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An Inquiry Submittal Proposal to Category III

a. Project Title and Applicant Name.

Contaminant Loadings from the Sacramento and San Joaquin Rivers and Delta.

Jay Davis, Ph.D., Rainer Hoenicke, Ph.D., Bruce Thompson, Ph.D.
San Francisco Estuary Institute
1325 S. 46th Street
Richmond, CA 94804
510 231-9539

b. Project Description and Primary Biological/Ecological Objectives. The mass transport, or loading of contaminants in the Sacramento and San Joaquin Rivers is very poorly characterized. Rough estimates were made by Gunther *et al.* (1987) based on limited data available at that time. While most monitoring programs measure contaminant concentrations, there have been no measurements of contaminant mass loadings. The proposed project would measure contaminant loads from the Sacramento River and San Joaquin River watersheds into the Delta, and from the Delta into San Francisco Bay. The information gained from this project will help identify which contaminants may pose the greatest ecological risks to aquatic organisms exposed to contamination, and would help focus future source control projects.

c. Approach/Tasks/Schedule. To accurately estimate loads, the flux of contaminant mass must be measured as often as possible through the full range of water flow conditions. A two year field project is proposed. Four stations would be established. One station each on the Sacramento River (Tower Bridge) and the San Joaquin River (Stockton or Vernalis) as they enter the Delta in order to provide estimates of contaminant loading from the Central Valley into the Delta. Another set of stations would be established on the Sacramento River (Rio Vista) and the San Joaquin River (Twitchell Is.) as they leave the Delta and enter San Francisco Bay in order to provide estimates for loads into San Francisco Bay from the Delta. The stations would be located at tide and flow measurement sites currently occupied by USGS or DWR since tidal and flow information are important for determination of loads. It would be prohibitively expensive to sample contaminants continuously. Therefore, sampling would be conducted during key periods during the annual hydrograph. Sampling would occur approximately 20 times during the year in order to characterize loads during increasing flows in the winter, peak flows, receding flows in the spring, and dry weather flow in the summer and fall. Additionally, sampling would occur during periods of known contaminant runoff and during major storm events. Sampling would be conducted for at least two years, hopefully over differing water years (wet and dry) to characterize a range of loading conditions. Samples would be collected using short interval (a few days) compositing water samplers operated during ebb tides. The parameters that could be measured are listed on Attachment 1. The final choice of parameters would be coordinated with the CALFED Water Quality Committee. If adequate, existing USGS data on pesticides, or other monitoring data could be used.

d. Justification for Project and Funding by CALFED. The lower Sacramento and San Joaquin Rivers and the Delta are the focus of CALFED's activities. Water quality is a common program in all of CALFED's alternatives. It is anticipated that water quality will improve as a result of source

control and habitat restoration conducted in conjunction with CALFED and Category III activities. A key component of providing good water quality is sound knowledge of contaminant loads in the Rivers and Delta. That knowledge will reduce conflict because high quality data will show unequivocally which contaminants are most prevalent. Contamination in water is a stressor in all aquatic habitats and for all aquatic species. Therefore, this study will have broad ecosystem benefits, including benefits for all of CALFED's priority habitats and species. Accurate mass loading information would provide the basis for determining whether restoration activities in the Bay-Delta watershed result in reductions in contaminant transport throughout the ecosystem. Therefore, this project should be a precursor to many restoration and source control projects. Estimates of the mass of contaminants in the water would provide an excellent index (response indicator) for tracking changes in contamination related to CALFED or Category III programs. The proposed study will show whether contaminants are from the Rivers or Delta. Using pattern analysis and "fingerprinting", general sources of contaminants can sometimes be identified, providing a focus for the implementation of restorations and specific source control actions. For example, ratios of certain of petroleum hydrocarbons could suggest industrial discharge vs. auto exhaust combustion products.

e. Budget Costs and Third Party Impacts. The cost for this project are estimated at this time. They are based on collecting and analyzing 20 sample per year for two years at four station. Field sampling: \$32 K; laboratory analysis: \$593 K; project coordination and management: \$60 K; data analysis and reporting: \$70 K, for a total estimated cost of \$760 K. Laboratory analysis costs are expensive because analysis is required for trace organics in pg/l (parts per quadrillion). That level of analysis is necessary because water quality criteria and objectives are in those units and the measurements will provide the precision needed for accurate loading estimates. Matching funds will be available (see h.). No third party impacts are anticipated.

f. Applicant Qualifications. SFEI is an independent, non-profit organization established to provide scientific information for management of the Bay and Delta. SFEI's Board of Directors and Committee of Policy Advisors includes many people from CALFED agencies, providing a policy link to CALFED. SFEI's Committee of Science Advisors would provide review of the proposed work. SFEI has a proven record of excellence in conducting contaminant studies in the region through the Regional Monitoring Program (RMP), including quality assurance and data management components. SFEI (as AHD) conducted the only previous loadings studies in the Bay-Delta (Guntner *et al.* 1987; 1991).

g. Monitoring and Data Evaluation. No response monitoring is needed for this project. Measurements of contaminant concentrations by the RMP and the Sacramento River Watershed Program will be used to verify the results of this study.

h. Local Support/Coordination with other Programs/Compatibility with CALFED objectives. Loadings and sources of contaminants will be a new major component of the RMP beginning in 1998. The RMP will provide matching funds for measurement of loads from the Delta at the Sacramento and San Joaquin Rivers confluence, into the Bay. Additionally, the RMP will provide comparable data for other adjacent watersheds such as the Napa and Petaluma Rivers, and other major Bay tributaries. The RMP will investigate other sources of contamination such as atmospheric deposition. This project directly addresses CALFED's first objective for the Bay-Delta Program: to provide good water quality for all beneficial uses.

Attachment 1. Listing of water parameters that could be measured to determine contaminant loadings.

Contaminants	Ancillary Water Quality Parameters
<p><u>Trace metals:</u> arsenic, cadmium, copper, chromium, lead, mercury, nickel, selenium, silver, zinc</p>	<p>conductivity temperature total suspended sediments dissolved organic carbon dissolved oxygen pH</p>
<p><u>Petroleum hydrocarbons:</u> alkanes, pristane, phytane polynuclear aromatics (26 PAHs compounds), alkylated PAHs</p>	<p><u>Nutrients:</u> phosphates, nitrates, nitrites, ammonia, silicates</p>
<p><u>Chlorinated hydrocarbons:</u> PCBs (40 congeners), DDTs (6 isomers), chlordanes (7 compounds), hexachlorobenzene</p>	
<p><u>Pesticides:</u> Diazinon, chlorpyrifos, aldrins, endosulfans hexachlorocyclohexanes (HCHs)</p>	

Attachment 2. References Cited

Gunther, A., J. Davis, and D. Phillips. 1987. An assessment of the loading of toxic contaminants to the San Francisco-Bay Delta. Technical Report of the Aquatic Habitat Institute (now San Francisco Estuary Institute), Richmond, California, 330 pp.

Gunther, A., C. Blanchard, and K. Gardels. 1991. The loading of toxic contaminants to the San Francisco Bay-Delta in urban runoff. Technical Report of the Aquatic Habitat Institute (now San Francisco Estuary Institute), Richmond, California, 73 pp.

Bruce E. Thompson, Ph.D.—Senior Scientist, San Francisco Estuary Institute

Dr. Thompson, a California native, is a graduate of California State University, Fresno and received his M.A. attending the Moss Landing Marine Laboratory, and his Ph.D. in biological sciences from the University of Southern California in 1982, working in marine benthic ecology. He worked at the Southern California Coastal Water Research Project (SCCWRP) for 11 years prior to joining the staff of SFEI. His research has included field and laboratory studies of the ecology of benthic communities and species off southern California, and how they are affected by contamination. He was also involved in the development of regional monitoring programs in southern California. He has held positions of Research Associate at the Los Angeles County Museum of Natural History, and Adjunct Professor at California State University, Long Beach. He has published many articles and a book chapter on benthic ecology, sediment toxicity, and monitoring program development.

At SFEI, in Richmond, California, Dr. Thompson directs the monitoring, research, and data management staff. He is the Program Manager for the San Francisco Estuary Regional Monitoring Program which monitors the entire Estuary for contaminants and their effects. He serves as member of the Interagency Ecological Programs Management Team working on monitoring and research related to the effects of water flows and diversion in the Delta, and on the Science Advisory Board for the State's Bay Protection and Toxic Cleanup Program.

Jay Davis - Environmental Scientist, San Francisco Estuary Institute

Jay Davis received his bachelor's degree in biological sciences from Northwestern University, a master's degree in environmental management from Duke University, and a doctorate in ecology from U.C. Davis. His dissertation research examined concentrations and effects of PCBs and DDTs in fish-eating birds in San Francisco Bay. He joined the Institute (then the Aquatic Habitat Institute) in 1986. Jay was the primary author on the Pollutant Status and Trends report in 199x for the San Francisco Estuary Project. In the past year Jay has coordinated and participated in the design of the new fish contamination monitoring elements of the Regional Monitoring Program and the Sacramento River Watershed Program. As a result the fish monitoring in these two programs is closely coordinated.

Rainer Hoenicke, Ph.D.—Environmental Scientist, San Francisco Estuary Institute

Dr. Hoenicke received his B.S. in Agricultural Sciences from the University of Bonn, Germany, and his Ph.D. in Ecology from the University of California at Davis with emphasis in limnology. He was a postdoctoral fellow at Moss Landing Marine Laboratory and subsequently worked on EPA's National Acid Precipitation Program. Dr. Hoenicke was the lead scientist for the Santa Monica Bay National Estuary Program at the Los Angeles Regional Water Quality Control Board. He was involved in the development of the regional monitoring strategy for the Santa Monica Bay and the Southern California Bight and was a key member of the Malibu Creek Watershed planning effort. Dr. Hoenicke joined the staff of SFEI in 1994.