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BEFORE THE STATE WATER RESOURCES CONTROL

In the Matter of the Water Rights Hearing for the Lower Mokelumne River

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CLOSING STATEMENT
U.S. FISH AND WILDLIFE SERVICE

EXISTING CONDITIONS

The U.S. Fish and Wildlife Service (Service) participated in this hearing to assist the State Water Resources Control Board (Board) in determining terms and conditions for an order to protect public trust resources in the lower Mokelumne River. The Service's testimony reflected agency concerns about fish and wildlife habitat and populations existing from Pardee Reservoir downstream to the Sacramento-San Joaquin Delta. While we are concerned about fish and wildlife resources throughout the Mokelumne River Basin, for purposes of this hearing our highest priority is to protect and restore the remaining 63 miles of

anadromous fish habitat below Camanche [illegible],
riparian vegetation of the river corridor.

We testified that the habitat is degraded and that anadromous fish populations have declined to extremely low levels, so low that consideration is being given to listing these fish populations as threatened or endangered. During the course of the hearing, the Service listened to testimony by East Bay Municipal Utility District (EBMUD) suggesting that pre-Camanche and post-Camanche adult salmon escapement numbers are essentially the same. However, cross-examination of EBMUD by the California Sportfishing Protection Alliance regarding the escapement data past Woodbridge Dam clearly points out the likelihood that pre-Camanche escapement numbers were greatly underestimated, and that post-Camanche escapement numbers are much lower than pre-Camanche escapement numbers.

Although there are few accurate records of the quality of the fishery habitat under pre-Camanche conditions, clearly, the severely reduced flows dedicated to fishery purposes have greatly impaired reproduction. For example, only 13,000 acre-feet are provided for fish flows during dry and above normal/wet years and 5,400 acre-feet during critical dry years. Also, the erratic nature of flows, resulting from peaking power and flood control releases, has had an adverse impact on adult migration, spawning, incubation and fry life stages. Even without precise historic information, it is reasonable to assume that the numerous impoundments throughout the watershed have caused an increase in

average annual water temperatures to the detriment of the anadromous fishery. Testimony by several parties confirmed that Camanche Reservoir, because of its large surface area and shallow depth, acts as a heat sink, warming the waters that flow into it.

In addition, Camanche Dam has intercepted recruitment of suitably sized spawning gravels from upstream sources, thus reducing salmon spawning habitat to a relatively short section of river, i.e., approximately 6.5 miles below Camanche Dam. It is well documented that below dams like Camanche, spawning habitat gradually declines over time. Without periodic replenishment of suitably sized gravels, the habitat value of the spawning beds declines in quality and quantity. The absence of properly timed flushing flows below Camanche Dam to cleanse the gravels of fine sediments also has reduced their suitability as spawning and incubation habitat.

Fish and Wildlife Service fishery biologist Gary Taylor testified that the lower river's riparian vegetation is diminishing over time. He noted that during Service site visits, he observed numerous areas in the riverine corridor devoid of vegetation along with a consistent absence of tree and shrub regeneration. A dense canopy of tall trees and overhanging undergrowth is needed to provide shade and cover along the main river channel and side channels. Such vegetation is important for both fish and wildlife survival, and as trees and shrubs die and fall into the river, they add to instream cover. As described in the California Department of Fish and Game (DFG)

Lower Mokelumne River Fisheries Management Plan, riparian vegetation also produces food which becomes available to a variety of fish species. We heard no testimony that refutes this account of diminishing riparian vegetation along the river.

The volume and timing of flows in the Mokelumne River greatly affect vegetation in the riparian corridor. Flows of sufficient volume are needed seasonally to fill the backwater channels, flush stagnant waters, and recruit nutrient-laden fine sediments that promote plant growth. Therefore, the Board should also consider the flow needs of the riparian corridor in setting terms and conditions.

Fish and Wildlife Service biologist Judy Sefchick testified that the management of Camanche Reservoir elevations and Pardee inflows have not consistently provided water of suitable quality to the Mokelumne River Fish Facility (MRFF) and the lower Mokelumne River fishery. Using EBMUD's own studies and monitoring results she documented occurrences of low dissolved oxygen, elevated hydrogen sulfide, and elevated heavy metal levels at critical times of the year for fisheries and other aquatic resources. Her findings substantiate the need for immediate action to restore water quality in Camanche Reservoir, the MRFF, and the lower Mokelumne River.

In repeated testimony at the hearing, low dissolved oxygen levels were cited as one of the major contributors to MRFF fish kills in 1987, 1988, and 1989. Ms. Sefchick recognized the efforts made by EBMUD to provide at least 7 ppm dissolved oxygen

to the lower Mokelumne River. However, she indicated that in order to adequately maintain all life cycle stages of salmonids, dissolved oxygen levels in the lower Mokelumne River must be greater than 8 ppm. This is consistent with the U. S. Environmental Protection Agency Quality Criteria for Water 1986 (USFWS Exhibit No. 6) for the maintenance and protection of aquatic resources.

While Russell Bowen of EBMUD suggested that heavy metals are not a problem in the lower Mokelumne River system, he and other EBMUD witnesses admitted during cross-examination that Camanche Reservoir releases regularly exceed EPA criteria for the maintenance and protection of aquatic resources. Ms. Sefchick testified that dissolved metal concentrations available to aquatic organisms have exceeded the EPA criteria of 0.0031 ppm copper and 0.0248 ppm zinc as recently as 1989, as shown in the Camanche Reservoir Water Quality Studies Final Report prepared by Brown and Caldwell (EBMUD Exhibit 33 A-13, pages 19-23). In addition, in her rebuttal testimony, Ms. Sefchick testified that the water quality data provided by EBMUD in Exhibit 83 shows exceedences of the EPA metals criteria as recently as October 20, 1992.

During rebuttal, Ms. Sefchick testified that the data provided in EBMUD Exhibit 83 shows that levels of copper and zinc repeatedly exceeded EPA criteria (EPA 1986) throughout EBMUD's water quality monitoring program. At CAMC, a sampling station for discharge to the river below Camanche Dam (map in EBMUD

Exhibit 33 Appendix A-5) (Enclosure 1), 26-53 percent of the sampling dates between 1989 and 1992 showed exceedences of the EPA criteria for copper or zinc, or both. Ms. Sefchick also pointed out that in 1987 no data was collected to determine metal concentrations, and in 1988, only total concentrations of metals were measured (dissolved metal concentrations are needed to assess concentrations that are bioavailable to fishery and aquatic resources).

Ms. Sefchick further testified during rebuttal that EBMUD Exhibit 83 shows that for many months of the year, fish in the lower river are exposed to levels of heavy metals that exceed healthful conditions. At sampling stations CAMC and CAMD, exceedences occurred in 9 months of the year in 1989, in 6 of the 8 months sampled in 1990, in 7 of the 11 months sampled in 1991, and in 6 of the 11 months sampled in 1992.

Ms. Sefchick also stated during rebuttal that the data in EBMUD Exhibit 83 show that the frequency of monitoring has been highly variable for the three sampling stations most indicative of water quality conditions in the lower Mokelumne River. Sometimes EBMUD monitored weekly, sometimes once a month, and on occasion, several times a day. Sometimes no monitoring was done for months or even years. She pointed out that for a period of over 2 years (June 1989 to August 1991) sampling station VAPK, the only sampling station in the lower Mokelumne River, was not monitored at all to determine metal concentrations. Only seven samples were taken to determine metal concentrations at sampling

site VAPK for the period of May 1988 through July 1991 (EBMUD Exhibit 83). She testified that in order to gain an accurate and complete account of Mokelumne River water quality conditions and their effects on fishes, and to fully assess the impact of EBMUD's operations on the MRFF and the lower Mokelumne River, a more intense strategy that includes a greater number of sampling sites and more frequent sampling of the lower River is needed. Bioassay testing for chronic effects; and monitoring of the river to observe changes in fish health, behavior, or fish mortality is also needed.

During the Service's cross examination of EBMUD, EBMUD indicated that no deleterious effects of metals have been observed in Mokelumne River fishes. However, they acknowledged that no testing has been done to determine the effects of elevated metal concentrations on fish. The Service testified that avoidance reactions, reduced swimming speeds, and delayed migration are all behavioral changes of fish that could result from exposure to water containing elevated metal concentrations. Monitoring the behavior and health of chinook salmon and other anadromous fish is especially important since they must navigate hundreds of miles of river and ocean to complete their life cycle. However, the necessary testing to determine the sublethal effects of the elevated metal concentrations on these fish has not been undertaken.

The acute bioassay done by EVS Consultants (EBMUD Exhibit A33 A-13) demonstrates that metal concentrations in Camanche

Reservoir sediments could be toxic to fish. The study report states on page 49 that, "The bioassay tests established that resuspension of the sediments from the river and reservoir can lead to toxic solutions."

In response to a February 18, 1993 request from Robert C. Helwick, Esq., of EBMUD, the Service provided general technical assistance concerning EBMUD's development of a lower Mokelumne River water quality monitoring plan (Enclosure 2). The Service provided framework guidelines for a water quality monitoring plan that would provide reliable data indicative of water quality conditions in Pardee and Camanche Reservoirs, the Mokelumne River Fish Facility, and the lower Mokelumne River. The Service recommended that EBMUD prepare a water quality monitoring plan, incorporating the Service's guidelines, for review by the Service and other appropriate parties. To our knowledge EBMUD has not responded to the Service's recommendation.

DFG AND EBMUD PLAN COMPARISON

Both the DFG and EBMUD prepared comprehensive plans for maintaining and restoring fish and wildlife public trust resources. The Service evaluated the DFG's Lower Mokelumne River Fisheries Management Plan (DFG Plan - DFG Exhibit 22), and EBMUD's Lower Mokelumne River Management Plan (EBMUD Exhibit 32), with regard to their goals and likelihood of success. We found some areas of agreement in terms of flow amounts, timing of releases, fluctuation control, temperature criteria, and non-flow

related measures. However, there are many areas of disagreement which are of great importance. These include (1) definition of water years for water availability and associated flow management, (2) water temperature criteria and measurement points, (3) management measures during low flow years, (4) Pardee and Camanche Reservoir operation to maximize coldwater storage, (5) water quality criteria implementation, and (6) instream flows.

Gary Taylor testified that the DFG Plan is superior to the EBMUD Plan for protecting and restoring fish and wildlife public trust resources in the lower Mokelumne River. After reviewing the hearing submittals and listening to testimony, the Service remains convinced that this is true. The minimum instream flows recommended in the EBMUD plan, as displayed in EBMUD Exhibit No. 25, Table 4, are far below those needed to restore the salmon and steelhead resources. Reducing flows following the spawning period and continuing lower flows through the spring rearing period is not a suitable management scheme. Spawning-level flows should be continued into the early and late spring period to ensure that habitat is available for steelhead spawning and for juvenile salmon and steelhead rearing. Increased levels of flow are needed in the late spring to encourage downstream emigration and to improve passage to the San Francisco Bay/Sacramento-San Joaquin Delta (Delta).

Another serious deficiency in the EBMUD Plan is the reliance on trapping emigrating juveniles and smolts and trucking them

farther downriver to the Delta in many years. This type of management action should only be employed under extreme conditions on rare occasions. Frequent reliance on this type of management, in lieu of implementing operational improvements to provide adequate flows and to meet water temperature criteria, is unacceptable. Reliance on trapping and trucking in approximately 50 percent of the water years would likely result in much greater straying of adults to other systems, lengthen the period for restoration of the Mokelumne River strain of fall-run chinook salmon, and cause unnecessary handling mortalities. Also, the extremely low flows coincident with the trapping and trucking scheme would adversely impact the entire ecosystem of the Mokelumne River downstream of Woodbridge Dam.

In contrast to the EBMUD Plan, the DFG Plan would provide higher spawning level flows throughout the spring period, and further increase flows in the late spring to ensure successful emigration of juveniles and smolts. The DFG Plan does not rely on trapping and trucking during dry and critically dry years but instead focuses on a more condensed life cycle for fall-run chinook salmon that avoids the negative aspects of trapping and trucking. The Service generally agrees with most of the elements in the DFG Plan, as Gary Taylor testified. However, Mr. Taylor informed the Board that the Service was conducting an independent analysis of instream flow needs for use in commenting on the Federal Energy Regulatory Commission's (FERC) Environmental Impact Statement for the Lower Mokelumne River Project, FERC No.

2916. The Service provided comments on FERC's draft Environmental Impact Statement for the Lower Mokelumne River Project on March 2, 1993. The comments include recommended instream flow schedules for the lower Mokelumne River. We have attached a copy of those comments for the Board's consideration (Enclosure 3).[1]

The Board should note the similarity of the Service's recommended flows to those of the DFG Plan. It is the Service's position that either of the instream flow schedules is superior to those proposed by EBMUD for the protection of fish and wildlife resources.

Water Availability

The DFG Plan proposes a more useful and practiced formula than the LMRMP for measuring water availability. By applying the formula in the DFG Plan, for example, unimpaired inflow into Pardee Reservoir provides a clear measure of water availability for allocation. In contrast, EBMUD's proposal allows for more manipulation of water between storage reservoirs and complicates comprehension of water availability within each water year.

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[1] Please be aware that page 11 of the March 2 letter was a duplicate of page 10 ("Minimum Flows... Normal and above Water years"), thus flows for dry and critical water years were omitted. On May 14, 1993, a letter was sent to the FERC explaining the omission and providing the correct dry/critical years schedule (Enclosure 4).

River Corridor Management

The DFG Plan strives to maintain and improve the entire 63 miles of river corridor below Camanche Dam for anadromous fish by setting flow and temperature criteria suitable for all life stages of salmon and steelhead. In contrast, the EBMUD plan dismisses the lower two-thirds of the river below Woodbridge Dam for all low flow years (50% occurrence) and resorts to trapping and trucking outmigrant fish (EBMUD-Exhibit 25, page 24). Testimony from the DFG and EBMUD emphasized the need to re-establish lower Mokelumne River stock because it would have the greatest likelihood of returning to spawn in the Mokelumne, instead of straying into some other San Joaquin River tributary or up the Sacramento River. No testimony at the hearing disputed that trapping and trucking increases mortality, resulting from handling, and leads to increased straying. The EBMUD plan, by employing this management practice in half the years, is decidedly inferior to the DFG Plan.

Water Temperature Criteria

In his testimony, Gary Taylor stated that he agrees with most of the water-temperature criteria recommended in the DFG Plan. He remains convinced, however, that water temperature criteria should not be based on water availability, i.e., dry and critical year designations. Instead, criteria should be based on

the biological needs of the target species, for example, chinook salmon and steelhead.

There are substantial data indicating that temperatures exceeding 16 degrees Celsius for an extended period during the juvenile life stage can result in growth stress, increased susceptibility to disease, and otherwise reduce survival. Page 66 of the DFG Plan cites some of the references (Rich 1987 and Reiser and Bjornn 1979) that support setting 15.6 degrees Celsius as the upper threshold for the juvenile life stage.

Temperature criteria should be set for measurement points that coincide with management plan goals and should be achievable in most years. This is another shortcoming of the EBMUD Plan. Instead of seeking alternative means to meet the water temperature needs of the species, the EBMUD Plan abandons temperature criteria for a reach of the river (downstream of Woodbridge Dam) that is essential for salmon and steelhead survival.

Russell Bowen testified that EBMUD had investigated several alternative means to provide colder, better oxygenated water for the river and the MRFF. However, EBMUD dismissed the Pardee Reservoir direct diversion option (described on page 4-10 of EBMUD-Exhibit 33, Appendix A-5), which, in the Service's view, is a viable option that would enable the DFG Plan temperature criteria to be met. This same concept was proposed as a solution to the water temperature and water quality problems associated with Camanche Reservoir by Dr. Chapman testifying on behalf of

the California Sport Fishing and Protection Alliance (CSPA-Exhibit 16, page 16). The Service believes there are feasible measures, such as a Pardee Reservoir direct diversion and a Camanche Reservoir multilevel intake structure, that can be taken to meet the DFG Plan water temperature criteria.

Woodbridge Dam/Lodi Lake Fish Passage

In his testimony, Gary Taylor identified many concerns about the adverse impacts of the Woodbridge Dam/Lodi Lake facilities on anadromous fish passage. He pointed out many deficiencies in the designs of the Woodbridge Canal fish screening facility and in the facilities at the dam to pass fish upstream and downstream. Mr. Taylor also testified that he believes Lodi Lake itself is an impediment to the safe and timely downstream migration of salmon and juvenile steelhead. Through their own independent investigation, EBMUD consultants identified many of the same deficiencies in the Woodbridge Canal fish screens and fish passage facilities. These deficiencies are pointed out in EBMUD-Exhibit 32, Appendix G. Dan Odenweller of the DFG testified that the fish screens do not meet current specifications and that modifications are warranted.

Although Woodbridge Irrigation District provided testimony and cross examination to emphasize that they were not responsible for any fish problems because (1) the DFG designed and constructed all the fish screening and passage facilities, and (2) there is a lack of conclusive evidence that the screening and

passage facilities or the lake are causing significant mortality, we stand by our assessment and conclusions. We remain convinced that the Lodi Lake complex, including the dam and diversion, is a serious impediment to timely anadromous fish migration and contributes to the low productivity of Mokelumne River anadromous fish populations.

Water Quality

The DFG Plan focuses on criteria implementation to insure the maintenance of suitable water quality in the MRFF, Camanche Reservoir, and the lower Mokelumne River. In contrast, the EBMUD Plan does not propose implementation of criteria and focuses on technical-fix solutions for water quality problems. The Service believes that the DFG Plan would better provide for the protection and restoration of fishery and other aquatic resources until additional studies can be conducted of Camanche Reservoir, the MRFF, and the lower Mokelumne River. During cross-examination by the Service, EBMUD acknowledged that the Speece Cone (EBMUD's primary physical solution to improve water quality to the MRFF and the lower Mokelumne River) is highly experimental. Although benefits from the Speece Cone could result, the technology is unproven and should not be relied upon as the sole means to improve water quality.

The Board should be aware that in its October 1992 report titled: "Camanche Hypolimnetic Oxygenation Demonstration Project", EBMUD stated the Speece Cone would be constructed and

in operation by June 1, 1993. Following a recent site visit, DFG staff informed the Service that no evidence of construction activity of the Speece Cone is evident at this time.

The potassium permanganate system that is currently being used at the MRFF to treat elevated levels of hydrogen sulfide has been proposed by EBMUD as the primary back-up system if the Speece Cone fails. Judy Sefchick testified during cross-examination that the potassium permanganate system has many drawbacks. Besides adding chemicals to the river, the system is unreliable. The system's flow meters and sniffers have never worked properly, as is indicated in EBMUD Exhibit 33 A-34.

Ms. Sefchick testified that the factor most responsible for the convergence of water quality problems such as low dissolved oxygen, elevated levels of hydrogen sulfide, and elevated levels of heavy metals appears to be the depletion of the Camanche Reservoir hypolimnion. The DFG Plan includes a more reliable way to provide good quality water by requiring that a minimum pool level be set in addition to minimum releases from Pardee Reservoir. The EBMUD proposes a minimum hypolimnion level in Camanche Reservoir to prevent early destratification; however, it also proposes that releases from Pardee, used to maintain the hypolimnion, be halted if Pardee storage falls below a certain level. Allowing EBMUD unfettered flexibility in the management of Pardee releases and Camanche Reservoir levels could result in inappropriate management of the reservoir, especially in dry years, that could further harm populations of chinook salmon and

steelhead trout. Both the DFG Plan and the Service support the adoption of a reservoir management plan that specifies a minimum pool that, with proper management of Pardee releases, will insure maintenance of an adequate hypolimnion in all water years. Although we agree that a minimum pool level must be maintained in order to preserve the Camanche Reservoir hypolimnion, we believe that further studies should be completed and limnological models developed to determine the optimum level under various water year conditions.

During the rebuttal testimony of Judy Sefchick, it became clear that the data in EBMUD Exhibit 83 provide additional support for the Service's recommendations that: (1) a more intensive and structured monitoring program for recording metals data and other water quality data be established, which includes several sampling sites in the lower Mokelumne River, (2) additional studies be done to assess chronic metal toxicity in lower Mokelumne River fish, and (3) interim metals criteria be set and met until site-specific criteria for the Mokelumne River can be developed.

RECOMMENDATIONS

The Service recognize that not all of the measures needed to accomplish full protection and restoration of the lower Mokelumne River fish and wildlife public trust resources are within the jurisdiction of the Board. We also recognize that not all needed measures within the jurisdiction of the Board are immediately

implementable. Therefore we present our recommendations under the headings of interim and long-term measures. Accordingly, the Fish and Wildlife recommends that:

INTERIM MEASURES

1. The instream flows developed by the Service for above normal, dry and critical water years, to be measured at Highway 99 and Woodbridge Dam, be implemented, along with followup monitoring to determine their effectiveness in attaining habitat and population maintenance and restoration goals.

2. The mean daily water temperature criteria specified on page xv of the DFG Plan be adopted, except that water temperature from April 1 through May 31 not exceed 15.6 degrees Celsius above the confluence of the Cosumnes River.

3. The short-term daily streamflow fluctuation and streamflow reduction measures described on page xvi of the DFG Plan be implemented.

4. The area below Camanche Dam be managed in low-flow years as described in the DFG Plan, but with the flow schedule recommended by the Service. Trapping and trucking fish during low flow years should not be considered as a management practice only in the rarest of emergencies.

5. A comprehensive bio-engineering study of the entire Lodi Lake complex be conducted to determine how it impacts upstream adult passage and downstream fry and juvenile passage.

6. A phased program be implemented that incorporates such non-flow measures, as increased law enforcement to halt poaching,

phased restoration of spawning gravels, elimination of gravel mining operations within the stream channel, state-of-the-art screening on all fish pumps along the river, and a riparian vegetation management plan.

7. Water quality criteria be adopted for Camanche Reservoir, the MRFF, and the lower Mokelumne River. The following interim water quality criteria should be imposed for the Lower Mokelumne River until site-specific studies can be conducted:

(1) > 8 ppm dissolved oxygen (EPA 1986)[2]

(2) < 0.002 ppm hydrogen sulfide (EPA 1986)

(3) 6.5 - 9.0 pH (EPA 1986)

(4) Criteria for copper, cadmium, and zinc as recommended in the DFG's 1991 Management Plan -

≤ 0.003 ppm copper

≤ 0.009 ppm zinc

≤ 0.0001 ppm cadmium

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[2] These criteria apply to the lower Mokelumne River only; 7.0 ppm dissolved oxygen is acceptable in Camanche and Pardee Reservoirs.
In her testimony, Judy Sefchick indicated that the Service supports adoption of the criteria developed by the DFG for Central Valley streams for cadmium, copper, and zinc until site-specific criteria for the lower Mokelumne River can be developed. This position is consistent with that of the EPA which supports each State developing water quality criteria that are appropriate for species, like chinook salmon, that are most sensitive to water quality conditions. Although precise heavy metals criteria for the lower Mokelumne River need to be determined, we believe that the criteria developed by the DFG for the upper Sacramento River should be used until site-specific studies can be done.

(5) other metals criteria as recommended by the EPA (1986) for the protection of aquatic resources.

Camanche Reservoir is a sink for heavy metals and has potentially toxic levels of heavy metals in its bottom sediments that may be resuspended under certain conditions. EBMUD, through its own studies (as shown in EBMUD Exhibit 33 A-1 and EBMUD Exhibit 33 A-13), has identified the same potential problems with heavy metal toxicity to aquatic organisms that the Service has recognized. The Camanche Reservoir Water Quality Studies Final Report (EBMUD Exhibit 33 A-13) states on page 51, "Resuspension of reservoir sediments during turnover conditions and the resulting release of metals as dissolved species, should be carefully monitored. During these turnover periods, levels of dissolved metals may contribute to the stress on fish in the reservoir and MRFF."

LONG TERM MEASURES

1. Instream flow requirements be revised after monitoring the effects of the Service's recommended regime for no less than a 10-year period that includes at least one representative example of each type water year as defined by the DFG Plan.

2. The water temperature regime described under the interim measure recommendations be continued unless a preponderance of study data or added project features justify further modifications.

criteria be continued, unless study data or added features justify modifications.

4. The area below Camanche Dam be managed in low-flow years as under the interim recommendations.

5. Modifications to the configuration and operation of the Woodbridge Dam/Lodi Lake fish passage facilities be made following completion of the interim bio-engineering study.

6. The phase-in of non-flow measures be continued based on ongoing monitoring and study results.

7. Water quality criteria be adjusted to reflect the results of site-specific studies of the lower Mokelumne River, and implement a reservoir management plan that, with the proper management of Camanche Reservoir elevations and Pardee releases, will insure the maintenance of an adequate hypolimnion in Camanche Reservoir to provide water for the MRFF and the lower Mokelumne River that meets the water quality criteria.

Respectfully submitted,

John W. Burke III
Regional Solicitor

May 17, 1993
Date

By: Lynn Cox
Assistant Regional Solicitor

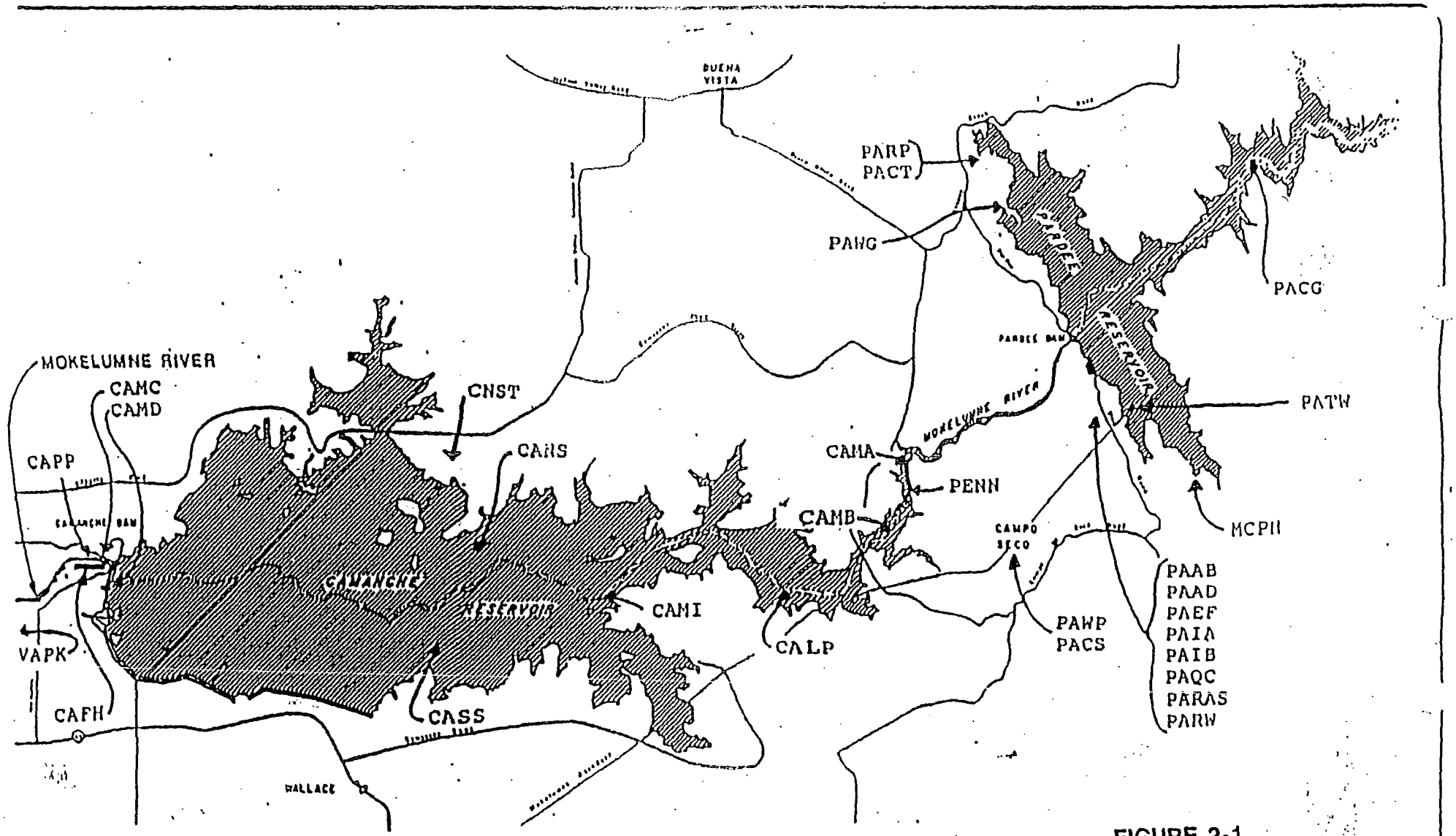

FIGURE 2-1

WATER QUALITY SAMPLING STATIONS FOR CAMANCHE AND PARDEE RESERVOIRS

Pursuant to Mr. Del Piero's request at the Mokelumne River Hearing in November 1992, additional water quality data concerning heavy metal concentrations was supplied by EBMUD. After reviewing this supplemental data, the USFWS made some general observations.

The data provided by EBMUD only included the 3 sampling stations most indicative of conditions in the lower Mokelumne River. Exhibit 83 has indicated that the 3 sampling stations were: CamC, which samples the discharge from Camanche Dam to the Mokelumne River; CamD, which samples the Camanche Reservoir lower outlet to the Mokelumne River; and station VAPK, which samples the Mokelumne River at Van Assen Park. According to the map in EBMUD Exhibit 33 Appendix A-5, CamD is the outlet within the Reservoir, whereas CamC samples the river side of the discharge and is therefore more indicative of Mokelumne River conditions.

Although EBMUD indicated in Exhibit 33 (page 4) that they began a water quality monitoring program in September 1987, after a fish kill at the MRFF to determine what was occurring in the releases from Camanche Reservoir to the hatchery and downstream, the data presented in Exhibit 83 show that heavy metal concentrations were not analyzed for at any of the 3 sampling sites until May 1988. In that month, heavy metals were monitored at sampling stations CamD and VAPK. EBMUD did not begin to monitor for heavy metal concentrations at CamC until September 1988.

The data contained in Exhibit 83 show that the frequency of monitoring has been highly variable for the 3 sampling stations most indicative of water quality conditions in the river. The data show that sometimes EBMUD monitored weekly, sometimes once a month, and on occasion, several times a day. Sometimes no monitoring was done for months or even years. For example, at the single sampling location in the lower river (VAPK), no monitoring at all was done to determine metal concentrations for a period of over 2 years (June 1989 to Augusst 1991). Only 7 samples were taken to determine metal concentrations for that site for the entire period between May 1988 through July 1991.

The sporadic nature of the sampling does not demonstrate an intensive water quality monitoring program which is necessary in order to obtain the information needed to fully assess the impact of EBMUD's operations on the MRFF and the lower Mokelumne River. Nor does the data provide an adequate database of baseline conditions in the river from which to draw a conclusion that heavy metals are no longer a problem.

After reviewing the data provided in EBMUD Exhibit 83, the USFWS had some concerns about the data as presented. On several occasions, the dissolved metal concentration exceeded its corresponding total metal concentration for both copper and zinc. Total metal concentrations represent the sum of such things as soluble complexed forms of the metal, the occluded forms of the metal in minerals, clays, and sorbed to particulate matter, as well as dissolved portions of the metal. The dissolved metal concentration should therefore only be a portion of the total metal concentration, and should not

exceed 100% of it. Overall, [illegible]
happened from 1989 to 1991 for copper and zinc.

The USFWS requested quality control and assurance data from EBMUD on December 28, 1992 in order to interpret the data in Exhibit 83 and understand these findings. We acknowledge and appreciate the additional information EBMUD provided to us however, no results were provided to explain the greater dissolved metal values. Since the USFWS found that the quality control and assurance information provided by EBMUD was not useful in interpreting the data in Exhibit 83, we have not included this information in our letter for your review. This information is available at our Sacramento office, however, if FERC wishes to review it in greater detail.

After reviewing the water hardness values supplied by EBMUD, we used hardness values of 20 at sampling stations CAMC and VAPK, and 25 at station CamD to assess the toxicity of copper and zinc. The data show that throughout EBMUD's monitoring program, there are elevated levels of copper and zinc and exceedences of the EPA (1986) criteria set for zinc and copper for the protection of aquatic resources. In the USFWS's examination of the data, zinc, copper, and cadmium were focused on.

In 1987, no data was collected to determine metal concentrations at any of the 3 sampling locations. In 1988, only total concentrations of metals, which are useless in evaluating the bioavailability of metals to fish, were measured. Dissolved metal concentrations, which are needed to assess the bioavailability to fishery and aquatic resources, were not measured.

In 1989, there were 11 sample dates in which exceedences of the EPA criteria for zinc occurred and 21 sample dates in which exceedences for copper occurred at CamC. Therefore, in 24 of the 67 sample dates, exceedences of the EPA criteria for copper, zinc, or both metals occurred. This represents 36% of the sampling dates. At CamD in 1989, 3 sample dates showed exceedences of the EPA criteria for zinc and 1 sample date showed exceedences for copper. At station VAPK, metal concentrations were given as total values in 1989, therefore exceedences could not be determined.

In 1990, even though fewer samples were taken at the sampling stations, 4 sample dates showed exceedences for zinc and 7 sample dates showed exceedences for copper at CamC. Nine of the 17 sample dates showed exceedences for copper, zinc, or both metals, which represented 53% of the data collected at CamC. At CamD in 1990, there was 1 exceedence of copper. No data was collected to determine metal concentrations at VAPK in 1990.

In 1991, 1 sample date showed an exceedence of zinc and 9 sample dates showed exceedences of copper at CamC. This represents 10 of the 26 samples or 38% of the sample dates that exceed the EPA (1986) criteria for copper, zinc, or both metals. One exceedence of zinc and 2 exceedences of copper occurred at CamD in 1991. There were no exceedences at VAPK, but only 5 samples were collected

there in 1991.

As recently as October 20, 1992, an exceedence of the EPA criteria for copper occurred. Six exceedences of copper occurred at CamC in 1992, which represents 26% of the sample dates. No exceedences were found at CamD of VAPK in 1992.

Although the frequency of monitoring has been highly variable for the 3 sampling stations most indicative of water quality conditions in the lower Mokelumne River, the data show elevated levels of copper and zinc and repeated exceedences of the EPA (1986) criteria over the entire period of monitoring. These exceedences indicate a potential problem for fisheries and aquatic resources in the Mokelumne River.

The data show that fish in the lower river are exposed to levels of heavy metals that exceed healthful conditions for many months of the year. In 1989, exceedences occurred during 9 months of the year, in 1990, exceedences occurred in 6 of the 8 months sampled, in 1991, exceedences occurred in 7 of the 11 months sampled at CamC and CamD, and in 1992, exceedences occurred in 6 of the 11 months sampled as indicated by the data.

Even though the data show frequent violations of the water quality standards for metals, the effects of those exceedences on fish have not been studied. To date, there has not been any chronic toxicity testing to determine the effects of the metals on such things as fish behavior, migration, swimming speed, feeding, or egg incubation. The information and studies presented to date by EBMUD do not provide a basis for the conclusion that heavy metals are not a factor affecting the fishery or aquatic resources in the Mokelumne River.