical habitat. ESA mandates that all Federal agencies participate in the conservation and recovery of listed threatened and endangered species and that each agency ensure that any action they authorize, fund, or carry out does not jeopardize the continued existence of a listed species or its critical habitat. Critical habitat identifies specific areas that have the physical and biological features that are essential to the conservation of a listed species, and that may require special management considerations for protection.

Section7(a)(2) requires Federal agencies to consult with USFWS and NMFS to ensure that they are not undertaking, funding, permitting, or authorizing actions likely to jeopardize the continued existence of listed species. NMFS also ensures that projects do not adversely affect Essential Fish Habitat, as defined in the 1996 Sustainable Fisheries Act (Public Law 104-23 297), to stop or reverse the continued loss of fish habitats through the goals of habitat protection, conservation, and enhancement.

If the issuance of a CWA Section 404 permit by USACE could affect any listed species, USACE must consult with USFWS and/or NMFS on the effects of the issuance of that permit. Two federally listed species occur in the Carmel River Watershed and could be present on the project site: the South-Central California Coast Steelhead and the California red-legged frog (CRLF). Steelhead and steelhead habitat is under the jurisdiction of NMFS and California Department of Fish and Game (CDFG). CLF and their habitat are under jurisdiction of USFWS and CDFG. Other sensitive species in the area include Coast Range newt, hooked popcornflower, prairie falcon, and western pond turtle. See Attachment A2 which includes a map of the California Natural Diversity Data Base species within the project area.

Protection and mitigation for steelhead and CRLF would be required prior to sediment removal activities. The following activities outline the major mitigation measures that could be proposed. Additional measures could be required by the permitting agencies as a result of the environmental review process.

Steelhead

- Two weeks prior to diverting the streamflow around the reservoir and dam, migrant trapping upstream of the reservoir would be initiated to reduce the number of steelhead that would be present within the reservoir pool.
- Fish rescues would occur in the areas between the diversion point on the Carmel River and the reservoir during the early phases of the reservoir drawdown.
- When the streamflow is diverted, fyke nets and traps would be installed upstream of the diversion point to prevent steelhead, red-legged frogs, turtles and other animals from entering the pipelines. The traps and nets would need to be maintained each construction season throughout the time the streams are diverted.
- After the streamflow is diverted, the water in the reservoir pool would be pumped out the outlet pipe (for the traditional earthmoving removal alternative). Prior to commencing activities in the reservoir (dredging or earthmoving), steelhead and red-legged frogs would be salvaged using nets and traps or other methods as appropriate. Steelhead would be relocated, by biologists who hold appropriate permits, downstream of construction activities. Red-legged frogs would be moved to relocation sites.

California Red-Legged Frog

- CRLF mitigation would occur prior to the start of each construction mobilization, during the construction season, and through annual demobilization for the winter season.
- During construction, CRLF protection and oversight require trained personnel, who hold appropriate permits, on site to monitor compliance with mitigation and conservation measures and communicate with Cal-Am and resource agencies.

- During construction, trained personnel would conduct daily visual inspections to clear construction areas of CRLF.
- During construction, trained personnel would also continually remove bullfrog adults and tadpoles from the remnant reservoir pool and upstream pools/ponds (late fall season) to reduce bullfrog numbers.
- During dewatering (or dredging) of the plunge pool, trained personnel would remove bullfrog adults and tadpoles and translocate any CRLF to appropriate translocation sites.
- After demobilization each fall, bullfrog tadpole removal would continue until November to maximize the reduction of the bullfrog populations.

Specific Strategies for Endangered Species Act Compliance

Specific strategies for obtaining permits associated with the ESA include:

- Conduct feasibility-level fieldwork, including listed species surveys and wetland delineations, as soon as practical after general project footprints can be established
- Develop a consistent internal strategy for meeting Federal ESA and CESA requirements, including a consistent approach to developing measures that avoid, minimize, and compensate for effects on listed species (both fish and terrestrial species) and critical habitat.
- Establish working relationships with USFWS, NMFS, and CDFG to:
    - identify issues early and help prevent future "surprises," and
    - engage NMFS, USFWS, and CDFG in constructive problem-solving in strategic meetings involving all three agencies so that the approach for restoration, avoidance, and minimization is streamlined and consistent.
    - Minimize conflicting permit terms.

In addition, develop mechanisms to avoid, minimize, and compensate for effects to listed species and include in the public draft CEQA/NEPA documents.

5.2.4 Fish and Wildlife Coordination Act

The Fish and Wildlife Coordination Act (FWCA) requires Federal agencies to consult with USFWS, NMFS, and CDFG before undertaking or approving water projects that would control or modify surface water. Because the Investigation would affect surface waters, USACE must conduct consultation pursuant to the Act.

FWCA coordination is typically incorporated into the NEPA process but may require the preparation of a separate FWCA report by USFWS based on information contained in the environmental compliance documents and Biological Assessments.

5.2.5 Migratory Bird Treaty Act

The Migratory Bird Treaty Act (MBTA), first enacted in 1918, implements domestically a series of treaties between the United States and Great Britain (on behalf of Canada), Mexico, Japan, and the former Soviet Union that provide for international migratory bird protection. The MBTA authorizes the Secretary of the Interior to regulate the taking of migratory birds; the act provides that it shall be unlawful, except as permitted by regulations, "to pursue, take, or kill any migratory bird, or any part, nest or egg of any such bird…" (U.S. Code Title 16, Section 703). This prohibition includes both direct and indirect acts, although harassment and habitat modification are not included unless they result in direct loss of birds, nests, or eggs. The current list of species protected by MBTA includes several hundred species and essentially includes all native birds. The act offers no statutory or regulatory mechanism for obtaining an incidental take permit for the loss of nongame migratory birds.

5.2.6 Executive Orders/Policies

Other executive orders which could be applicable to the project are

- Executive Order 11990 (Wetlands Policy)
- Executive Order 11988 (Flood Hazard Policy)
- Executive Order 12898 (Environmental Justice Policy)
- Executive Order 13112 (Invasive Species)
- Executive Order 13186 (Further Implement MBTA)
- Indian Trust Assets

6 State Agency Environmental Permitting

The section below discusses the general needs related to state agency environmental permitting.

6.1 Section 401 of the Clean Water Act

Under Section 401 of CWA, an applicant for a Section 404 permit must obtain a certificate from the appropriate Regional Water Quality Control Board (RWQCB) stating that proposed fill is consistent with the State's water quality standards and criteria. In California, the authority to grant water quality certification is generally delegated by the State Water Resources Control Board (SWRCB) to the nine RWQCBs.

The proposed project will require submittal of a Section 401 certification application to the Central Coast Regional Water Quality Control Board (CCRWQCB) as part of the Section 404 permitting process.

Specific Strategies to Obtain Section 401 Water Quality Certification

Specific strategies for obtaining permits associated with the 401 Water Quality Certification include:

- Attend a USACE pre-application agency coordination meeting that includes CCRWQCB personnel to identify water quality issues prior to application to CCRWQCB for water quality certification.
- Submit a certified CEQA document and copies of other permit applications (e.g., CWA Section 404 application, Fish and Game Code Section 1602 application, if needed) to CCRWQCB along with the application for water quality certification.
- Work early and closely with CCRWQCB to determine their informational needs and potential mitigation measures such as an effective strategy for treating water prior to discharge during construction, and utilizing land disposal to the extent possible to minimize permitting issues.
- Work closely with RWQCB contacts to establish working relationships and quickly respond to supplemental information requests.

6.2 Section 402 of the Clean Water Act

Dischargers whose projects disturb one or more acres of soil or whose projects disturb less than one acre but are part of a larger common plan of development that in total disturbs one or more acres, are required to obtain coverage under the General Permit for Discharges of Storm Water Associated with Construction Activity Construction General Permit Order 2009-0009-DWQ. Construction activity subject to this permit includes clearing, grading and disturbances to the ground such as stockpiling, or excavation, but does not include regular maintenance activities performed to restore the original line, grade, or capacity of the facility.

The Construction General Permit requires the development and implementation of a SWPPP. The SWPPP should contain a site map(s) which shows the construction site perimeter, existing and proposed buildings, lots, roadways, storm water collection and discharge points, general topography both before and after construction, and drainage patterns across the project. The SWPPP must list Best Management Practices (BMPs) the discharger will use to protect storm water runoff and the placement of those BMPs. Additionally, the SWPPP must contain a visual monitoring program; a chemical monitoring program for "non-visible" pollutants to be implemented if there is a failure of BMPs; and a sediment monitoring plan if the site discharges directly to a water body listed on the 303(d) list for sediment.

6.3 Annual MOS on Carmel River Flows

According to Cal-Am, no official statement of required downstream releases exists. However, current practice is to provide a minimum of 5 cfs release downstream of Los Padres Dam during the dry season.

6.4 California Endangered Species Act and Other Fish and Game Codes

Pursuant to the CESA, a permit from CDFG is required for projects that could result in the take of a plant or animal species that is state listed as threatened or endangered. Under CESA, “take” is defined as an activity that would directly or indirectly kill an individual of a species, but the CESA definition of take does not include “harming” or “harassing,” as the Federal ESA definition does. As a result, the threshold for take is higher under CESA than under ESA (i.e., habitat modification is not necessarily considered take under CESA). California Fish and Game Code Sections 3503 and 3503.5state that it is unlawful to take, possess, or needlessly destroy the nest or eggs of any bird, and that it is unlawful to take, possess, or destroy any raptors (i.e., species in the orders Falconiformes and Strigiformes), including their nests or eggs. Typical violations of these codes include destruction of active nests resulting from removing vegetation in which the nests are located. Violation of Section 3503.5 could also include failure of active raptor nests resulting from disturbance of nesting pairs by nearby project construction. This statute does not provide for the issuance of any type of incidental take permit.

Specific strategies for CESA are described above in the “Endangered Species Compliance” section.

6.5 California Fish and Game Code Section 1600 et seq – Streambed Alteration

All diversions, obstructions, or changes to the natural flow or bed, channel, or bank of any river, stream, or lake in California that supports wildlife resources are subject to regulation by CDFG under Section 1600 et seq. of the California Fish and Game Code. Under Section 1600, it is unlawful for any person, governmental agency, or public utility to do the following without first notifying CDFG:

> …substantially divert or obstruct the natural flow of, or substantially change or use any material from the bed, channel, or bank of any river, stream, or lake, or deposit or dispose of debris, waste,

or other material containing crumbled, flaked, or ground pavement where it may pass into any river, stream, or lake.

A stream is defined as a body of water that flows at least periodically or intermittently through a bed or channel that has banks and supports fish or other aquatic life. This definition includes watercourses with a surface or subsurface flow that supports or has supported riparian vegetation. CDFG's jurisdiction within altered or artificial waterways is based on the value of those waterways to fish and wildlife. A CDFG streambed alteration agreement (SAA) must be obtained for any project that would result in an impact on a river, stream, or lake.

Several different SAA could be necessary for this project as the work involves stream crossings at more than one location and construction activity over multiple years. All SAAs define the seasonal work windows and protection measures required by CDFG.

Specific Strategies to Obtain a Streambed Alteration Agreement

Specific strategies for obtaining permits associated with obtaining a SAA from CDFG include:

- Coordinate early with CDFG to ensure that the permit application materials are complete, are technically accurate, and meet the needs of CDFG.
- Submit the certified CEQA document and copies of other permit applications (e.g., CWA Section 404 application, RWQCB Section 401 Certification application) to CDFG along with the SAA application.

6.6 California Native Plant Society Species Designations

The California Native Plant Society (CNPS) is a statewide nonprofit organization that seeks to increase understanding of California's native flora and to preserve this rich resource for future generations. CNPS has developed and maintains lists of vascular plants of special concern in California. CNPS-listed species have no formal legal protection, but the values and importance of these lists are widely recognized. CNPS List 1 and 2 species are considered rare plants pursuant to Section 15380 of the CEQA Guidelines, and it is recommended that they be fully considered while preparing environmental documents relating to CEQA.

7 Regional and Local Agency Environmental Compliance and Permitting

The section below discusses the general needs related to regional and local agency environmental compliance and permitting.

7.1 Monterey Bay Unified Air Pollution Control District

The Monterey Bay Unified Air Pollution Control District (MBUAPCD) requires permits for any new or modified machine, equipment, or other device which may emit any of the criteria air pollutants (particulate, organic gases, sulfur dioxide, nitrogen dioxide, or carbon monoxide), any of the toxic air contaminants (carcinogens listed in Attachment A of Rule 1000, substances listed in Section 5155, Title 8 of the California Administrative Code, or Hazardous Air Pollutants identified by Environmental Protection Agency) or odorous pollutants.

MBUAPCD grants an Authority to Construct permit. An Authority to Construct is a certification that the emissions from the proposed project will meet all applicable MBUAPCD requirements and not interfere with air quality standards when constructed.

The project may affect air quality, primarily during construction and sediment removal operations. For general conformity, the project will need to show that it does not conflict with the Air Quality Management Plan for the Monterey Bay Region and the statewide Portable Equipment Registration Program, if applicable.

Specific Strategies to Obtain Air Quality Permit
Specific strategies for obtaining permits associated with air quality include:

- Include specific dust-control measures in contractor specifications to the extent feasible. Ensure that the contractor specifications and the Dust Control Plan reflect the MBUAPCD guidance
- Develop detailed project descriptions with specific information on construction equipment quantities, vehicle trips, project schedules, etc. as soon as practicable that provides relevant information necessary to perform air quality modeling and the associated conformity applicability analysis.
- Participate in a pre-application meeting with MBUAPCD staff more than 6 months before the planned equipment installation. Submit complete application material as early as possible, but more than 6 months before the planned equipment installation.

7.2 Monterey Peninsula Water Management District

The Monterey Peninsula Water Management District (MPWMD) has many unique functions, including but not limited to local, integrated control of resources (including groundwater); allocation of water to jurisdictions; water conservation ordinances and inspections, and river works (erosion control).

Cal-Am provides water to the largest percent of customers within the MPWMD. As specified in MPWMD Rules and Regulations 20(B) “Permits to Connect or Modify a Connection to a Water Distribution System”, before any person connects or modifies a connection to water distribution system regulated by the district, such parson shall obtain a written permit from MPWMD.

7.3 Monterey County Policies and Regulations

Under the provisions of Title 16, Chapter 16.60, Monterey County Code, no native tree six inches or more in diameter two feet above ground level shall be removed in the Cachagua Area Plan area without a tree removal permit. "Native trees," for the purpose of this Section, are:

- Santa Lucia Fir;
- Black Cottonwood;
- Fremont Cottonwood;
- Box Elder;
- Willows;
- California Laurel;
- Sycamores;
- Oaks; and
- Madrones.

Chapter 16.60 also provides that no landmark oak tree shall be removed in any area except as approved by the Director of Planning and Building Inspection. Landmark oak trees are defined as trees 24 inches or greater in diameter (at two feet above ground level), or trees that are visually significant, historically significant, or exemplary of their species. Replacement of oak trees removed by project actions at a 1: 1 ratio is required under Chapter 16.60.

It is anticipated that oak trees will need to be removed as part project, specifically with regards to the disposal of the removed sediment and Cal-Am will need to comply with the Monterey County Code.

7.4 Monterey County Land Use Plans

The Monterey Country Comprehensive Plan and Local Area Plans (such as the Cachagua Area Plan) set planning and development policy for areas throughout the County, including those areas in which the project could be developed. The Monterey County Planning Department may require permits for the following activities:

- Removal of more than 3 oaks or any other protected trees for development or improvement of road or other project features would require a County permit.
- Development of any slopes over 30 percent would require Use Permits from Planning and Building Inspection.
- An encroachment permit would be required from County Public Works Department to access existing roads with new access points or improvements in existing rights-of-way.
- Grading permits would be required for the concrete batch plant, installation of the crane, and development of new and existing access roads

8 Summary

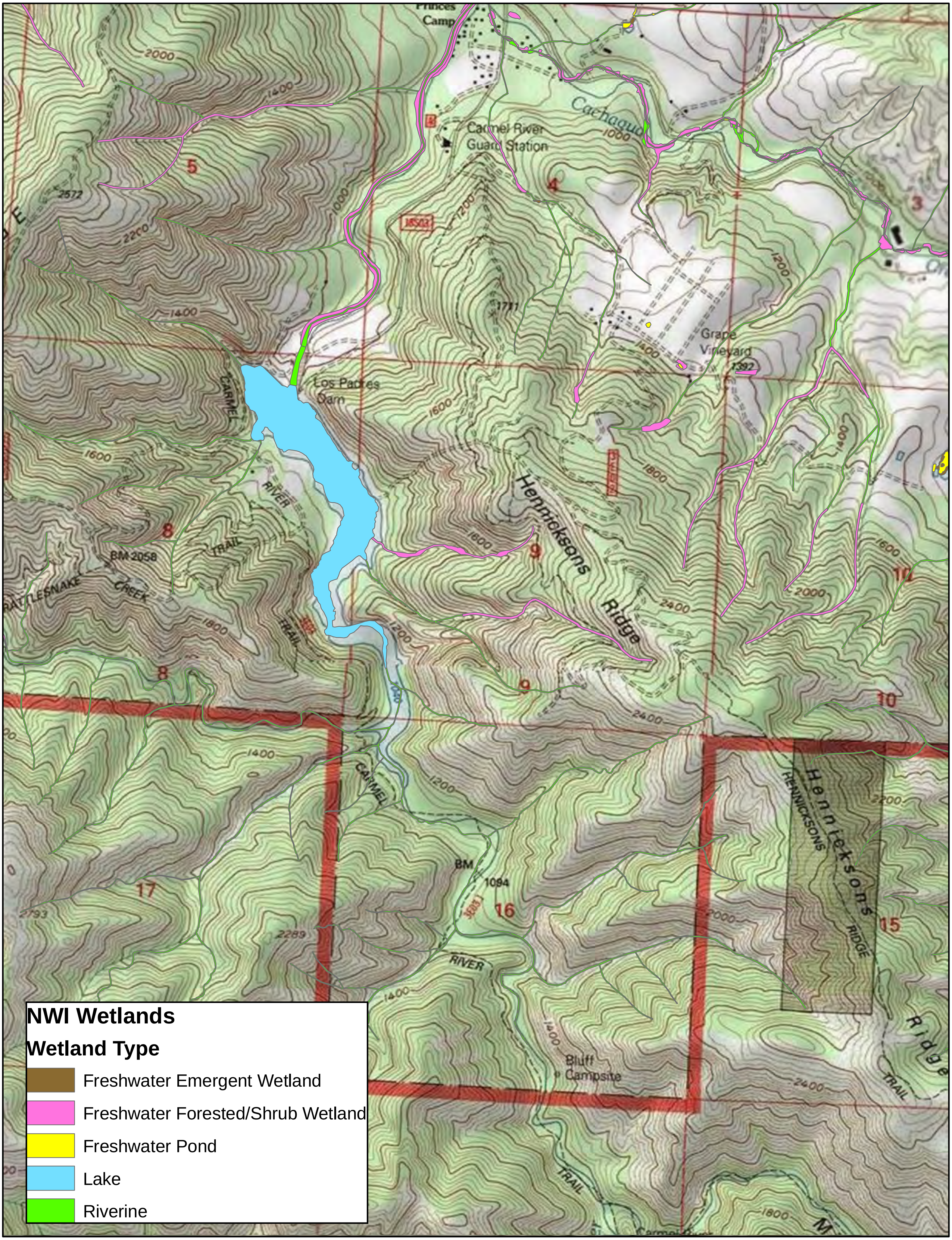
Environmental impact assessment, documentation and review process, and acquisition of required environmental permits could be critical path schedule activities for the sediment removal project. Because of known resources in the project area, the environmental compliance and permitting process can be a complicated process and will require multiple approvals/permits from multiple agencies in a specific order. Therefore, all these pieces require careful consideration during the project planning in order to meet construction needs. Incorporation of the general and specific strategies (listed above) into the CEQA/NEPA and permit application and approval processes which, when implemented, could minimize risk of delays before, during, and after construction.

Appendix A
Attachment A1

Map of Potential Wetlands of the Project Area

and

USACE “Approved Jurisdictional Determination Form” for the Carmel River Reroute and San Clemente Removal Project


NWI Wetlands
Wetland Type
Freshwater Emergent Wetland
Freshwater Forested/Shrub Wetland
Freshwater Pond
Lake
Riverine
Carmel River Guard Station
Los Padres Dam
Hennicksons Ridge
Grape Vineyard
Rattlesnake Creek
Carmel River Trail
Bluff Campsite
Cachagua

APPROVED JURISDICTIONAL DETERMINATION FORM
U.S. Army Corps of Engineers

This form should be completed by following the instructions provided in Section IV of the JD Form Instructional Guidebook.

SECTION I: BACKGROUND INFORMATION

A. REPORT COMPLETION DATE FOR APPROVED JURISDICTIONAL DETERMINATION (JD): 12 April 2012

B. DISTRICT OFFICE: San Francisco District **FILE NUMBER:** 23303S
File Name: Carmel River Reroute and San Clemente Dam Removal Project (CRRDR)
Waterbody Name: Carmel River, San Clemente River and associated wetlands

C. PROJECT LOCATION AND BACKGROUND INFORMATION:
State: California County/parish/borough: Monterey Co. City: Carmel Valley
Center coordinates of site: (lat/long (in degree decimal format): Lat: 36.4314 N Long: -121.7106 W
Pick List (lat/long (in degree decimal format): Lat: Pick Long: Pick
Pick List (lat/long (in degree decimal format): Lat: Pick Long: Pick
Universal Transverse Mercator: 10
Name of nearest waterbody: Carmel River
Name of nearest Traditional Navigable Water (TNW) into which the aquatic resource flows: Carmel River
Name of watershed or Hydrologic Unit Code (HUC): 18060012 Central California Coast
☒ Check if map/diagram of review area and/or potential jurisdictional areas is/are available upon request
☐ Check if other sites (e.g., offsite mitigation sites, disposal sites, etc) are associated with this action and are recorded on a different JD form.

D. REVIEW PERFORMED FOR SITE EVALUATION (CHECK ALL THAT APPLY):
☐ Office (Desk) Determination. Date:
☒ Field Determination. Date(s): 15 February 2012

SECTION II: SUMMARY OF FINDINGS

A. RHA SECTION 10 DETERMINATION OF JURISDICTION.

There are no "*navigable waters of the U.S.*" within Rivers and Harbors Act (RHA) jurisdiction (as defined by 33 CFR part 329) in the review area. [*Required*].
☐ Waters subject to the ebb and flow of the tide.
☐ Waters are presently used, or have been used in the past, or may be susceptible for use to transport interstate or foreign commerce. ***Explain*:**

B. CWA SECTION 404 DETERMINATION OF JURISDICTION

There are "*waters of the U.S.*" within Clean Water Act (CWA) jurisdiction (as defined by 33 CFR part 328) in the review area. [*Required*]

1. Waters of the U.S:
   a. Indicate presence of waters of U.S. in review area (check all that apply): [1]

      ☒ TNWs, including territorial seas
      ☒ Wetlands adjacent to TNWs
      ☒ Relatively permanent waters[2] (RPWs) that flow directly or indirectly into TNWs
      ☐ Non-RPWs that flow directly or indirectly into TNWs
      ☐ Wetlands directly abutting RPWs that flow directly or indirectly into TNWs
      ☐ Wetlands adjacent to but not directly abutting RPWs that flow directly or indirectly into TNWs
      ☐ Wetlands adjacent to non-RPWs that flow directly or indirectly into TNWs
      ☐ Impoundments of jurisdictional waters
      ☐ Isolated (interstate or intrastate) waters, including isolated wetlands

   b. **Identify (estimate) size of waters of the U.S. in the review area**
      Non-wetland waters: 1407 linear feet: width (ft) and/or 25.68 acres. (other comments:)
      Wetlands: 2.95 acres. (other comments:)

   c. Limits (boundaries) of jurisdiction based on: Established by OHWM
      Elevation of established OHWM (if known):

2. Non-regulated waters/wetlands (check if applicable):[3]

[1] Boxes checked below shall be supported by completing the appropriate sections in Section III below.
[2] For purposes of this form, an RPW is defined as a tributary that is not a TNW and that typically flows year-round or has continuous flow at least "seasonally" (e.g., typically 3 months).
[3] Supporting documentation is presented in Section III.F.

☐ Potentially jurisdictional waters and/or wetlands were assessed within the review area and determined to be not jurisdictional. *Explain:*

SECTION III: CWA ANALYSIS

A TNWs AND WETLANDS ADJACENT TO TNWs

The agencies will assert jurisdiction over TNWs and wetlands adjacent to TNWs. If the aquatic resource is a TNW, complete Section III.A.1 and Section III.D.1. only; if the aquatic resource is a wetland adjacent to a TNW, complete Sections III.A.1 and 2 and Section III.D.1.; otherwise, see Section III.B below.

1. TNW

Identify TNW: San Clemente Reservoir and Carmel River

Summarize rationale supporting determination that waterbody is a TNW: Conducted wetland delineation verification via motor boat.

2. Wetland adjacent to TNW

Summarize rationale supporting conclusion that wetland is "adjacent": wetlands lie within OHWM of reservoir

B CHARACTERISTICS OF TRIBUTARY (THAT IS NOT A TNW) AND ITS ADJACENT WETLANDS (IF ANY)**:**

This section summarizes information regarding characteristics of the tributary and its adjacent wetlands, if any, and it helps determine whether or not the standards for jurisdiction established under *Rapanos* have been met.

The agencies will assert jurisdiction over non-navigable tributaries of TNWs where the tributaries are "relatively permanent waters" (RPWs), i.e. tributaries that typically flow year-round or have continuous flow at least seasonally (e.g., typically 3 months). A wetland that directly abuts an RPW is also jurisdictional. If the aquatic resource is not a TNW, but has year-round (perennial) flow, skip to Section III.D.2. If the aquatic resource is a wetland directly abutting a tributary with perennial flow, skip to Section III.D.4.

A wetland that is adjacent to but that does not directly abut an RPW requires a significant nexus evaluation. Corps districts and EPA regions will include in the record any available information that documents the existence of a significant nexus between a relatively permanent tributary that is not perennial (and its adjacent wetlands if any) and a traditional navigable water, even though a significant nexus finding is not required as a matter of law.

If the waterbody[4] is not an RPW, or a wetland directly abutting an RPW, a JD will require additional data to determine if the waterbody has a significant nexus with a TNW. If the tributary has adjacent wetlands, the significant nexus evaluation must consider the tributary in combination with all of its adjacent wetlands. This significant nexus evaluation that combines, for analytical purposes, the tributary and all of its adjacent wetlands is used whether the review area identified in the JD request is the tributary, or its adjacent wetlands, or both. If the JD covers a tributary with adjacent wetlands, complete Section III.B.1 for the tributary, Section III.B.2 for any onsite wetlands, and Section III.B.3 for all wetlands adjacent to that tributary, both onsite and offsite. The determination whether a significant nexus exists is determined in Section III.C below.

1. Characteristics of non-TNWs that flow directly or indirectly into TNW

(i) General Area Conditions:

Watershed size: 163638.9 acres
Drainage area: 6323.33 acres
Average annual rainfall: 17.49 inches
Average annual snowfall: 0.1 inches

(ii) Physical Characteristics:

a. <u>Relationship with TNW</u>:

☒ Tributary flows directly into TNW
☐ Tributary flows through Pick List tributaries before entering TNW

Project waters are Pick List river miles from TNW.
Project waters are Pick List river miles from RPW.
Project waters are Pick List aerial (straight) miles from TWN.
Project waters are Pick List aerial (straight) miles from RPW.
Project waters cross or serve as a state boundary. ***Explain:***

Identify flow route to TNW[5]:
Tributary stream order, if known:

b. General Tributary Characteristics (check all that apply)::

[4] Note that the Instructional Guidebook contains additional information regarding swales, ditches, washes, and erosional features generally and in the arid West.
[5] Flow route can be described by identifying, e.g., tributary a, which flows through the review area, to flow into tributary b, which then flows into TNW.

Tributary is:

- ☒ Natural: (comment if needed)
- ☐ Artificial (man-made): ***Explain:***
- ☒ Manipulated (man-altered): ***Explain:*** subject to hydroloc alterations due to San Clemente Dam and Reservoir operation.

Tributary properties with respect to top of bank (*estimate*):

Average width: 15-20 feet (measured from top of bank to top of bank)
Average depth: 4 feet. (measured from OHWM to top of bank)
Average side slopes: 2:1 (vertical : horozontal)

Primary tributary substrate composition (***check all that apply***):

- ☒ Silt**:**
- ☒ Sand:
- ☐ Clay:
- ☒ Cobbles:
- ☐ Gravel:
- ☐ Muck:
- ☐ Bedrock:
- ☐ Concrete:
- ☐ Vegetation (Type / % cover):
- ☐ Other (Explain):

Tributary condition/stability [e.g., highly eroding, sloughing banks]. ***Explain***: Most of San Clemente Creek has stable banks within the Project Area, though some areas are eroded/undercut at the banks. Near San Clemente Reservoir, there are sediment deposits on the banks and in the creek itself.
Presence of run/riffle/pool complexes. ***Explain***: There are run/riffle/pool complexes within the Project Area, but they are exclusively at the far-upstream end of the feature.
Tributary geometry: Relatively Straight .
Tributary gradient (approximate average slope): 1 %

c. FLOW INFORMATION

Tributary provides for: Seasonal flow
Estimate average number of flow events in review area/year: 20 (or greater)
Describe flow regime: San Clemente Creek is regularly inundated and flows throughout the rainy season and into the dry season. In some years, it dries up late in the dry season.
Other information on duration and volume: .
Surface flow is: discrete. Characteristics: .
Subsurface flow: Unknown. ***Explain findings***: .

- ☐ Dye (or other) test performed:. .

Tributary has (check all that apply):

- ☒ Bed and banks
- ☒ OHWM[6] (check all indicators that apply):
  - ☒ clear, natural line impressed on the bank
  - ☐ changes in the character of soil
  - ☐ destruction of terrestrial vegetation
  - ☐ vegetation matted down, bent, or absent
  - ☒ leaf litter disturbed or washed away
  - ☐ multiple observed or predicted flow events
  - ☐ water staining
  - ☐ abrupt change in plant community. ***Explain***:
  - ☐ other (list):
  - ☒ the presence of litter and debris
  - ☒ shelving
  - ☒ the presence of wrack line
  - ☐ sediment sorting
  - ☒ scour
  - ☒ sediment deposition
- ☐ Discontinuous OHWM.[7] ***Explain***:

If factors other than the OHWM were used to determine lateral extent of CWA jurisdiction (***check all that apply***):

[6]A natural or man-made discontinuity in the OHWM does not necessarily sever jurisdiction (e.g., where the stream temporarily flows underground, or where the OHWM has been removed by development or agricultural practices). Where there is a break in the OHWM that is unrelated to the waterbody's flow regime (e.g., flow over a rock outcrop or through a culvert), the agencies will look for indicators of flow above and below the break.
[7]Ibid.

☐ High Tide Line indicated by: **OR** ☐ Mean High Water Mark indicated by:

- ☐ oil or scum line along shore objects
- ☐ fine shell or debris deposits (foreshore)
- ☐ physical markings/characteristics
- ☐ tidal gauges
- ☐ other (***list***):

- ☐ survey to available datum
- ☐ physical markings
- ☐ vegetation lines/changes in vegetation types

(iii) **Chemical Characteristics:**

Characterize tributary (e.g., water color is clear, discolored, oily film; water quality; general watershed characteristics, etc.). Explain: Water is generally clear, though substantial fine sediments flow through and likely cause high turbidity during rain/high-flow events.

Identify specific pollutants, if known: unknown

(iv) Biological Characteristics. Channel supports (*check all that apply*):

- ☒ Riparian corridor. Characteristics (type, average width): dominated by red willow, arroyo willow, black alder; average width is approximately 15 feet.
- ☒ Wetland fringe. Characteristics: wetlands abut San Clemente Creek
- ☒ Habitat for:
  - ☒ Federally Listed species. ***Explain findings***: California red-legged frog (Rana draytonii) and steelhead trout (Oncorhynchus mykiss)
  - ☒ Fish/spawn areas. ***Explain findings***: steelhead spawning habitat is presently and has historically been present in the Project Area.
  - ☐ Other environmentally-sensitive species. ***Explain findings***:
  - ☐ Aquatic/wildlife diversity. ***Explain findings***:

2. Characteristics of wetlands adjacent to non-TNW that flow directly or indirectly into TNW

(i) Physical Characteristics:

(a) General Wetland Characteristics:

Properties

Wetland size: 1.95 acres

Wetland type. ***Explain***: riverine unconsolidated bottom

Wetland quality. ***Explain***: wetlands exist on sediment deposited by San Clemente Creek and Carmel River due to the San Clemente Dam. Alluvial plain and much of the wetland/river bottom is unnatural. Wetlands are otherwise presumed to be of high quality. Plant species are predominantly native and wetlands and surrounding habitat are utilized by native wildlife, including ESA listed species and migratory waterfowl.

Project wetlands cross or serve as state boundaries. ***Explain***:

(b) General Flow Relationship with Non-TNW:

Flow is: Intermittent Flow Explain: Water is typicaly not present year-round. flow is limited to rain events associated with the Carmel River Watershed. In long periods between rain events, flow is likely minimal to absent.

Surface flow is: Overland Flow

Characteristics: Wetlands receive some overland flow when San Clemente Creek and/or San Clemente Reservoir overflow during major rain events. Water levels reach relatively high levels more regularly than would occur under natural conditions due to the presence of the dam. Some sheetflow also occurs from runoff during lighter, local rain events.

Subsurface flow: Unknown ***Explain findings***:

☐ Dye (or other) test performed:

(c) Wetland Adjacency Determination with Non-TNW:

- ☒ Directly abutting
- ☐ Not directly abutting
  - ☐ Discrete wetland hydrologic connection. ***Explain***:
  - ☐ Ecological connection. ***Explain***:
  - ☐ Separated by berm / barrier. ***Explain***:

(d) Proximity (Relationship) to TNW

Project wetlands are 1 (or less) river miles from TNW.

Project waters are: 1 (or less) aerial (straight) miles from TNW.
Flow is from: wetland to / from navigable waters
Estimate approximate location of wetland as within the: 2-year or less floodplain.

(ii) Chemical Characteristics:

Characterize wetland system (e.g., water color is clear, brown, oil film on surface; water quality; general watershed characteristics; etc.). ***Explain***: Water is generally turbid due to high sediment load in adjacent waterbodies. Water quality appears otherwise excellent.

Identify specific pollutants, if known: ***Explain***: unknown

(iii) Biological Characteristics. Wetland supports (*check all that apply*):

☒ Riparian buffer. Characteristics (type, average width): Dominated by red willow, arroyo willow, black alder; average width is approximately 15 feet.

☒ Vegetation type/percent cover. ***Explain***: dominance of hydrophytic vegetation in both herb and tree strata. Cover is approximately 60% in the herb stratum and 50% in the tree stratum

☒ Habitat for:

- ☒ Federally Listed species. ***Explain findings***: wetlands may support CRLF; CRLF have been found in the reservoir.
- ☐ Fish/spawn areas. ***Explain findings***:
- ☐ Other environmentally-sensitive species. ***Explain findings***:
- ☐ Aquatic/wildlife diversity. ***Explain findings***:

3. Characteristics of all wetlands adjacent to the tributary (if any)

(i) All wetland(s) being considered in the cumulative analysis: 10

(ii) Approximately (2.95) acres in total are being considered in the cumulative analysis.

(iii) For each wetland associated with the reach or waterbody being analyzed in this form, specify the following:

Number/Name[8]	Directly abuts (Yes/No)	Size
WL 1	Yes	0.56 acres
WL 2	Yes	1.39 acres
WL 3	Yes	0.41 acres
WL 4	Yes	0.37 acres
WL 5	Yes	0.03 acres
WL 6	Yes	0.01 acres

Number/Name	Directly abuts (Yes/No)	Size
WL 7	Yes	0.01 acres
WL 8	Yes	<0.01 acres
WL 9	Yes	0.06 acres
WL 10	Yes	0.10 acres
	Pick	acres
	Pick	acres

(iv) Summarize overall biological, chemical and physical functions being performed**:**

C. SIGNIFICANT NEXUS DETERMINATION

A significant nexus analysis will assess the flow characteristics and functions of the tributary itself and the functions performed by any wetlands adjacent to the tributary to determine if they significantly affect the chemical, physical, and biological integrity of a TNW. For each of the following situations, a significant nexus exists if the tributary, in combination with all of its adjacent wetlands, has more than a speculative or insubstantial effect on the chemical, physical and/or biological integrity of a TNW. Considerations when evaluating significant nexus include, but are not limited to the volume, duration, and frequency of the flow of water in the tributary and its proximity to a TNW, and the functions performed by the tributary and all its adjacent wetlands. It is not appropriate to determine significant nexus based solely on any specific threshold of distance (e.g. between a tributary and its adjacent wetland or between a tributary and the TNW). Similarly, the fact an adjacent wetland lies within or outside of a floodplain is not solely determinative of significant nexus.

Draw connections between the features documented and the effects on the TNW, as identified in the *Rapanos* Guidance and discussed in the Instructional Guidebook. Factors to consider include, for example:

[8] In the Number/Name column, add the number and/or name that you have given the wetland being referred to in the table. Example, you are referring to a wetland on your wetland delineation map number 6, that you call wetland No.3 on a reach you refer to as Putah Creek. For this wetland you would add to the table in the Number/Name column, something like the following: (No. 3, Putah Ck., Map # 6).

- Does the tributary, in combination with its adjacent wetlands (if any), have the capacity to carry pollutants or flood waters to TNWs, or to reduce the amount of pollutants or flood waters reaching a TNW?
- Does the tributary, in combination with its adjacent wetlands (if any), provide habitat and lifecycle support functions for fish and other species, such as feeding, nesting, spawning, or rearing young for species that are present in the TNW?
- Does the tributary, in combination with its adjacent wetlands (if any), have the capacity to transfer nutrients and organic carbon that support downstream foodwebs?
- Does the tributary, in combination with its adjacent wetlands (if any), have other relationships to the physical, chemical, or biological integrity of the TNW?

Note: the above list of considerations is not inclusive and other functions observed or known to occur should be documented below:

1. **Significant nexus findings for non-RPW that has no adjacent wetlands and flows directly or indirectly into TNWs**. ***Explain*** findings of presence or absence of significant nexus below, based on the tributary itself, then go to Section III.D

2. **Significant nexus findings for non-RPW and its adjacent wetlands, where the non-RPW flows directly or indirectly into TNWs.** ***Explain*** findings of presence or absence of significant nexus below, based on the tributary in combination with all of its adjacent wetlands, then go to Section III.D:

3 **Significant nexus findings for wetlands adjacent to an RPW but that do not directly abut the RPW.** ***Explain*** findings of presence or absence of significant nexus below, based on the tributary in combination with all of its adjacent wetlands, then go to Section III.D:

D. DETERMINATIONS OF JURISDICTIONAL FINDINGS. THE SUBJECT WATERS/WETLANDS ARE (CHECK ALL THAT APPLY):

☒ **1. TNWs and Adjacent Wetlands**. Check all that apply and provide size estimates in review area:

☒ TNWs: 1407 linear feet width (ft), and/or 25.68 acres.

☒ Wetlands adjacent to TNWs: 2.95 acres.

☒ **2. RPWs that flow directly or indirectly into TNWs**.

☐ Tributaries of TNWs where tributaries typically flow year-round are jurisdictional. Provide data and rationale indicating that tributary is perennial: .

☒ Tributaries of TNW where tributaries have continuous flow "seasonally" (e.g., typically three months each year) are jurisdictional. Data supporting this conclusion is provided at Section III.B. Provide rationale indicating that tributary flows seasonally: San Clemente Creek is regularly inundated and flows throughout the rainy season and into the dry season. In some years, it dries up late in the dry season.

Provide estimates for jurisdictional waters in the review area (***check all that apply***)

☒ Tributary waters: 955.58 linear feet 5 width (ft).

☐ Other non-wetland waters: acres.

Identify type(s) of waters: .

☐ **3. Non-RPWs[9] that flow directly or indirectly into TNWs.**

☐ Waterbody that is not a TNW or an RPW, but flows directly or indirectly into a TNW, and it has a significant nexus with a TNW is jurisdictional. Data supporting this conclusion is provided at Section III.C.

Provide estimates for jurisdictional waters within the review area (***check all that apply***):

☐ Tributary waters: linear feet width (ft).

☐ Other non-wetland waters: acres.

Identify type(s) of waters: **.**

[9]See Footnote # 3.

☐ **4. Wetlands directly abutting an RPW that flow directly or indirectly into TNWs.**

☐ Wetlands directly abut RPW and thus are jurisdictional as adjacent wetlands.

☐ Wetlands directly abutting an RPW where tributaries typically flow year-round. Provide data and rationale indicating that tributary is perennial in **Section III.D.2**, above. Provide rationale indicating that wetland is directly abutting an RPW: **.**

☐ Wetlands directly abutting an RPW where tributaries typically flow "seasonally." Provide data indicating that tributary is seasonal in **Section III.B** and rationale in **Section III.D.2**, above. Provide rationale indicating that wetland is directly abutting an RPW: .

Provide acreage estimates for jurisdictional wetlands in the review area: acres.

☐ **5. Wetlands adjacent to but not directly abutting an RPW that flow directly or indirectly into TNWs.**

☐ Wetlands that do not directly abut an RPW, but when considered in combination with the tributary to which they are adjacent and with similarly situated adjacent wetlands, have a significant nexus with a TNW are jurisidictional. Data supporting this conclusion is provided at **Section III.C**.

Provide acreage estimates for jurisdictional wetlands in the review area: acres.

☐ **6. Wetlands adjacent to non-RPWs that flow directly or indirectly into TNWs.**

☐ Wetlands adjacent to such waters, and have when considered in combination with the tributary to which they are adjacent and with similarly situated adjacent wetlands, have a significant nexus with a TNW are jurisdictional. Data supporting this conclusion is provided at **Section III.C**.

Provide estimates for jurisdictional wetlands in the review area: acres.

☐ 7. Impoundments of jurisdictional waters.[10]

As a general rule, the impoundment of a jurisdictional tributary remains jurisdictional.

☐ Demonstrate that impoundment was created from "waters of the U.S.," or

☐ Demonstrate that water meets the criteria for one of the categories presented above (1-6), or

☐ Demonstrate that water is isolated with a nexus to commerce (see E below).

E. ISOLATED [INTERSTATE OR INTRA-STATE] WATERS, INCLUDING ISOLATED WETLANDS, THE USE, DEGRADATION OR DESTRUCTION OF WHICH COULD AFFECT INTERSTATE COMMERCE, INCLUDING ANY SUCH WATERS (*CHECK ALL THAT APPLY*):[11]

☐ which are or could be used by interstate or foreign travelers for recreational or other purposes.

☐ from which fish or shellfish are or could be taken and sold in interstate or foreign commerce.

☐ which are or could be used for industrial purposes by industries in interstate commerce.

☐ Interstate isolated waters. Explain: .

☐ Other factors. Explain: .

Identify water body and summarize rationale supporting determination: **.**

Provide estimates for jurisdictional waters in the review area (***check all that apply***)

☐ Tributary waters: linear feet width (ft).

☐ Other non-wetland waters: acres.

Identify type(s) of waters: .

☐ Wetlands: acres.

F. NON-JURISDICTIONAL WATERS, INCLUDING WETLANDS (CHECK ALL THAT APPLY):

☐ If potential wetlands were assessed within the review area, these areas did not meet the criteria in the 1987 Corps of Engineers Wetland Delineation Manual and/or appropriate Regional Supplements.

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[10] To complete the analysis refer to the key in Section III.D.6 of the Instructional Guidebook.

[11] Prior to asserting or declining CWA jurisdiction based solely on this category, Corps Districts will elevate the action to Corps and EPA HQ for review consistent with the process described in the Corps/EPA *Memorandum Regarding CWA Act Jurisdiction Following Rapanos.*

☐ Review area included isolated waters with no substantial nexus to interstate (or foreign) commerce.

☐ Prior to the Jan 2001 Supreme Court decision in "*SWANCC*," the review area would have been regulated based solely on the "Migratory Bird Rule" (MBR).

☐ Waters do not meet the "Significant Nexus" standard, where such a finding is required for jurisdiction. ***Explain***: .

☐ Other: (explain, if not covered above): .

Provide acreage estimates for non-jurisdictional waters in the review area, where the sole potential basis of jurisdiction is the MBR factors (i.e., presence of migratory birds, presence of endangered species, use of water for irrigated agriculture), using best professional judgment (***check all that apply***):

☐ Non-wetland waters (i.e., rivers, streams): linear feet width (ft).

☐ Lakes/ponds: acres.

☐ Other non-wetland waters: acres. List type of aquatic resource: .

☐ Wetlands: acres.

☐

SECTION IV: DATA SOURCES.

A. SUPPORTING DATA. Data reviewed for JD (check all that apply - checked items shall be included in case file and, where checked and requested, appropriately reference sources below):

☒ Maps, plans, plots or plat submitted by or on behalf of the applicant/consultant: .

☒ Data sheets prepared/submitted by or on behalf of the applicant/consultant.

☒ Office concurs with data sheets/delineation report.

☐ Office does not concur with data sheets/delineation report.

☐ Data sheets prepared by the Corps: .

☐ Corps navigable waters' study: .

☐ U.S. Geological Survey Hydrologic Atlas: .

☐ USGS NHD data.

☐ USGS 8 and 12 digit HUC maps.

☐ U.S. Geological Survey map(s). Cite scale & quad name: .

☐ USDA Natural Resources Conservation Service Soil Survey. Citation: .

☐ National wetlands inventory map(s). Cite name: .

☐ State/Local wetland inventory map(s): .

☐ FEMA/FIRM maps: .

☐ 100-year Floodplain Elevation is: (National Geodectic Vertical Datum of 1929)

☐ Photographs: ☐ Aerial (Name & Date): .

☐ Other (Name & Date): .

☐ Previous determination(s). File no. and date of response letter: .

☐ Applicable/supporting case law: .

☐ Applicable/supporting scientific literature: .

☐ Other information (please specify): .

☐

B. ADDITIONAL COMMENTS TO SUPPORT JD:

☐

APPROVED JURISDICTIONAL DETERMINATION FORM
U.S. Army Corps of Engineers

This form should be completed by following the instructions provided in Section IV of the JD Form Instructional Guidebook.

SECTION I: BACKGROUND INFORMATION

A. REPORT COMPLETION DATE FOR APPROVED JURISDICTIONAL DETERMINATION (JD): 12 April 2012

B. DISTRICT OFFICE: San Francisco District **FILE NUMBER:** 23303OS
File Name: Carmel River Reroute and San Clemente Dam Removal Project (CRRDR)
Waterbody Name: Cachagua Creek

C. PROJECT LOCATION AND BACKGROUND INFORMATION:
State: California County/parish/borough: Monterey Co. City: Carmel Valley
Center coordinates of site: (lat/long (in degree decimal format): Lat: 36.3923 N Long: -121.6386 W
Pick List (lat/long (in degree decimal format): Lat: Pick Long: Pick
Pick List (lat/long (in degree decimal format): Lat: Pick Long: Pick
Universal Transverse Mercator: 10
Name of nearest waterbody: Cachagua Creek
Name of nearest Traditional Navigable Water (TNW) into which the aquatic resource flows: Carmel River
Name of watershed or Hydrologic Unit Code (HUC): 18060012 Central California Coast
☒ Check if map/diagram of review area and/or potential jurisdictional areas is/are available upon request
☐ Check if other sites (e.g., offsite mitigation sites, disposal sites, etc) are associated with this action and are recorded on a different JD form.

D. REVIEW PERFORMED FOR SITE EVALUATION (CHECK ALL THAT APPLY):
☐ Office (Desk) Determination. Date:
☒ Field Determination. Date(s): 15 February 2012

SECTION II: SUMMARY OF FINDINGS

A. RHA SECTION 10 DETERMINATION OF JURISDICTION.

There are no "*navigable waters of the U.S.*" within Rivers and Harbors Act (RHA) jurisdiction (as defined by 33 CFR part 329) in the review area. [*Required*].
☐ Waters subject to the ebb and flow of the tide.
☐ Waters are presently used, or have been used in the past, or may be susceptible for use to transport interstate or foreign commerce. ***Explain*:**

B. CWA SECTION 404 DETERMINATION OF JURISDICTION

There are "*waters of the U.S.*" within Clean Water Act (CWA) jurisdiction (as defined by 33 CFR part 328) in the review area. [*Required*]

1. Waters of the U.S:
   a. Indicate presence of waters of U.S. in review area (check all that apply): [1]

      ☐ TNWs, including territorial seas
      ☐ Wetlands adjacent to TNWs
      ☒ Relatively permanent waters[2] (RPWs) that flow directly or indirectly into TNWs
      ☐ Non-RPWs that flow directly or indirectly into TNWs
      ☐ Wetlands directly abutting RPWs that flow directly or indirectly into TNWs
      ☐ Wetlands adjacent to but not directly abutting RPWs that flow directly or indirectly into TNWs
      ☐ Wetlands adjacent to non-RPWs that flow directly or indirectly into TNWs
      ☐ Impoundments of jurisdictional waters
      ☐ Isolated (interstate or intrastate) waters, including isolated wetlands

   b. Identify (estimate) size of waters of the U.S. in the review area
   Non-wetland waters: 200 linear feet: width (ft) and/or 0.01 acres. (other comments:)
   Wetlands: 0 acres. (other comments:)

   c. Limits (boundaries) of jurisdiction based on: Established by OHWM
   Elevation of established OHWM (if known):

2. Non-regulated waters/wetlands (check if applicable):[3]

---
[1] Boxes checked below shall be supported by completing the appropriate sections in Section III below.
[2] For purposes of this form, an RPW is defined as a tributary that is not a TNW and that typically flows year-round or has continuous flow at least "seasonally" (e.g., typically 3 months).
[3] Supporting documentation is presented in Section III.F.

☐ Potentially jurisdictional waters and/or wetlands were assessed within the review area and determined to be not jurisdictional. *Explain:*

SECTION III: CWA ANALYSIS

A TNWs AND WETLANDS ADJACENT TO TNWs

The agencies will assert jurisdiction over TNWs and wetlands adjacent to TNWs. If the aquatic resource is a TNW, complete Section III.A.1 and Section III.D.1. only; if the aquatic resource is a wetland adjacent to a TNW, complete Sections III.A.1 and 2 and Section III.D.1.; otherwise, see Section III.B below.

1. TNW

   Identify TNW:

   Summarize rationale supporting determination that waterbody is a TNW:

2. Wetland adjacent to TNW

   Summarize rationale supporting conclusion that wetland is "adjacent":

B CHARACTERISTICS OF TRIBUTARY (THAT IS NOT A TNW) AND ITS ADJACENT WETLANDS (IF ANY)**:**

This section summarizes information regarding characteristics of the tributary and its adjacent wetlands, if any, and it helps determine whether or not the standards for jurisdiction established under *Rapanos* have been met.

The agencies will assert jurisdiction over non-navigable tributaries of TNWs where the tributaries are "relatively permanent waters" (RPWs), i.e. tributaries that typically flow year-round or have continuous flow at least seasonally (e.g., typically 3 months). A wetland that directly abuts an RPW is also jurisdictional. If the aquatic resource is not a TNW, but has year-round (perennial) flow, skip to Section III.D.2. If the aquatic resource is a wetland directly abutting a tributary with perennial flow, skip to Section III.D.4.

A wetland that is adjacent to but that does not directly abut an RPW requires a significant nexus evaluation. Corps districts and EPA regions will include in the record any available information that documents the existence of a significant nexus between a relatively permanent tributary that is not perennial (and its adjacent wetlands if any) and a traditional navigable water, even though a significant nexus finding is not required as a matter of law.

If the waterbody[4] is not an RPW, or a wetland directly abutting an RPW, a JD will require additional data to determine if the waterbody has a significant nexus with a TNW. If the tributary has adjacent wetlands, the significant nexus evaluation must consider the tributary in combination with all of its adjacent wetlands. This significant nexus evaluation that combines, for analytical purposes, the tributary and all of its adjacent wetlands is used whether the review area identified in the JD request is the tributary, or its adjacent wetlands, or both. If the JD covers a tributary with adjacent wetlands, complete Section III.B.1 for the tributary, Section III.B.2 for any onsite wetlands, and Section III.B.3 for all wetlands adjacent to that tributary, both onsite and offsite. The determination whether a significant nexus exists is determined in Section III.C below.

1. Characteristics of non-TNWs that flow directly or indirectly into TNW

(i) General Area Conditions:

Watershed size: 163638.9 acres

Drainage area: 6323.33 acres

Average annual rainfall: 17.49 inches

Average annual snowfall: 0.1 inches

(ii) Physical Characteristics:

a. Relationship with TNW:

☒ Tributary flows directly into TNW

☐ Tributary flows through Pick List tributaries before entering TNW

Project waters are Pick List river miles from TNW.

Project waters are Pick List river miles from RPW.

Project waters are Pick List aerial (straight) miles from TWN.

Project waters are Pick List aerial (straight) miles from RPW.

Project waters cross or serve as a state boundary. ***Explain:***

Identify flow route to TNW[5]:

Tributary stream order, if known:

b. General Tributary Characteristics (check all that apply)::

Tributary is:

[4] Note that the Instructional Guidebook contains additional information regarding swales, ditches, washes, and erosional features generally and in the arid West.

[5] Flow route can be described by identifying, e.g., tributary a, which flows through the review area, to flow into tributary b, which then flows into TNW.

☒ Natural: (comment if needed)
☐ Artificial (man-made): ***Explain:***
☒ Manipulated (man-altered): ***Explain:*** Cachagua Creek is lined by low-density residential housing and runs adjacent to a road, which has constrained it's ability to meander

Tributary properties with respect to top of bank (*estimate*):

Average width: 10 feet (measured from top of bank to top of bank)
Average depth: 1 feet. (measured from OHWM to top of bank)
Average side slopes: 2:1 (vertical : horozontal)

Primary tributary substrate composition (***check all that apply***):

☒ Silt**:**
☒ Sand:
☐ Clay:
☒ Cobbles:
☐ Gravel:
☐ Muck:
☐ Bedrock:
☐ Concrete:
☐ Vegetation (Type / % cover):
☐ Other (Explain):

Tributary condition/stability [e.g., highly eroding, sloughing banks]. ***Explain***: Cachagua Creek has stable banks within the Project Area.
Presence of run/riffle/pool complexes. ***Explain***: .
Tributary geometry: Relatively Straight .
Tributary gradient (approximate average slope): 1 %

c. FLOW INFORMATION

Tributary provides for: Seasonal flow
Estimate average number of flow events in review area/year: 20 (or greater)
Describe flow regime: Cachagua Creek is regularly inundated and flows throughout the rainy season.
Other information on duration and volume: .
Surface flow is: discrete. Characteristics: .
Subsurface flow: Unknown. ***Explain findings***: .
☐ Dye (or other) test performed:. .

Tributary has (check all that apply):
☒ Bed and banks
☒ OHWM[6] (check all indicators that apply):

☒ clear, natural line impressed on the bank
☐ changes in the character of soil
☒ destruction of terrestrial vegetation
☐ vegetation matted down, bent, or absent
☒ leaf litter disturbed or washed away
☐ multiple observed or predicted flow events
☐ water staining
☐ abrupt change in plant community. ***Explain***:
☐ other (list):
☒ the presence of litter and debris
☒ shelving
☒ the presence of wrack line
☐ sediment sorting
☒ scour
☒ sediment deposition

☐ Discontinuous OHWM.[7] ***Explain***:

If factors other than the OHWM were used to determine lateral extent of CWA jurisdiction (***check all that apply***):
☐ High Tide Line indicated by**:** **OR** ☐ Mean High Water Mark indicated by**:**
☐ oil or scum line along shore objects
☐ fine shell or debris deposits (foreshore)
☐ physical markings/characteristics
☐ survey to available datum
☐ physical markings
☐ vegetation lines/changes in vegetation types

[6]A natural or man-made discontinuity in the OHWM does not necessarily sever jurisdiction (e.g., where the stream temporarily flows underground, or where the OHWM has been removed by development or agricultural practices). Where there is a break in the OHWM that is unrelated to the waterbody's flow regime (e.g., flow over a rock outcrop or through a culvert), the agencies will look for indicators of flow above and below the break.
[7]Ibid.

☐ tidal gauges
☐ other (***list***):

(iii) **Chemical Characteristics:**

Characterize tributary (e.g., water color is clear, discolored, oily film; water quality; general watershed characteristics, etc.). Explain: Water is generally clear, though substantial fine sediments flow through and likely cause high turbidity during rain/high-flow events.

Identify specific pollutants, if known: unknown

(iv) Biological Characteristics. Channel supports (*check all that apply*):

☐ Riparian corridor. Characteristics (type, average width):
☐ Wetland fringe. Characteristics:
☒ Habitat for:
  ☒ Federally Listed species. ***Explain findings***: steelhead trout (Oncorhynchus mykiss)
  ☒ Fish/spawn areas. ***Explain findings***: steelhead spawning habitat is presently and has historically been present in the Project Area.
  ☐ Other environmentally-sensitive species. ***Explain findings***:
  ☐ Aquatic/wildlife diversity. ***Explain findings***:

2. Characteristics of wetlands adjacent to non-TNW that flow directly or indirectly into TNW NONE

(i) Physical Characteristics:

(a) General Wetland Characteristics:

Properties

Wetland size: acres

Wetland type. ***Explain***:

Wetland quality. ***Explain***:

Project wetlands cross or serve as state boundaries. ***Explain***:

(b) General Flow Relationship with Non-TNW:

Flow is: Pick List Explain:

Surface flow is: Pick List

Characteristics:

Subsurface flow: Pick List ***Explain findings***:

☐ Dye (or other) test performed:

(c) Wetland Adjacency Determination with Non-TNW:

☐ Directly abutting
☐ Not directly abutting
  ☐ Discrete wetland hydrologic connection. ***Explain***:
  ☐ Ecological connection. ***Explain***:
  ☐ Separated by berm / barrier. ***Explain***:

(d) Proximity (Relationship) to TNW

Project wetlands are Pick List river miles from TNW.

Project waters are: Pick List aerial (straight) miles from TNW.

Flow is from: Pick List

Estimate approximate location of wetland as within the: Pick List floodplain.

(ii) Chemical Characteristics:

Characterize wetland system (e.g., water color is clear, brown, oil film on surface; water quality; general watershed characteristics; etc.). ***Explain***:

Identify specific pollutants, if known: ***Explain***:

(iii) Biological Characteristics. Wetland supports (*check all that apply*):

☐ Riparian buffer. Characteristics (type, average width):
☐ Vegetation type/percent cover. ***Explain***:
☐ Habitat for:
  ☐ Federally Listed species. ***Explain findings***:

☐ Fish/spawn areas. ***Explain findings***:
☐ Other environmentally-sensitive species. ***Explain findings***:
☐ Aquatic/wildlife diversity. ***Explain findings***:

3. Characteristics of all wetlands adjacent to the tributary (if any)

(i) All wetland(s) being considered in the cumulative analysis: Pick List

(ii) Approximately ( ) acres in total are being considered in the cumulative analysis.

(iii) For each wetland associated with the reach or waterbody being analyzed in this form, specify the following:

Number/Name[8]	Directly abuts (Yes/No)	Size	Number/Name	Directly abuts (Yes/No)	Size
	Yes	acres		Yes	acres
	Yes	acres		Yes	acres
	Yes	acres		Yes	acres
	Yes	acres		Yes	acres
	Yes	acres		Pick	acres
	Yes	acres		Pick	acres

(iv) Summarize overall biological, chemical and physical functions being performed**:**

C. SIGNIFICANT NEXUS DETERMINATION

A significant nexus analysis will assess the flow characteristics and functions of the tributary itself and the functions performed by any wetlands adjacent to the tributary to determine if they significantly affect the chemical, physical, and biological integrity of a TNW. For each of the following situations, a significant nexus exists if the tributary, in combination with all of its adjacent wetlands, has more than a speculative or insubstantial effect on the chemical, physical and/or biological integrity of a TNW. Considerations when evaluating significant nexus include, but are not limited to the volume, duration, and frequency of the flow of water in the tributary and its proximity to a TNW, and the functions performed by the tributary and all its adjacent wetlands. It is not appropriate to determine significant nexus based solely on any specific threshold of distance (e.g. between a tributary and its adjacent wetland or between a tributary and the TNW). Similarly, the fact an adjacent wetland lies within or outside of a floodplain is not solely determinative of significant nexus.

Draw connections between the features documented and the effects on the TNW, as identified in the *Rapanos* Guidance and discussed in the Instructional Guidebook. Factors to consider include, for example:

- Does the tributary, in combination with its adjacent wetlands (if any), have the capacity to carry pollutants or flood waters to TNWs, or to reduce the amount of pollutants or flood waters reaching a TNW?
- Does the tributary, in combination with its adjacent wetlands (if any), provide habitat and lifecycle support functions for fish and other species, such as feeding, nesting, spawning, or rearing young for species that are present in the TNW?
- Does the tributary, in combination with its adjacent wetlands (if any), have the capacity to transfer nutrients and organic carbon that support downstream foodwebs?
- Does the tributary, in combination with its adjacent wetlands (if any), have other relationships to the physical, chemical, or biological integrity of the TNW?

Note: the above list of considerations is not inclusive and other functions observed or known to occur should be documented below:

1. Significant nexus findings for non-RPW that has no adjacent wetlands and flows directly or indirectly into TNWs. ***Explain*** findings of presence or absence of significant nexus below, based on the tributary itself, then go to Section III.D

[8] In the Number/Name column, add the number and/or name that you have given the wetland being referred to in the table. Example, you are referring to a wetland on your wetland delineation map number 6, that you call wetland No.3 on a reach you refer to as Putah Creek. For this wetland you would add to the table in the Number/Name column, something like the following: (No. 3, Putah Ck., Map # 6).

2. **Significant nexus findings for non-RPW and its adjacent wetlands, where the non-RPW flows directly or indirectly into TNWs.** ***Explain*** findings of presence or absence of significant nexus below, based on the tributary in combination with all of its adjacent wetlands, then go to Section III.D:

3 **Significant nexus findings for wetlands adjacent to an RPW but that do not directly abut the RPW.** ***Explain*** findings of presence or absence of significant nexus below, based on the tributary in combination with all of its adjacent wetlands, then go to Section III.D:

D. DETERMINATIONS OF JURISDICTIONAL FINDINGS. THE SUBJECT WATERS/WETLANDS ARE (CHECK ALL THAT APPLY):

☐ 1. **TNWs and Adjacent Wetlands**. Check all that apply and provide size estimates in review area:

- ☐ TNWs: linear feet width (ft), and/or acres.
- ☐ Wetlands adjacent to TNWs: acres.

☒ 2. **RPWs that flow directly or indirectly into TNWs**.

- ☐ Tributaries of TNWs where tributaries typically flow year-round are jurisdictional. Provide data and rationale indicating that tributary is perennial: .
- ☒ Tributaries of TNW where tributaries have continuous flow "seasonally" (e.g., typically three months each year) are jurisdictional. Data supporting this conclusion is provided at Section III.B. Provide rationale indicating that tributary flows seasonally: Cachagua Creek is regularly inundated and flows throughout the rainy season.

Provide estimates for jurisdictional waters in the review area (***check all that apply***)

- ☒ Tributary waters: 200 linear feet 10 width (ft).
- ☐ Other non-wetland waters: acres.
  - Identify type(s) of waters: .

☐ 3. **Non-RPWs[9] that flow directly or indirectly into TNWs.**

- ☐ Waterbody that is not a TNW or an RPW, but flows directly or indirectly into a TNW, and it has a significant nexus with a TNW is jurisdictional. Data supporting this conclusion is provided at Section III.C.

Provide estimates for jurisdictional waters within the review area (***check all that apply***):

- ☐ Tributary waters: linear feet width (ft).
- ☐ Other non-wetland waters: acres.
  - Identify type(s) of waters: .

☐ 4. **Wetlands directly abutting an RPW that flow directly or indirectly into TNWs.**

- ☐ Wetlands directly abut RPW and thus are jurisdictional as adjacent wetlands.
  - ☐ Wetlands directly abutting an RPW where tributaries typically flow year-round. Provide data and rationale indicating that tributary is perennial in **Section III.D.2**, above. Provide rationale indicating that wetland is directly abutting an RPW: .
  - ☐ Wetlands directly abutting an RPW where tributaries typically flow "seasonally." Provide data indicating that tributary is seasonal in **Section III.B** and rationale in **Section III.D.2**, above. Provide rationale indicating that wetland is directly abutting an RPW: .

Provide acreage estimates for jurisdictional wetlands in the review area: acres.

☐ 5. **Wetlands adjacent to but not directly abutting an RPW that flow directly or indirectly into TNWs.**

- ☐ Wetlands that do not directly abut an RPW, but when considered in combination with the tributary to which they are adjacent and with similarly situated adjacent wetlands, have a significant nexus with a TNW are jurisidictional. Data supporting this conclusion is provided at **Section III.C**.

Provide acreage estimates for jurisdictional wetlands in the review area: acres.

---

[9]See Footnote # 3.

☐ **6. Wetlands adjacent to non-RPWs that flow directly or indirectly into TNWs.**

☐ Wetlands adjacent to such waters, and have when considered in combination with the tributary to which they are adjacent and with similarly situated adjacent wetlands, have a significant nexus with a TNW are jurisdictional. Data supporting this conclusion is provided at **Section III.C**.

Provide estimates for jurisdictional wetlands in the review area: acres.

☐ 7. Impoundments of jurisdictional waters.[10]

As a general rule, the impoundment of a jurisdictional tributary remains jurisdictional.

☐ Demonstrate that impoundment was created from "waters of the U.S.," or

☐ Demonstrate that water meets the criteria for one of the categories presented above (1-6), or

☐ Demonstrate that water is isolated with a nexus to commerce (see E below).

E. ISOLATED [INTERSTATE OR INTRA-STATE] WATERS, INCLUDING ISOLATED WETLANDS, THE USE, DEGRADATION OR DESTRUCTION OF WHICH COULD AFFECT INTERSTATE COMMERCE, INCLUDING ANY SUCH WATERS (*CHECK ALL THAT APPLY*):[11]

☐ which are or could be used by interstate or foreign travelers for recreational or other purposes.

☐ from which fish or shellfish are or could be taken and sold in interstate or foreign commerce.

☐ which are or could be used for industrial purposes by industries in interstate commerce.

☐ Interstate isolated waters. Explain: .

☐ Other factors. Explain: .

Identify water body and summarize rationale supporting determination: **.**

Provide estimates for jurisdictional waters in the review area (***check all that apply***)

☐ Tributary waters: linear feet width (ft).

☐ Other non-wetland waters: acres.

Identify type(s) of waters: .

☐ Wetlands: acres.

F. NON-JURISDICTIONAL WATERS, INCLUDING WETLANDS (CHECK ALL THAT APPLY):

☐ If potential wetlands were assessed within the review area, these areas did not meet the criteria in the 1987 Corps of Engineers Wetland Delineation Manual and/or appropriate Regional Supplements.

☐ Review area included isolated waters with no substantial nexus to interstate (or foreign) commerce.

☐ Prior to the Jan 2001 Supreme Court decision in "*SWANCC*," the review area would have been regulated based <u>solely</u> on the "Migratory Bird Rule" (MBR).

☐ Waters do not meet the "Significant Nexus" standard, where such a finding is required for jurisdiction. ***Explain***: .

☐ Other: (explain, if not covered above): **.**

Provide acreage estimates for non-jurisdictional waters in the review area, where the <u>sole</u> potential basis of jurisdiction is the MBR factors (i.e., presence of migratory birds, presence of endangered species, use of water for irrigated agriculture), using best professional judgment (***check all that apply***):

☐ Non-wetland waters (i.e., rivers, streams): linear feet width (ft).

☐ Lakes/ponds: acres.

☐ Other non-wetland waters: acres. List type of aquatic resource: .

☐ Wetlands: acres.

☐

[10] To complete the analysis refer to the key in Section III.D.6 of the Instructional Guidebook.

[11] Prior to asserting or declining CWA jurisdiction based solely on this category, Corps Districts will elevate the action to Corps and EPA HQ for review consistent with the process described in the Corps/EPA *Memorandum Regarding CWA Act Jurisdiction Following Rapanos.*

SECTION IV: DATA SOURCES.

A. SUPPORTING DATA. Data reviewed for JD (check all that apply - checked items shall be included in case file and, where checked and requested, appropriately reference sources below):

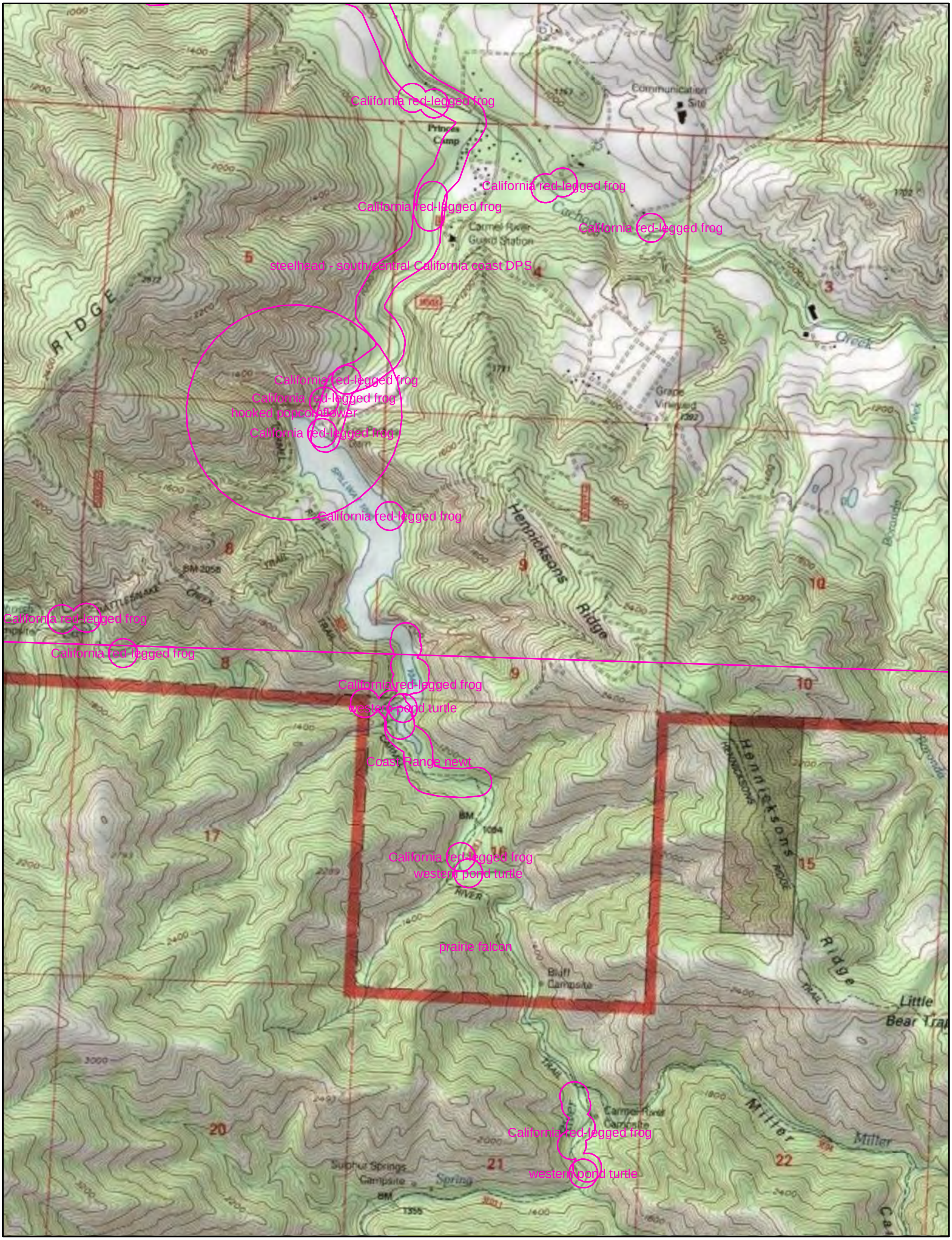
- ☒ Maps, plans, plots or plat submitted by or on behalf of the applicant/consultant: .
- ☒ Data sheets prepared/submitted by or on behalf of the applicant/consultant.
  - ☒ Office concurs with data sheets/delineation report.
  - ☐ Office does not concur with data sheets/delineation report.
- ☐ Data sheets prepared by the Corps: .
- ☐ Corps navigable waters' study: .
- ☐ U.S. Geological Survey Hydrologic Atlas: .
  - ☐ USGS NHD data.
  - ☐ USGS 8 and 12 digit HUC maps.
- ☐ U.S. Geological Survey map(s). Cite scale & quad name: .
- ☐ USDA Natural Resources Conservation Service Soil Survey. Citation: .
- ☐ National wetlands inventory map(s). Cite name: .
- ☐ State/Local wetland inventory map(s): .
- ☐ FEMA/FIRM maps: .
- ☐ 100-year Floodplain Elevation is: (National Geodectic Vertical Datum of 1929)
- ☐ Photographs: ☐ Aerial (Name & Date): .
  - ☐ Other (Name & Date): .
- ☐ Previous determination(s). File no. and date of response letter: .
- ☐ Applicable/supporting case law: .
- ☐ Applicable/supporting scientific literature: .
- ☐ Other information (please specify): .
- ☐

B. ADDITIONAL COMMENTS TO SUPPORT JD:

☐

Appendix A
Attachment A2

Map of the California Natural Diversity Data Base species



California red-legged frog
Princes Camp
Communication Site
California red-legged frog
California red-legged frog
Carmel River Guard Station
California red-legged frog
steelhead - south/central California coast DPS
RIDGE
California red-legged frog
California red-legged frog
hooked popcornflower
California red-legged frog
Grape Vineyard
California red-legged frog
Henninksons Ridge
RATTLESNAKE CREEK
California red-legged frog
California red-legged frog
California red-legged frog
western pond turtle
Coast Range newt
Hennicksons Ridge
California red-legged frog
western pond turtle
prairie falcon
Bluff Campsite
Little Bear Trap
Carmel River Campsite
California red-legged frog
Miller
western pond turtle
Sulphur Springs Campsite
Spring

Appendix B

Opinion of Probable Program Cost (OPPC) & Schedule (OPPS)

PROGRAM COST ESTIMATE & SCHEDULE

1 Methodology

This section outlines the general approach employed by MWH to prepare the Opinions of Probable Program Cost (OPPC), hereinafter referred to as “cost estimate(s)" or “OPPC” and the Opinions of Probable Program Schedule (OPPS) and referred to as the “alternative schedule(s)” for this study.

1.1 Pricing Basis

Presented pricing and scheduling reflects the estimator’s opinion as to the probable costs and time requirements that a “prudent” contractor would include in his tender to remove all or part of the sediments deposited at Los Padres Dam. The OPPCs and OPPS attempt to capture framework costs expected to be borne by the owner for pre-construction activities and for expenses related to the management and support of field construction activities. The OPPC and the OPPS are intended to be an indication of fair market value are not necessarily a predictor of the lowest possible bid or the shortest time to complete the project. Fair market value is assumed to be a mid-range contractor’s proposal considering four or more competitive bids. Finally, the OPPC the OPPS are predicated on the contractor’s compliance with all contract specifications and design parameters during field execution.

1.2 Estimate and Schedule Classification

MWH classifies all cost estimating and scheduling opinions in accordance with the criteria established by the Association for the Advancement of Cost Engineering’s (AACE) cost estimating classification system referred to as Standard Practice 18R-97. The AACE Cost Estimate Classification System maps the various stages of project cost estimating together with a generic maturity and quality matrix, which can be applied across a wide variety of industries and capital infrastructure. Attachment A of that document provides a high level summary of the AACE cost estimate classification system.

1.3 OPPC and OPPS Methodology

The following table summarizes the typical estimating methodology employed relative to the designated AACE cost estimate classification:

Table 1 Methodology vs. AACE Classification

AACE Class	System	Methodology
5	Excel /P6	Parametric/Stochastic
4	Excel/P6	Semi-detailed Unit Price
3	IPE ™/P6	Detailed Crew Analysis
2	IPE ™/P6	Detailed Crew Analysis w/ Budget Quotes

Note: Class 1 cost estimates and construction schedules are reserved for actual contractor proposals that factor in final subcontractor quotes, project addenda and firm vendor materials pricing.

1.4 Estimating & Scheduling Accuracy

The following table provides some basic guidance regarding expected estimating/scheduling accuracy and contingency level recommendations relative to estimate class and input design definition:

Table 2 Accuracy Range vs. AACE Classification

AACE Class	Design	Accuracy Range	Typical Contingency
5	<5%	-35% to +50%	20% to 40%
4	<15%	-25% to +35%	10% to 30%
3	10%-40%	-15% to +20%	5% to 20%
2	50%-99%	-10% to +15%	0% to 10%

Note: Class 1 estimates are reserved for actual contractor proposals that rely on finalized bidding documents and access to all pre-tender addendums.

1.5 Direct Cost and Work Item Development

Directs costs and work item activities representing the project's fixed physical scope are organized against a work breakdown structure (WBS) to structure the project detail.

Software functionality allows the direct cost detail or work item tasks to be decomposed to multiple sub-levels, which are referred to as item activities. Class 3 and 2 cost estimates derive pricing under a crew productivity analysis per line item whereas Class 5 and 4 cost opinions typically apply all-in unit prices against the developed line item quantities.

1.6 Indirect Cost Development

Indirect costs representing the contractor's time related variable field management expenses or general conditions (GCs) costs are factored to Class 4 and 5 OPPCs in a top-down approach as a function of running direct costs. For Class 3 and 2 OPPCs, indirect costs are estimated in a bottoms-up fashion to determine actual resource needs in relation to the proposed construction duration schedule or OPPS.

1.7 Estimate Adders

Estimate add-ons representing the contractor's allowances for home office overhead expenses, sales taxes, insurance costs, risk provision and fee are added to the cost estimate as a function of running direct costs.

1.8 Labor Rate Development

All-inclusive craft labor rates are built-up from local wage determinations to include all applicable fringes (i.e., health and welfare, vacation, training and union dues,) and tax burdens (i.e., workers compensation, payroll taxes). Shift differentials are applied in accordance with expected contractor means and methods and known schedule constraints.

1.9 Equipment Rate Development

All-inclusive rolling equipment rates are built-up using depreciation schedules and calculated hourly operating costs. Developed equipment rates are calibrated against published rental rate schedules and are not discounted for depressed market conditions or situations where a contractor may take an adjustment relative to owned equipment. Software functionality allows the default fuel rate to be adjusted to account for fluctuating fuel costs.

Note: Class 4 and 5 cost estimates typically rely on all-in historical database prices and do not require development of hourly rates for labor and equipment resources.

1.10 Escalation

Estimated capital costs reflect current price levels consistent with the OPPC publish date. If requested, escalation to the notice-to-proceed (NTP) or mid-point of construction can be added to the OPPC using i available cost indexing tools. Escalation can be applied to the OPPC as a constant or variable annual factor against the entire project or selected scope items.

1.11 Allowances & Contingency

Allowances are added to the OPPC to anticipate expenses for known but undefined scope items. Contingency is added to the cost estimate to account for unknown risks or unforeseen market conditions. Monte Carlo simulation techniques can be used to refine and defend the contingency recommendation. Contingency can be applied to the OPPC as a constant or variable factor against the entire project or selected scope items. Typically, contingency is not applied to the scheduling opinion. Finally, the OPPC and OPPS typically exclude an allowance for the owner's management reserve, which represents the owner's contingency for changed field conditions.

1.12 Market Conditions

Unprecedented market volatility has been a significant factor in contractor pricing over the last several years. Current market conditions have shown an aggressive approach to pricing with contractors assuming more risk to win project work. Consequently, while the market price may be significantly under the reported "fair valuation" of the OPPC or OPPS, owners need to be aware of the increased potential for claims and other compensation demands that contractors may employ to offset aggressive bidding strategies.

2 Basis of Estimate and Schedule

MWH developed an OPPC and OPPS for each of the three alternatives identified in the concept level study for the Los Padres Dam Sediment Removal project. The following sections outline the specific estimating/scheduling methodology employed by the estimating team during the development of the cost and schedule opinions. In addition, significant OPPC and OPPS assumptions/exclusions and qualifications are also detailed to define and document the pricing basis.

2.1 OPPC and OPPS Background

Interim OPPCs and OPPSs were not developed during earlier design phases. As such, the attached Class 4 OPPC and OPPS represent the only estimating and scheduling effort undertaken to date. The attached Class 4 OPPC is based on documents dated October 2012. These documents were described as being the final 35% interim design.

2.2 OPPC Quantity Basis

Detailed line item quantities were developed by scaling the developed concept drawings.

2.3 OPPC and OPPS Classification

Based on the following evaluation criteria, the OPPC qualifies as a Class 4 opinion relative to the AACE classification matrix.

Table 3 Evaluation Criteria

Evaluation Criteria	Developed OPPC	AACE Class
Project Definition	<5% Design Package	5
End Usage	Initial Concept Budget	4
Methodology	Detailed Crew Analysis – Semi-detailed unit costs.	3-4
Preparation Effort	40 hrs	4-5

2.4 OPPC& OPPS General Assumptions

The following generic assumptions are incorporated into the OPPC:

- Competitive bid conditions will prevail at tender (e.g. +3 bidders)
- Standard industry commercial terms will attach to all procurements
- Stable market conditions will prevail without significant geopolitical events or economic disruptions
- An optimized contracting strategy will be employed to efficiently sequence and coordinate the work scope
- No trade discounts were considered
- Due to the short construction season, contractors will be mobilized over a period of 6+ years depending on the alternative requirements.
- Multiple double shifts will be permitted on a 6 day/week work schedule.

2.5 OPPC Labor Assumptions

The following labor assumptions are incorporated into the OPPC and OPPS:

Table 4 Labor Assumptions

Parameter	OPPC Assumption
Wage Determination	Data from other projects
Shift Basis | Shifts/Day | Days/Week	10 hrs | 2 Shift/day | 6 Days/Week
Living Per diems or Camp Costs	n/a

2.6 OPPC Equipment Assumptions

The following equipment assumptions are incorporated into the OPPC:

Table 5 Equipment Assumptions

Parameter	OPPC Assumption
Equipment Rate Basis	Data from other projects, quotation and Internet estimation.
Performance	Estimated based on CATERPILLAR PERFORMANCE HANDBOOK — 40th edition
Fuel Rates : Gasoline |Diesel	Included

2.7 OPPC Indirect Cost Assumptions

Other site costs, such as workshop, construction plants, site office, site engineering, site topography, site administration, laboratory, mobilization and demobilization, personnel and construction equipment moving and cost of non-working construction equipment were analyzed taking into account requirements for offices, office furniture and material, PCs, software, vehicles, and other needs such as communication and other services were included in the Indirect Cost evaluation.

2.8 OPPC Proportional Cost Assumptions

The following assumptions were made in order to take into account proportional costs:

(TCC: Total construction cost includes project Direct and Indirect Costs):

Insurance cost: 2.0% of TCC (e.g., bonding, general liability, builder’s risk, etc.)

OH&P: 11-15% of TCC (e.g., home office overhead, job fee, risk, etc.)

Labor Premium: 2.0% of TCC (e.g., overtime issues, workforce turnover, prediems, etc.)

Construction Mgt: 4.0 of TCC (e.g., owner’s oversight of field work)

Engineering 3% of TCC (e.g., owner’s costs for pre-construction planning, procurement)

EDC: 1% of TCC (e.g., owner’s costs for engineering during construction)

Scope Contingency: 15% of TCC (e.g., scope growth, estimating accuracy)

Mgt Reserve: 10% of TCC (e.g., allowance for changed field conditions)

2.9 OPPC and OPPS General Exclusions/Exceptions

The developed cost estimates and schedule excludes the following:

- Non-conventional environmental mitigation measures
- Non-conventional heritage and cultural mitigation measures
- Escalation to NTP
- Interest during construction (IDC)
- Removal of unforeseen underground obstructions
- Hazardous material remediation or disposal
- Utility costs for power connects or incoming transmission
- Permits beyond those normally needed for the type of project
- Facility O&M costs
- Permanent access roads or bridges
- All local duties, import fees, port charges and local taxes
- No allowance has been included for additional shift work or weekend work
- Special inspections and testing
- Furnishings, moving costs, artwork, furniture
- Costs associated with loss of revenue, water supply or power production

2.10 OPPC and OPPS Specific Assumptions

The developed cost estimates and schedules assume the following:

- Despite the long execution over multiple years, the project can be contracted to local bidders
- Air pollution restrictions will be mitigated with usage of newer equipment
- The limited staging space can be optimized to support contractor operations
- The sediment will not be processed for commercial uses
- The “dry” sediment will decant rapidly to support continuous operations

2.11 OPPC Bidding Assumptions

The following bidding assumptions were considered in the development of this OPPC:

- Bidders will develop competitive proposals with regards to materials pricing and labor productivity, and will not include allowances for changes, extra work, unforeseen conditions or any other unplanned costs
- Estimated costs are based on a minimum of four bidders. Actual bid prices may increase for fewer bidders or decrease for a greater number of bidders.
- The prime contractor will self-perform most of the work scope.
- The prime contractor can subcontract minor and special works.
- Contractors will structure their proposals to promote positive cash flow and to minimize operational finance.

2.12 OPPC Contingency Recommendation

MWH recommends a constant contingency application. For the civil scope, 15% is recommended to account for design growth, estimating accuracy and market conditions. A positive OPPC adjustment to account for local market conditions is not considered necessary. Additionally, an unlisted items allowance is not considered necessary based on the employed methodology and detailed estimate inputs.

2.13 Project Risks/Opportunities

The following standard project risks can influence bid results:

- Specifications requiring special phasing constraints
- Onerous contract terms and conditions
- Owner reputation for processing changed conditions claims
- Owner reputation for prompt payment

3 Program Cost

Following these criteria, assumptions and exclusions, three alternatives of the Los Padres Dam sediment removal project were evaluated with comparative costs summarized in Table 6.

Table 6 Alternative Cost Comparison

Los Padres Dam Sediment Removal				
Alternative	Construction Costs ($USD)	Total Program Costs ($USD)	Estimated Removal Quantity (cy)	Parametric Unit Price $/cy
Alt. No. 1	$62M	$90M	1.830M	$49.18
Alt. No. 2	$32M	$47M	0.810M	$58.02
Alt. No. 3	$36M	$50M	0.900M	$55.56

This chapter is accompanied by the following attachments:

- Attachment B1: Alternative Cost Estimates

4 Program Schedule

A Class 4 Opinion of Probable Program Schedule (OPPS) was developed to understand the conceptual program timeline for the implementation of the decommissioning scope. The reconnaissance level schedule uses a high-level work breakdown structure (WBS) to differentiate the pre-construction planning and permitting activities from the final field construction work. A second level WBS provides additional schedule organization to group and sequence the individual work tasks. The project calendar uses an ordinal numbering system as a generic means to present the timeline since the actual project start date is not currently known.

The initial scheduling opinion considers the following general assumptions:

- Unlimited resources (i.e., agency and contractor)
- Contractor and agency resources are trained and competent
- Cash flow will accommodate the contracting strategy
- Stable market conditions will prevail
- Standard industry commercial terms will attach to all procurements
- Normal weather conditions will prevail
- Major natural disasters will not impact the project’s critical path (CP)

- New regulatory legislation or Environmental Impact Statement directives will not impact the CP
- Unknown claim issues or procurement protests will not impact the CP
- Unknown legal challenges will not impact the CP
- Contractors will be mobilized once per contract
- Contractor interference issues or traffic impacts will be mitigated
- Staging space will be optimized to maximize concurrent contracting
- The contracting strategy will realize competitive conditions
- A one-step request-for-bids (RFB) process will consume a maximum of six months

The initial scheduling opinion considers the following specific assumptions:

- Permit applications will be submitted based on priority design inputs (e.g., civil, etc.)
- Double/triple shifting of key completion activities will be permitted
- In water work is limited to the period between June through October
- Project permitting will take approximately 3.5 years
- Project procurement activities will consume approximately 0.5 years

The schedule employs the following procurement assumptions referred to as the *contracting strategy*:

- All major procurement will be done via a conventional design-bid-build (DBB) process
- All major procurement will use a one-step RFB tendering approach
- When deemed necessary, early completion incentives will be offered
- Risk will be equitably allocated between owner and contractor

The schedule's calendar observes the traditional eight holiday days per year as non-working days. In addition, the calendar reserves approximately twenty additional days per year as non-working to account for anticipated weather related impacts. Sediment removal work is progressed on an accelerated 6 day per week work basis with 2-10-hour shifts per day.

All activity durations are listed in working days (WD) and use the following color scheme:

- Green = task-dependent non-critical activity (driving)
- Red = task-dependent critical activity (driving)
- Blue = level-of-effort (LOE) summary bar (non-driving)

Note: The duration of an LOE activity is determined by its predecessor and successor activities (i.e., it identifies the window of time within which the activity must be completed). LOE bars typically represent ongoing tasks dependent on other activities.

The developed alternative's schedules are presented in Attachment B2 (i.e., one page Gantt charts), attached to the back of this report, and reports the following schedule drivers:

- Permitting
- Bid evaluation
- Establishment of temporary works (e.g., haul roads, clearing, logistics, etc.)
- Wet sediment removal and disposal
- Environmental mitigations/restorations

Following these criteria, assumptions and exclusions, three alternatives of the Los Padres Dam sediment removal project were evaluated with comparative timelines summarized in Table 7.

Table 7 Alternative Time Comparison

Los Padres Dam Sediment Removal			
Alternative	Pre-construction Planning & Permitting (yrs)	Field Construction Work (yrs)	Total (yrs)
Alt. No. 1	4	7	11
Alt. No. 2	4	6	10
Alt. No. 3	4	7	11

This chapter is accompanied by the following attachments:

- Attachment B2: Alternative Program Timelines

Experience identifies examples of common issues that may lead to schedule performance risk. These may include:

- Deficient or incomplete design/contract documents
- Scope creep/changes
- Insufficient planning, coordination, and management of work
- Lower productivity than anticipated
- Adverse weather conditions
- Delays in processing submittals and/or material deliveries
- Late approval of submittals or untimely response to requests for information
- Suppliers or subcontractors that do not perform as promised
- Materials that are late or unacceptable upon arrival
- Funding changes that impact payment applications and change order payment
- New regulations that impact permits, installations, or inspection
- Poor activity duration estimates
- Initial assumptions that may be proved wrong
- Other unforeseen conditions

In addition to the factors discussed above, the dynamic and complex nature of construction projects breeds uncertainties in many unanticipated ways. This may cause the actual durations and completion dates to slip from the original plan and float management evermore critical

The developed schedules report a conceptual timeline of approximately four to complete the permitting work and an additional six to seven years of seasonal interrupted work to complete the field construction activities associated with the sediment removal schemes at Los Padres Dam. The schedule does not include added contingency as a means to mitigate uncertainty, but instead a range of -1 years to + 3 years can be assigned to address known and unknown uncertainties.

Appendix B

Attachment B1

Alternative Cost Estimates

MWH **JLL**
Walnut Creek 12/20/2012

California American Water
Los Padres Dam
Sediment Removal Study
Alternative 1 - Full Wet/Dry Sediment Removal to U/S Disposal Site

Opinion of Probable Program Costs

Currency: USD-United States-DECEMBER 2012 Dollar

Total Estimated Sediment Qty = 2,030,000 cys (2012)	*$33.88*	Grand Total Price: $ 62,000,000	**Construction**
Alternative Removal Qty = 1,830,000 cys	*$48.13*	Grand Total Price: $ 90,000,000	**Program (w/ Contingency)**

FERC #	P S	Description	Quantity	UOM	Unit Price	Total Price	Comments
330.000		**Land & Rights**					n/a
331.000		**Powerhouse**					n/a
332.000		**Reservoirs, Dams & Waterways**					
332.100		**Temporary Works/Constructability**				**$2,599,529**	
332.101	P	***Prep D/S Staging & Contractors Yard Areas***	1	ls	$15,000	$15,000	Level/base area near entrance gate for trailers, eqp laydown, WTP, etc.
332.102	P	***Upgrade (e) Spillway Bridge***					
332.103	P	Fortify Bridge to Support Construction Operations	1	ls	$35,000	$35,000	allowance for misc improvements
332.104	P	***Improve (e) Jeep Trail & Dam Crest Road (4,000')***			***$140,000***		widen existing road to support construction traffic
332.105	P	Tree Removal	30	ea	$400	$12,000	clear 20', say 25 trees/ac, for3,000'
332.106	P	Import Fill	9,000	cys	$7.50	$67,500	import from downstream borrow area near staging area
332.107	P	Grade/Compact Road	14,000	sys	$2.00	$28,000	
332.108	P	Switchback Section to New SDS Access Road	1	ls	$225,000	$225,000	drop 80+ to lake perimeter at 1040'
332.109	P	***Build New Access Road to U/S Sediment Disposal Site (SDS)***			***$270,000***		7800'
332.110	P	Heavy Clearing	6.3	ac	$10,000	$62,672	remove trees/boulders, etc.
332.111	P	Cut->Fill Operations	10,000	cys	$4.00	$40,000	
332.112	P	Place Embankment Fill -5'	35,000	cys	$6.00	$210,000	excavate river sediment for haul road section
332.113	P	Grade/Compact Road	23,000	sys	$1.50	$34,500	
332.114	P	Rip Rap Protection	1,000	cys	$20	$20,000	sort/haul & place river materials to protect embankment section
332.115	P	Other Erosion Controls/Culverts	1	ls	$30,000	$30,000	
332.116	P	***Build New Access Road from Base to Top of SDS***			***$470,000***		4500', switchback road
332.117	P	Heavy Clearing	3.6	ac	$15,000	$54,236	remove trees/boulders, etc., chip wood debris
332.118	P	Cut->Fill Operations	20,000	cys	$8.00	$160,000	
332.119	P	Place Embankment Fill -5'	10,000	cys	$12.00	$120,000	excavate river sediment for haul road section
332.120	P	Grade/Compact Road	12,000	sys	$1.50	$18,000	
332.121	P	Rip Rap Protection	1,000	cys	$20	$20,000	sort/haul & place river materials to protect embankment section
332.122	P	Other Erosion Controls/Culverts	1	ls	$25,000	$25,000	
332.123	P	***Build New Temporary Staging Area at Base of SDS***					
332.124	P	Heavy Clearing	8.0	ac	$12,000	$96,000	remove trees/boulders, etc., chip wood debris
332.125	P	Cut->Fill Operations	5,000	cys	$5.00	$25,000	
332.126	P	Place Embankment Fill -5'	5,000	cys	$6.00	$30,000	excavate river sediment for haul road section
332.127	P	Rip Rap Protection	500	cys	$20	$10,000	
332.128	P	Other Erosion Controls/Culverts	1	ls	$25,000	$25,000	
332.129	P	***Provide Steep Slope Clearing at SDS***					
332.130	P	Heavy Clearing	18	ac	$10,000	$183,655	
332.131	P	***Clear/Prep Temporary Sediment Decant Areas***					
332.132	P	Medium Clearing	9	ac	$5,000	$45,000	remove trees/boulders, etc., chip wood debris
332.133	P	***Perform General Reservoir Clearing***					
332.134	P	Heavy Clearing	9	ac	$7,500	$68,871	remove trees/boulders, etc., chip wood debris
332.135	P	Medium Clearing	9	ac	$6,000	$55,096	<ditto>
332.136	P	***Improve Ramp Area into Reservoir***					
332.137	P	All Required to Support Dredging Operations	1	ls	$50,000	$50,000	build a bigger landing/material staging area at base of spillway
332.138	P	Provide Access for Dewatering Wells	1	lot	$25,000	$25,000	
332.139	P	***Excavate SDS Foundation***					
332.140	P	Heavy Clearing	1.7	ac	$10,000	$17,000	remove trees/boulders, etc., chip wood debris
332.141	P	Excavate Foundation	55,000	cys	$4.00	$220,000	transport to temporary staging area, <750'
332.142	P	Install 3-6" Perf Drain Pipe	4,000	lf	$18.00	$72,000	
332.143	P	***Other Temporary Works/Access Considerations***	1	lot	$500,000	$500,000	ramps into and out of excavation zones
332.200		**Water Diversion/Controls**				**$5,222,200**	
332.200	P	***Upstream Diversion Cofferdam***					
332.201	P	Install Sheet piles/Earthen Berm Cofferdam	1	ls	$64,000	$64,000	100'x20'=2000sf = 2-100' x10' dirt berms
332.202	P	Seasonal Breach of Diversion Cofferdam	4	ea	$10,000	$40,000	pull piles, breach Berm
332.203	P	Seasonal Rebuild of Diversion Cofferdam	4	ea	$15,000	$60,000	install piles. Rebuild berm
332.204	P	Remove Diversion Cofferdam	1	ls	$10,000	$10,000	
332.205	P	***Carmel River Bypass Piping***					
332.206	P	Install 18" HDPE Pipeline at Access Road Section	13,200	lf	$126	$1,663,200	a/g installation with quick couplers
332.207	S	Repair 18" HDPE Pipeline for Reuse	10,560	lf	$90	$950,400	say 20% gets rebuilt each season x four seasons
332.208	S	Remove 18" HDPE Pipeline	13,200	lf	$18	$237,600	
332.209	P	***Dewatering Wells***					
332.210	S	Install Perimeter Sediment Dewatering Wells	64	ea	$10,000	$640,000	50' deep
332.211	P	Manifold Piping - 8"	3,000	lf	$64	$192,000	
332.212	P	Drain Piping to Reservoir - 8"	1,000	lf	$48	$48,000	
332.213	P	Repair Piping for Reuse	3,000	lf	$48	$144,000	say 25% gets rebuilt each season x four seasons
332.214	P	Remove Manifold/Drain Piping	4,000	lf	$12	$48,000	
332.215	P	***Water Treatment Plant***					
332.216	P	Rent Package Filtration/Settling Plant	16	mo	$25,000	$400,000	4 seasons x 3 mos, Rain-for-Rent system
332.217	P	Erect/Commission WTP Plant	5	ea	$25,000	$125,000	/ season
332.218	P	De-erect/Demobe WTP to Storage/Salvage	5	ea	$20,000	$100,000	<ditto>

MWH — Walnut Creek | **JLL** — 12/20/2012

California American Water
Los Padres Dam
Sediment Removal Study
Alternative 1 - Full Wet/Dry Sediment Removal to U/S Disposal Site

Opinion of Probable Program Costs

Currency: USD-United States-DECEMBER 2012 Dollar

Total Estimated Sediment Qty = 2,030,000 cys (2012)	*$33.88*	Grand Total Price:	$ 62,000,000	**Construction**
Alternative Removal Qty = 1,830,000 cys	*$48.13*	Grand Total Price:	$ 90,000,000	**Program (w/ Contingency)**

FERC #	P S	Description	Quantity	UOM	Unit Price	Total Price	Comments
332.219	P	***Other Water Controls or Dewatering***	1	lot	$500,000	$500,000	mitigate deeper wet excavations
332.300		**Wet Sediment Removal**			*$18.01*	**$18,373,404**	
332.301	P	*-Lake level below 1020' to facilitate access and wet removal operations*					
332.302	P	*-Assumed construction season: July 1st to Oct 1st*					
332.303	P	*-Winterize/demobe from reservoir: Oct 2nd to Oct 15th*					
332.304	P	*-Assume two 10-hr shifts/day at 6 days/week, Sunday = equipment maintenance*					
332.305	P	*-Number of production available days / season: 3 mos or 75 days*					
332.306	P	*-Assume 50 mins/hr for crew efficiency*					
332.307	P	*-Assume in-water mechanical clamshell operation loading to a floating conveyor system that transfers sediment to designated temporary U/S decant areas*					
332.308	P	*-Production: assume a 2-3 yard clamshell bucket at 30-45 secs/cycle = say 165 cys/hr (day) and 125 cys/hr (night)/clamshell*					
332.309	P	*-Assume wet dredging during the day only for a two in-water crews*					
332.310	P	*-Use floating material conveyor system with feed hopper on adjacent barge, convey to shore, shore delivery to decant zones, with radial stackers*					
332.311	P	*-Production/day = 2,900 cys/day(day/night combined*					
332.312	P	*-Assumed total sediment removal quantity = 1,200,000 cys*					
332.313	P	*-Assumed sediment removal efficiency = 85% or 1,020,000 cys*					
332.314	P	*-Number of days/seasons required: 350 days or 4.6 or say 5 seasons or 7,800 hrs (5sx3mx20hx26d)*					
332.315	P	*-Assumed haul distance to SDS = 9,000' or 1.7 miles, truck cycle = 20 mins at 20 cys/load, # of trucks = 5*					
332.316	P						
332.317	P	***Excavation/Haul/Disposal Operation***			*$18.01*		
332.318	P	Purchase Floating Material Conveyor System	2,500	lf	$750	$1,875,000	
332.319	P	Purchase Land Based Material Conveyor System	1,000	lf	$500	$500,000	
332.320	P	Purchase On-water Feed Hopper	1	ea	$35,000	$35,000	
332.321	P	Purchase Land Based Radial stackers	2	ea	$75,000	$150,000	
332.322	P	Purchase Flexi-floats (10'x40') Units	10	ea	$24,000	$240,000	1-40'wx30'l and 3-40'wx20'l, say 8 tons/float
332.323	P	Purchase Generators	2	ea	$125,000	$250,000	
332.324	P	Purchase U/W GPS Tracking Unit	1	ea	$25,000	$25,000	hardware + software
332.325	P	Plate Steel for Decking -1/2"	4,800	sf	$29	$139,104	
332.326	P	25-35 Ton Crane (1)	7,800	hr	$110	$858,000	on-water
332.327	P	Clamshell Bucket (1)	7,800	hr	$5	$39,000	
332.328	P	D7 Dozer at Radial Stackers (1)	7,800	hr	$85	$663,000	land based
332.329	P	CAT 330 Excavator (1) or CAT 980 Loader (1)	7,800	hr	$75	$585,000	load trucks from surge pile
332.330	P	Volvo Off-Hwy 26 tn Articulated Trucks (5)	39,000	hr	$56	$2,184,000	50 min/5 mins for dump time = 10 trucks max
332.331	P	Work Boat (1)	7,800	hr	$100	$780,000	transport crews/parts/equip, tow conveyor system
332.332	P	Cat 825 Compactor (1)	7,800	hr	$52.00	$405,600	at SDS
332.333	P	Cat D7 Dozer (1)	7,800	hr	$65.00	$507,000	at SDS
332.334	P	Work Boat Driver (1)	7,800	hr	$58.00	$452,400	
332.335	P	Operator (6)	46,800	hr	$55.00	$2,574,000	
332.336	P	Truck Driver (5)	39,000	hr	$52.00	$2,028,000	
332.337	P	Laborer/Boat Deck Hand (2)	15,600	hr	$49.00	$764,400	
332.338	P	Equipment Fueling/Oil Service Truck (1)	7,800	hr	$21.00	$163,800	
332.339	P	Master Mechanic (1)	7,800	hr	$56.00	$436,800	
332.340	P	FOG Allowance	85,800	hr	$15.00	$1,287,000	at 2-5 gals/hr + parts
332.341	P	Conveyor Power (2 - 250 kw gensets)	15,600	hr	$15.00	$234,000	
332.342	P	Lights/Portable Gensets	3,900	hr	$15.00	$58,500	
332.343	P	Pickup Trucks (2)	15,600	hr	$13.00	$202,800	
332.344	P	Crew Foreman	15,600	hr	$60.00	$936,000	
332.400		**Dry Sediment Removal**			*$12.30*	**$9,966,513**	
332.401	P	*-The lake level needs to be below 1000' to support access and dry removal operations*					
332.402	P	*-Assumed construction season: August 1st to Oct 1st*					
332.403	P	*-Winterize/demobe from reservoir: Oct 2nd to Oct 15th*					
332.404	P	*-Assume two 10-hr shifts/day at 6 days/week, Sunday = equipment maintenance*					
332.405	P	*-Number of production days: 2 mos/season or 50 days*					
332.406	P	*-Assume 50 mins/hr for crew efficiency*					
332.407	P	*-Assume 250 cy/hr for the day shift and 200 cys/hr for the night shift*					
332.408	P	*-Production/day = 4,500 cys (day + night)*					
332.409	P	*-Assumed sediment removal quantity = 900,000 cys*					
332.410	P	*-Assumed sediment removal efficiency = 90% to 100%*					
332.411	P	*-Number of days/seasons required: 200 days or 4 seasons or 4,000 hrs (4sx2mx25dx20h)*					
332.412	P	*-Assumed haul distance to SDS = 9,000' or 1.7 miles, truck cycle = 20 mins at 20 cys/load, # of trucks = 5*					
332.413	P						
332.414	P	***Dry Excavation/Haul/Disposal Operation***			*$9.00*		
332.415	P	Cat 380 Excavator (1)	4,000	hr	$75.00	$300,000	at excavation site, 4sx50dx20h
332.416	P	Cat 633 Scraper (2)	4,000	hr	$65.00	$260,000	haul to surge pile, , 1,000' haul
332.417	P	Cat D8 Dozer (1)	4,000	hr	$65.00	$260,000	at surge pile
332.418	P	Cat 980 Loader (1)	4,000	hr	$50.00	$200,000	at surge pile
332.419	P	Volvo Off-Hwy 26 tn Articulated Trucks (5)	20,000	hr	$56.00	$1,120,000	haul to temporary staging area or SDS

California American Water
Los Padres Dam
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Opinion of Probable Program Costs

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FERC #	P S	Description	Quantity	UOM	Unit Price	Total Price	Comments
332.420	P	Cat 140G Blade at Haul Road (1/2 time)	2,000	hr	$50.00	$100,000	maintain haul roads
332.421	P	4000 Gal Water Truck (1/2 time)	2,000	hr	$42.00	$84,000	dust control
332.422	P	Cat 825 Compactor (1)	4,000	hr	$52.00	$208,000	at SDS
332.423	P	Cat D7 Dozer (1)	4,000	hr	$65.00	$260,000	at SDS
332.424	P	Operator (7.5)	30,000	hr	$55.00	$1,650,000	
332.425	P	Truck Driver (5.5)	22,000	hr	$52.00	$1,144,000	
332.426	P	Laborer/Load Spotter (2)	8,000	hr	$49.00	$392,000	
332.427	P	Equipment Fueling/Oil Service Truck	2,000	hr	$21.00	$42,000	day shift only
332.428	P	Master Mechanic	2,000	hr	$56.00	$112,000	<ditto>
332.429	P	FOG Allowance	48,000	hr	$15.00	$720,000	2-5 gal/hr avg
332.430	P	Lights/Portable Gensets	2,000	hr	$15.00	$30,000	
332.431	P	Dewatering Equipment	4,000	hr	$15.00	$60,000	trash pumps/hoses
332.432	P	Pickup Trucks (2)	8,000	hr	$13.00	$104,000	
332.433	P	Crew Foreman	4,000	hr	$60.00	$240,000	
332.434	P						
332.435	P	***Soil Cement Stabilization Operation***					
332.436	P	*-Assume a continuous pug mill or in-place mixing operation*					
332.437	P	*-Fdn qty = 50,000 cys + 400,000 cys for the block = 450,000 cys at 110 pcf*					
332.438	P	*-Assume 3% by weight PC Type IP as the re-agent =*	743	tn			
332.439	P	*-Assume day shift only, 450,000 cys at (4 seasons) or 3,000 hrs (4sx3mx26x10) or 150 cys/hr or 1,500 day*					
332.440	P				*$4.01*		
332.441	P	In-place Soil/Cement Mixers (2)	6,000	hr	$75.00	$450,000	Bomag
332.442	P	Cat 140G Blade (1/2 time)	1,500	hr	$50.00	$75,000	
332.443	P	Pneumatic Rollers (2)	6,000	hr	$43.00	$258,000	
332.444	P	4000 Gal Water Truck (1/2 time)	1,500	hr	$42.00	$63,000	
332.445	P	Operator (4.5)	13,500	hr	$55.00	$742,500	
332.446	P	Laborer (4)	12,000	hr	$49.00	$588,000	cement addition
332.447	P	Truck Driver (1)	1,500	hr	$52.00	$78,000	
332.448	P	Purchase Cement	817	tn	$150.00	$122,513	
332.449	P	Pickup Trucks (1)	1,500	hr	$13.00	$19,500	
332.45	P	Crew Foreman	1,500	hr	$56.00	$84,000	
332.451	P	Cement Delivery Logistics	1	lot	$200,000	$200,000	silo, in-line pneumatic pumps, hoses, spreader scheme
332.500		**Daily Supporting Operations**			*$2.07*	**$3,794,000**	
332.501	S	***Haul Roads***					
332.502	S	Rebuild Haul Roads/Season	5	ea	$35,000	$175,000	
332.503	S	Haul Road Maintenance	1	lot	$0	$0	covered above
332.504	S	***Security***					
332.505	S	Gate Watchman	4,500	hr	$20.00	$90,000	
332.506	S	Night Watchman	4,500	hr	$23.00	$103,500	
332.507	S	***Water Treatment Plant O&M***					
332.508	S	Plant Operator + PT Labor (1.5) day shift	6,750	hr	$50	$337,500	
332.509	S	Plant Power Cost	600	days	$75	$45,000	4 mos/season for 5 seasons at 7 days/week
332.510	S	Plant Maintenance/Chemicals, etc.	600	days	$50	$30,000	<ditto>
332.511	S	***Dewatering System O&M***					
332.512	P	Pump Maintenance Labor (1)	600	days	$520	$312,000	4 mos/season for 5 seasons at 7 days/week
332.513	P	Pump Maintenance (Matls/Equip/Vendor)	500	days	$100	$50,000	pull/repair/replace submersible pumps - 64 pumps at 5 days/week
332.514	P	Pump Power Cost	600	days	$960	$576,000	say 3 gal/hr x 20 hrs/day x 4 gensets = 240 gals/day
332.515	P	***Pipeline Maintenance***					
332.516	P	Inspect/Repair Bypass Piping	83	wks	$950	$79,167	say 1 days/week for 8 hrs for 2 people + parts at $150/week
333.516	P	***Traffic Controls***					
333.517	P	Haul Road Flaggers/Truck Safety	500	days	$3,000	$1,500,000	say 2 flaggers/ shift
333.518	P	***Light Plants***					
333.519	P	Light Plant Maintenance	83	days	$550	$45,833	say 1 day/week for 8 hrs for 2 people to service lights/gensets
333.520	P	Light Plant Power	500	days	$400	$200,000	say 3 gal/hr x 8 hrs/day x 4 gensets = 100 gals/day
333.521	S	***Helicopter Support***					
333.522	S	All required to support remote operations	1	lot	$250,000	$250,000	initial mobilization + on-going
336.100		**Restorations**			*$0.34*	**$614,091**	
336.101	P	***Remove/Restore Haul Road Areas***					
336.102	P	Remove Lake Perimeter Haul Road	1.48	mi	$50,000	$73,864	from Section C-C to SDS, push temporary embankments out of stream bed
336.103	P	Remove SDS Access Road	0.85	mi	$100,000	$85,227	steep switchback section from base to top of SDS, scarify, grade
336.104	P	***Restore Staging Areas***					
336.105	P	Restore Temporary Staging Area at Base of SDS	8	ac	$5,000	$40,000	scarify, grade, contour
336.106	P	Reduce Staging Area at Ramp	1	ls	$15,000	$15,000	<ditto>
336.107	P	***River/Channel Restoration***					
336.108	P	Remove Debris/Grade	8,000	lf	$25.00	$200,000	minor grading, no natural habitat restoration, see allowances
336.109	P	***Other Restoration Work***	1	lot	$200,000	$200,000	

California American Water
Los Padres Dam
Sediment Removal Study
Alternative 1 - Full Wet/Dry Sediment Removal to U/S Disposal Site

Opinion of Probable Program Costs

Currency: USD-United States-DECEMBER 2012 Dollar

Total Estimated Sediment Qty = 2,030,000 cys (2012)	*$33.88*	Grand Total Price: $ 62,000,000	**Construction**
Alternative Removal Qty = 1,830,000 cys	*$48.13*	Grand Total Price: $ 90,000,000	**Program (w/ Contingency)**

FERC #	P S	Description	Quantity	UOM	Unit Price	Total Price	Comments
1.000		**Allowances**					
1.100		**Undefined Scope Items**				**$3,410,000**	
1.101	P	Environmental Mitigations / Fish Habitat Restoration	1	ls	5.0%	$2,000,000	Scope TDB, temporary works & habitat restoration, EIS, NEPA
1.102	P	Restore/Conceal to Natural & Mitigate Hazards	1	ls	2.5%	$1,000,000	scope TDB, restore to natl look, disguise construction works
1.103	P	SDS D/S Bank Erosion Controls	1	ls	1.0%	$410,000	Scope TBD, v-ditches, contouring, plantings, benching, etc.
2.000		**Mobilization/Plant Erection Expenses**				**$500,000**	
2.101	P	Mobe/Demobe Marine Fleet	5	ea	$10,000	$50,000	10 loads, on-site storage during off-season period for floats
2.102	P	Assemble Marine Fleet/Conveyors	5	ea	$44,000	$220,000	say 2 weeks for 8 staff + equip + misc
2.103	P	Disassemble Marine Spread	5	ea	$22,000	$110,000	at 50%
2.104	P	Mobe/Demobe Rolling Equipment	4	ea	$30,000	$120,000	20 loads
					Running Subtotal:	**$44,479,740**	
3.000		**General Condition Expenses**				**$2,840,000**	
3.101	P	Contractor General Conditions (Prime)	1	ls	6%	$2,670,000	misc field indirects, work plans, QC, supervision, prediems
3.102	S	Contractor General Conditions (Subcontractor)	1	ls	6%	$170,000	<ditto>
4.000		**Parametric Contingency**				**$1,300,000**	
4.101	P	Unlisted Items Allowance	1	ls	3.0%	$1,300,000	known, but not priced, misc details, estimating accuracy
					Running Subtotal:	**$48,620,000**	
		Markups				**$13,843,000**	
1	S	Subcontractor Markups	1	ls	15.0%	**$454,000**	Incl above, H/O Overheads, Job Fee & Risk, insur, bond
2	P	Prime Contractor OH&P on Subs	1	ls	4.0%	**$139,000**	Incl above, Oversight + Risk
3	P	Prime Contractor OH&P on Self-Perform	1	ls	11.0%	**$5,015,000**	Incl above, Job Fee + Risk
4	P	Prime Contractor Insurance Program	1	ls	2.0%	**$1,085,000**	Incl above, Performance/Payments Bonds, GL, & Bldr's Risk
5	P	State Sales Taxes	1	ls	8.8%	**$1,597,000**	Incl above, CA Sales Tax on 33%
6	P	Escalation	1	ls	8.0%	**$4,553,000**	Escalation during constr period only, n= 2.5, i=3%
7	P	Premium, Remote Conditions	1	ls	2.0%	**$1,000,000**	market, productivity allowance, OT
					Running Subtotal:	**$62,000,000**	Total Estimated Constr Costs w/o contingency
				Cost Range:	**$45,000,000**	**$82,000,000**	Per AACE cost estimate guidelines
			MU Factor:	1.275			
		Project Administration & Management				**$28,310,000**	
1	--	Construction Oversight & Mgt	1	ls	4%	**$2,480,000**	Owner's field oversight
2	--	Engineering/EA/Permitting/FERC	1	ls	3%	**$1,930,000**	
3	--	Geotechnical	1	ls	1%	**$620,000**	
4	--	Engineering During Construction	1	ls	1%	**$640,000**	
5	--	Misc Owner's Soft Costs (All)	1	ls	6%	**$3,980,000**	Owner's allowance for PM/oversight/legal, etc.
6	--	Land Acquisition	1	ls	0%	**$0**	n/a
7	--	Scope Contingency/Market Conditions	1	ls	15%	**$10,560,000**	Scope definition/market allowance/estimating accuracy
8	--	Interest During Construction	1	ls	0%	**$0**	Excluded, Owner's allowance for financing costs
9	--	Management Reserve	1	ls	10%	**$8,100,000**	Owner's allowance for changed field conditions
				1.4516	**Grand Total:**	**$90,000,000**	Total Estimated Constr Costs w/ Contingency
				Cost Range:	**$60,000,000**	**$107,000,000**	Per AACE cost estimate guidelines
					Total Contingency:	**$19,000,000**	21%

Assumptions

1) The project can be contracted to local contractors despite the long-term execution and short season constraints.
2) The contracting strategy will realize competition with either a single multi-year contract or individual yearly contracts.
3) Air pollution restrictions will be mitigated with usage of newer modified equipment.
4) Limited staging/decant space can be optimized to support concurrent dry/wet operations.
5) Sediment will not be processed or optimized for commercial uses.
6) "Dry" sediment does not require decanting prior to load-out operations (dewatering wells will suffice).
7) "Wet" sediment will decant rapidly to support a continuous operation and limited staging space constraints.

MWH **JLL**
Walnut Creek 12/20/2012

California American Water
Los Padres Dam
Sediment Removal Study
Alternative 1 - Full Wet/Dry Sediment Removal to U/S Disposal Site

Opinion of Probable Program Costs

Currency: USD-United States-DECEMBER 2012 Dollar

Total Estimated Sediment Qty = 2,030,000 cys (2012)			*$33.88*	Grand Total Price:	$ 62,000,000	**Construction**	
Alternative Removal Qty = 1,830,000 cys			*$48.13*	Grand Total Price:	$ 90,000,000	**Program (w/ Contingency)**	

FERC #	P S	Description	Quantity	UOM	Unit Price	Total Price	Comments

Exclusions:

1) Cost escalation from pricing date (12/2012) to project NTP (period unknown).
2) Unknown Agency fees or mitigations.
3) Allowances for unknown or newly developed regulations.
4) Allowance for water supply impacts due to any disruption issues.
5) Incremental annual (~15-25 ac-ft/yr) sediment deposited in reservoir post the pricing date of this cost estimate.

Standard Qifications:

1) This OPCC is classified as a Class 5 cost estimate per AACE guidelines. Stated accuracy range = -25% to + 35%
2) Pricing basis = 4th Qtr 2012, escalation to midpoint of construction is partially included
3) P=Prime, S=Subcontractor
4) Pricing assumes competitive market conditions at time of tender (+3 bidders/trade).
5) Owner soft costs and project management expenses included.
6) Capital spare parts included.
7) Special Inspections not included.
8) Permit Fees excluded

OPCC Disclaimer

The client hereby acknowledges that MWH has no control over the costs of labor, materials, competitive bidding environments, unidentified field conditions, financial and/or commodity market conditions, or any other factors likely to affect the OPCC of this project, all of which are and will unavoidably remain in a state of change, especially in light of high market volatility attributable to Acts of God and other market forces or events beyond the control of the parties. As such, Client recognizes that this OPCC deliverable is based on normal market conditions, defined by stable resource supply/demand relationships, and does not account for extreme inflationary or deflationary market cycles. Client further acknowledges that this OPCC is a "snapshot in time" and that the reliability of this OPCC will degrade over time. Client agrees that MWH cannot and does not make any warranty, promise, guarantee or representation, either express or implied that proposals, bids, project construction costs, or cost of O&M functions will not vary significantly from MWH's good faith **Class 5** OPCC

AACE International CLASS 5 Cost Estimate – Class 5 estimates are generally prepared based on very limited information, and subsequently have wide accuracy ranges. Typically, engineering is from 2% to 10% complete. They are often prepared for strategic planning purposes, market studies, assessment of viability, project location studies, and long range capital planning. Virtually all Class 5 estimates use stochastic estimating methods such as cost curves, capacity factors, and other parametric techniques. Expected accuracy ranges are from –20% to –50% on the low side and +30% to 100% on the high side, depending on technological complexity of the project, appropriate reference information, and the inclusion of an appropriate contingency determination. Ranges could exceed those shown in unusual circumstances. As little as 1 hr or less to perhaps more than 200 hours may be spent preparing the estimate based on the project and estimating methodology

California American Water
Los Padres Dam
Sediment Removal Study
Alternative 2 - Partial Dry Sediment Removal to U/S Disposal Site

Opinion of Probable Program Costs

Currency: USD-United States-DECEMBER 2012 Dollar

Total Estimated Sediment Qty = 2,030,000 cys (2012)	*$39.51*	Grand Total Price: $ 32,000,000	**Construction**
Alternative Removal Qty = 800k-900k cys	*$55.29*	Grand Total Price: $ 47,000,000	**Program (w/ Contingency)**

FERC #	P S	Description	Quantity	UOM	Unit Price	Total Price	Comments
330.000		**Land & Rights**					n/a
331.000		**Powerhouse**					n/a
332.000		**Reservoirs, Dams & Waterways**					
332.100		**Temporary Works/Constructability**				**$2,265,875**	
332.101	P	***Prep D/S Staging & Contractors Yard Areas***	1	ls	$15,000	$15,000	Level/base area near entrance gate for trailers, eqp laydown, WTP, etc.
332.102	P	***Upgrade (e) Spillway Bridge***					
332.103	P	Fortify Bridge to Support Construction Operations	1	ls	$35,000	$35,000	allowance for misc improvements
332.104	P	***Improve (e) Jeep Trail & Dam Crest Road (4,000')***			*$140,000*		widen existing road to support construction traffic
332.105	P	Tree Removal	30	ea	$400	$12,000	clear 20', say 25 trees/ac, for3,000'
332.106	P	Import Fill	9,000	cys	$7.50	$67,500	import from downstream borrow area near staging area
332.107	P	Grade/Compact Road	14,000	sys	$2.00	$28,000	
332.108	P	Switchback Section to New SDS Access Road	1	ls	$225,000	$225,000	drop 80+ to lake perimeter at 1040'
332.109	P	***Build New Access Road to U/S Sediment Disposal Site (SDS)***			*$270,000*		7800'
332.110	P	Heavy Clearing	6.3	ac	$10,000	$62,672	remove trees/boulders, etc.
332.111	P	Cut->Fill Operations	10,000	cys	$4.00	$40,000	
332.112	P	Place Embankment Fill -5'	35,000	cys	$6.00	$210,000	excavate river sediment for haul road section
332.113	P	Grade/Compact Road	23,000	sys	$1.50	$34,500	
332.114	P	Rip Rap Protection	1,000	cys	$20	$20,000	sort/haul & place river materials to protect embankment section
332.115	P	Other Erosion Controls/Culverts	1	ls	$30,000	$30,000	
332.116	P	***Build New Access Road from Base to Top of SDS***			*$470,000*		4500', switchback road
332.117	P	Heavy Clearing	3.6	ac	$15,000	$54,236	remove trees/boulders, etc., chip wood debris
332.118	P	Cut->Fill Operations	20,000	cys	$8.00	$160,000	
332.119	P	Place Embankment Fill -5'	10,000	cys	$12.00	$120,000	excavate river sediment for haul road section
332.120	P	Grade/Compact Road	12,000	sys	$1.50	$18,000	
332.121	P	Rip Rap Protection	1,000	cys	$20	$20,000	sort/haul & place river materials to protect embankment section
332.122	P	Other Erosion Controls/Culverts	1	ls	$25,000	$25,000	
332.123	P	***Build New Temporary Staging Area at Base of SDS***					
332.124	P	Heavy Clearing	8.0	ac	$12,000	$96,000	remove trees/boulders, etc., chip wood debris
332.125	P	Cut->Fill Operations	5,000	cys	$5.00	$25,000	
332.126	P	Place Embankment Fill -5'	5,000	cys	$6.00	$30,000	excavate river sediment for haul road section
332.127	P	Rip Rap Protection	500	cys	$20	$10,000	
332.128	P	Other Erosion Controls/Culverts	1	ls	$25,000	$25,000	
332.129	P	***Provide Steep Slope Clearing at SDS***					
332.130	P	Heavy Clearing	9	ac	$10,000	$90,000	
332.131	P	***Clear/Prep Temporary Sediment Decant Areas***					
332.132	P	Medium Clearing	6	ac	$5,000	$30,000	remove trees/boulders, etc., chip wood debris
332.133	P	***Perform General Reservoir Clearing***					
332.134	P	Heavy Clearing	9	ac	$7,500	$68,871	remove trees/boulders, etc., chip wood debris
332.135	P	Medium Clearing	9	ac	$6,000	$55,096	<ditto>
332.136	P	***Excavate SDS Foundation***					
332.137	P	Heavy Clearing	1.7	ac	$10,000	$17,000	remove trees/boulders, etc., chip wood debris
332.138	P	Excavate Foundation	55,000	cys	$4.00	$220,000	transport to temporary staging area, <750'
332.139	P	Install 3-6" Perf Drain Pipe	4,000	lf	$18.00	$72,000	
332.140	P	***Other Temporary Works/Access Considerations***	1	lot	$350,000	$350,000	ramps into and out of excavation zones
332.200		**Water Diversion/Controls**				**$5,024,200**	
332.200	P	***Upstream Diversion Cofferdam***					
332.201	P	Install Sheet piles/Earthen Berm Cofferdam	1	ls	$64,000	$64,000	100'x20'=2000sf = 2-100' x10' dirt berms
332.202	P	Seasonal Breach of Diversion Cofferdam	4	ea	$10,000	$40,000	pull piles, breach Berm
332.203	P	Seasonal Rebuild of Diversion Cofferdam	4	ea	$15,000	$60,000	install piles. Rebuild berm
332.204	P	Remove Diversion Cofferdam	1	ls	$10,000	$10,000	
332.205	P	***Carmel River Bypass Piping***					
332.206	P	Install 18" HDPE Pipeline at Access Road Section	13,200	lf	$126	$1,663,200	a/g installation with quick couplers
332.207	S	Repair 18" HDPE Pipeline for Reuse	10,560	lf	$90	$950,400	say 20% gets rebuilt each season x four seasons
332.208	S	Remove 18" HDPE Pipeline	13,200	lf	$18	$237,600	
332.209	P	***Dewatering Wells***					
332.210	S	Install Perimeter Sediment Dewatering Wells	64	ea	$10,000	$640,000	50' deep
332.211	P	Manifold Piping - 8"	3,000	lf	$64	$192,000	
332.212	P	Drain Piping to Reservoir - 8"	1,000	lf	$48	$48,000	
332.213	P	Repair Piping for Reuse	2,250	lf	$48	$108,000	say 25% gets rebuilt each season x four seasons
332.214	P	Remove Manifold/Drain Piping	3,000	lf	$12	$36,000	
332.215	P	***Water Treatment Plant***					
332.216	P	Rent Package Filtration/Settling Plant	16	mo	$25,000	$400,000	4 seasons x 3 mos, Rain-for-Rent system
332.217	P	Erect/Commission WTP Plant	5	ea	$25,000	$125,000	/ season
332.218	P	De-erect/Demobe WTP to Storage/Salvage	5	ea	$20,000	$100,000	<ditto>
332.219	P	***Other Water Controls or Dewatering***	1	lot	$350,000	$350,000	mitigate deeper wet excavations
332.300		**Dry Sediment Removal**			*$11.95*	**$9,681,288**	

California American Water
Los Padres Dam
Sediment Removal Study
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Alternative Removal Qty = 800k-900k cys	*$55.29*	Grand Total Price:	$ 47,000,000	**Program (w/ Contingency)**

FERC #	P S	Description	Quantity	UOM	Unit Price	Total Price	Comments
332.301	P	*-The lake level needs to be below 1000' to support access and dry removal operations*					
332.302	P	*-Assumed construction season: August 1st to Oct 1st*					
332.303	P	*-Winterize/demobe from reservoir: Oct 2nd to Oct 15th*					
332.304	P	*-Assume two 10-hr shifts/day at 6 days/week, Sunday = equipment maintenance*					
332.305	P	*-Number of production days: 2 mos/season or 50 days*					
332.306	P	*-Assume 50 mins/hr for crew efficiency*					
332.307	P	*-Assume 250 cy/hr for the day shift and 200 cys/hr for the night shift*					
332.308	P	*-Production/day = 4,500 cys (day + night)*					
332.309	P	*-Assumed sediment removal total quantity = 900,000 cys*					
332.310	P	*-Assumed sediment removal efficiency = 90% to 100%*					
332.311	P	*-Number of days/seasons required: 200 days or 4 seasons or 4,000 hrs (4sx2mx25dx20h)*					
332.312	P	*-Assumed haul distance to SDS = 9,000' or 1.7 miles, truck cycle = 20 mins at 20 cys/load, # of trucks = 5*					
332.313	P						
332.314	P	***Dry Excavation/Haul/Disposal Operation***			*$9.00*		
332.315	P	Cat 380 Excavator (1)	4,000	hr	$75.00	$300,000	at excavation site, 4sx50dx20h
332.316	P	Cat 633 Scraper (2)	4,000	hr	$65.00	$260,000	haul to surge pile, , 1,000' haul
332.317	P	Cat D8 Dozer (1)	4,000	hr	$65.00	$260,000	at surge pile
332.318	P	Cat 980 Loader (1)	4,000	hr	$50.00	$200,000	at surge pile
332.319	P	Volvo Off-Hwy 26 tn Articulated Trucks (5)	20,000	hr	$56.00	$1,120,000	haul to temporary staging area or SDS
332.320	P	Cat 140G Blade at Haul Road (1/2 time)	2,000	hr	$50.00	$100,000	maintain haul roads
332.321	P	4000 Gal Water Truck (1/2 time)	2,000	hr	$42.00	$84,000	dust control
332.322	P	Cat 825 Compactor (1)	4,000	hr	$52.00	$208,000	at SDS
332.323	P	Cat D7 Dozer (1)	4,000	hr	$65.00	$260,000	at SDS
332.324	P	Operator (7.5)	30,000	hr	$55.00	$1,650,000	
332.325	P	Truck Driver (5.5)	22,000	hr	$52.00	$1,144,000	
332.326	P	Laborer/Load Spotter (2)	8,000	hr	$49.00	$392,000	
332.327	P	Equipment Fueling/Oil Service Truck	2,000	hr	$21.00	$42,000	day shift only
332.328	P	Master Mechanic	2,000	hr	$56.00	$112,000	<ditto>
332.329	P	FOG Allowance	48,000	hr	$15.00	$720,000	2-5 gal/hr avg
332.330	P	Lights/Portable Gensets	2,000	hr	$15.00	$30,000	
332.331	P	Dewatering Equipment	4,000	hr	$15.00	$60,000	trash pumps/hoses
332.332	P	Pickup Trucks (2)	8,000	hr	$13.00	$104,000	
332.333	P	Crew Foreman	4,000	hr	$60.00	$240,000	
332.334	P						
332.335	P	***Soil Cement Stabilization Operation***					
332.336	P	*-Assume a continuous pug mill or in-place mixing operation*					
332.337	P	*-Fdn qty = 50,000 cys + 300,000 cys for the block = 350,000 cys at 110 pcf*					
332.338	P	*-Assume 3% by weight PC Type IP as the re-agent =*	578	tn			
332.339	P	*-Assume day shift only, 350,000 cys at (3 seasons) or 2,500 hrs (3sx3mx26x10) or 140 cys/hr or 1,400 day*					
332.340	P				*$4.61*		
332.341	P	In-place Soil/Cement Mixers (2)	5,000	hr	$75.00	$375,000	Bomag
332.342	P	Cat 140G Blade (1/2 time)	1,250	hr	$50.00	$62,500	
332.343	P	Pneumatic Rollers (2)	5,000	hr	$43.00	$215,000	
332.344	P	4000 Gal Water Truck (1/2 time)	1,250	hr	$42.00	$52,500	
332.345	P	Operator (4.5)	11,250	hr	$55.00	$618,750	
332.346	P	Laborer (4)	10,000	hr	$49.00	$490,000	cement addition
332.347	P	Truck Driver (1)	2,500	hr	$52.00	$130,000	
332.348	P	Purchase Cement	635	tn	$150.00	$95,288	
332.349	P	Pickup Trucks (1)	1,250	hr	$13.00	$16,250	
332.350	P	Crew Foreman	2,500	hr	$56.00	$140,000	
332.351	P	Cement Delivery Logistics	1	lot	$200,000	$200,000	silo, in-line pneumatic pumps, hoses, spreader scheme
332.500		**Daily Supporting Operations**			*$1.65*	**$3,020,200**	
332.501	S	***Haul Roads***					
332.502	S	Rebuild Haul Roads/Season	3	ea	$35,000	$105,000	
332.503	S	Haul Road Maintenance	1	lot	$0	$0	covered above
332.504	S	***Security***					
332.505	S	Gate Watchman	3,600	hr	$20.00	$72,000	
332.506	S	Night Watchman	3,600	hr	$23.00	$82,800	
332.507	S	***Water Treatment Plant O&M***					
332.508	S	Plant Operator + PT Labor (1.5) day shift	5,400	hr	$50	$270,000	
332.509	S	Plant Power Cost	480	days	$75	$36,000	4 mos/season for 4 seasons at 7 days/week
332.510	S	Plant Maintenance/Chemicals, etc.	480	days	$50	$24,000	<ditto>
332.511	S	***Dewatering System O&M***					
332.512	P	Pump Maintenance Labor (1)	480	days	$520	$249,600	4 mos/season for 4 seasons at 7 days/week
332.513	P	Pump Maintenance (Matls/Equip/Vendor)	400	days	$100	$40,000	pull/repair/replace submersible pumps - 64 pumps at 5 days/week
332.514	P	Pump Power Cost	480	days	$960	$460,800	say 3 gal/hr x 20 hrs/day x 4 gensets = 240 gals/day
332.515	P	***Pipeline Maintenance***					

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California American Water
Los Padres Dam
Sediment Removal Study
Alternative 2 - Partial Dry Sediment Removal to U/S Disposal Site

Opinion of Probable Program Costs

Currency: USD-United States-DECEMBER 2012 Dollar

Total Estimated Sediment Qty = 2,030,000 cys (2012)			*$39.51*	Grand Total Price:	$ 32,000,000	**Construction**	
Alternative Removal Qty = 800k-900k cys			*$55.29*	Grand Total Price:	$ 47,000,000	**Program (w/ Contingency)**	

FERC #	P S	Description	Quantity	UOM	Unit Price	Total Price	Comments
332.516	P	Inspect/Repair Bypass Piping	80	days	$950	$76,000	say 1 day/week for 8 hrs for 2 people + parts at $150/week
333.516	P	***Traffic Controls***					
333.517	P	Haul Road Flaggers/Truck Safety	400	days	$3,000	$1,200,000	say 2 flaggers/ shift
333.518	P	***Light Plants***					
333.519	P	Light Plant Maintenance	80	days	$550	$44,000	say 1 day/week for 8 hrs for 2 people to service lights/gensets
333.520	P	Light Plant Power	400	days	$400	$160,000	say 3 gal/hr x 8 hrs/day x 4 gensets = 100 gals/day
333.521	S	***Helicopter Support***					
333.522	S	All required to support remote operations	1	lot	$200,000	$200,000	initial mobilization + on-going
336.100		**Restorations**			*$0.32*	**$593,864**	
336.101	P	***Remove/Restore Haul Road Areas***					
336.102	P	Remove Lake Perimeter Haul Road	1.48	mi	$50,000	$73,864	from Section C-C to SDS, push temporary embankments out of stream bed
336.103	P	Remove SDS Access Road	0.65	mi	$100,000	$65,000	steep switchback section from base to top of SDS, scarify, grade
336.104	P	***Restore Staging Areas***					
336.105	P	Restore Temporary Staging Area at Base of SDS	8	ac	$5,000	$40,000	scarify, grade, contour
336.106	P	Reduce Staging Area at Ramp	1	ls	$15,000	$15,000	<ditto>
336.107	P	***River/Channel Restoration***					
336.108	P	Remove Debris/Grade	8,000	lf	$25.00	$200,000	minor grading, no natural habitat restoration, see allowances
336.109	P	***Other Restoration Work***	1	lot	$200,000	$200,000	
1.000		**Allowances**					
1.100		**Undefined Scope Items**				**$1,710,000**	
1.101	P	Environmental Mitigations / Fish Habitat Restoration	1	ls	5.0%	$1,000,000	Scope TDB, temporary works & habitat restoration, EIS, NEPA
1.102	P	Restore/Conceal to Natural & Mitigate Hazards	1	ls	2.5%	$500,000	scope TDB, restore to natl look, disguise construction works
1.103	P	SDS D/S Bank Erosion Controls	1	ls	1.0%	$210,000	Scope TBD, v-ditches, contouring, plantings, benching, etc.
2.000		**Mobilization/Plant Erection Expenses**				**$120,000**	
2.101	P	Mobe/Demobe Rolling Equipment	4	ea	$30,000	$120,000	20 loads
					Running Subtotal:	**$22,415,430**	
3.000		**General Condition Expenses**				**$1,500,000**	
3.101	P	Contractor General Conditions (Prime)	1	ls	6%	$1,340,000	misc field indirects, work plans, QC, supervision, prediems
3.102	S	Contractor General Conditions (Subcontractor)	1	ls	6%	$160,000	<ditto>
4.000		**Parametric Contingency**				**$700,000**	
4.101	P	Unlisted Items Allowance	1	ls	3.0%	$700,000	known, but not priced, misc details, estimating accuracy
					Running Subtotal:	**$24,620,000**	
		Markups				**$7,124,000**	
1	S	Subcontractor Markups	1	ls	15.0%	**$417,000**	Incl above, H/O Overheads, Job Fee & Risk, insur, bond
2	P	Prime Contractor OH&P on Subs	1	ls	4.0%	**$128,000**	Incl above, Oversight + Risk
3	P	Prime Contractor OH&P on Self-Perform	1	ls	11.0%	**$2,402,000**	Incl above, Job Fee + Risk
4	P	Prime Contractor Insurance Program	1	ls	2.0%	**$551,000**	Incl above, Performance/Payments Bonds, GL, & Bldr's Risk
5	P	State Sales Taxes	1	ls	8.8%	**$812,000**	Incl above, CA Sales Tax on 33%
6	P	Escalation	1	ls	8.0%	**$2,314,000**	Escalation during constr period only, n= 2.5, i=3%
7	P	Premium, Remote Conditions	1	ls	2.0%	**$500,000**	market, productivity allowance, OT
					Running Subtotal:	**$32,000,000**	Total Estimated Constr Costs w/o contingency
				Cost Range:	**$23,000,000**	**$42,000,000**	Per AACE cost estimate guidelines
			MU Factor:	1.300			
		Project Administration & Management				**$14,620,000**	
1	--	Construction Oversight & Mgt	1	ls	4%	**$1,280,000**	Owner's field oversight
2	--	Engineering/EA/Permitting/FERC	1	ls	3%	**$1,000,000**	
3	--	Geotechnical	1	ls	1%	**$320,000**	
4	--	Engineering During Construction	1	ls	1%	**$330,000**	
5	--	Misc Owner's Soft Costs (All)	1	ls	6%	**$2,060,000**	Owner's allowance for PM/oversight/legal, etc.
6	--	Land Acquisition	1	ls	0%	**$0**	n/a
7	--	Scope Contingency/Market Conditions	1	ls	15%	**$5,450,000**	Scope definition/market allowance/estimating accuracy
8	--	Interest During Construction	1	ls	0%	**$0**	Excluded, Owner's allowance for financing costs
9	--	Management Reserve	1	ls	10%	**$4,180,000**	Owner's allowance for changed field conditions
				1.4688	**Grand Total:**	**$47,000,000**	Total Estimated Constr Costs w/ Contingency

California American Water
Los Padres Dam
Sediment Removal Study

Alternative 2 - Partial Dry Sediment Removal to U/S Disposal Site

Opinion of Probable Program Costs

Currency: USD-United States-DECEMBER 2012 Dollar

Total Estimated Sediment Qty = 2,030,000 cys (2012)			*$39.51*		Grand Total Price:	$ 32,000,000	**Construction**
Alternative Removal Qty = 800k-900k cys			*$55.29*		Grand Total Price:	$ 47,000,000	**Program (w/ Contingency)**
FERC #	**P S**	**Description**	**Quantity**	**UOM**	**Unit Price**	**Total Price**	**Comments**
				Cost Range:	**$31,000,000**	**$56,000,000**	Per AACE cost estimate guidelines
					Total Contingency:	**$10,000,000**	21%

Assumptions

1) The project can be contracted to local contractors despite the long-term execution and short season constraints.
2) The contracting strategy will realize competition with either a single multi-year contract or individual yearly contracts.
3) Air pollution restrictions will be mitigated with usage of newer modified equipment.
4) Limited staging/decant space can be optimized to support concurrent dry/wet operations.
5) Sediment will not be processed or optimized for commercial uses.
6) "Dry" sediment does not require decanting prior to load-out operations (dewatering wells will suffice).
7) "Wet" sediment will decant rapidly to support a continuous operation and limited staging space constraints.

Exclusions:

1) Cost escalation from pricing date (12/2012) to project NTP (period unknown).
2) Unknown Agency fees or mitigations.
3) Allowances for unknown or newly developed regulations.
4) Allowance for water supply impacts due to any disruption issues.
5) Incremental annual (~15-25 ac-ft/yr) sediment deposited in reservoir post the pricing date of this cost estimate.

Standard Qifications:

1) This OPCC is classified as a Class 5 cost estimate per AACE guidelines. Stated accuracy range = -25% to + 35%
2) Pricing basis = 4th Qtr 2012, escalation to midpoint of construction is partially included
3) P=Prime, S=Subcontractor
4) Pricing assumes competitive market conditions at time of tender (+3 bidders/trade).
5) Owner soft costs and project management expenses included.
6) Capital spare parts included.
7) Special Inspections not included.
8) Permit Fees excluded

OPCC Disclaimer

The client hereby acknowledges that MWH has no control over the costs of labor, materials, competitive bidding environments, unidentified field conditions, financial and/or commodity market conditions, or any other factors likely to affect the OPCC of this project, all of which are and will unavoidably remain in a state of change, especially in light of high market volatility attributable to Acts of God and other market forces or events beyond the control of the parties. As such, Client recognizes that this OPCC deliverable is based on normal market conditions, defined by stable resource supply/demand relationships, and does not account for extreme inflationary or deflationary market cycles. Client further acknowledges that this OPCC is a "snapshot in time" and that the reliability of this OPCC will degrade over time. Client agrees that MWH cannot and does not make any warranty, promise, guarantee or representation, either express or implied that proposals, bids, project construction costs, or cost of O&M functions will not vary significantly from MWH's good faith **Class 5** OPCC

AACE International CLASS 5 Cost Estimate – Class 5 estimates are generally prepared based on very limited information, and subsequently have wide accuracy ranges. Typically, engineering is from 2% to 10% complete. They are often prepared for strategic planning purposes, market studies, assessment of viability, project location studies, and long range capital planning. Virtually all Class 5 estimates use stochastic estimating methods such as cost curves, capacity factors, and other parametric techniques. Expected accuracy ranges are from –20% to –50% on the low side and +30% to 100% on the high side, depending on technological complexity of the project, appropriate reference information, and the inclusion of an appropriate contingency determination. Ranges could exceed those shown in unusual circumstances. As little as 1 hr or less to perhaps more than 200 hours may be spent preparing the estimate based on the project and estimating methodology

California American Water

Los Padres Dam

Sediment Removal Study

Alternative 3 - Partial Wet Sediment Removal to D/S Disposal Site

Opinion of Probable Program Costs

Currency: USD-United States-DECEMBER 2012 Dollar

Total Estimated Sediment Qty = 2,030,000 cys (2012) — *$37.78* — Grand Total Price: **$ 34,000,000** — **Construction**

Alternative Removal Qty = 900,000 cys — *$55.56* — Grand Total Price: **$ 50,000,000** — **Program (w/ Contingency)**

FERC #	P S	Description	Quantity	UOM	Unit Price	Total Price	Comments
330.000		**Land & Rights**					n/a
331.000		**Powerhouse**					n/a
332.000		**Reservoirs, Dams & Waterways**					
332.100		**Temporary Works/Constructability**				**$2,040,500**	
332.101	P	***Prep D/S Staging & Contractors Yard Areas***	1	ls	$15,000	$15,000	Level/base area near entrance gate for trailers, eqp laydown, WTP, etc.
332.102	P	***Upgrade (e) Spillway Bridge***					
332.103	P	Re-build Bridge to Support Construction Operations	1	ls	$250,000	$250,000	allowance for misc improvements
332.104	P	***Improve (e) Jeep Trail & Dam Crest Road (3,200')***			*$190,000*		widen existing road to support construction traffic
332.105	P	Tree Removal	30	ea	$400	$12,000	clear 20', say 25 trees/ac, for3,000'
332.106	P	Import Fill	15,000	cys	$7.50	$112,500	import from downstream borrow area near staging area
332.107	P	Grade/Compact Road	11,000	sys	$2.00	$22,000	
332.108	P	Switchback Section Down Hill at Decant	1	ls	$125,000	$125,000	drop 80+ to lake perimeter at 1040'
332.109	P	***Build New Temporary Decant Area***					
332.110	P	Heavy Clearing	11.0	ac	$12,000	$132,000	remove trees/boulders, etc.
332.111	P	Cut->Fill Operations	110,000	cys	$5.00	$550,000	
332.112	P	Rip Rap Protection	1,500	cys	$20	$30,000	
332.113	P	Other Erosion Controls/Culverts	1	ls	$25,000	$25,000	
332.114	P	***Improve Ramp Area into Reservoir***					
332.115	P	All Required to Support Dredging Operations	1	ls	$50,000	$50,000	build a bigger landing/material staging area at base of spillway
332.116	P	***Excavate SDS Foundation***					
332.117	P	Heavy Clearing	3.1	ac	$10,000	$31,000	remove trees/boulders, etc.
332.118	P	Excavate Foundation	75,000	cys	$4.00	$300,000	transport to temporary staging area, <750'
332.119	P	Install 3-6" Perf Drain Pipe	2,000	lf	$18.00	$36,000	
332.120	P	***Other Temporary Works/Access Considerations***	1	lot	$350,000	$350,000	ramps into and out of excavation zones
332.200		**Water Diversion/Controls**				**$875,000**	
332.201	P	***Water Treatment Plant***					
332.202	P	Rent Package Filtration/Settling Plant	16	mo	$25,000	$400,000	4 seasons x 3 mos, Rain-for-Rent system
332.203	P	Erect/Commission WTP Plant	5	ea	$25,000	$125,000	/ season
332.204	P	De-erect/Demobe WTP to Storage/Salvage	5	ea	$20,000	$100,000	<ditto>
332.205	P	***Other Water Controls or Dewatering***	1	lot	$250,000	$250,000	mitigate deeper wet excavations
332.300		**Wet Sediment Removal**			*$16.84*	**$17,174,060**	
332.301	P	*-Lake level below 1020' to facilitate access and wet removal operations*					
332.302	P	*-Assumed construction season: July 1st to Oct 1st*					
332.303	P	*-Winterize/demobe from reservoir: Oct 2nd to Oct 15th*					
332.304	P	*-Assume two 10-hr shifts/day at 6 days/week, Sunday = equipment maintenance*					
332.305	P	*-Number of production available days / season: 3 mos or 75 days*					
332.306	P	*-Assume 50 mins/hr for crew efficiency*					
332.307	P	*-Assume in-water mechanical clamshell operation loading to a floating conveyor system that transfers sediment to designated temporary U/S decant areas*					
332.308	P	*-Production: assume a 2-3 yard clamshell bucket at 30-45 secs/cycle = say 165 cys/hr (day) and 125 cys/hr (night)/clamshell*					
332.309	P	*-Assume wet dredging during the day only for a two in-water crews*					
332.310	P	*-Use floating material conveyor system with feed hopper on adjacent barge, convey to shore, shore delivery to decant zones, with radial stackers*					
332.311	P	*-Production/day = 2,900 cys/day(day/night combined*					
332.312	P	*-Assumed total sediment removal quantity = 1,200,000 cys*					
332.313	P	*-Assumed sediment removal efficiency = 75% or 900,000 cys (constraint = SDS sizing)*					
332.314	P	*-Number of days/seasons required: 310 days or 4.1 or say 4.5 seasons or 7,000 hrs (4.5sx3mx20hx26d)*					
332.315	P	*-Assume 2500' or 0.50 miles from the decant zone to the SDS*					
332.316	P						
332.317	P	***Excavation/Haul/Disposal Operation***			*$14.68*		
332.318	P	Purchase Floating Material Conveyor System	2,000	lf	$750	$1,500,000	
332.319	P	Purchase Land Based Material Conveyor System	1,500	lf	$500	$750,000	
332.320	P	Purchase On-water Feed Hopper	1	ea	$35,000	$35,000	
332.321	P	Purchase Land Based Radial stackers	2	ea	$75,000	$150,000	
332.322	P	Purchase Flexi-floats (10'x40') Units	10	ea	$24,000	$240,000	1-40'wx30'l and 3-40'wx20'l, say 8 tons/float
332.323	P	Purchase Generators	2	ea	$125,000	$250,000	
332.324	P	Purchase U/W GPS Tracking Unit	1	ea	$25,000	$25,000	hardware + software
332.325	P	Plate Steel for Decking -1/2"	4,800	sf	$29	$139,104	
332.326	P	25-35 Ton Crane (1)	7,000	hr	$110	$770,000	on-water
332.327	P	Clamshell Bucket (1)	7,000	hr	$5	$35,000	
332.328	P	D7 Dozer at Radial Stackers (1)	7,000	hr	$85	$595,000	land based
332.329	P	CAT 330 Excavator (1) or CAT 980 Loader (1)	7,000	hr	$75	$525,000	load trucks from surge pile
332.330	P	Volvo Off-Hwy 26 tn Articulated Trucks (3)	21,000	hr	$56	$1,176,000	50 min/5 mins for dump time = 10 trucks max
332.331	P	Work Boat (1)	7,000	hr	$100	$700,000	transport crews/parts/equip, tow conveyor system
332.332	P	Cat 825 Compactor (1)	7,000	hr	$52.00	$364,000	at SDS
332.333	P	Cat D7 Dozer (1)	7,000	hr	$65.00	$455,000	at SDS
332.334	P	Work Boat Driver (1)	7,000	hr	$58.00	$406,000	
332.335	P	Operator (6)	42,000	hr	$55.00	$2,310,000	

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California American Water
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Sediment Removal Study
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Opinion of Probable Program Costs

Currency: USD-United States-DECEMBER 2012 Dollar

Total Estimated Sediment Qty = 2,030,000 cys (2012)	*$37.78*	Grand Total Price: $ 34,000,000 **Construction**
Alternative Removal Qty = 900,000 cys	*$55.56*	Grand Total Price: $ 50,000,000 **Program (w/ Contingency)**

FERC #	P S	Description	Quantity	UOM	Unit Price	Total Price	Comments
332.336	P	Truck Driver (3)	21,000	hr	$52.00	$1,092,000	
332.337	P	Laborer/Boat Deck Hand (2)	14,000	hr	$49.00	$686,000	
332.338	P	Equipment Fueling/Oil Service Truck (1)	7,000	hr	$21.00	$147,000	
332.339	P	Master Mechanic (1)	7,000	hr	$56.00	$392,000	
332.340	P	FOG Allowance	63,000	hr	$15.00	$945,000	at 2-5 gals/hr + parts
332.341	P	Conveyor Power (2 - 250 kw gensets)	14,000	hr	$15.00	$210,000	
332.342	P	Lights/Portable Gensets	3,500	hr	$15.00	$52,500	
332.343	P	Pickup Trucks (2)	14,000	hr	$13.00	$182,000	
332.344	P	Crew Foreman	14,000	hr	$60.00	$840,000	
332.434	P						
332.435	P	***Soil Cement Stabilization Operation***					
332.436	P	*-Assume a continuous pug mill or in-place mixing operation*					
332.437	P	*-Fdn qty = 75,000 cys + 150,000 cys for the block = 225,000 cys at 110 pcf*					
332.438	P	*-Assume 3% by weight PC Type IP as the re-agent =*	371	tn			
332.439	P	*-Assume day shift only, 225,000 cys at (3 seasons) or 2,400 hrs (3sx3mx26x10) or 100 cys/hr or 1,000 day*					
332.440	P				*$3.30*		
332.441	P	In-place Soil/Cement Mixers (2)	4,800	hr	$75.00	$360,000	Bomag
332.442	P	Cat 140G Blade (1/2 time)	1,200	hr	$100.00	$120,000	
332.443	P	Pneumatic Rollers (2)	4,800	hr	$43.00	$206,400	
332.444	P	4000 Gal Water Truck (1/2 time)	1,200	hr	$52.00	$62,400	
332.445	P	Operator (4.5)	10,800	hr	$55.00	$594,000	
332.446	P	Laborer (4)	9,600	hr	$49.00	$470,400	cement addition
332.447	P	Truck Driver (1)	1,200	hr	$52.00	$62,400	
332.448	P	Purchase Cement	408	tn	$150.00	$61,256	
332.449	P	Pickup Trucks (1)	2,400	hr	$13.00	$31,200	
332.450	P	Crew Foreman	2,400	hr	$56.00	$134,400	
332.451	P	Cement Delivery Logistics	1	lot	$100,000	$100,000	silo, in-line pneumatic pumps, hoses, spreader scheme
332.500		**Daily Supporting Operations**			*$1.39*	**$2,549,900**	
332.501	S	***Haul Roads***					
332.502	S	Rebuild Haul Roads/Season	3	ea	$35,000	$105,000	
332.503	S	Haul Road Maintenance	1	lot	$0	$0	covered above
332.504	S	***Security***					
332.505	S	Gate Watchman	4,050	hr	$20.00	$81,000	
332.506	S	Night Watchman	4,050	hr	$23.00	$93,150	
332.507	S	***Water Treatment Plant O&M***					
332.508	S	Plant Operator + PT Labor (1.5) day shift	6,075	hr	$50	$303,750	
332.509	S	Plant Power Cost	540	days	$75	$40,500	4 mos/season for 5 seasons at 7 days/week
332.510	S	Plant Maintenance/Chemicals, etc.	540	days	$50	$27,000	<ditto>
332.511	P	***Pipeline Maintenance***					
332.512	P	Inspect/Repair Bypass Piping	83	days	$950	$78,850	say 1 days/week for 8 hrs for 2 people + parts at $150/week
332.513	P	***Traffic Controls***					
332.514	P	Haul Road Flaggers/Truck Safety	500	days	$3,000	$1,500,000	say 2 flaggers/ shift
332.515	P	***Light Plants***					
332.516	P	Light Plant Maintenance	83	days	$550	$45,650	say 1 day/week for 8 hrs for 2 people to service lights/gensets
332.517	P	Light Plant Power	500	days	$400	$200,000	say 3 gal/hr x 8 hrs/day x 4 gensets = 100 gals/day
332.518	S	***Helicopter Support***					
332.519	S	All required to support remote operations	1	lot	$75,000	$75,000	initial mobilization + on-going
336.100		**Restorations**			*$0.18*	**$330,000**	
336.101	P	***Remove/Restore Haul Road Areas***					
336.103	P	Remove SDS Access Road	0.60	mi	$100,000	$60,000	steep switchback section from base to top of SDS, scarify, grade
336.104	P	***Restore Staging Areas***					
336.105	P	Restore Temporary Decant Area at Base of SDS	11	ac	$5,000	$55,000	scarify, grade, contour
336.106	P	Reduce Staging Area at Ramp	1	ls	$15,000	$15,000	<ditto>
336.107	P	***River/Channel Restoration***					
336.108	P	Remove Debris/Grade	-	lf	$25.00	$0	minor grading, no natural habitat restoration, see allowances
336.109	P	***Other Restoration Work***	1	lot	$200,000	$200,000	
1.000		**Allowances**					
1.100		**Undefined Scope Items**				**$1,130,000**	
1.101	P	Environmental Mitigations / Fish Habitat Restoration	1	ls	2.5%	$600,000	Scope TDB, temporary works & habitat restoration, EIS, NEPA
1.102	P	Restore/Conceal to Natural & Mitigate Hazards	1	ls	1.5%	$300,000	scope TDB, restore to natl look, disguise construction works
1.103	P	SDS D/S Bank Erosion Controls	1	ls	1.0%	$230,000	Scope TBD, v-ditches, contouring, plantings, benching, etc.
2.000		**Mobilization/Plant Erection Expenses**				**$424,000**	
2.101	P	Mobe/Demobe Marine Fleet	4	ea	$10,000	$40,000	10 loads, on-site storage during off-season period for floats
2.102	P	Assemble Marine Fleet/Conveyors	4	ea	$44,000	$176,000	say 2 weeks for 8 staff + equip + misc

California American Water
Los Padres Dam
Sediment Removal Study
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Opinion of Probable Program Costs

Currency: USD-United States-DECEMBER 2012 Dollar

Total Estimated Sediment Qty = 2,030,000 cys (2012)			*$37.78*		Grand Total Price:	$ 34,000,000	**Construction**	
Alternative Removal Qty = 900,000 cys			*$55.56*		Grand Total Price:	$ 50,000,000	**Program (w/ Contingency)**	

FERC #	P S	Description	Quantity	UOM	Unit Price	Total Price	Comments
2.103	P	Disassemble Marine Spread	4	ea	$22,000	$88,000	at 50%
2.104	P	Mobe/Demobe Rolling Equipment	4	ea	$30,000	$120,000	20 loads
					Running Subtotal:	**$24,523,460**	
3.000		**General Condition Expenses**				**$1,510,000**	
3.101	P	Contractor General Conditions (Prime)	1	ls	6%	$1,470,000	misc field indirects, work plans, QC, supervision, prediems
3.102	S	Contractor General Conditions (Subcontractor)	1	ls	6%	$40,000	<ditto>
4.000		**Parametric Contingency**				**$700,000**	
4.101	P	Unlisted Items Allowance	1	ls	3.0%	$700,000	known, but not priced, misc details, estimating accuracy
					Running Subtotal:	**$26,730,000**	
		Markups				**$7,474,000**	
1	S	Subcontractor Markups	1	ls	15.0%	**$115,000**	Incl above, H/O Overheads, Job Fee & Risk, insur, bond
2	P	Prime Contractor OH&P on Subs	1	ls	4.0%	**$35,000**	Incl above, Oversight + Risk
3	P	Prime Contractor OH&P on Self-Perform	1	ls	11.0%	**$2,856,000**	Incl above, Job Fee + Risk
4	P	Prime Contractor Insurance Program	1	ls	2.0%	**$595,000**	Incl above, Performance/Payments Bonds, GL, & Bldr's Risk
5	P	State Sales Taxes	1	ls	8.8%	**$876,000**	Incl above, CA Sales Tax on 33%
6	P	Escalation	1	ls	8.0%	**$2,497,000**	Escalation during constr period only, n= 2.5, i=3%
7	P	Premium, Remote Conditions	1	ls	2.0%	**$500,000**	market, productivity allowance, OT
					Running Subtotal:	**$34,000,000**	Total Estimated Constr Costs w/o contingency
			Cost Range:		**$25,000,000**	**$45,000,000**	Per AACE cost estimate guidelines
			MU Factor:	1.272			
		Project Administration & Management				**$15,530,000**	
1	--	Construction Oversight & Mgt	1	ls	4%	**$1,360,000**	Owner's field oversight
2	--	Engineering/EA/Permitting/FERC	1	ls	3%	**$1,060,000**	
3	--	Geotechnical	1	ls	1%	**$340,000**	
4	--	Engineering During Construction	1	ls	1%	**$350,000**	
5	--	Misc Owner's Soft Costs (All)	1	ls	6%	**$2,190,000**	Owner's allowance for PM/oversight/legal, etc.
6	--	Land Acquisition	1	ls	0%	**$0**	n/a
7	--	Scope Contingency/Market Conditions	1	ls	15%	**$5,790,000**	Scope definition/market allowance/estimating accuracy
8	--	Interest During Construction	1	ls	0%	**$0**	Excluded, Owner's allowance for financing costs
9	--	Management Reserve	1	ls	10%	**$4,440,000**	Owner's allowance for changed field conditions
				1.4706	**Grand Total:**	**$50,000,000**	Total Estimated Constr Costs w/ Contingency
			Cost Range:		**$33,000,000**	**$60,000,000**	Per AACE cost estimate guidelines
					Total Contingency:	**$10,000,000**	20%

Assumptions

1) The project can be contracted to local contractors despite the long-term execution and short season constraints.
2) The contracting strategy will realize competition with either a single multi-year contract or individual yearly contracts.
3) Air pollution restrictions will be mitigated with usage of newer modified equipment.
4) Limited staging/decant space can be optimized to support concurrent dry/wet operations.
5) Sediment will not be processed or optimized for commercial uses.
6) "Dry" sediment does not require decanting prior to load-out operations (dewatering wells will suffice).
7) "Wet" sediment will decant rapidly to support a continuous operation and limited staging space constraints.

Exclusions:

1) Cost escalation from pricing date (12/2012) to project NTP (period unknown).
2) Unknown Agency fees or mitigations.
3) Allowances for unknown or newly developed regulations.
4) Allowance for water supply impacts due to any disruption issues.
5) Incremental annual (~15-25 ac-ft/yr) sediment deposited in reservoir post the pricing date of this cost estimate.

Standard Qifications:

1) This OPCC is classified as a Class 5 cost estimate per AACE guidelines. Stated accuracy range = -25% to + 35%
2) Pricing basis = 4th Qtr 2012, escalation to midpoint of construction is partially included
3) P=Prime, S=Subcontractor
4) Pricing assumes competitive market conditions at time of tender (+3 bidders/trade).
5) Owner soft costs and project management expenses included.
6) Capital spare parts included.

California American Water
Los Padres Dam
Sediment Removal Study
Alternative 3 - Partial Wet Sediment Removal to D/S Disposal Site

Opinion of Probable Program Costs

Currency: USD-United States-DECEMBER 2012 Dollar

Total Estimated Sediment Qty = 2,030,000 cys (2012)	*$37.78*	Grand Total Price:	$ 34,000,000	**Construction**
Alternative Removal Qty = 900,000 cys	*$55.56*	Grand Total Price:	$ 50,000,000	**Program (w/ Contingency)**

FERC #	P S	Description	Quantity	UOM	Unit Price	Total Price	Comments
7)		Special Inspections not included.					
8)		Permit Fees excluded					

OPCC Disclaimer

The client hereby acknowledges that MWH has no control over the costs of labor, materials, competitive bidding environments, unidentified field conditions, financial and/or commodity market conditions, or any other factors likely to affect the OPCC of this project, all of which are and will unavoidably remain in a state of change, especially in light of high market volatility attributable to Acts of God and other market forces or events beyond the control of the parties. As such, Client recognizes that this OPCC deliverable is based on normal market conditions, defined by stable resource supply/demand relationships, and does not account for extreme inflationary or deflationary market cycles. Client further acknowledges that this OPCC is a "snapshot in time" and that the reliability of this OPCC will degrade over time. Client agrees that MWH cannot and does not make any warranty, promise, guarantee or representation, either express or implied that proposals, bids, project construction costs, or cost of O&M functions will not vary significantly from MWH's good faith **Class 5** OPCC

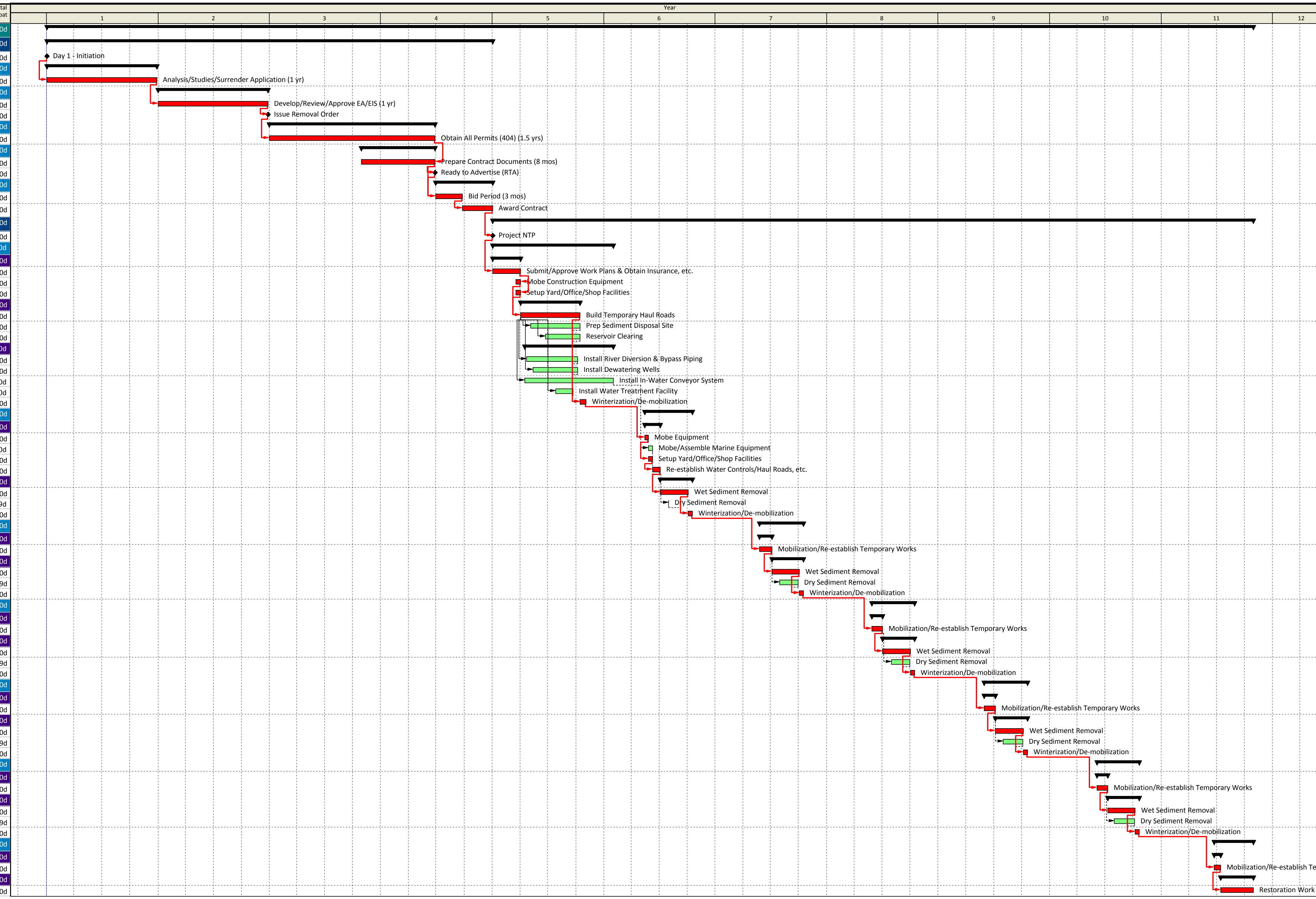
AACE International CLASS 5 Cost Estimate – Class 5 estimates are generally prepared based on very limited information, and subsequently have wide accuracy ranges. Typically, engineering is from 2% to 10% complete. They are often prepared for strategic planning purposes, market studies, assessment of viability, project location studies, and long range capital planning. Virtually all Class 5 estimates use stochastic estimating methods such as cost curves, capacity factors, and other parametric techniques. Expected accuracy ranges are from –20% to –50% on the low side and +30% to 100% on the high side, depending on technological complexity of the project, appropriate reference information, and the inclusion of an appropriate contingency determination. Ranges could exceed those shown in unusual circumstances. As little as 1 hr or less to perhaps more than 200 hours may be spent preparing the estimate based on the project and estimating methodology

Appendix B

Attachment B2

Alternative Program Timelines

Activity ID	Activity Name	Original Duration	Start	Finish	Total Float
Alternative No. 1 - Sediment Removal Study		2798.0d	03-Jan-00	30-Oct-10	0.0d
Pre-Construction		1038.9d	03-Jan-00	02-Jan-04	0.0d
A1530	Day 1 - Initiation	0.0d	03-Jan-00		0.0d
Studies		260.0d	03-Jan-00	29-Dec-00	0.0d
A1000	Analysis/Studies/Surrender Application (1 yr)	260.0d	03-Jan-00	29-Dec-00	0.0d
FERC Process		260.0d	01-Jan-01	28-Dec-01	0.0d
A1020	Develop/Review/Approve EA/EIS (1 yr)	260.0d	01-Jan-01	28-Dec-01	0.0d
A1030	Issue Removal Order	0.0d		28-Dec-01	0.0d
Permitting		390.0d	31-Dec-01	27-Jun-03	0.0d
A1040	Obtain All Permits (404) (1.5 yrs)	390.0d	31-Dec-01	27-Jun-03	0.0d
Design		173.0d	30-Oct-02	27-Jun-03	0.0d
A1050	Prepare Contract Documents (8 mos)	173.0d	30-Oct-02	27-Jun-03	0.0d
A1100	Ready to Advertise (RTA)	0.0d		27-Jun-03	0.0d
Procurement		134.9d	30-Jun-03	02-Jan-04	0.0d
A1060	Bid Period (3 mos)	64.9d	30-Jun-03	26-Sep-03	0.0d
A1070	Award Contract	70.0d	26-Sep-03	02-Jan-04	0.0d
Construction		1759.1d	02-Jan-04	30-Oct-10	0.0d
A1080	Project NTP	0.0d	02-Jan-04		0.0d
Year 1		275.0d	02-Jan-04	01-Feb-05	98.0d
Mobilization		65.0d	02-Jan-04	02-Apr-04	0.0d
A1090	Submit/Approve Work Plans & Obtain Insurance, etc.	65.0d	02-Jan-04	02-Apr-04	0.0d
A1720	Mobe Construction Equipment	10.0d	19-Mar-04	02-Apr-04	0.0d
A1730	Setup Yard/Office/Shop Facilities	10.0d	19-Mar-04	02-Apr-04	0.0d
Temporary Works		165.0d	02-Apr-04	15-Oct-04	0.0d
A1540	Build Temporary Haul Roads	165.0d	02-Apr-04	15-Oct-04	0.0d
A1550	Prep Sediment Disposal Site	134.0d	07-May-04	14-Oct-04	1.0d
A1560	Reservoir Clearing	94.0d	24-Jun-04	14-Oct-04	1.0d
Water Diversion/Controls		200.0d	16-Apr-04	01-Feb-05	98.0d
A1840	Install River Diversion & Bypass Piping	115.0d	23-Apr-04	06-Oct-04	7.0d
A1850	Install Dewatering Wells	100.0d	14-May-04	06-Oct-04	7.0d
A1855	Install In-Water Conveyor System	200.0d	16-Apr-04	01-Feb-05	98.0d
A1860	Install Water Treatment Facility	40.0d	27-Jul-04	22-Sep-04	17.0d
A1865	Winterization/De-mobilization	16.0d	15-Oct-04	03-Nov-04	0.0d
Year 2		107.9d	14-May-05	17-Oct-05	0.0d
Mobilization		34.9d	14-May-05	05-Jul-05	0.0d
A1110	Mobe Equipment	10.0d	14-May-05	26-May-05	0.0d
A1115	Mobe/Assemble Marine Equipment	10.0d	26-May-05	10-Jun-05	16.0d
A1120	Setup Yard/Office/Shop Facilities	10.0d	26-May-05	10-Jun-05	0.0d
A1700	Re-establish Water Controls/Haul Roads, etc.	20.0d	10-Jun-05	05-Jul-05	0.0d
Sediment Removal		88.0d	05-Jul-05	17-Oct-05	0.0d
A1590	Wet Sediment Removal	77.0d	05-Jul-05*	04-Oct-05	0.0d
A1600	Dry Sediment Removal	0.0d	01-Aug-05*	01-Aug-05	54.9d
A1690	Winterization/De-mobilization	11.0d	04-Oct-05	17-Oct-05	0.0d
Year 3		98.0d	26-May-06	16-Oct-06	0.0d
Mobilization		26.0d	26-May-06	05-Jul-06	0.0d
A1710	Mobilization/Re-establish Temporary Works	26.0d	26-May-06	05-Jul-06	0.0d
Sediment Removal		88.0d	05-Jul-06	16-Oct-06	0.0d
A1610	Wet Sediment Removal	77.0d	05-Jul-06*	03-Oct-06	0.0d
A1620	Dry Sediment Removal	52.0d	01-Aug-06*	29-Sep-06	2.9d
A1680	Winterization/De-mobilization	11.0d	03-Oct-06	16-Oct-06	0.0d
Year 4		101.0d	28-May-07	16-Oct-07	0.0d
Mobilization		26.0d	28-May-07	03-Jul-07	0.0d
A1750	Mobilization/Re-establish Temporary Works	26.0d	28-May-07	03-Jul-07	0.0d
Sediment Removal		88.0d	03-Jul-07	16-Oct-07	0.0d
A1630	Wet Sediment Removal	77.0d	03-Jul-07*	03-Oct-07	0.0d
A1640	Dry Sediment Removal	52.0d	01-Aug-07*	01-Oct-07	1.9d
A1670	Winterization/De-mobilization	11.0d	03-Oct-07	16-Oct-07	0.0d
Year 5		102.0d	30-May-08	21-Oct-08	0.0d
Mobilization		26.0d	30-May-08	07-Jul-08	0.0d
A1760	Mobilization/Re-establish Temporary Works	26.0d	30-May-08	07-Jul-08	0.0d
Sediment Removal		90.0d	07-Jul-08	21-Oct-08	0.0d
A1650	Wet Sediment Removal	77.0d	07-Jul-08*	06-Oct-08	0.0d
A1660	Dry Sediment Removal	55.0d	01-Aug-08*	04-Oct-08	0.9d
A1770	Winterization/De-mobilization	13.0d	06-Oct-08	21-Oct-08	0.0d
Year 6		98.0d	05-Jun-09	21-Oct-09	0.0d
Mobilization		24.0d	05-Jun-09	09-Jul-09	0.0d
A1780	Mobilization/Re-establish Temporary Works	24.0d	05-Jun-09	09-Jul-09	0.0d
Sediment Removal		88.0d	09-Jul-09	21-Oct-09	0.0d
A1790	Wet Sediment Removal	77.0d	09-Jul-09*	08-Oct-09	0.0d
A1800	Dry Sediment Removal	55.0d	01-Aug-09*	05-Oct-09	2.9d
A1810	Winterization/De-mobilization	11.0d	08-Oct-09	21-Oct-09	0.0d
Year 7		92.1d	23-Jun-10	30-Oct-10	0.0d
Mobillization		15.0d	23-Jun-10	14-Jul-10	0.0d
A1820	Mobilization/Re-establish Temporary Works	15.0d	23-Jun-10*	14-Jul-10	0.0d
Restorations		100.0d	14-Jul-10	30-Oct-10	0.0d
A1830	Restoration Work	100.0d	14-Jul-10	30-Oct-10	0.0d



Start: 03-Jan-00, Finish: 30-Oct-10

Data Date: 01-Jan-00, Page 1 of 1

Run Date: 27-Dec-12

TASK filter: All Activities

Actual Work

Remaining Work

Critical Remaining Work

Milestone

Summary

Figure 1

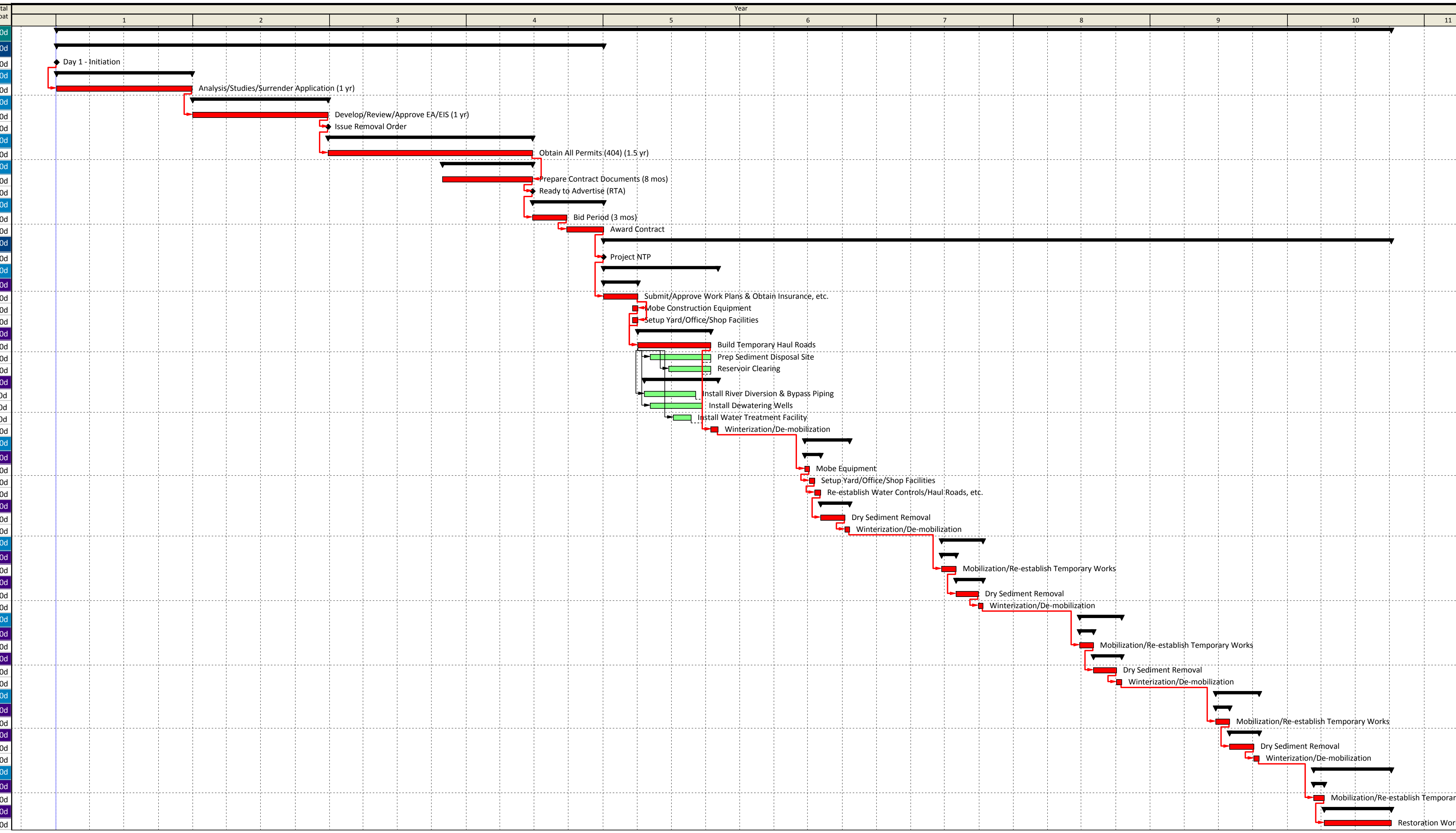
Alternative No. 1 - Sediment Removal Study

Program Timeline

Date	Revision	Checked	Approved
24-Dec-12	Baseline (rev1)	JLL	

MWH

Activity ID	Activity Name	Original Duration	Start	Finish	Total Float
Alternative No. 2 - Sediment Removal Study		2518.4d	03-Jan-00	05-Oct-09	0.0d
Pre-Construction		1044.4d	03-Jan-00	02-Jan-04	0.0d
A1530	Day 1 - Initiation	0.0d	03-Jan-00		0.0d
Studies		260.0d	03-Jan-00	29-Dec-00	0.0d
A1000	Analysis/Studies/Surrender Application (1 yr)	260.0d	03-Jan-00	29-Dec-00	0.0d
FERC Process		259.5d	01-Jan-01	28-Dec-01	0.0d
A1020	Develop/Review/Approve EA/EIS (1 yr)	259.5d	01-Jan-01	28-Dec-01	0.0d
A1030	Issue Removal Order	0.0d		28-Dec-01	0.0d
Permitting		390.0d	28-Dec-01	27-Jun-03	0.0d
A1040	Obtain All Permits (404) (1.5 yr)	390.0d	28-Dec-01	27-Jun-03	0.0d
Design		173.0d	29-Oct-02	27-Jun-03	0.0d
A1050	Prepare Contract Documents (8 mos)	173.0d	29-Oct-02	27-Jun-03	0.0d
A1100	Ready to Advertise (RTA)	0.0d		27-Jun-03	0.0d
Procurement		134.9d	27-Jun-03	02-Jan-04	0.0d
A1060	Bid Period (3 mos)	64.9d	27-Jun-03	26-Sep-03	0.0d
A1070	Award Contract	70.0d	26-Sep-03	02-Jan-04	0.0d
Construction		1480.0d	02-Jan-04	05-Oct-09	0.0d
A1080	Project NTP	0.0d	02-Jan-04		0.0d
Year 1		215.0d	02-Jan-04	03-Nov-04	0.0d
Mobilization		65.0d	02-Jan-04	02-Apr-04	0.0d
A1090	Submit/Approve Work Plans & Obtain Insurance, etc.	65.0d	02-Jan-04	02-Apr-04	0.0d
A1720	Mobe Construction Equipment	10.0d	19-Mar-04	02-Apr-04	0.0d
A1730	Setup Yard/Office/Shop Facilities	10.0d	19-Mar-04	02-Apr-04	0.0d
Temporary Works		165.0d	02-Apr-04	15-Oct-04	0.0d
A1540	Build Temporary Haul Roads	165.0d	02-Apr-04	15-Oct-04	0.0d
A1550	Prep Sediment Disposal Site	134.0d	07-May-04	14-Oct-04	1.0d
A1560	Reservoir Clearing	94.0d	24-Jun-04	14-Oct-04	1.0d
Water Diversion/Controls		166.0d	20-Apr-04	03-Nov-04	0.0d
A1840	Install River Diversion & Bypass Piping	115.0d	20-Apr-04	04-Sep-04	35.0d
A1850	Install Dewatering Wells	115.0d	07-May-04	22-Sep-04	20.0d
A1860	Install Water Treatment Facility	40.0d	07-Jul-04	23-Aug-04	45.0d
A1865	Winterization/De-mobilization	16.0d	15-Oct-04	03-Nov-04	0.0d
Year 2		84.0d	22-Jun-05	20-Oct-05	0.0d
Mobilization		29.0d	22-Jun-05	03-Aug-05	0.0d
A1110	Mobe Equipment	10.0d	22-Jun-05	05-Jul-05	0.0d
A1120	Setup Yard/Office/Shop Facilities	10.0d	05-Jul-05	19-Jul-05	0.0d
A1700	Re-establish Water Controls/Haul Roads, etc.	13.0d	19-Jul-05	03-Aug-05	0.0d
Sediment Removal		66.0d	03-Aug-05	20-Oct-05	0.0d
A1600	Dry Sediment Removal	55.0d	03-Aug-05	07-Oct-05	0.0d
A1690	Winterization/De-mobilization	11.0d	07-Oct-05	20-Oct-05	0.0d
Year 3		78.0d	22-Jun-06	12-Oct-06	0.0d
Mobilization		26.0d	22-Jun-06	31-Jul-06	0.0d
A1605	Mobilization/Re-establish Temporary Works	26.0d	22-Jun-06	31-Jul-06	0.0d
Sediment Removal		63.0d	31-Jul-06	12-Oct-06	0.0d
A1620	Dry Sediment Removal	52.0d	31-Jul-06	29-Sep-06	0.0d
A1680	Winterization/De-mobilization	11.0d	29-Sep-06	12-Oct-06	0.0d
Year 4		79.0d	27-Jun-07	16-Oct-07	0.0d
Mobilization		26.0d	27-Jun-07	02-Aug-07	0.0d
A1635	Mobilization/Re-establish Temporary Works	26.0d	27-Jun-07	02-Aug-07	0.0d
Sediment Removal		63.0d	02-Aug-07	16-Oct-07	0.0d
A1640	Dry Sediment Removal	52.0d	02-Aug-07	03-Oct-07	0.0d
A1670	Winterization/De-mobilization	11.0d	03-Oct-07	16-Oct-07	0.0d
Year 5		83.6d	24-Jun-08	18-Oct-08	0.0d
Mobilization		26.0d	24-Jun-08	30-Jul-08	0.0d
A1655	Mobilization/Re-establish Temporary Works	26.0d	24-Jun-08	30-Jul-08	0.0d
Sediment Removal		68.0d	30-Jul-08	18-Oct-08	0.0d
A1660	Dry Sediment Removal	55.0d	30-Jul-08	03-Oct-08	0.0d
A1770	Winterization/De-mobilization	13.0d	03-Oct-08	18-Oct-08	0.0d
Year 6		174.0d	12-Mar-09	05-Oct-09	0.0d
Mobilization		24.0d	12-Mar-09	09-Apr-09	0.0d
A1780	Mobilization/Re-establish Temporary Works	24.0d	12-Mar-09	09-Apr-09	0.0d
Restorations		150.0d	09-Apr-09	05-Oct-09	0.0d
A1830	Restoration Work	150.0d	09-Apr-09	05-Oct-09	0.0d



Start: 03-Jan-00, Finish: 05-Oct-09

Data Date: 01-Jan-00, Page 1 of 1

Run Date: 08-Jan-13

TASK filter: All Activities

- Actual Work
- Remaining Work
- Critical Remaining Work
- Milestone
- Summary

Figure 2

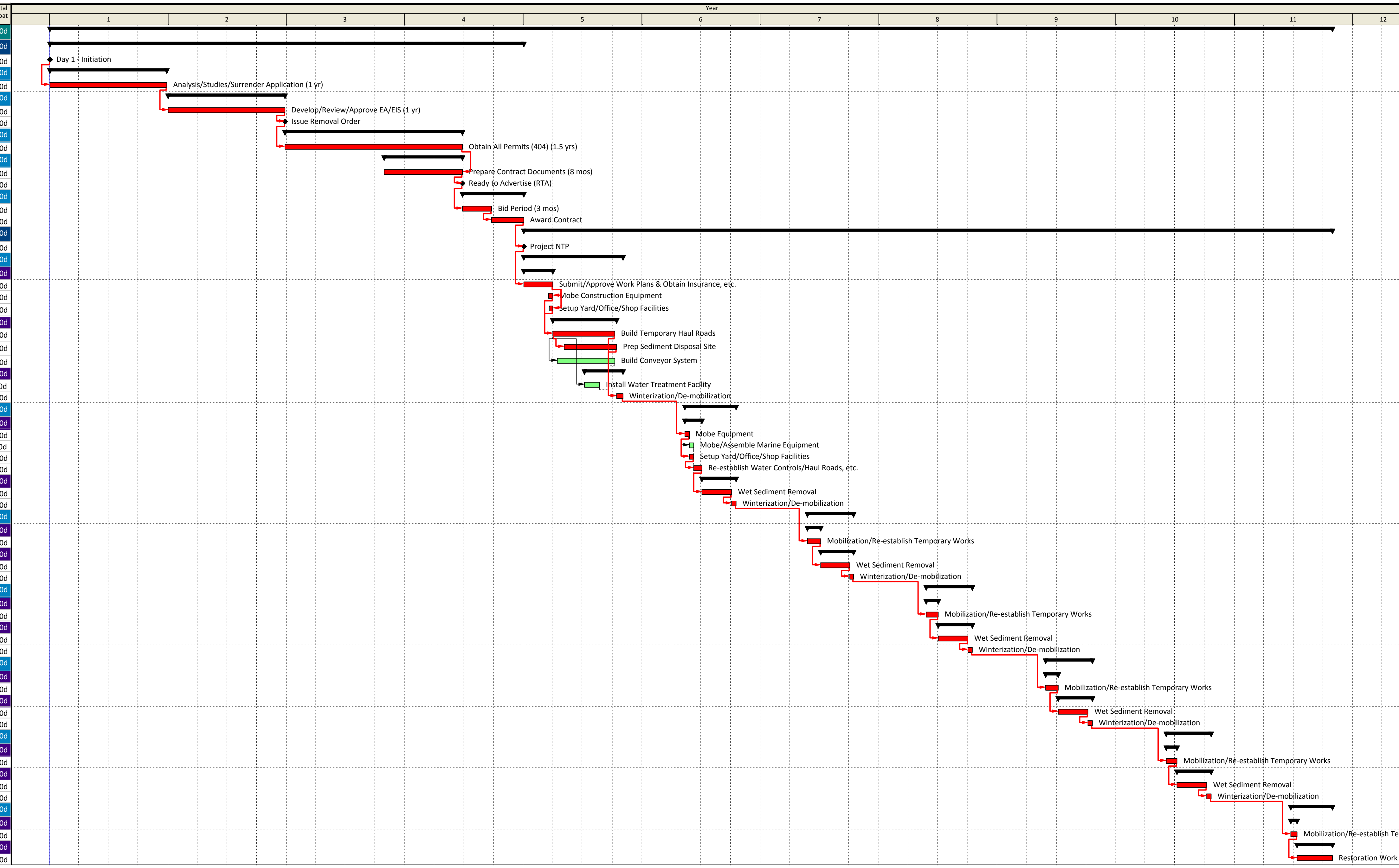
Alternative No. 2 - Sediment Removal Study

Program Timeline

Date	Revision	Checked	Approved
24-Dec-12	Baseline (rev1)	JLL	

MWH

Activity ID	Activity Name	Original Duration	Start	Finish	Total Float
Alternative No. 3 - Sediment Removal Study		2798.0d	03-Jan-00	30-Oct-10	0.0d
Pre-Construction		1038.4d	03-Jan-00	02-Jan-04	0.0d
A1530	Day 1 - Initiation	0.0d	03-Jan-00		0.0d
Studies		260.0d	03-Jan-00	29-Dec-00	0.0d
A1000	Analysis/Studies/Surrender Application (1 yr)	260.0d	03-Jan-00	29-Dec-00	0.0d
FERC Process		259.5d	01-Jan-01	28-Dec-01	0.0d
A1020	Develop/Review/Approve EA/EIS (1 yr)	259.5d	01-Jan-01	28-Dec-01	0.0d
A1030	Issue Removal Order	0.0d		28-Dec-01	0.0d
Permitting		390.0d	28-Dec-01	27-Jun-03	0.0d
A1040	Obtain All Permits (404) (1.5 yrs)	390.0d	28-Dec-01	27-Jun-03	0.0d
Design		173.0d	29-Oct-02	27-Jun-03	0.0d
A1050	Prepare Contract Documents (8 mos)	173.0d	29-Oct-02	27-Jun-03	0.0d
A1100	Ready to Advertise (RTA)	0.0d		27-Jun-03	0.0d
Procurement		134.9d	27-Jun-03	02-Jan-04	0.0d
A1060	Bid Period (3 mos)	64.9d	27-Jun-03	26-Sep-03	0.0d
A1070	Award Contract	70.0d	26-Sep-03	02-Jan-04	0.0d
Construction		1759.6d	02-Jan-04	30-Oct-10	0.0d
A1080	Project NTP	0.0d	02-Jan-04		0.0d
Year 1		215.0d	02-Jan-04	03-Nov-04	0.0d
Mobilization		65.0d	02-Jan-04	02-Apr-04	0.0d
A1090	Submit/Approve Work Plans & Obtain Insurance, etc.	65.0d	02-Jan-04	02-Apr-04	0.0d
A1720	Mobe Construction Equipment	10.0d	19-Mar-04	02-Apr-04	0.0d
A1730	Setup Yard/Office/Shop Facilities	10.0d	22-Mar-04	02-Apr-04	0.0d
Temporary Works		165.0d	02-Apr-04	15-Oct-04	0.0d
A1540	Build Temporary Haul Roads	160.0d	02-Apr-04	09-Oct-04	0.0d
A1550	Prep Sediment Disposal Site	135.0d	07-May-04	15-Oct-04	0.0d
A1870	Build Conveyor System	150.0d	14-Apr-04	09-Oct-04	5.0d
Water Diversion/Controls		101.0d	07-Jul-04	03-Nov-04	0.0d
A1860	Install Water Treatment Facility	40.0d	07-Jul-04	23-Aug-04	45.0d
A1865	Winterization/De-mobilization	16.0d	15-Oct-04	03-Nov-04	0.0d
Year 2		107.4d	14-May-05	17-Oct-05	0.0d
Mobilization		34.4d	14-May-05	05-Jul-05	0.0d
A1110	Mobe Equipment	10.0d	14-May-05	26-May-05	0.0d
A1115	Mobe/Assemble Marine Equipment	10.0d	26-May-05	10-Jun-05	16.0d
A1120	Setup Yard/Office/Shop Facilities	10.0d	26-May-05	10-Jun-05	0.0d
A1700	Re-establish Water Controls/Haul Roads, etc.	20.0d	10-Jun-05	05-Jul-05	0.0d
Sediment Removal		88.0d	05-Jul-05	17-Oct-05	0.0d
A1590	Wet Sediment Removal	77.0d	05-Jul-05*	04-Oct-05	0.0d
A1690	Winterization/De-mobilization	11.0d	04-Oct-05	17-Oct-05	0.0d
Year 3		98.0d	26-May-06	16-Oct-06	0.0d
Mobilization		26.0d	26-May-06	05-Jul-06	0.0d
A1710	Mobilization/Re-establish Temporary Works	26.0d	26-May-06	05-Jul-06	0.0d
Sediment Removal		88.0d	05-Jul-06	16-Oct-06	0.0d
A1610	Wet Sediment Removal	77.0d	05-Jul-06*	03-Oct-06	0.0d
A1680	Winterization/De-mobilization	11.0d	03-Oct-06	16-Oct-06	0.0d
Year 4		101.0d	28-May-07	16-Oct-07	0.0d
Mobilization		26.0d	28-May-07	03-Jul-07	0.0d
A1750	Mobilization/Re-establish Temporary Works	26.0d	28-May-07	03-Jul-07	0.0d
Sediment Removal		88.0d	03-Jul-07	16-Oct-07	0.0d
A1630	Wet Sediment Removal	77.0d	03-Jul-07*	03-Oct-07	0.0d
A1670	Winterization/De-mobilization	11.0d	03-Oct-07	16-Oct-07	0.0d
Year 5		102.0d	30-May-08	21-Oct-08	0.0d
Mobilization		26.0d	30-May-08	07-Jul-08	0.0d
A1760	Mobilization/Re-establish Temporary Works	26.0d	30-May-08	07-Jul-08	0.0d
Sediment Removal		90.0d	07-Jul-08	21-Oct-08	0.0d
A1650	Wet Sediment Removal	77.0d	07-Jul-08*	06-Oct-08	0.0d
A1770	Winterization/De-mobilization	13.0d	06-Oct-08	21-Oct-08	0.0d
Year 6		98.0d	05-Jun-09	21-Oct-09	0.0d
Mobilization		24.0d	05-Jun-09	09-Jul-09	0.0d
A1780	Mobilization/Re-establish Temporary Works	24.0d	05-Jun-09	09-Jul-09	0.0d
Sediment Removal		88.0d	09-Jul-09	21-Oct-09	0.0d
A1790	Wet Sediment Removal	77.0d	09-Jul-09*	08-Oct-09	0.0d
A1810	Winterization/De-mobilization	11.0d	08-Oct-09	21-Oct-09	0.0d
Year 7		92.6d	23-Jun-10	30-Oct-10	0.0d
Mobillization		15.0d	23-Jun-10	14-Jul-10	0.0d
A1820	Mobilization/Re-establish Temporary Works	15.0d	23-Jun-10*	14-Jul-10	0.0d
Restorations		100.0d	14-Jul-10	30-Oct-10	0.0d
A1830	Restoration Work	100.0d	14-Jul-10	30-Oct-10	0.0d



Start: 03-Jan-00, Finish: 30-Oct-10

Data Date: 01-Jan-00, Page 1 of 1

Run Date: 27-Dec-12

TASK filter: All Activities

- Actual Work
- Remaining Work
- Critical Remaining Work
- Milestone
- Summary

Figure 3

Alternative No. 3 - Sediment Removal Study

Program Timeline

Date	Revision	Checked	Approved
24-Dec-12	Baseline (rev1)	JLL	

MWH

Appendix C

Marketability Memo for San Clemente Dam

M E M O R A N D U M

MWH
MONTGOMERY WATSON HARZA

To:	Fred Feizollahi and Dave Gutierrez	**Date:**	March 9, 2005
From:	Alberto Pujol and Dan Wade	**Reference:**	1004231.010101

Subject: San Clemente Dam
Commercial Value of Sediment in the Reservoir

As you requested in our December 7, 2004 meeting, we have attempted to answer the question of whether the sediment in San Clemente Reservoir has commercial value. We have concluded that while there is commercial value for the sediment, this value at the present time is completely offset by processing and transportation costs and, therefore, there is not a positive benefit-cost ratio for selling the sediment. Although our assessment is predominantly qualitative, we believe that it is sufficient to answer your question. More detailed quantitative evaluations can be made but would require additional effort and, we believe, would result in the same overall conclusion.

Background

San Clemente Reservoir has been estimated to contain approximately 2.5 million cubic yards (or about 3 million tons) of sediment. The sediment consists of sandy gravel, gravelly sand, sand, silty sand, and sandy silt. The finer-grained sediment is located nearest to the dam in both arms of the reservoir, and the coarser (gravelly) materials are encountered in the upper reaches of the Carmel River arm of the reservoir. Generally speaking, the grain size distribution of these materials, as excavated from the reservoir, would not meet typical specification requirements for high-value aggregate products (concrete sand, concrete aggregate, drain rock, base rock, etc.). Therefore, development of reservoir sediment for aggregate products would require the installation and operation of a screening and washing plant and the disposal of waste byproduct (primarily wet silt) from the processing operation in a sediment disposal site. For purposes of this evaluation, we have assumed an aggregate yield of 70%, i.e., we have assumed that about one third of the total volume of sediment would be too silty and would be wasted.

Communication with local aggregate suppliers suggests that aggregate demand could be on the order of magnitude of 200,000 tons per year (Attachment 1), suggesting that development of aggregate resources directly from the reservoir would likely take on the order of ten years. Transport of this quantity of material by highway truck via Carmel Valley Road would entail an average of about 60 truck roundtrips per business day, or about one roundtrip every ten minutes (assuming 10-hour days). In principle, this traffic impact would appear to be not significant, so transport of sand and gravel materials at this rate appears to be realistic.

We considered two main scenarios for development of aggregate resources: (1) aggregate production at the reservoir, and (2) aggregate production at a sediment disposal site. These are described and evaluated below.

On-Site Development of Aggregate Resources

This scenario envisions that sediment would be excavated from San Clemente Reservoir and processed into marketable aggregate products at the reservoir site. The waste byproduct of the processing operation would be transported to a disposal site, and the aggregate materials would be hauled off to the purchaser's site.

Evaluation: Sediment excavation and on-site aggregate processing over a period of time on the order of ten years would be difficult due to (1) the potential for environmental impacts from protracted reservoir dredging and sediment processing operations, and (2) the high cost of winter shutdowns and related annual mobilizations, installation and removal of river diversion facilities, operation of reservoir dewatering equipment, fish rescue operations, and other environmental compliance activities. Protection and mitigation measures for steelhead and California Red-Legged Frog (CRLF) during reservoir dredging operations were developed by Entrix (2004). Cost estimates prepared by Entrix and Granite Construction for annual stream diversion, dewatering, and environmental protection activities suggest that the incremental cost of these activities alone (i.e., not including the cost of sediment excavation, processing and transport operations) would be on the order of $3 million per year, or about $15 per ton of aggregate at a production rate of 200,000 tons per year. This incremental cost of environmental protection related to long-term on-site aggregate development is higher than the current price of processed aggregate at commercial sources, and therefore is higher than the revenue that could be derived. Therefore, we do not believe this to be a realistic scenario. It appears to us that from the point of view of both cost and environmental impact considerations, the removal of San Clemente Dam and its impounded sediment would need to occur over as short a time span as possible (a small number of years) in order for it to be practicable.

Development of Aggregate Resources at Disposal Site

This scenario assumes that Cal-Am moves the sediment as expeditiously as possible to a disposal site near a local highway. The question then is whether there would be a positive benefit-cost ratio in mining the sediment at the disposal site, i.e., whether the revenue from the aggregate sales would exceed the incremental costs of processing, transporting and selling the aggregate. Potential development approaches are described and evaluated below:

(1) **Mineral resources company buys the sediment "as-is," excavates it from the sediment pile, loads it on trucks, hauls it to its processing plant, processes it, disposes of the waste by-product, and sells the processed aggregate.** Operating expenses for Cal-Am could include commercial license fees, ongoing disposal site maintenance and restoration costs, ongoing disposal site environmental monitoring and mitigation costs, and legal and administration costs related to community concerns. We briefly discussed this approach with Graniterock, a leading local mineral resources

company. However, Graniterock would not be interested because of the high cost of transporting the material to its processing facility (see Attachment 1). Indeed, if we assume a cost of $2 per ton to excavate and load the sediment, 25 to 30 cents per ton-mile to haul it, $3 to $4 per ton to process it and dispose of waste material, and an aggregate yield from the sediment of 70%, it would appear that a haul distance in excess a few miles would render this approach uneconomical, i.e., the cost of this operation to the mineral resource developer would exceed the proceeds from the aggregate sales.

(2) **Mineral resources company installs an aggregate processing facility at Cal-Am's sediment disposal site, excavates sediment from the sediment pile, processes it, disposes of the waste by-product on site, and stockpiles and sells the processed aggregate.** The cost of this operation to Cal-Am could also include commercial license fees, site maintenance and restoration, environmental monitoring and mitigation, and legal and administration costs related to community concerns. Because of the greater level of industrial activity at the site, environmental risks and community relations risks would be higher. Under this approach Graniterock potentially would pay a nominal amount of $.50 per ton (see Attachment 1). However, at a production rate of about 200,000 tons per year, the resulting revenue to Cal-Am ($100,000 per year) would be highly unlikely to cover Cal-Am's costs. We conclude that this approach does not present value for Cal-Am.

(3) **Cal-Am's dam removal contractor installs an aggregate processing facility at Cal-Am's sediment disposal site, processes the sediment as it arrives to the disposal site, disposes of the waste by-product at the disposal site, and stockpiles the processed aggregate for future sale by Cal-Am or a licensee.** Under this scenario, Cal-Am would incur the initial cost of processing the 3 million tons of sediment. We believe that the incremental cost to Cal-Am of processing the sediment would be on the order of $3 to $4 per ton, so Cal-Am's initial investment may be on the order of $10 million. We have assumed that Cal-Am would then sell about 2 million tons of aggregate over a period of about 10 years, i.e., at a rate of about 200,000 tons per year. Because of the relatively large distance of this area with respect to major demand centers (Monterey and Salinas areas) and associated haul costs, it is unlikely that the aggregate products could command prices higher than $8 to $10 per ton, i.e., on the order of $1.6 million to $2 million per year. (Note that in June 2004, Graniterock estimated that the price of concrete sand at an on-site location close to Carmel Valley Road would have to range from about $1.50 per ton to $7.40 per ton to compete with closer sources, see Attachment 2). To sell the sediment, Cal-Am or its licensee would need to set up a site facility, including an office, scales, and earth-moving equipment to load third-party trucks. It is anticipated that a staff of at least three full-time personnel would be needed to cover (1) management, marketing and sales, (2) facility operation, and (3) dispatching and administration. Cal-Am's operating expenses would include but not be limited to labor costs; lease costs for the scales, loader, and office trailer; utilities; commercial license fees; site maintenance and restoration; environmental monitoring and mitigation; and legal and administration costs related to community concerns. While we have not prepared a detailed estimation, we anticipate that operating expenses could easily run on the order of $500,000 per year. The

maximum operating income might thus be in the range of $1 to $1.5 million per year over 10 years.

This approach carries risks for Cal-Am, including but not limited to production risk (that the yield of marketable aggregate will decrease because of either quality or grain-size considerations), market risk (that the assumed demand for aggregate will either not materialize or will materialize at a lower price), and operating risks (due to numerous factors including, for instance, the potential for legal challenges arising from community opposition to an industrial-type operation in their backyards). The rate of return on Cal-Am's investment that is implicit in the stream of cash flows described above is in the range of 0% to perhaps 8%, far lower than the cost of capital. Therefore, we conclude that this approach does not present value for Cal-Am at this time.

Conclusion

An approach for cost effective development of mineral resources in the sediment now stored in San Clemente Reservoir does not appear to exist at this time. While the sediment could be processed into products that have commercial value, this value is significantly and completely offset by the incremental processing and transportation costs involved. Therefore, it is concluded that there is not a positive benefit-cost ratio for selling the sediment based on current market conditions.

Attachments:

1. Letter from Mr. M. Munn, Graniterock, to Mr. Don Crone, MWH, dated January 7, 2005.
2. Letter from Mr. M. Munn, Graniterock to Mr. Fred Feizollahi, California American Water, dated June 10, 2004.

ATTACHMENT 1

Graniterock.

January 7, 2005

Dan Crone
M. W. H.
Re: San Clemente Dam

Malcolm Baldrige National Quality Award 1992 Winner

Dear Mr. Crone:

Thank you for the opportunity to consider the 2 million tons of sand and gravel from the San Clemente Dam. Upon further evaluation, the material has no value to us for reprocessing into concrete sand, pea gravel, and drainrock unless the material can be screened on site. Freight costs negatively impact the economics of moving material to our processing plant in Hollister.

We would consider the material at $0.50/ton if a screening plant could be brought on site at the stockpile location and if we were allowed to run the plant roughly 12 hours per day, five days per week, over a 10 year period. There is a possibility we would not need the full 10 years, but we cannot be certain based on current market conditions.

Sincerely,

Michael D. Munn
Sales Manager
Aggregate Division
Graniterock

- Monterey County
- San Benito County
- San Mateo County
- Santa Clara County
- Santa Cruz County
- City and County of San Francisco

Material Supplier/Engineering Contractor
License #22

P.O. Box 50001 Watsonville, CA 95077-5001 (831) 768-2000 Fax: (831) 768-2201
www.graniterock.com

ATTACHMENT 2

Graniterock.

RECEIVED
JUN 14 2004
CAL-AM WATER CO.

June 10, 2004

Mr. Fred Feizollahi, P.E.
Sr. Operations Manager
California American Water
P.O. Box 951
Monterey, CA 93942

Re: San Clemente Reservoir Sand

National Quality Award 1992 Winner

Dear Mr. Feizollahi:

California American Water has asked Graniterock, as a courtesy, to provide preliminary information regarding the potential retail market value of the sand deposit that has accumulated behind the San Clemente Reservoir on the Carmel River. We understand that you are not requesting a formal appraisal or opinion of value, but rather our informal thoughts on the value of the sand in today's construction market.

Based on the drilling logs provided by Cal Am and two "grab" samples we took during a site visit in May of 2004, the sand deposit would likely be suitable for use as concrete or plaster sand. More tests would be necessary to confirm this to the satisfaction of a potential buyer, but initial indications based on the samples tested appear promising.

With aggregate products, one of the biggest factors affecting market price is the haul distance from the point of origin to the point of use. Freight costs are often greater than the cost of material shipped. Our market analysis assumes the sand would be mined from the reservoir and stockpiled at a location close to Carmel Valley Road. We used the location adjacent to the Cal Am filer plant site to conduct our analysis of freight costs, and have assumed that all shipping would be from that site to U.S. 101 through Greenfield, rather than to Highway 1 through Carmel Valley Village. The feasible market area for the sand includes the Monterey Bay and southern Santa Clara County markets. There are numerous ready-mix concrete manufacturers in that market area with a demand for concrete sand.

Concrete sand in the potential market area from closer sources (e.g. from the sand quarry located in San Juan Bautista) is currently priced at a *delivered* price of $13.00 to $17.00 per ton, depending on the length of haul. We estimated a shipping cost of between $6.00 to nearly $16.00 per ton for various customer locations within that market area for the San Clemente sand. Depending on the landed location for the San Clemente sand, the price of the sand would have to range from about $1.50 per ton to $7.40 per ton to compete with closer sources. We think a median price for the sand would be approximately $3.00 per ton.

• Monterey County
• San Benito County
• San Mateo County
• Santa Clara County
• Santa Cruz County
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Assuming that there are 2 million tons of usable sand in the reservoir, the revenue from the sale of sand from a stockpile located at the filter plant to concrete manufactures in today's market would by roughly $6 million (2 million tons x $3.00 per ton).

These are our preliminary thoughts on the market value of the sand. Of course, if Cal Am or anyone else needs more definitive information on which to base a decision regarding the sand, please let us know and we can discuss the steps required for a more definitive analysis.

Very truly yours,

GRANITE ROCK COMPANY

Cc: Joyce Ambrosius

Appendix D

Site Visit Photographs

Reservoir Elevation 1013 (October 30, 2012)

- From dam in the background to about 1 mile upstream

- Between 0.5 and 0.8 miles upstream from dam (between Sections B-B and C-C from Exhibit 1)

- Between 0.75 and 0.95 miles upstream from dam (upstream Section C-C from Exhibit 1)

Eliminated disposal site 1500 feet upstream across the Carmel River from Upstream disposal site, view up the ravine with entrance from River at bottom (October 30, 2012)

Toe area of upstream disposal site (October 30, 2012)

Los Padres Dam ramp area (September 14, 2012)

Spillway bridge (September 14, 2012)

Dam access road (September 14, 2012)

Downstream area (September 14, 2012)

View from access road towards dam, processing area for Alternative 3 would be at bottom right corner

View from dam in downstream direction, downstream disposal site would be on right side next to access road

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