LOWER MOKELUMNE RIVER PROJECT

WATER QUALITY AND RESOURCE MANAGEMENT PROGRAM

BACKGROUND

The Federal Energy Regulatory Commission (FERC) November 27, 1998 Order Approving Settlement Agreement and Amending License approved the June, 1997 offer of settlement (Agreement) filed by the East Bay Municipal Utility District (EBMUD), U.S. Fish and Wildlife Service (USFWS) and California Department of Fish and Game (CDFG) in June 1997. Under the terms of the Agreement, EBMUD, USFWS and CDFG established a Lower Mokelumne River Partnership, the objectives of which included:

- Protection and enhancement of the anadromous fishery;
- Protection and improvement of the Mokelumne River ecosystem;
- Encouragement of stakeholder participation and cooperation; and
- Integration of Mokelumne River strategies with the Bay Delta Accord, CVPIA implementation, or similar measures.

The Partnership Steering Committee, composed of one representative each from CDFG, USFWS and EBMUD, developed this Water Quality and Resource Management Program (Program) to define reasonable goals, measures, performance criteria and responsive actions associated with the implementation of the Agreement. To enhance the Program and to have the ability to adapt to changing conditions, the Program may be modified by the Partnership. Any such modification must be made by unanimous written approval of EBMUD, USFWS and CDFG. Progress will be assessed annually at the Mokelumne River Symposium. Ten years after the effective date of the Agreement (November 1998), the committee will cooperate in the preparation of a report that describes the successes and failures of achieving the goals identified in the Agreement.

The Program focuses on the approximately 40-mile reach of the Mokelumne River from Camanche Reservoir to the San Joaquin River, including about 22 miles in the lower part of this reach that is tidally influenced. Three water quality monitoring sites (CAMA, CAMD and PENN20) are located in Camanche Reservoir and two (CAMC and Elliott Road Bridge) are located in the lower Mokelumne River.

PROGRAM VISION OF FUTURE CONDITION

The Program envisions a future condition in which the lower Mokelumne River is managed to provide sustainable supplies of water, hydropower and other natural resources while rehabilitating and maintaining diverse migratory and resident fish and wildlife populations. This vision also includes a comprehensive monitoring and applied research program integrated with a well coordinated program to adaptively manage water and power supply operations, flood control, hatchery operations and ecosystem rehabilitation actions. The following goals, implementation measures and performance criteria constitute the first iteration of a plan designed to achieve this vision.

GOALS, MEASURES AND PERFORMANCE CRITERIA

The following are the Program goals and the associated measures and performance criteria. The Partnership Steering Committee will develop responsive actions should the performance criteria not be achieved.

1. **Provide, to the extent feasible, habitat quality and availability in the lower Mokelumne River to maintain fishery, wildlife and riparian resources in good condition.**

   The goal of maintaining the fishery and riparian resources of the lower Mokelumne River in good condition is in concert with the goals and objectives of the CALFED Bay-Delta program. The CALFED Bay-Delta program was established to reduce conflicts in the San Francisco Bay/Sacramento-San Joaquin Delta estuary (Bay-Delta) by solving problems in ecosystem quality, water supply reliability, and levee and channel integrity. The lower Mokelumne River is a tributary to the Bay-Delta and the

tidally influenced lower 22 miles of the river are within CALFED's geographic scope for developing possible solutions to the Bay-Delta problems.

The mission of the CALFED Bay-Delta program is to develop a long-term, comprehensive plan that will restore ecological health and improve water management for beneficial uses of the Bay-Delta system. The Ecosystem Restoration Program (ERP) is the principal component designed to increase and improve aquatic and terrestrial habitats to support stable, self-sustaining populations of diverse and valuable species. The ERP will also help fulfill the mission of improving water management for beneficial uses of the Bay-Delta system. Current protections for endangered and threatened fish species require that exports of Bay-Delta water be reduced or curtailed when they pose a risk to the species. By helping to recover currently endangered and threatened species and by maintaining populations of non-listed species, the ERP can help circumvent diversion restrictions and preclude more stringent export restrictions in the future, thereby improving the reliability of Bay-Delta water supplies. The ERP represents one of the most ambitious and comprehensive ecosystem restoration projects ever undertaken in the United States. It encompasses a wide range of aquatic, riparian and upland habitats throughout the Bay-Delta ecosystem and near-shore ocean environment.

The CALFED Bay-Delta program's vision for the Eastside Delta Tributaries Ecological Zone, which includes the lower Mokelumne River, is to improve the values of the rivers and riparian zones as fish and wildlife corridors from the delta to the upland and upstream habitats. This will be accomplished through restoration of tidal wetlands; creation and maintenance of permanent freshwater marshes, seasonal wetlands, and floodplain habitat; improving spawning conditions and stream shading, and providing valuable habitat for a variety of wildlife species.

The CALFED vision includes improved streamflow patterns, reconnecting the river with its floodplain, restoring riparian and riverine aquatic habitat, reducing loss of salmon and steelhead and other young fish at unscreened diversions, and reducing

fish passage problems at diversion dams. Ecological health will be attained when levees are modified to allow seasonal floodplain inundation; chinook salmon and steelhead populations reach target levels; habitat is improved for resident native fishes, sandhill cranes, and migratory waterfowl; migration corridors are improved for aquatic and terrestrial species; and riparian and stream channel habitats are restored.

The Program vision for the lower Mokelumne River focuses on improving streamflows and stream channel and gravel recruitment processes needed to support habitat for anadromous salmonids and other fish species. It also focuses on rehabilitating tidal wetlands, floodplains, seasonal floodplain inundation, and natural flood regimes. On the lower Mokelumne River, rehabilitation will focus on habitat for fall-run chinook salmon and steelhead. Throughout the lower Mokelumne River, rehabilitating actions and evaluations will be guided by a scientifically-based adaptive management approach directed at increasing natural production of anadromous and resident fish and rehabilitating and protecting a diverse and self-sustaining community of riparian and wetland plants and animals.

The following implementation measures are designed to provide, to the extent feasible, habitat quality and availability in the lower Mokelumne River to maintain the fishery, wildlife and riparian resources in good condition.

Measure

- Maintain water temperatures in the lower Mokelumne River to meet the life-history needs of aquatic organisms.

  Performance Criteria

  - ✓ Use best efforts to maintain a minimum of 28,000 acre-feet of hypolimnetic volume (the volume of water colder than 16.4º C as determined by weekly hyro-lab at CAMD) in Camanche Reservoir through October whenever Pardee Reservoir total volume is in excess of 100,000 acre-feet.

- ✓ Operate the upper and lower level outlets in Camanche Reservoir to maintain the best possible release temperatures to meet the life-history needs of aquatic organisms based on EBMUD's operation plan prepared annually in March.

Measure

- Maintain dissolved oxygen levels and reduce hydrogen sulfide levels in the Camanche Reservoir hypolimnion.

Performance Criterion

- ✓ Operate the Hypolimnetic Oxygenation System when dissolved oxygen levels in the Camanche Reservoir hypolimnion drop to 2 ppm (as measured at CAMC) during the period May through October.

Measure

- Increase summer and fall base flows in the lower Mokelumne River by developing new water supplies.

Performance Criterion

- ✓ Increase instream flows beyond the flows specified in Attachment 1 of the Agreement by an amount equal to 20% of the actual yield (up to 20,000 acre-feet) of additional water supplies developed by EBMUD from new facilities. Said gainsharing water shall be available in accord with Section F.2 of the Agreement.

Measure

- Improve opportunities for the lower Mokelumne River from Camanche Dam downstream to the San Joaquin River to seasonally inundate the floodplain.

Performance Criteria

- ✓ Examine how revisions to the flood control requirements of the U.S. Army Corps of Engineers and the pattern of the flood flow releases could be modified to support restoration of ecological processes, and not create undue risk of flood damage.

- ✓ Conduct a feasibility study to identify activities to minimize flood-related damage and improve flood plain habitats and processes. Activities considered for implementation will be those that respect private property rights, protect water rights and maintain economic viability of land owners and water users. The activities will be identified through a cooperative planning effort that will include

landowners, local governments, land and water users, and interested public.

- ✓ Modify the minimum flow regime, in accord with Section F.1 of the Agreement, to optimize the conditions for ecosystem values provided the total quantity of water released in any given year will not be less than the quantity of water provided by the flow requirements specified in Attachment 1 of the Agreement.

Measure

- Maintain and enhance high quality habitat conditions for terrestrial riparian communities and shaded riverine aquatic habitat.

Performance Criteria

- ✓ Identify and map the aquatic and terrestrial components of the riparian system from Camanche Dam downstream to tidewater and cooperate with others to identify and map these components downstream to the San Joaquin River.

- ✓ Continue monitoring invertebrates, fish, amphibian, reptile, mammal, raptor and neotropical bird communities in the lower Mokelumne River from Camanche Dam downstream to tidewater and cooperate with others to monitor these communities downstream to the San Joaquin River.

- ✓ Develop a cooperative program with local interests to improve land management and livestock grazing practices along riparian zones to reduce streambank erosion and fine sediment input.

Measure

- Reduce the adverse effects of invasive riparian plants on native species and ecosystem processes.

Performance Criterion

- ✓ Develop and implement a coordinated control program to reduce or eliminate invasive plant species from the riparian corridor along the lower Mokelumne River.

2. Contribute towards the state and federal fishery restoration goals as defined in the California Salmon, Steelhead Trout and Anadromous Fisheries Program Act and the Central Valley Project Improvement Act.

The Salmon, Steelhead Trout, and Anadromous Fisheries Program Act was passed by the California legislature, signed by Governor Deukmejian, and chaptered into the Fish and Game Code in 1988 (Section 6900 et. seq.). Its intent was to implement the recommendations of the California Advisory Committee on Salmon and Steelhead Trout (CACSST) to conserve and restore the anadromous fisheries resources of the State. The CACSST is a citizen's advisory committee created by the state Legislature in 1983 to develop a strategy for the conservation and restoration of salmon and steelhead resources in California. It consists of representatives from commercial and sport fishing organizations, native Americans, aquatic scientists, and public interest groups. The Act established the Salmon and Steelhead Trout Restoration Program within CDFG, whose purpose is to "develop a plan and program that strives to double the current [1988] natural production of salmon and steelhead." The legislation found that protection and restoration must be accomplished primarily through the improvement of stream habitat and declared that it is a policy of the State to recognize and encourage the participation of the public in mitigation, restoration, and enhancement programs in order to protect and increase natural spawning salmon and steelhead resources.

The Central Valley Project Improvement Act (CVPIA) of October 1992 amends the authority of the Bureau of Reclamation's Central Valley Project to include fish and wildlife protection, restoration, and mitigation as an equal priority with other CVP functions, which include navigation, flood control, irrigation, and municipal water supply. Section 3406 (b) of the CVPIA directs the USFWS to develop and implement programs and actions to ensure that by 2002 the natural production of anadromous fish in Central Valley streams, including the Mokelumne River, will be sustainable, on a long-term basis, at levels at least twice the average levels of natural production during the 1967-1991 baseline period.

Sections 3406(b)(1) of the CVPIA established the Anadromous Fish Restoration Program (AFRP). The AFRP established baseline production numbers for Central Valley streams for naturally produced chinook salmon (all races), steelhead trout, striped bass, American shad, white sturgeon, and green sturgeon. Baseline production estimates were developed using monitoring data collected from 1967 through 1991. Production targets for anadromous fish were determined by doubling the baseline production estimates.

The Comprehensive Assessment and Monitoring Program (CAMP), which was established by Section 3406(b)(16) of the CVPIA, has two distinct goals:

- To assess the overall effectiveness of actions implemented pursuant to CVPIA Section 3406(b) in meeting the AFRP production targets.

- To assess the relative effectiveness of water management modifications, structural modifications, habitat restoration and fish screens in meeting AFRP production targets.

Progress toward meeting anadromous fish production targets (CVPIA goal 1) is assessed based on estimates of adult production of all races of chinook salmon, steelhead trout, striped bass, American shad, white sturgeon, and green sturgeon. Data collected by adult fish monitoring programs are used to calculate annual production estimates for each species and race. Trends in natural production for each species and race are developed by comparing the annual production estimates to the 1967 through 1991 baseline period estimates for each targeted watershed, including the Mokelumne River. The adult monitoring program relies extensively on existing monitoring programs and is planned to be consistent and long-term (25 to 50 years duration).

Estimates of juvenile chinook salmon production, which are determined by monitoring selected watersheds, including the Mokelumne River, are used to evaluate

the relative effectiveness of the four categories of restoration actions (water management modifications, structural modifications, habitat restoration and fish screens) in increasing production (CVPIA goal 2). Evaluating the effectiveness of these and other efforts to restore anadromous fish populations is important because it provides a quantitative basis for redesigning existing restoration actions and for developing and prioritizing future actions.

The watersheds targeted for CVPIA monitoring include the American River, Battle Creek, Big Chico Creek, Butte Creek, Clear Creek, Deer Creek, Feather River, Merced River, Mill Creek, Mokelumne River, Sacramento River, San Joaquin River, Stanislaus River, Tuolumne River and Yuba River. The following restoration actions for the lower Mokelumne River have been proposed by CVPIA.

Habitat Restoration

- ➢ Replenish spawning gravel
- ➢ Cleanse spawning gravel and prevent sediment
- ➢ Enhance and maintain the riparian corridor
- ➢ Eliminate or restrict gravel mining

Water Management

- ➢ Improve flows for chinook and steelhead
- ➢ Reduce flow fluctuations
- ➢ Maintain suitable water temperatures
- ➢ Establish and enforce water quality standards

Fish Screens

- ➢ Screen all diversions

The following implementation measures are designed to contribute towards the state and federal fishery restoration goals as defined in the California Salmon, Steelhead Trout and Anadromous Fisheries Program Act and the Central Valley Project Improvement Act.

Measure

- Support the assessment of the overall effectiveness of actions implemented pursuant to the Central Valley Project Improvement Act in meeting Anadromous Fisheries Restoration Program production targets.

  Performance Criteria

  - ✓ Continue the daily enumeration of migrating adult chinook salmon and steelhead by video monitoring and trapping at Woodbridge Dam (or other appropriate methods). The enumeration begins in August and continues through March.

  - ✓ Continue conducting weekly redd surveys in the lower Mokelumne River between Camanche Dam and the Elliott Road bridge from October through April.

Measure

- Support the assessment of the relative effectiveness of water management modifications, structural modifications, habitat restoration and fish screen installations to meet Anadromous Fisheries Restoration Program targets.

  Performance Criteria

  - ✓ Continue estimating the emigration of juvenile chinook salmon and steelhead by trapping at Woodbridge Dam and operation of the rotary screw traps below Woodbridge Dam (or other appropriate methods) and marking a portion of the natural outmigrants. The trapping begins in December and continues through July.

  - ✓ Continue monitoring CAMC and CAMD in Camanche Reservoir to measure temperature, pH, dissolved oxygen, conductivity, oxidation-reduction potential, and turbidity. In addition, collect monthly water quality samples at CAMC and CAMD to analyze for volatile suspended solids (VSS), total suspended solids (TSS), nutrients (total and dissolved phosphorus and nitrogen), chlorophyll (corrected and uncorrected for phaeopigments), and phytoplankton and zooplankton abundance and taxonomic composition (to genus).

- ✓ Collect monthly water quality samples in the lower Mokelumne River at the Elliott Road Bridge to analyze for VSS, TSS, nutrients (total and dissolved phosphorus and nitrogen), chlorophyll (corrected and uncorrected for phaeopigments), and phytoplankton and zooplankton abundance and taxonomic composition (to genus). In addition, the samples are analyzed for hardness, Al, Cd, Cr, Cu, Fe, Ni, Pb, Zn, Hg, Ti, pH and turbidity.

- ✓ Collect monthly water quality samples at CAMA and PENN20 in Camanche Reservoir to analyze for TSS, hardness, Al, Cd, Cr, Cu, Fe, Ni, Pb, Zn, Hg, Ti, pH, and turbidity.

Measure

- Maintain processes that provide for adequate sediment supply, channel meandering, and other fluvial geomorphologic attributes.

  Performance Criteria

  - ✓ When river flows allow it, provide average annual supplementation of approximately 1,200 cubic yards of suitably sized spawning gravel in the active stream channel to maintain and enhance spawning areas and to replace gravel that is transported downstream.

  - ✓ Continue monitoring spawning reach substrate characteristics, including channel configuration and gradient; substrate size; intergravel permeability, dissolved oxygen content, and temperature; and macroinvertebrate community structure (composition and abundance).

Measure

- Reduce entrainment of juvenile fish into water diversions to increase survival and contribute to restoration goals.

  Performance Criteria

  - ✓ Work cooperatively with the Woodbridge Irrigation District to install state-of-the-art fish screens and fish bypass system at Woodbridge Dam.

  - ✓ Work cooperatively with riparian diverters to install state-of-the-art fish screens where appropriate in the lower Mokelumne River between Camanche Dam and the San Joaquin River.

- ✓ Work cooperatively with the North San Joaquin Conservation District to evaluate the installation of permanent fish screens on their diversions.

Measure

- Manage flow releases to prevent stranding of juvenile fish and exposure of redds.

Performance Criterion

- ✓ Except in case of emergencies or when flood control releases are being made, average daily flow releases from Camanche Dam will not decrease by more than 50 cfs per day during the period October 16 through March 31, and by not more than 100 cfs per day at other times of the year.

Measure

- Improve anadromous fish passage at dams and diversions below Camanche Dam.

Performance Criteria

- ✓ Work cooperatively with the Woodbridge Irrigation District to improve fish passage at Woodbridge Dam.

- ✓ Work cooperatively with the Woodbridge Irrigation District and the City of Lodi to isolate the City of Lodi's Lake Lodi to improve salmon and steelhead passage and juvenile fish survival.

Measure

- Reduce the loss of juvenile anadromous fish caused by hydraulic conditions created by man-made structures within or directly adjacent to the lower Mokelumne River.

Performance Criteria

- ✓ Modify and improve the fish bypass at the Woodbridge canal.

- ✓ Reduce the impact of predators on juvenile salmonids below Woodbridge Dam by modifying the stream channel below the dam and/or implementing a controlled recreational fishery.

- ✓ Construct a fish barrier separating recreational Lodi Lake from the river reach seasonally impounded behind Woodbridge Dam.

3. Sustain the long-term viability of the salmon and steelhead fishery while protecting the genetic diversity of naturally producing populations in the lower Mokelumne River.

Fishery managers have recognized the need to maintain the diversity and complexity of salmonid stocks. Reasons for this include the maintenance or biodiversity and genetic integrity which allows for the wide variety of forms and behaviors found among individual species, which is essential to survival in sometimes harsh, changeable environments; maintenance of genetic diversity for future adaptations; maintenance of wild stocks to insure that there will be adequate supply of traits to reestablish genetic variability in hatchery stocks; and, the maintenance of populations best suited to a local environment.

It is the policy of the California Fish and Game Commission that salmon and steelhead shall be managed to protect, restore and maintain populations and genetic integrity of all identifiable stocks. Naturally spawned salmon shall provide the foundation for CDFG's management program.

The following implementation measures are designed to sustain the long-term viability of the salmon and steelhead fishery while protecting the genetic diversity of naturally produced populations in the lower Mokelumne River.

Measure

- Continue operation of the Mokelumne River Fish Hatchery to meet the mitigation requirements to supplement natural production and sustain a viable commercial and recreational fishery.

Performance Criteria

- ✓ Reconstruct the hatchery in accordance with the 1996 Hatchery Master Plan and the final design in consultation with CDFG, USFWS and NMFS.

- ✓ Operate the hatchery in accord with CDFG Best Management Practices.

- ✓ Implement a protocol that will ensure notification of the parties of any abnormal losses and remedial actions taken.

- ✓ Monitor temperature, pH, dissolved oxygen, conductivity, oxidation-reduction potential, total and volitile suspended solids, total and dissolved phosphorous and nitrogen, and turbidity of the Mokelumne River Fish Hatchery water supply and effluent.

- ✓ Operate the hatchery to provide the flexibility necessary to conduct focussed research to better integrate hatchery management practices with natural production.

Measure

- Employ methods to limit straying of hatchery-produced fish and the possible reduction of the genetic integrity of naturally produced fish.

  Performance Criteria

  - ✓ Develop a cooperative program to evaluate the benefits of changing release locations in the Mokelumne River of salmon and steelhead produced at the Mokelumne River Fish Hatchery.

  - ✓ Develop a plan to reduce the importation of eggs and fry from other hatcheries.

  - ✓ Continue coded-wire tagging representative lots of chinook salmon released from the Mokelumne River Fish Hatchery and expand or modify the program if a statewide strategy is developed to constant fractional mark or coded-wire tag all salmon released from California fish hatcheries in cooperation with commercial salmon trawlers, the Resource Agencies and the California Fish and Game Commission.

  - ✓ Develop a cooperative plan to reduce impacts of imported fish released in Camanche and Pardee reservoirs.

Measure

- Develop harvest management strategies that allow naturally produced fish to increase their reproductive potential.

  Performance Criteria

  - ✓ Implement enforcement efforts to reduce or eliminate illegal salmon and steelhead harvest in the lower Mokelumne River.

  - ✓ Mark and tag all hatchery-produced steelhead and establish a selective fishery in the lower Mokelumne River.