

6, 1, 7 1.4m I1-020

Toxicity Assessment Consortium at University of California Davis--Inquiry Submittal

Susan L. Anderson (Lawrence Berkeley National Laboratory and Bodega Marine Laboratory, University of California Davis) and David E. Hinton (Department of Veterinary Medicine, Anatomy, Physiology and Cell Biology, University of California Davis)

Project Description and Primary Objectives

The objective of this project would be to create a toxicity assessment consortium at UC Davis to characterize habitat impairment attributable to toxic contaminants and to provide support for development of remediation alternatives. The geographic scope of the project would include The Delta, Suisun Marsh, North Bay, Eastside tributaries, and the San Joaquin River. We propose to combine the expertise and resources of the two most experienced toxicity assessment research laboratories in the Bay/Delta region to provide a timely and comprehensive evaluation of habitat impairment. This effort would be linked with ongoing and proposed investigations and would utilize a broad range of resources at UC Davis.

The primary objectives would be to:

- 1) characterize the spatial and temporal dynamics of habitat impairment due to toxic impacts with emphasis on agricultural discharge,
- 2) examine potential linkages between habitat impairment and impacts on early lifestages of chinook salmon and other priority species,
- 3) identify toxic substances of concern based on toxicity identification evaluations (TIE) and land use data,
- 4) assist agencies in developing site-specific water quality objectives for select toxicants, and
- 5) provide rapid response monitoring which is crucial to understanding impacts of ephemeral toxic events.

Findings would be linked directly to efforts (Hinton and others) at UC Davis to evaluate pest management alternatives. In addition, toxicity testing support needed to evaluate other remedial alternatives would be provided.

Approach/Tasks/Schedule

Spatial and temporal dynamics of habitat impairment will be assessed using water column, sediment, and *in situ* toxicity testing with both indicator and resident species. The timing of each study and the locale will be linked to potential exposure events (already under extensive discussion and coordination). Exposure events will focus on the impacts of agricultural chemical discharges related to specific crops as well as to the influence of storm events. These studies will be large-scale and require the combined resources of two well-established laboratories. Extensive coordination with other agency investigations of priority species and of toxicant concentrations is envisioned.

Linkages between habitat impairment and impacts on priority species will be developed using a three-pronged approach. First, occurrence of toxicity in key habitat areas will be documented. Secondly, *in situ* toxicity tests with early lifestages of priority species, such as chinook salmon, will be conducted. Third, in select cases toxicity biomarkers and histopathologic techniques will be used on resident species to examine impacts of toxicants on field-collected organisms.

Toxic substances of concern will be identified using both chemical characterization of the sites and TIE investigations coupled with existing knowledge of agricultural and other land use patterns. Select biomarkers of exposure, such as acetylcholinesterase inhibition for pesticides, will also be examined to confirm exposure to specific toxicants in resident species.

Site-specific water quality objectives would be developed for one or two of the identified toxicants, and the area impacted by the toxicant examined. Site-specific water quality objectives are developed using toxicity tests conducted on site waters that are spiked with the chemical of concern. Variation in toxicity among site waters is examined.

Rapid response monitoring will be facilitated by development of a rapid response plan. Implementation of the plan will be greatly facilitated by the unprecedented combination of resources in the two laboratories.

Justification for Project Funding by CALFED

To restore ecological health and improve water quality management in the Bay/Delta and tributaries, the effects of contaminants must be considered. Widespread distribution of toxicity has been documented in the Sacramento River and tributaries as well as in wetland habitats of San Francisco Bay. Toxic levels of contaminants can render habitat unsuitable for aquatic life. Existing efforts to quantify the spatial and temporal distribution of toxicity and assess larger ecological effects are hampered because funding has not been adequate to: 1) conduct comprehensive watershed-level assessments, 2) link toxicity test results to damages in resident species, 3) provide rapid response studies following major storms or exposure events, and 4) provide assistance with the development of remediation and control efforts. Although numerous agencies have contributed to previous efforts, CALFED funding represents the only conceivable opportunity to develop a larger-scale integrated program. Results would lead to immediate assessment of water quality control and remediation alternatives.

Budget Costs and Third Party Impacts

The estimated budget for this project is \$450K per year for 3 years. The majority of water column toxicity tests for the Delta, North Bay, and Suisun Bay would be conducted in the Anderson laboratory and the majority of water column toxicity tests for the Sacramento and San Joaquin Rivers would be conducted by the Hinton laboratory. The Anderson laboratory would also conduct sediment and *in situ* toxicity testing; whereas the Hinton laboratory would conduct the TIE investigations and research on pest management alternatives. Studies on site-specific water quality objectives for freshwater would be undertaken at UC Davis Center for Ecological Health Research and estuarine and marine investigations would be located at the Bodega Marine Laboratory. The final proposal will include a budget for UC Davis that maintains flexibility in allocation of funds among the two groups. No third party impacts are anticipated.

Applicant Qualifications

The laboratories of Drs. Hinton and Anderson have been responsible for the majority of toxicity-related research investigations in the estuary. Dr. David Hinton is a cell biologist-anatomist with 28 years of academic teaching and research experience. He has been a major contributor to research on fish pathobiology and his laboratory has performed toxicity tests on ambient water in California for 6 years. Dr. Anderson has conducted research on toxicity testing in San Francisco Bay wetlands and sediments for 8 years. She is Ecological Research Group Leader at the Lawrence Berkeley National Laboratory but plans to relocate to the UC Davis Bodega Marine Laboratory fall 1997. Both investigators have extensive research experience in assessment of sublethal effects of toxicant exposure on aquatic organisms.

Monitoring and Data Evaluation

Techniques for data evaluation will be specified for each objective in the final proposal. Semi-annual data and program reviews will be conducted using a team of designated research and agency personnel, including researchers from outside the area. The purpose of the reviews will be to ensure that the research is directed at the highest priority exposure events, species, and toxicants as well as to review actions to be taken based on key findings. The goal is to conduct coordinated watershed-level assessments which will be facilitated by extensive coordination and technical review.

Local Support/Coordination and Compatibility

Both the Anderson and Hinton laboratories have worked in close cooperation with the State and Regional Water Quality Control Boards, USEPA Region IX, the Interagency Ecological Studies Program Pollutant Work Team (IEP/PWT), flood control districts, and other entities involved with water quality in the region. For this project, we would specifically coordinate our sampling with researchers at USGS monitoring toxicant levels in the estuary, with studies underway funded by the IEP/PWT and other ongoing investigations. The proposed project is compatible with CALFED goals to assess the sources and effects of contaminant exposure in priority locales with linkages to potential effects on priority species.

Please address reply to: Dr. Susan Anderson, Bldg 70-193a, Lawrence Berkeley Laboratory, 1 Cyclotron Road, Berkeley, CA 94720. Phone (510)486-4654, FAX (510)486-7303, email standerson@lbl.gov