ATTACHMENT C

Department of Water Resources Proposed Monitoring Program

C-089276

Prospect Island Monitoring Proposal

July 1998

DEPARTMENT OF WATER RESOURCES
Environmental Services Office

C-089277

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C-089278

EXECUTIVE SUMMARY

The Prospect Island Restoration Project is designed to restore shallow water tidal habitat in the northern Sacramento-San Joaquin Delta. The Department of Water Resources and the U.S. Army Corps of Engineers sponsor the project with funding support from California Urban Water Agencies via CALFED's Category III Program. Presently, no funds have been allocated for monitoring. DWR is requesting that Category III fund three years of post-project monitoring with focus on the following elements: fish, wildlife, water quality, vegetation, phytoplankton, zooplankton, benthos, bathymetry and organic carbon. An IEP Project Work team would conduct three years of monitoring beginning in November 2000. Costs are estimated to be approximately $850,000 the first year, and $750,000 the following two years for a total of $2.3 million dollars. A description of project objectives and monitoring questions and objectives that will help determine whether the Prospect Island project is succeeding or failing as a restoration site is presented in the following section. A summary of target animals and habitat types is found in Table 1; a summary of the proposed monitoring plan is in Table 2; and detailed descriptions of the monitoring elements are presented in Appendices A through J. Figure 2 shows the sampling sites for the different monitoring elements.

Prospect Island is a pilot project and therefore it is important to evaluate the extent restoration activities result in beneficial conditions for targeted aquatic, terrestrial and avian species. Results of the monitoring will be presented in the IEP Newsletter and annual reports submitted to the IEP for publication. A comprehensive report will be prepared after three years of sampling. All data collected will be stored on the IEP home page and will be accessible to the public. The proposed Prospect Island monitoring plan adheres to IEP QA/QC guidelines as referenced in Appendix J.

The monitoring plan is designed to provide information in three areas. The first is ecological processes taking place on the island as a result of restoration activities (subsidence or erosion of habitat features, water circulation patterns as a result of location of the breaches); the second is success of the project through use of habitat by targeted species; the third is flux of organic carbon from the restored habitat to Delta channels (organic carbon is important as a potential food source for organisms downstream and for its potential effects on drinking water quality). In each case, the information provided will enable the use of adaptive management principles to help guide the successful restoration of similar projects through the Delta. However, it is important to note that this proposal covers only three years of monitoring. Ideally, monitoring should continue until biological and physical project features stabilize, a period of at least 10-15 years. Finally, it is important to establish a precedent for post-project monitoring for future restoration projects in the Delta. It is our hope that the Prospect Island monitoring plan will be used as a baseline plan for the monitoring of future restoration projects.

Leo Winternitz,
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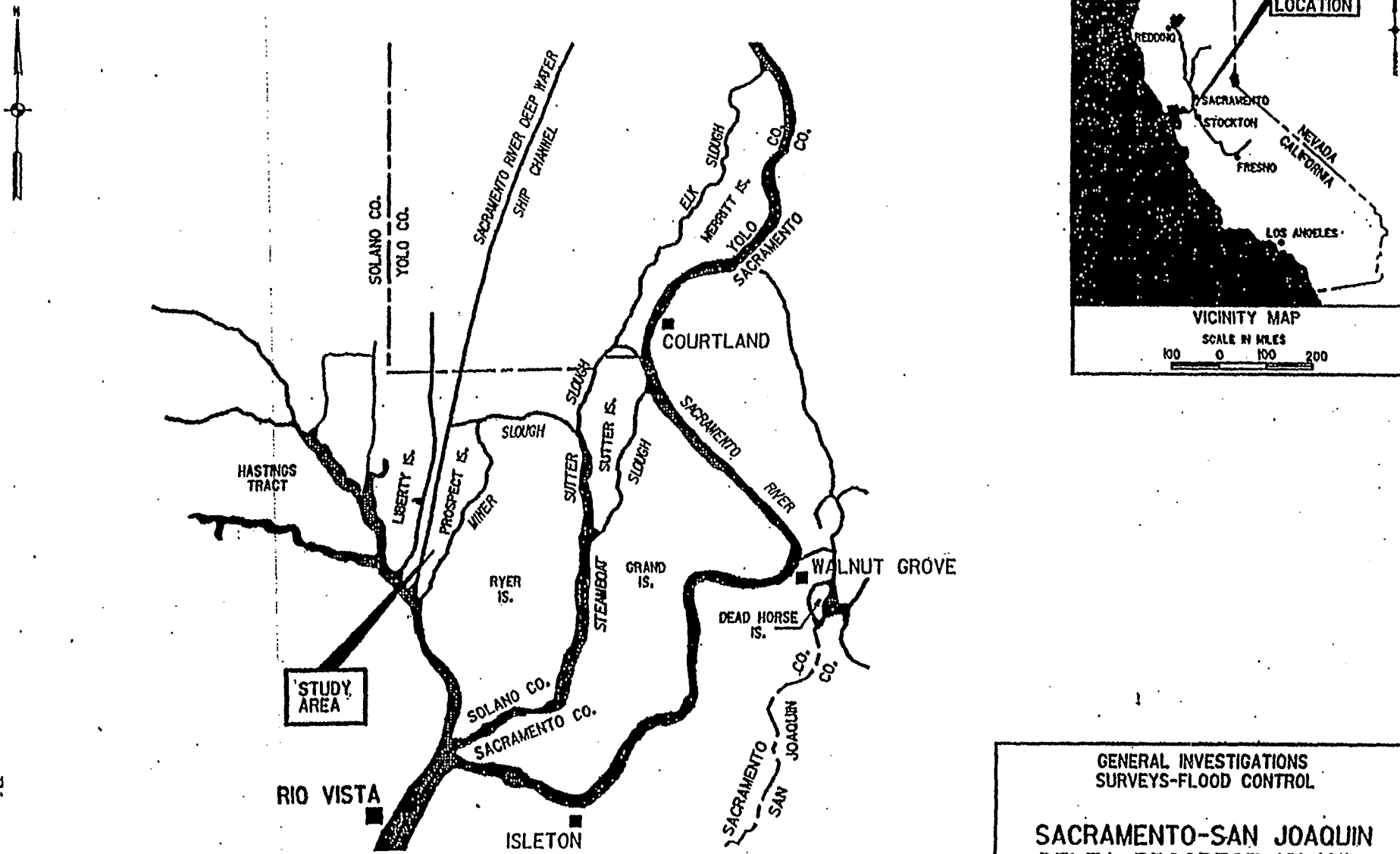

GENERAL INVESTIGATIONS
SURVEYS-FLOOD CONTROL

SACRAMENTO-SAN JOAQUIN DELTA, PROSPECT ISLAND, CALIFORNIA

SOUTH PACIFIC DIVISION
SACRAMENTO DISTRICT, CORPS OF ENGINEERS

Figure 1

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I. CONCEPTUAL FRAMEWORK FOR THE MONITORING PROGRAM

There are nine monitoring elements associated with this monitoring plan. The nine elements were selected in order to characterize the ecology of the restored habitat as completely as possible. The nine elements are inter-related in that information will be used from combinations of elements in order to assess habitat restoration features, habitat use and biochemical changes taking place as a result of the project. Each element addresses specific questions and has specific objectives. Most of the elements (except bathymetry) include a comparison of the Prospect Island restored habitat with habitat in the adjacent Delta channels, the Sacramento Deep Water Ship Channel and Miner Slough (Figure 1). The Delta channels represent the current condition of most of the Delta before shallow-water habitat restoration. For the fish, zooplankton, and water quality elements, there will also be a comparison of habitat in Prospect Island with habitat in Liberty Island, an agricultural island in the northern Delta that was flooded and has been left to develop naturally.

It is noted here that the funds being requested for monitoring cover only a three-year period. This is the maximum length allowed for funding requests from CALFED's Category III program. While the monitoring time frames for many projects of this type fall within the 3-5 year range, closer to 15-20 years is needed to judge the success or lack thereof. One of the fundamental requirements for achieving success is to give the system time, allowing for the self-designing capacity of nature (Mitsch and Wilson, 1996). Ideally, monitoring should cover this time period. To address this concern, after the second year of monitoring and dependent upon subsequent assessment, additional funds may be requested to extend monitoring over a reasonable time period to document the natural progression of restoration and use of the habitat restored.

There are three purposes for monitoring the Prospect Island project. The first is to assess physical processes taking place on the island as a result of restoration activities. Examples include potential subsidence of habitat islands, build-up or loss of sediment on shallow benches on the islands and adjacent to the levees, and water circulation patterns throughout the island resulting from location of the breaches.

The second purpose is to document the establishment of shallow water, riparian and upland vegetation; document the abundance of aquatic and terrestrial animals (fish, waterfowl, shorebirds, terrestrials) on Prospect Island; and document the use of various habitat types by aquatic and terrestrial animals created by this project.

The third purpose is to measure the flux of organic carbon from the restored habitat to Delta channels. Organic carbon is important as a potential food source for organisms downstream and for its potential effects on drinking water quality.

All the monitoring elements are related to one another and address the physical, biological and chemical factors associated with taking a section of agricultural land, creating habitat features on it, then flooding it for purposes of providing aquatic habitat.

The following sections identify the restoration project objectives and criteria and describe their relationship to monitoring objectives. Specific questions to be answered by monitoring activities are also described.

Restoration Project Habitat Objectives

Prospect Island restoration objectives are:

- Create habitat suitable for Federally listed threatened delta smelt and proposed threatened Sacramento splittail.
- Develop feeding, cover, and resting areas for anadromous fish including chinook salmon.
- Improve waterfowl and shorebird habitat.
- Provide terrestrial and aquatic habitat for other wildlife species.

Table 1 identifies target animals and their associated habitat along with some criteria associated with the habitat. Monitoring elements are designed to assess in part, whether the habitat objectives have been met, whether criteria for the habitat have been met and whether the habitat is being used by targeted and other species. It is important to note that while restoration objectives target native species (in particular native aquatic species), it is expected that many non-native species may also benefit from the habitat restoration. One question monitoring will address is what species use the restored habitat. In part, success of the project will depend upon the answer to this question. If the habitat restored is being used primarily by non-native species (and not by targeted native species), then the project will not have succeeded as intended.

TABLE 1 – TARGET ANIMALS AND HABITAT TYPE

Target Animals	Habitat Type
Delta Smelt, Sacramento Splittail, Chinook Salmon and Other Native Species	• Shallow water (3 to 8 feet deep, no greater than 11 feet deep) encompassing open waters and along the edges of rivers, channels and sloughs. • Shoal regions containing submerged substrate such as vegetation rocks and roots for spawning and rearing of delta smelt, splittail and cover for chinook salmon. • Dead-end sloughs. • Flooded vegetation and vegetated open waters for spawning and rearing of splittail. • Deeper pools and channels for juvenile chinook to rest and rear. • Shaded riverine vegetation to provide cooling, cover and terrestrial insects. • Open water to provide zooplankton and crustaceans for juvenile salmon. Fresh water (<2.0 parts per thousand salinity), well oxygenated (> 5.0 mg/l dissolved oxygen), and relatively cool (44-72 degrees, Fahrenheit) particularly during the winter-spring spawning season for delta smelt and splittail and the out-migration period for juvenile chinook.

TABLE 1 – TARGET ANIMALS AND HABITAT TYPE	
	Sources: Sommer et al in prep; Sweetnam and Stevens 1993; Meng 1993; Sato and Moyle 1988; Wang 1986; Daniels and Moyle 1983; Moyle 1976; Caywood 1974
Waterfowl	• Tule marsh to provide nesting habitat for dabbling and diving ducks and other crustacean and fish-eating birds such as grebes, coots and great blue herons. • A covering of water 3 feet deep or less and/or emergent vegetation over 40-85% percent of the site. • Mudflat and SRA habitat to provide a source of invertebrates, especially during winter. • Open water to provide loafing areas safe from predators. • Upland habitat to provide escape and nesting cover and food for breeding waterfowl. • Nesting island with upland vegetation. Sources: USFWS A 1986
Shorebirds	• Mudflats flooded to depths of zero to 2 inches to provide (invertebrate) food sources for shorebirds. • Optimal shorebird habitat greater than 150 feet from disturbance areas (such as footpaths). • Nesting and loafing habitat, including nonvegetated or sparsely vegetated islands. Sources: USFWS B 1986; Corps of Engineers 1990.

Questions to be Addressed by Monitoring and Monitoring Objectives

The following section describes monitoring objectives and questions expected to be addressed for each monitoring element. Additional information on individual monitoring elements detailing gear to be used, sampling methodology and the like are found in subsequent sections.

1. Fish Monitoring Element

Targeted fish and other native fish use is a criterion for success for this restoration project. The purpose of this element is to document fish use on Prospect Island habitat features. All fish caught will be identified and recorded. General questions to be addressed by this element are:

- What species use the various habitat structures provided on Prospect Island?
- What is the abundance and composition of native and non-native species on Prospect Island and how does this compare to the comparison sites- deep channels and Liberty Island (naturally developing site)?
- What may limit or enhance native and exotic fish use of Prospect Island? (This question may be answered in part by the water quality, vegetation, benthic, phytoplankton and zooplankton monitoring elements).

Objectives to address the questions are:

- Estimate general fish species use.
- Estimate spawner use by delta smelt and splittail. Assess associated habitat conditions.
- Estimate larval rearing by delta smelt and splittail. Assess associated habitat conditions.
- Estimate salmon fry/smolt use. Assess associated habitat conditions.

2. Wildlife Monitoring Element

Wildlife use is another criteria of success for this project. The purpose of this element is to document wildlife use of habitat features. Assessment of use or non-use by wildlife will be closely coordinated and tied to assessments from the vegetation monitoring element, which in turn is related to assessments from the water quality and bathymetry monitoring elements. The general questions to be addressed by this element are:

- What species of wildlife use the various habitat structures provided on Prospect Island?
- What project features may limit or enhance wildlife use on Prospect Island?

Objectives associated with these questions are:

- Quantify wildlife use in each of the following habitat types: open water, mudflats, emergent vegetation and riparian communities.
- Assess conditions of use and/or non-use to vegetation, water quality conditions and/or physical changes of project design resulting from natural events.

3. Water Quality Monitoring Element

The purpose of this element is to document water quality conditions on Prospect Island at various aquatic habitat sites throughout the year (main channel, breach openings, open water, dead-end slough, and shallow water). Information from this element will help assess fish and wildlife use and aquatic vegetation success by providing data on temperature, specific conductance, pH, dissolved oxygen, and water velocities among other parameters. This element will also be closely tied to the phytoplankton and zooplankton monitoring elements providing information on factors that may influence the abundance and species composition of these plants and animals. In addition, data obtained from this element will be used to help assess circulation patterns throughout the Island resulting from placement of the breaches. The general questions to be addressed are:

- Are water quality conditions on the Island sufficient to support phytoplankton, zooplankton, targeted fish, wildlife and aquatic vegetation?
- Are circulation patterns on the Island resulting from placement of the breaches and tidal exchange sufficient to provide adequate water quality conditions throughout the Island?

Monitoring objectives associated with these questions are:

- Provide comprehensive water quality data on a real-time basis throughout the year at various stations representing different aquatic habitat sites.
- Assess water quality conditions resulting from placement of the levee breaches.

4. Vegetation Monitoring Element

Open water aquatic, riparian, marsh and upland vegetation are all planned features of this project. Success of establishing vegetation depends primarily upon the interrelationships between elevation and hydrology, and subsequent plant community development. The purposes of this element are to document that targeted plant communities are or are not being established; to assess reasons for non-establishment; and to provide information on the relationships between physical processes at the project site and the response of plant communities. The water quality and bathymetry monitoring elements will also provide data that are useful for these assessments. In turn the vegetation monitoring element will provide information valuable to assessing wildlife use on Prospect Island. Questions to be addressed by this monitoring element are:

- What plant communities are being established on Prospect Island ?
- How do physical processes at the project site affect the establishment of plant communities?
- What are plant community values (diversity, percent cover, native vs. non-native plants, community structure) at elevation transect sites?

Monitoring objectives associated with these questions are:

- Track the quality and quantity of plant communities that develop after changing land use from agricultural to tidally influenced open water and wetland habitat.
- Document the interrelationship between physical processes at the site and the response of plant communities over the three years study.

5. Phytoplankton Monitoring Element

Phytoplankton are an important element of the food chain, and as such, are one of the criteria of "ecological success" of the Prospect restoration project. Some phytoplankton species serve as food for zooplankton which in turn serve as food for fish and other organisms. Other phytoplankton (particularly the blue-green algae) may also be indicators of poor water quality and some species cause taste and odor problems in drinking water supplies. The issue here is not simply documenting phytoplankton presence, but determining species composition and abundance and comparing those qualities to adjacent channels and the Liberty Island comparison site. This monitoring element is closely tied to water quality monitoring (water quality conditions affect and effect phytoplankton production) will also provide information relevant to assessment of the zooplankton community on Prospect Island. Questions to be addressed through this element are:

- What communities and quantities of phytoplankton are produced through a restoration project of this nature and how does this compare to adjacent channels and reference sites?
- Are "good quality" phytoplankton that may provide nutritional benefits to targeted zooplankton organisms produced in sufficient quantities compared to adjacent channels and reference sites?
- Are "problem" phytoplankton (blue-green algae) being produced in concentrations that may warrant concern (such as taste and odor problems to drinking water supplies)?
- How do primary production rates of phytoplankton compare between deep and shallow water stations?

Monitoring objectives associated with these questions are:

- Evaluate phytoplankton species composition, changes in chlorophyll *a* concentrations and primary production rates at input channels, main channels, open water, sloughs and shallow water.

6. Zooplankton Monitoring Element

Zooplankton, like phytoplankton are another important element of the aquatic food chain. Zooplankton, particularly species of copepods serve as food for many native and non-native fish. The purpose of this monitoring element is to document the composition and abundance of the zooplankton community, including mysid shrimp and amphipods, on Prospect Island and to compare those results with collections made on adjacent channels and the Liberty Island comparison site. As previously mentioned, water quality conditions and phytoplankton community structure greatly influence zooplankton abundance and composition. Therefore, care has been taken to ensure that these elements are monitored synoptically to be able to relate data developed from each element to each other. The questions to be addressed through this element are:

- What species and densities of zooplankton are produced and how do they compare with the Liberty Island comparison site, adjacent channels, other delta channels, and Suisun Bay?
- Will sufficient quantities of copepods preferred by the targeted fish species be produced? Will they be produced when juvenile fish are present?
- If the project initially fails to produce sufficient quantities of copepods can modifications be made to enable it to do so?

The objective of this element related to the questions is:

- Quantify and evaluate zooplankton species composition, mysid shrimp, and amphipods in input channels, main channels, open water, sloughs and shallow water.

7. Benthos Monitoring Element

This sampling element proposes to collect and identify benthic organisms from Prospect Island. Soil samples will also be collected and analyzed to relate benthic communities to specific habitat conditions. Benthic (bottom dwelling) organisms

are another important food source for fish and waterfowl and aquatic shorebirds. In addition to clams and other permanent benthic dwellers, many free-swimming and flying insects start their life cycle as larvae in the benthos. This monitoring element will provide descriptive information on developing benthic communities and generally assess by way of comparison with the Miner Slough and Sacramento Deep Water Ship Channel sites, this project's ability to contribute benthic derived food sources for other organisms. One element that will not be sampled is emergent insects. UC Davis was contacted for support but they are currently unable to provide a graduate student for this work. Questions to be addressed by this monitoring element are:

- What are the developing benthic communities on Prospect Island?
- How do these communities relate to the substrate types upon which they are found?
- How does the community structure (number of organisms per square meter, identification of organisms by phylum to species, life stage of organisms) compare to different habitats within and outside of Prospect Island (main channel on Prospect, vegetated and nonvegetated shallow sites, dead-end sloughs, Miner Slough and the Sacramento Deep Water Ship Channel)?

Objectives associated with these questions are:

- Quantify and evaluate benthic macrofauna from the main channel, vegetated and nonvegetated shallow water sites on Prospect Island and compare findings to Miner Slough and the Deep Water Ship Channel.
- Assess benthic community development with substrate composition.

8. Bathymetry Monitoring Element

The bathymetric monitoring element is included to provide above and below water elevation baseline information of important and representative project features immediately after the island is flooded and to provide information on the erosion, accretion or subsidence of these features. These features include berms, islands, levees, shallow water and the excavated channels. For example, it is assumed that project islands will initially subside a total of 1-2 feet after project flooding and will stabilize thereafter. This monitoring element will document actual subsidence. The basic purposes of this element are:

1. To provide information on the natural succession of project features designed to provide habitat (deep channel, shallow water areas, islands, berms and levees);
2. To provide information regarding the relative success or failure of project features (project islands and berms) designed to protect adjacent levees from wind fetch.
3. To provide information on the general condition of project features (levees, berms and islands).

Questions associated with this element are:

- What are the settling, siltation or erosion rates (natural succession) of important project features such as islands, channels, shallow water, berms and levees?

- What is the relative success of using project islands and berms to protect levees from wind fetch?
- What are the general conditions of levees and berms within Prospect Island as a result of project operation?

9. Organic Carbon Monitoring Element

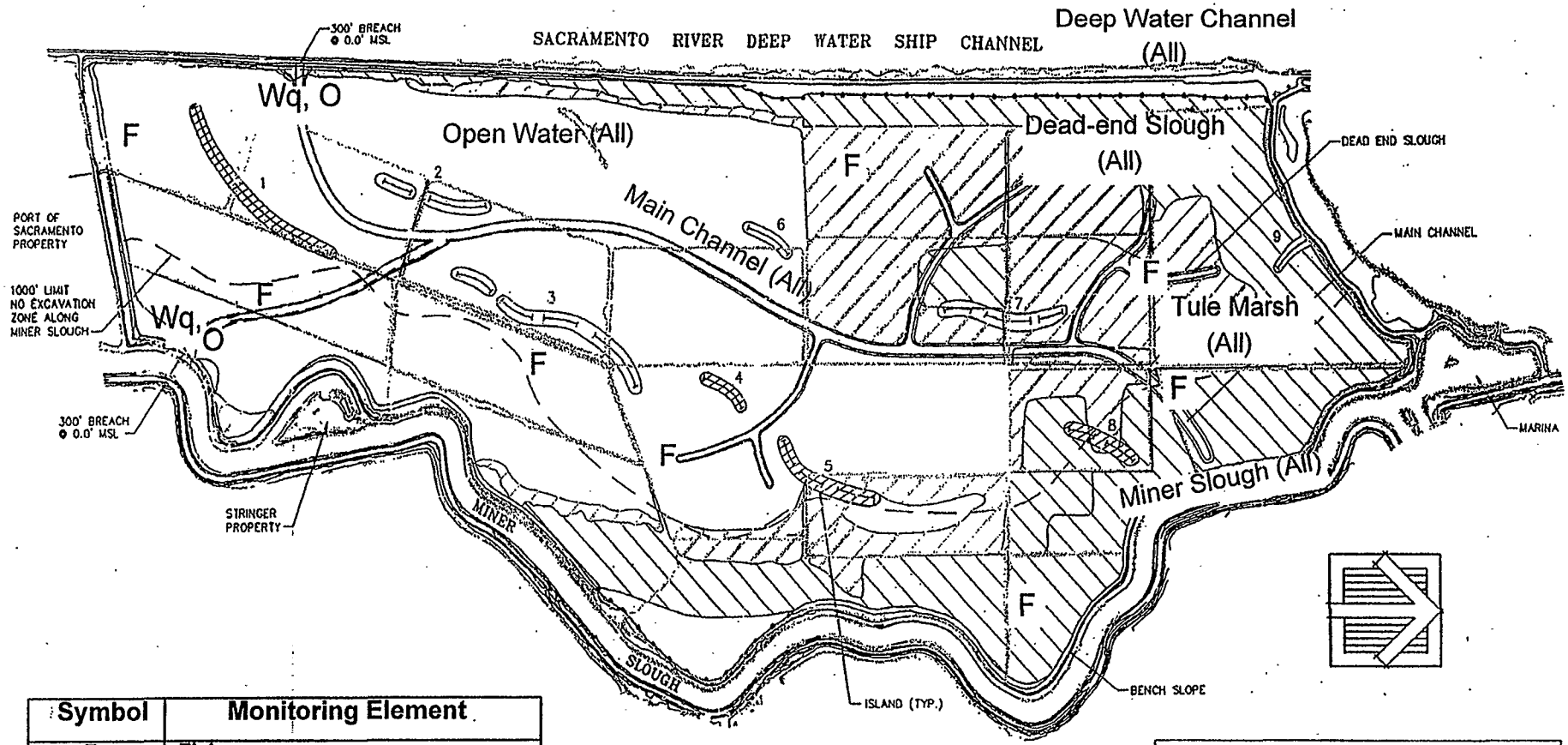
This monitoring element addresses the possible contribution of the flooded habitat of organic carbon to adjacent Delta channels. Organic carbon is important both as a element in the food chain and as a potential precursor to disinfection by-products in drinking water

- Is there a net flux of particulate and organic carbon from Prospect Island to adjacent Delta channels?
- Which habitats within Prospect Island (dead-end sloughs, open channel, vegetated shallow-water, open shallow-water) have greater concentrations of particulate and dissolved organic carbon?
- Which habitats have greater concentrations of disinfection by-product precursors?

In addition to the habitat benefits, some think that restoration projects of this nature (shallow water, tidal marsh) are an overall benefit to the estuarine environment by providing significant amounts of organic material that serve as nutrients and food sources for lower trophic organisms such as phytoplankton, bacteria, zooplankton. These organisms in turn serve as food for higher trophic organisms such as fish and birds. The first question addresses the issue of whether an extensive shallow water, tidal marsh habitat contributes organic carbon to Delta channels. The second question addresses the issue of which habitats within Prospect Island have greater organic material that may be correlated with fish, vegetation, phytoplankton or zooplankton concentrations.

The third question addresses the issue of whether the organic carbon found in habitats in Prospect Island is the type of organic carbon that will form carcinogenic drinking water disinfection by-products upon drinking water treatment. There has been concern that flooding peaty islands in the Delta may result in increased concentrations of disinfection by-product precursors in Delta channels. Prospect Island is within the general region of the North Bay Aqueduct which provides drinking water to Solano county. The purpose of this element is to assess water quality with regard to disinfection byproduct precursor concentrations resulting from flooding Prospect Island. The objectives associated with this element are:

- Determine the net flux of dissolved and particulate organic carbon to adjacent channels.
- Determine particulate and dissolved organic carbon and disinfection by-product precursor concentrations in different habitats within Prospect Island and compare to concentrations in adjacent channels.



Symbol	Monitoring Element
F	Fish
Wq	Water Quality
O	Organic Carbon
All	Fish, Water Quality, Phytoplankton, Zooplankton, Benthic, Organic Carbon, Wildlife, Vegetation, and Bathymetry

*Wildlife, Vegetation, and Bathymetry sampling will take place throughout the island including islands, channels, levee berms, open water, emergent marsh, and mudflats.

LEGEND		
HABITAT TYPES	SYMBOL	ACRES
OPEN WATER (>-1.0' MSL)		594.5
MUDFLAT (@ 0.0' MSL)		4.0
TULE/EMERGENT (0.0' MSL TO 3.0' MSL)		333.8
POTENTIAL TULE/EMERGENT (-0.5' MSL TO 0.0' MSL)		230.0
SRA/RIPARIAN/UPLAND (>3.0' MSL)		153.7
TOTAL ACREAGE:		1316.0

PROSPECT ISLAND

FISH & WILDLIFE HABITAT RESTORATION

GRAPHIC SCALE
0 600 1200 2400
1" = 600 Ft.

Figure 2

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Table 2. Summary of the Prospect Island Monitoring Proposal

	Fish	Wildlife	Water Quality	Vegetation	Phytoplankton	Zooplankton	Benthic	Bathymetry	Organic Carbon
Ave. Annual Cost	$378,152	$20,138	$105,394	$24,199	$83,052	$10,871	$48,728	$32,670	$80,993
Principal Investigators	Dale Sweetnam Randy Baxter	Frank Wernette	Hank Gebhard Katie Wadsworth	Kent Nelson Jean Witzman	Peggy Lehman	Jim Orsi	Heather Peterson	Howard Mann	Peggy Lehman Collette Zemitis
Monitoring Objectives	To quantify use of island by various fish species; To quantify spawning use and larval rearing by delta smelt & splittail; To quantify salmon fry/ smolt use	To quantify wildlife use in open water, mudflat, emergent marsh, and riparian habitats	Determine water quality conditions in different aquatic habitats on Prospect Island	Characterize plant communities in different habitats on Prospect Island and how they change over time.	To evaluate phytoplankton species composition, biomass, primary productivity, nutrients, sediments and ancillary water quality data	To determine which zooplankton species, mysid shrimp, and amphipods are utilizing the Prospect Island restoration site	To evaluate benthic macro fauna and substrate composition	To evaluate changes in habitat features due to siltation and erosion.	To determine if Prospect Island is a source of organic carbon to the Delta channels. To quantify organic carbon and potential THM production.
Data Usage	To show fish benefits of project	To show wildlife benefits of project	Provide information on water quality conditions that affect aquatic species	To show vegetation succession of project, effects of physical processes on plants	To evaluate phyto-plankton concentrations, an important component of the food chain	To evaluate zooplankton species composition, an important component of the food chain	To evaluate benthic species, an important component of the food chain	To provide information on success of habitat features useful for adaptive management decisions.	To determine the potential effect on water quality with respect to organic carbon concentrations and potential effects on the food web.
Data Acquisition (Methodology)	Quarterly sampling of all fish species. Mid-February to mid-June, bi-monthly sampling of delta smelt and splittail spawning. Mid-February to mid-June, weekly sampling of smelt and splittail larval rearing. December through May, weekly sampling of salmon fry/smolt use. All sampling on both spring and neap tides. Gear includes purse seine (delta smelt), gill nets (splittail), push nets, beach seine, light traps, egg and larval nets and electrofishing.	A combination of sampling methods (point counts, canoe surveys, incidental surveys, rail counts, walking transects, live trapping, and pit fall traps) will be used to quantify and determine the types of wildlife in various habitats of Prospect Island.	Samples will be collected on a continuous basis year round. Two (permanent) full component stations will monitor the following parameters: specific conductance, water temp, dissolved oxygen, pH, turbidity, stage, chlorophyll, wind speed & direction, solar radiation, air temp, barometric pressure, and humidity. In addition, three portable systems will measure a combination of the water quality parameters listed above.	Baseline plant communities within the project site will be compared with developing plant communities over time. Site specific plant community characterizations will also be conducted.	Discrete monitoring will be conducted year round on a monthly basis. Samples for chlorophyll a concentrations will be taken at 1 meter depths. Additional water samples will be taken for phyto-plankton species identification. Chlorophyll a concs., sediments and nutrients will be measured daily for 2 weeks between April and September in association with the carbon flux study.	Zooplankton samples will be collected year-round on a monthly basis with Clark-Bumpus nets, a ski mounted Neomysis net or egg & larval net w/ 505 µm mesh, and a 15 l/min. capacity pump.	Benthic samples will be collected on a monthly basis. Four benthic samples will be collected at each site with a Birge-Ekman dredge. Samples will then be washed and preserved in formalin. Benthic organisms will be analyzed by an outside contractor.	A horizontal and vertical control around the project will be complete before the island is flooded. Baseline evaluations of representative project features (berms, islands levees, shallow water, excavated channel) will be established after flooding. Annual elevation surveys wil be conducted to monitor erosion, accretion, and subsidence.	Continuous samples will be collected by auto-samplers at the levee breaches during incoming and outgoing tides. Samples will be analyzed for dissolved and particulate organic carbon and ultra-violet absorbance. Grab samples will also be collected monthly at various stations in Prospect Island These samples will be analyzed for dissolved and particulate organic carbon and ultraviolet absorbance. Selected samples will also be analyzed for trihalo-methane formation potential, haloacetic acid formation potential and dissolved ammonia.
Data Reduction Analysis, and Reporting	Information for all elements will be presented in the quarterly IEP Newsletters and in an annual report to CALFED. Data will be available through the IEP Home Page.								

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Prospect Island Monitoring Proposal
For Submittal to Category III – June 1998

1. Project Management

A. Name of Monitoring Element:
Prospect Island Fish Monitoring Proposal

B. Principal Investigators:
Dale Sweetnam, Randy Baxter

C. Estimated Cost:
$378,152/ave. annual cost

D. Responsible Agency:
Department of Fish and Game

E. Project Coordinator:
Leo Winternitz

F. Project Organization and Responsibilities :
Field work to be conducted by a DFG Fishery Biologist, a Fish and Wildlife Assistant I and a Fish and Wildlife Scientific Aide. Laboratory work will be coordinated and partially conducted by a Senior Lab Assistant (larval fish processing and identification). A full time DFG Associate Biologist will coordinate fishery tasks with other elements, supervise QA/QC and data processing, analyze data, write reports, participate in a PWT and plan future projects.

G. Project Description
- Objectives:
  1) Estimate general fish species use (i.e., relative abundance) quarterly, for larval, juvenile and adult life stages
  2) Estimate spawner use (i.e., relative abundance) by delta smelt and splittail
  3) Estimate larval rearing by delta smelt and splittail, compare use of habitats
  4) Estimate salmon fry/smolt use of Prospect Island

  All objectives will include a comparison between habitats in Prospect Island and the adjacent channels. In addition, habitats in Prospect Island will be compared to Liberty Island, an agricultural island that has been flooded and has been left to develop naturally.

- Data Usage: Data collected will be used to show the fisheries benefits of the Prospect Island Restoration Project

H. Data Quality Objectives:

Data collected, data analyzed, and reports prepared will adhere to the IEP QA/QC requirements. (Please refer to IEP Quality Assurance and Quality Control Program for Collection and Evaluation of Environmental Data)

I. Documentation and Records:

Data collected in the field will be recorded on data sheets and entered onto the computer in spreadsheet format. After the data is error checked, the data will be uploaded onto the IEP home page and stored under the Prospect Island Monitoring Results heading.

2. Data Acquisition

A. Estimate General Fish Species Use

- Sampling Schedule:
  Quarterly (January, April, July, October)

- Life Stage Targeted:
  Larval, juveniles, and adults for all species

- Gear Type:
  Active gear: electrofishing, purse seine, beach seine, larval push net
  Passive gear: gill nets, light traps

- Sampling Frequency:
  Once per quarter on neap tidal cycle and once per quarter on spring tidal cycle

- Habitats Sampled:
  1) Three or more sites in open channel areas (1 site on the north end, 1 site on the south end, and 1 site in the mid region of the island)
  2) Two or more sites in each of the dead end sloughs (a total of 4 sites)
  3) Three or more sites in shallow water areas (1 site on the north end, 1 site on the south end, and 1 site in the mid region of the island)

- Comparison with the Following Other Areas:

Channel areas outside Prospect island and adjacent to Liberty Island for comparison with deeper water areas inside Prospect Island. Habitats inside Liberty Island, a similar agricultural island that has been allowed to develop naturally.

B. Estimate Spawner Use by Delta smelt and Splittail

- Sampling Schedule:
  Mid-February through mid-June

- Life Stages Targeted:
  Pre/post spawning adult delta smelt and splittail

- Gear Types:
  Active gear: purse seine (delta smelt), gill nets (splittail), push nets (delta smelt and splittail), beach seine (delta smelt and splittail)

- Sampling Frequency:
  Bi-monthly on neap tidal cycle and bi-monthly on spring tidal cycle

- Habitats Sampled:
  1) Three or more sites in open channel areas
  (1 site on the north end, 1 site on the south end, and 1 site in the mid region of the island)
  2) Two or more sites in each of the dead end sloughs
  (a total of 4 sites)

- Comparison with Other Areas:
  Liberty Island for comparison with shallow areas. Channel areas outside Prospect Island and adjacent to Liberty Island for comparisons with deeper water areas inside Prospect Island.

C. Estimate Larval Rearing by Delta Smelt and Splittail

- Sampling Schedule:
  Mid-February through mid-June

- Life Stages Targeted:
  Larval delta smelt and splittail

- Gear Type:
  Active gear: larval push net

Passive gear: larval light traps

- Sampling Frequency:
  Weekly mid-February through mid-June with larval net and light traps

- Habitats Sampled:
  1) Three or more sites in open channel areas (1 site on the north end, 1 site on the south end, and 1 site in the mid region of the island)
  2) Two or more sites in each of the dead end sloughs (a total of 4 sites)
  3) Three or more sites in shallow water areas (1 site on the north end, 1 site on the south end, and 1 site in the mid region of the island)
  4) Three or more sites in vegetated areas

- Comparison with Other Areas:
  Liberty Island for comparison with shallow areas. Channel areas outside Prospect Island and adjacent to Liberty Island for comparisons with deeper water areas inside Prospect Island.

D. Estimate Salmon Use of Prospect Island

- Sampling Schedule:
  December through May

- Life Stages Targeted:
  Chinook salmon smolts and salmon fry

- Gear Type:
  Active gear: beach seine and purse seine

- Sampling Frequency:
  Weekly sampling with the beach seine and purse seine to complement other sampling.

- Habitats Sampled:
  In and near breaches in the Miner Slough levee and Ship Channel levee

3. Data Reduction, Analysis, and Reporting

A. Quarterly updates summarizing the data collected will be presented in the IEP Newsletter, which is published every Fall, Winter, Spring, and Summer. Copies of the updates will also be forwarded to CALFED/Category III.

B. Annual reports will be prepared and submitted to the IEP for publication and copies of the report will be forwarded to CALFED/Category III.

C. All data will stored on the IEP home page under the Prospect Island Monitoring Results heading.

Prospect Island Monitoring Proposal
For Submittal to Category III – June 1998

1. Project Management

A. Name of Monitoring Element:
Prospect Island Wildlife Monitoring Proposal

B. Principal Investigator
Frank Wernette

C. Estimated Cost:
$20,138/ave. annual cost

D. Responsible Agency:
Department of Fish and Game

E. Project Coordinator:
Leo Winternitz

F. Project Organization and Responsibilities:
Field work to be conducted by one Department of Fish and Game biologist and one scientific aide. Data analysis and report writing to be overseen by Frank Wernette, Senior Biologist of Department of Fish and Game.

G. Project Description

- Objectives:
  - Quantify wildlife use in each of the following habitat types: open water, mudflats and emergent marsh, riparian
  - Assess conditions of use and/or non-use to vegetation, water quality conditions and/or physical changes of project design resulting from natural events.

- Data Usage:
  Data collected will be used to show the wildlife benefits of the Prospect Island Restoration Project

H. Data Quality Objectives:
Data collected, data analyzed, and reports prepared will adhere to the IEP QA/QC requirements. (Please refer to IEP Quality Assurance and Quality Control Program for Collection and Evaluation of Environmental Data)

I. Documentation and Records:

Data collected in the field will be recorded on data sheets and entered onto the computer in spreadsheet format. After the data is error checked, the data will be uploaded onto the IEP home page and stored under the Prospect Island Monitoring Results heading.

2. Data Acquisition

A. Quantify/Qualify Wildlife Use in the Open Water Habitats

- Survey Schedule:
  Quarterly (January, April, July, October)
- Targeted Species:
  Waterfowl and other waterbirds, amphibians
- Special Status Species:
  Western pond turtle
- Habitat to be Sampled
  1) Open channel areas
  2) Dead end sloughs
  3) Shallow water areas
- Survey Methods
  Point counts, canoe surveys, and incidental surveys
- Comparison with the Following Other Area:
  Little Holland Tract

B. Quantify/Qualify Wildlife Use in the Mudflats and Emergent Marsh

- Survey Schedule:
  Quarterly (January, April, July, October)
- Targeted Species:
  Shorebirds, waterfowl, and other waterbirds, small mammals, amphibians
- Listed Species:
  California black rail

- Habitat to be Sampled
  1) Dead end sloughs
  2) Tidal mudflats
  3) Non-tidal mudflats
  4) Shallow water
  5) Tidal emergent marsh

- Survey Techniques
  Rail counts, walking transects, point counts, live trapping, canoe surveys, incidental surveys

- Comparison with the Following Other Area:
  Little Holland Tract

C. Quantify/Qualify Wildlife Use in the Riparian Areas

- Survey Schedule:
  Quarterly (January, April, July, October)

- Targeted Species:
  Migratory and non-migratory birds, raptors, small mammals, amphibians, and reptiles

- Listed Species:
  Swainson's hawk

- Habitat to be Sampled
  1) Riparian woodland
  2) Riparian scrub
  3) Shaded riverine aquatic

- Survey Techniques
  Walking transects, point counts, live trapping, pit fall traps

- Comparison with the Following Other Area:
  Little Holland Tract

3. Data Reduction, Analysis, and Reporting

A. Quarterly updates summarizing the data collected will be presented in the IEP Newsletter, which is published every Fall, Winter, Spring, and Summer. Copies of the updates will also be forwarded to CALFED/Category III.

B. Annual reports will be prepared and submitted to the IEP for publication and copies of the report will be forwarded to CALFED/Category III.

C. All data will stored on the IEP home page under the Prospect Island Monitoring Results heading.

Prospect Island Monitoring Proposal
For Submittal to Category III - June 1998

1. Project Management

A. Name of Monitoring Element:
Prospect Island Water Quality Monitoring Proposal

B. Principal Investigators
Katie Wadsworth, Hank Gebhard

C. Estimated Cost:
$105,400/ave. annual cost

D. Responsible Agency:
Department of Water Resources

E. Project Coordinator:
Leo Winternitz

F. Project Organization and Responsibilities :
Field work to be conducted by one Department of Water Resources Control Systems Engineer, one biologist, and one scientific aide. Data analysis and report writing to be prepared by Katie Wadsworth, Environmental Specialist III with Department of Water Resources.

G. Project Description

- Objectives:
  - Provide comprehensive water quality data on a real-time basis throughout the year at various stations representing different aquatic habitat sites.
  - Assess water quality conditions resulting from placement of the levee breaches.

- Data Usage:
  Data acquired will provide information on water quality conditions that affect aquatic species including fish, plankton, plants and wildlife.

H. Data Quality Objectives:

Data collected, data analyzed, and reports prepared will adhere to the IEP QA/QC requirements. (Please refer to IEP Quality Assurance and Quality Control Program for Collection and Evaluation of Environmental Data)

I. Documentation and Records:

Data collected in the field will be telemetered from Prospect Island to DWR's Environmental Services Office. After the data is error checked, the data will be uploaded onto the IEP home page and stored under the Prospect Island Monitoring Results heading.

2. Data Acquisition

A. Water Quality Monitoring

- Sampling Stations:
  1) At each of the breach openings (2 permanent stations)
  2) Main channel (1 portable station)
  3) Open water (1 portable station)
  4) Dead-end slough (1 portable station)
  5) Shallow water (1 portable station)

- Sampling Frequency:

  Samples will be collected on a continuous basis year round.

- Measurements:

  There will be at least two full complement stations just inside the two breaches that monitor the following listed parameters:
  1) Specific conductance
  2) Water temperature
  3) Dissolved oxygen
  4) pH
  5) Turbidity
  6) Stage
  7) Chlorophyll
  8) Wind speed
  9) Wind direction
  10) Solar radiation
  11) Air temperature
  12) Barometric pressure
  13) Humidity
  14) Velocities

Four portable systems will be used to measure the following combinations of water quality parameters at different habitat sites inside Prospect Island:

1) Specific conductance and water temperature
2) Water temperature and turbidity
3) Dissolved oxygen, water temperature, and pH
4) Dissolved oxygen, water temperature, and specific conductance

These portable systems would not require commercial power and would telemeter data via cell phone to DWR Environmental Services Office. These portable systems could be moved as required and would include a data logger.

3. Data Reduction, Analysis, and Reporting

A. Quarterly updates summarizing the data collected will be presented in the IEP Newsletter, which is published every Fall, Winter, Spring, and Summer. Copies of the updates will also be forwarded to CALFED/Category III.

B. Annual reports will be prepared and submitted to the IEP for publication and copies of the report will be forwarded to CALFED/Category III.

C. All data will stored on the IEP home page under the Prospect Island Monitoring Results heading.

Prospect Island Monitoring Proposal
For Submittal to Category III - June 1998

1. Project Management

A. Name of Monitoring Element:
Prospect Island Vegetation Monitoring Proposal

B. Principal Investigators
Kent Nelson, Jean Witzman

C. Estimated Cost:
$24,199/ave. annual cost

D. Responsible Agency:
Department of Water Resources

E. Project Coordinator:
Leo Winternitz

F. Project Organization and Responsibilities :
Field work to be conducted by two Department of Water Resources Biologists. Data analysis and report writing to be prepared by Kent Nelson and Jean Witzman, Environmental Specialists for Department of Water Resources.

G. Project Description

- Objective:

The objective of the vegetation monitoring element is to track quality and quantity of the plant communities that develop after changing land use from agricultural to tidally influenced open water and wetland habitat. The vegetation monitoring element will document the interrelationship between physical processes at the site and the response of the plant communities over the three years study. This element is not intended to determine if specific success criteria are met, but rather to identify a trend toward development of diverse riparian, wetland, and upland communities.

- Data Usage:

Data collected will be used to describe
- plant community composition and distribution
- effects of physical processes (elevation, tidal action,

accretion and erosion) on vegetation establishment
- plant community values such as diversity, percent cover, native vs. nonnative, and community structure

H. Data Quality Objectives:

Data collected, data analyzed, and reports prepared will adhere to the IEP QA/QC requirements. (Please refer to IEP Quality Assurance and Quality Control Program for Collection and Evaluation of Environmental Data)

I. Documentation and Records:

Data collected in the field will be recorded on data sheets and entered onto the computer in spreadsheet format. After the data is error checked, the data will be uploaded onto the IEP home page and stored under the Prospect Island Monitoring Results heading.

2. Data Acquisition - Quantify /qualify plant communities. This vegetation monitoring plan is based on the interrelationship between the fundamental physical processes of elevation and hydrology, and plant community development at Prospect Island.

A. Compare existing baseline plant communities within the project site to developing plant communities over time.

- Take 1:24,000 color aerial photos during a low tide cycle.
- Pre-delineate plant communities on photo survey.
- Ground truth and adjust delineation lines.
- Measure acreage of community types.
- Repeat each year at same time of year and tidal cycle for three consecutive years.

B. Site specific plant community characterizations.

- Establish fixed transects that measure the relationship between plant community types, elevation and inundation cycles.
- Tie transect locations with elevation survey sites (see Bathymetry monitoring element).
- Determine plant community values at elevation transect sites using stratified

random sampling and permanent photo points.

- Plant diversity
- Percent cover
- Native vs. non-native plants
- Community structure
- Correlate with wildlife use

3. Data Reduction, Analysis, and Reporting

A. Quarterly updates summarizing the data collected will be presented in the IEP Newsletter, which is published every Fall, Winter, Spring, and Summer. Copies of the updates will also be forwarded to CALFED/Category III.

B. Annual reports will be prepared and submitted to the IEP for publication and copies of the report will be forwarded to CALFED/Category III.

C. All data will stored on the IEP home page under the Prospect Island Monitoring Results heading.

Prospect Island Monitoring Proposal
For Submittal to Category III - June 1998

1. Project Management

A. Name of Monitoring Element:
Prospect Island Phytoplankton, Sediment and Nutrient Monitoring Proposal

B. Principal Investigator
Peggy Lehman

C. Estimated Cost:
$83,052/ ave. annual cost

D. Responsible Agency:
Department of Water Resources

E. Project Coordinator:
Leo Winternitz

F. Project Organization and Responsibilities:
Field work to be conducted by one Department of Water Resources biologist and one scientific aide. Data analysis and report writing to be prepared by Peggy Lehman, Environmental Specialist IV of Department of Water Resources.

G. Project Description

- Objective:
  To evaluate phytoplankton production, species composition and growth rates, nutrients and sediment concentrations and their flux to the Delta.

- Data Usage:
  The levels of phytoplankton on Prospect Island will be compared to other sites to determine the value and contribution of Prospect Island restoration relative to other locations.

H. Data Quality Objectives:
Data collected, data analyzed, and reports prepared will adhere to the IEP QA/QC requirements. (Please refer to IEP Quality Assurance and Quality Control Program for Collection and Evaluation of Environmental

Data)

I. Documentation and Records:

Data collected in the field will be recorded on data sheets and entered onto the computer in spreadsheet format. After the data is error checked, the data will be uploaded onto the IEP home page and stored under the Prospect Island Monitoring Results heading.

2. Data Acquisition

A. Discrete Monitoring

- Sampling Stations:
  1) Input channels outside of study site (2 stations)
  2) Main channel within study site (1 station)
  3) Open water (1 station)
  4) Dead-end slough (1 station)
  5) Shallow water (1 station)

- Sampling Frequency:
  Samples will be collected year-round on a monthly basis.

- Measurements:
  At each station, water samples will be taken for chlorophyll *a* concentration, phytoplankton species identification, nutrients and sediment at 1 meter depths. Primary production rates will be determined at an open and vegetated shallow water stations using on-board incubation chambers.

  To evaluate changes in chlorophyll *a* concentration, phytoplankton species composition and primary production rates, the following water quality data will also be collected monthly: turbidity, Secchi disk depth, dissolved oxygen, water temperature, specific conductance, nitrate, ammonia, ortho-phosphate, silica, volatile and suspended solids.

- Ancillary Information Required:
  Other water quality data collected for the Water Quality and Organic Carbon portions of this monitoring proposal will also be used in the evaluation of the chlorophyll *a* data.

B. Continuous Monitoring

- Chlorophyll *a* concentrations, sediments and nutrients will be measured daily for 2 weeks between April and September at the two levee breaches in

association with the carbon flux study. (Refer to Organic Carbon Monitoring Proposal.)

3. Data Reduction, Analysis, and Reporting

A. Quarterly updates summarizing the data collected will be presented in the IEP Newsletter, which is published every Fall, Winter, Spring, and Summer. Copies of the updates will also be forwarded to CALFED/Category III.

B. Annual reports will be prepared and submitted to the IEP for publication and copies of the report will be forwarded to CALFED/Category III.

C. All data will stored on the IEP home page under the Prospect Island Monitoring Results heading.

Prospect Island Monitoring Proposal
For Submittal to Category III - June 1998

1. Project Management

A. Name of Monitoring Element:
Prospect Island Zooplankton Monitoring Proposal

B. Principal Investigator
Jim Orsi

C. Estimated Cost:
$10,871/ave. annual cost

D. Responsible Agency:
Department of Fish and Game

E. Project Coordinator:
Leo Winternitz

F. Project Organization and Responsibilities :
Field work to be conducted by one Department of Water Resources biologist and one scientific aide. Data analysis and report writing to be prepared Jim Orsi, Senior Biologist of Department of Fish and Game.

G. Project Description

- Objective:
  Quantify and evaluate zooplankton species composition, mysid shrimp, and amphipods in input channels, main channels, open water, sloughs and shallow water.

- Data Usage:
  The levels of zooplankton will be compared to other sites to determine the value and contribution of Prospect Island restoration relative to other locations.

H. Data Quality Objectives:
Data collected, data analyzed, and reports prepared will adhere to the IEP QA/QC requirements. (Please refer to IEP Quality Assurance and Quality Control Program for Collection and Evaluation of Environmental Data)

I. Documentation and Records:

Data collected in the field will be recorded on data sheets and entered onto the computer in spreadsheet format. After the data is error checked, the data will be uploaded onto the IEP home page and stored under the Prospect Island Monitoring Results heading.

2. Data Acquisition

A. Zooplankton Monitoring

- Sampling Stations:
  1) Input channels outside of study site (2 stations)
  2) Main channels within study site (1 station)
  3) Open water (1 station)
  4) Sloughs (1 station)
  5) Shallow water (1 station)

- Sampling Frequency:
  Samples will be collected year-round on a monthly basis.

- Sampling Gear:
  Clarke-Bumpus 150 um net, ski mounted Neomysis net or egg and larval net with 505 um mesh, 15 l/min capacity pump.

- Sampling Procedures:
  For the three channel stations, zooplankton tows will be conducted on the bottom for five minutes, followed by five minutes in midwater. At the shallow shoal stations (less than 2 meters deep), tows will be on the bottom for the entire 10 minutes. At all stations, pump samples will be taken from the bottom to the surface.

- Laboratory Procedures:
  Samples will be processed using the same methodology as the currently sponsored DFG Neomysis/Zooplankton Study..

- Ancillary Information Required:
  At the same time that zooplankton, mysid shrimp, and amphipods are collected, the following water quality parameters will also be collected: temperature, Secchi disc depth, surface EC, and chlorophyll *a* from 1 meter depth.

3. Data Reduction, Analysis, and Reporting

A. Quarterly updates summarizing the data collected will be presented in the IEP Newsletter, which is published every Fall, Winter, Spring, and Summer. Copies of the updates will also be forwarded to CALFED/Category III.

B. Annual reports will be prepared and submitted to the IEP for publication and copies of the report will be forwarded to CALFED/Category III.

C. All data will stored on the IEP home page under the Prospect Island Monitoring Results heading.

Prospect Island Monitoring Proposal
For Submittal to Category III - June 1998

1. Project Management

A. Name of Monitoring Element:
Prospect Island Benthic Monitoring Proposal

B. Principal Investigator
Heather Peterson

C. Estimated Cost:
$48,728/annually

D. Responsible Agency:
Department of Water Resources

E. Project Coordinator:
Leo Winternitz

F. Project Organization and Responsibilities :
Field work to be conducted by one Department of Water Resources biologist and one scientific aide. Data analysis and report writing to be prepared by Heather Peterson, Environmental Specialist with the Department of Water Resources.

G. Project Description

- Objectives:
  - Evaluate benthic macrofauna and substrate composition in each of the following habitats in Prospect Island and compare to adjacent channels:
    1) Main Channel
    2) Open water
    3) Vegetated shallow water
    4) Dead-end slough
  - Assess benthic community development with substrate composition.

- Data Usage:
  The levels of benthic macro fauna and substrate composition will be compared to other sites to determine the value and contribution

of Prospect Island restoration relative to other locations.

H. Data Quality Objectives:

Data collected, data analyzed, and reports prepared will adhere to the IEP QA/QC requirements. (Please refer to IEP Quality Assurance and Quality Control Program for Collection and Evaluation of Environmental Data)

I. Documentation and Records:

Data collected in the field will be recorded on data sheets and entered onto the computer in spreadsheet format. After the data is error checked, the data will be uploaded onto the IEP home page and stored under the Prospect Island Monitoring Results heading.

2. Data Acquisition

A. Benthic Macro fauna Collection

- Sampling Stations:
  1) Input channels outside of study site (2 stations)
  2) Main channel within study site (1 station)
  3) Open water (1 station)
  4) Dead-end slough (1 station)
  5) Vegetated shallow-water (1 station)

- Sampling Frequency:

  Samples will be collected year-round on a monthly basis.

- Measurements:

  At each station, four benthic samples are collected from a boat using a Birge-Ekman dredge, either pole-mounted or cable-mounted depending upon accessibility. The contents of each grab will be washed into a Standard No. 30 mesh screen (0.595 mm openings). Each sample is carefully washed with a fine spray to remove as much of the substrate as possible. All material remaining on the screen is washed into a plastic jar and preserved with buffered formalin containing Rose Bengal dye. Each replicate is processed individually. Benthic data records consist of the number of organisms per square meter. Organisms are identified mnemonically from phylum to species, and by life stage (larval, pupal, or adult).

- Sampling Procedures:

Benthic macroinvertebrate sampling methodology can be found in Standard Methods for the Examination of Water and Wastewater, 16th ed. 1985 American Public Health Association, Washington D.C. (See method 1005:6 Ekman Grab sampling pages 1113-1130.)

- Laboratory Analysis:
  Laboratory identification and enumeration of macro-benthic organisms in each sample will be performed under the contract for D1485 Benthic sample analysis. A reference sample library will be kept by the contracting taxonomist.

B. Substrate Samples

- Sampling Stations:
  1) Input channels outside of study site (2 stations)
  2) Main channel within study site (1 station)
  3) Open water (1 station)
  4) Dead-end slough (1 station)
  5) Vegetated shallow-water (1 station)

- Sampling Frequency:
  Samples will be collected year-round on a monthly basis.

- Measurements:
  One liter samples of benthic substrate will be collected with the Birge-Ekman Dredge.

- Laboratory Analysis:
  DWR's Bryte Soils and Concrete Laboratory will do grain size analysis and organic matter content analysis as per the specifications for D1485 substrate samples.

3. Data Reduction, Analysis, and Reporting

A. Quarterly updates summarizing the data collected will be presented in the IEP Newsletter, which is published every Fall, Winter, Spring, and Summer. Copies of the updates will also be forwarded to CALFED/Category III.

B. Annual reports will be prepared and submitted to the IEP for publication and copies of the report will be forwarded to CALFED/Category III.

C. All data will stored on the IEP home page under the Prospect Island Monitoring

Results heading.

Prospect Island Monitoring Proposal
For Submittal to Category III - June 1998

1. Project Management

A. Name of Monitoring Element:
Prospect Island Bathymetry Monitoring Proposal

B. Principal Investigator
Howard Mann

C. Estimated Cost:
$32,670/ave. annual cost

D. Responsible Agency:
Department of Water Resources

E. Project Coordinator:
Leo Winternitz

F. Project Organization and Responsibilities :
Field work to be conducted by two Department of Water Resources Engineers. Data analysis and report writing to be prepared by Howard Mann, Senior Engineer for Department of Water Resources.

G. Project Description

- Objective:
  Evaluate changes in habitat features in Prospect Island due to siltation and erosion.

- Data Usage:
  Data collected will be used to evaluate the relative success of habitat features in Prospect Island. As mentioned in the vegetation monitoring section, the elevation of manmade geographic features determine the response of the biotic communities. Therefore, annual surveys of the manmade islands and berms should be performed in order for adaptive management decisions to be made.

H. Data Quality Objectives:
Data collected, data analyzed, and reports prepared will adhere to the IEP QA/QC requirements. (Please refer to IEP Quality Assurance and Quality Control Program for Collection and Evaluation of Environmental

Data)

I. Documentation and Records:

Data collected in the field will be recorded on data sheets and entered onto the computer. Global Positioning System data will be collected for the different sampling sites. After the data is error checked, the data will be uploaded onto the IEP home page and stored under the Prospect Island Monitoring Results heading.

2. Data Acquisition:

Bathymetry monitoring will consist of a topographic survey of Prospect Island prior to flooding and annual soundings of the island after flooding. There will be a total of 4 surveys during the 3-year monitoring period.

A. Baseline Survey.

- A traverse will be established around the perimeter of the island. Survey markers will be installed at each point of the traverse. GPS readings will be taken at each point and reference points will be established for each point.

- Elevations will be established at each of the survey markers. The elevations will be established from the benchmark located on the bridge at Miner Slough.

- Cross-sections will be made every 500-feet and at points where changes should be noted. All cross-sections will be tied to the traverse.

B. Establish baseline elevation of representative project features after the island is flooded:

- Berms
- Islands
- Levees
- Shallow water
- Excavated channel

A preliminary examination will be done to reestablish missing or damaged points of the traverse. Elevations of points will be checked for changes. Soundings using a sounding rod and fathometers will be taken of the flooded island at selected points.

C. Conduct annual elevation surveys of same features to monitor:

- Erosion
- Accretion
- Subsidence

3. Data Reduction, Analysis, and Reporting

A. Quarterly updates summarizing the data collected will be presented in the IEP Newsletter, which is published every Fall, Winter, Spring, and Summer. Copies of the updates will also be forwarded to CALFED/Category III.

B. Annual reports will be prepared and submitted to the IEP for publication and copies of the report will be forwarded to CALFED/Category III.

C. All data will stored on the IEP home page under the Prospect Island Monitoring Results heading.

Prospect Island Monitoring Proposal
For Submittal to Category III – June 1998

1. Project Management

A. Name of Monitoring Element:
Prospect Island Organic Carbon Monitoring Proposal

B. Principal Investigators
Peggy Lehman, Collette Zemitis

C. Estimated Cost:
$80,993/annually

D. Responsible Agency:
Department of Water Resources

E. Project Coordinator:
Leo Winternitz

F. Project Organization and Responsibilities :
Field work to be conducted by one Department of Water Resources biologist and one scientific aide. Data analysis and report writing to be prepared by Peggy Lehman, Environmental Specialist IV and Collette Zemitis, Environmental Specialist III of the Department of Water Resources.

G. Project Description

- Objectives:
  - Quantify particulate and organic carbon concentrations and disinfection by-product precursor concentrations in different habitats in Prospect Island and compare to concentrations in adjacent channels.
  - Determine if the Prospect Island project is a source of particulate and dissolved organic carbon to Delta channels.

- Data Usage:
  Data collected will be used to determine the potential effects on the food web and on drinking water quality due to production of organic carbon. Organic carbon and trihalomethane and haloacetic

acid formation potential concentrations in habitats in Prospect Island and the adjacent channels will be compared.

H. Data Quality Objectives:

Data collected, data analyzed, and reports prepared will adhere to the IEP QA/QC requirements. (Please refer to IEP Quality Assurance and Quality Control Program for Collection and Evaluation of Environmental Data)

I. Documentation and Records:

Field and laboratory data will be entered into the DWR Bryte laboratory electronic data system. Data will be transferred electronically to DWR's Environmental Services Office. After the data are error checked, the data will be uploaded onto the IEP home page and stored under the Prospect Island Monitoring Results heading.

2. Data Acquisition

A. Sampling Stations

There will be both discrete and continuous sampling. Discrete sampling will be done in coordination with sampling for the Water Quality, Phytoplankton, and Benthic monitoring elements. Continuous monitoring will take place at the two breaches which will be monitored at inflowing and outflowing tides.

Discrete Sampling

- Input channels outside of study site (2 stations)
- Main channel (1 station)
- Open water (1 station)
- Dead-end slough (1 station)
- Vegetated shallow water (1 station)

Continuous Sampling

- At each of the breach locations (2 stations)

B. Sampling Frequency

Discrete Sampling

- Samples will be collected monthly.

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Continuous Sampling

- Flow recorders will be placed at both levee breaches. Water samples will be collected as water flows across the levee breach using an automatic sampler. Samples will be collected twice each day to coincide with periods when flow is expected across the levee breach; the levee breaches are exposed at low tide. Because of the high cost of analyses and the high sampling frequency required for the study, samples will be collected for only two weeks each month between April and September.

C. Parameters

Discrete Sampling

- Dissolved organic carbon
- Particulate organic carbon
- Ultra-violet absorbance
- Bromide
- Ammonia (2 sampling events only)
- Reactivity-based trihalomethane formation potential and haloacetic acid formation potential (2 sampling events only)

Continuous Sampling

- Dissolved organic carbon
- Particulate organic carbon
- Ultra-violet absorbance
- Bromide

3. Data Reduction, Analysis, and Reporting

A. Quarterly updates summarizing the data collected will be presented in the IEP Newsletter, which is published every Fall, Winter, Spring, and Summer. Copies of the updates will also be forwarded to CALFED/Category III.

B. Annual reports will be prepared and submitted to the IEP for publication and copies of the report will be forwarded to CALFED/Category III.

C. All data will stored on the IEP home page under the Prospect Island Monitoring Results heading.

INTERAGENCY ECOLOGICAL PROGRAM QUALITY ASSURANCE AND QUALITY CONTROL PROGRAM FOR COLLECTION AND EVALUATION OF ENVIRONMENTAL DATA

C-089329

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SUMMARY

This document describes a proposed QAQC Program for the IEP prepared by the QAQC Working Group. It was prepared at the request of the IEP Management Team to facilitate collection and evaluation of environmental data among IEP program elements that meet QAQC standards of the IEP agencies. The program is primarily a formalization of the existing process with some refinements.

The proposed QAQC Program described in this document has two components 1) Quality Assurance Management Plan (QAMP) and 2) Quality Assurance Project Plan (QAPP) Checksheet. The QAPP provides guidelines for the information and procedures needed to document and conduct an IEP program element. The QAMP describes the organizational process, procedures and responsibilities for assuring completion of the QAPP within IEP.

The QAQC Working Group relied heavily on the QAQC guidelines developed by the American National Standards Institute (ANSI) and the U.S. Environmental Protection Agency (EPA) in developing the QAQC Program. The Program also incorporates guidelines developed by all IEP agencies. However, EPA was the most strongly represented since most agencies use EPA guidelines.

Please review the following document. Send comments to the Chair of the QAQC Working Group:

Dr. P. W. Lehman

Department of Water Resources

3251 S Street

Sacramento, CA 95816

plehman@water.ca.gov

and discuss this document with members of the QAQC Working Group:

Peggy Lehman, Chair - DWR

Katie Wadsworth - DWR

Barry Gump - DWR/Fresno State

Jennifer Hogan - DWR

Sheryl Baughman - USBR

Bob Young - USBR

PART I.

QUALITY ASSURANCE MANAGEMENT PLAN (QAMP)

INTRODUCTION

This QAMP describes the organization, responsibilities and procedures within the IEP that facilitate a quality assurance and quality control program. A major goal of the QAMP is to ensure completion of the Quality Assurance Project Plan (QAPP). It is the responsibility of all management and staff within the IEP to implement and follow QAMP procedures.

I. POLICY

Policy: It is the policy of IEP that all program elements conducted by or on behalf of IEP shall be carried out in accordance with the Quality Assurance Management Plan and Project Plan described in this document. It is also the policy of IEP for all program elements to document their QAQC systems.

II. ROLES AND RESPONSIBILITIES

1. The QAQC program will be the responsibility of all IEP managers and staff. The organization of IEP is described in Figure 1.

2. Specific responsibilities of IEP managers and staff are outlined below:

   IEP Coordinators - final approval and funding of program elements; decision for

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publication

Science Advisory Group - develop technical review committee

QAQC Work Group - Review and revise QAQC Management Plan and Project Plan

IEP Manager - Responsible for acceptance of fact sheets, final proposals and final reports; resolve disputes; conductance of Management Plan in timely fashion; maintain communication between PWT and Management

IEP Management Team - review fact sheets, proposals and final reports

PWT - review fact sheets, final proposals, progress reports and final reports

Project Manager - prepare fact sheet, final proposal, progress reports, final report in accordance with Management Plan and Project Plan

Technical staff - implement QAQC program and report problems to management

3. Signature page: commitment to this QAQC Program indicated by signatures of the IEP Manager and Coordinators.

III. IMPLEMENTATION

The steps for review of a proposal and completion of a project plan are briefly discussed below. These steps are also summarized in flow diagrams in Figures 2a,b.

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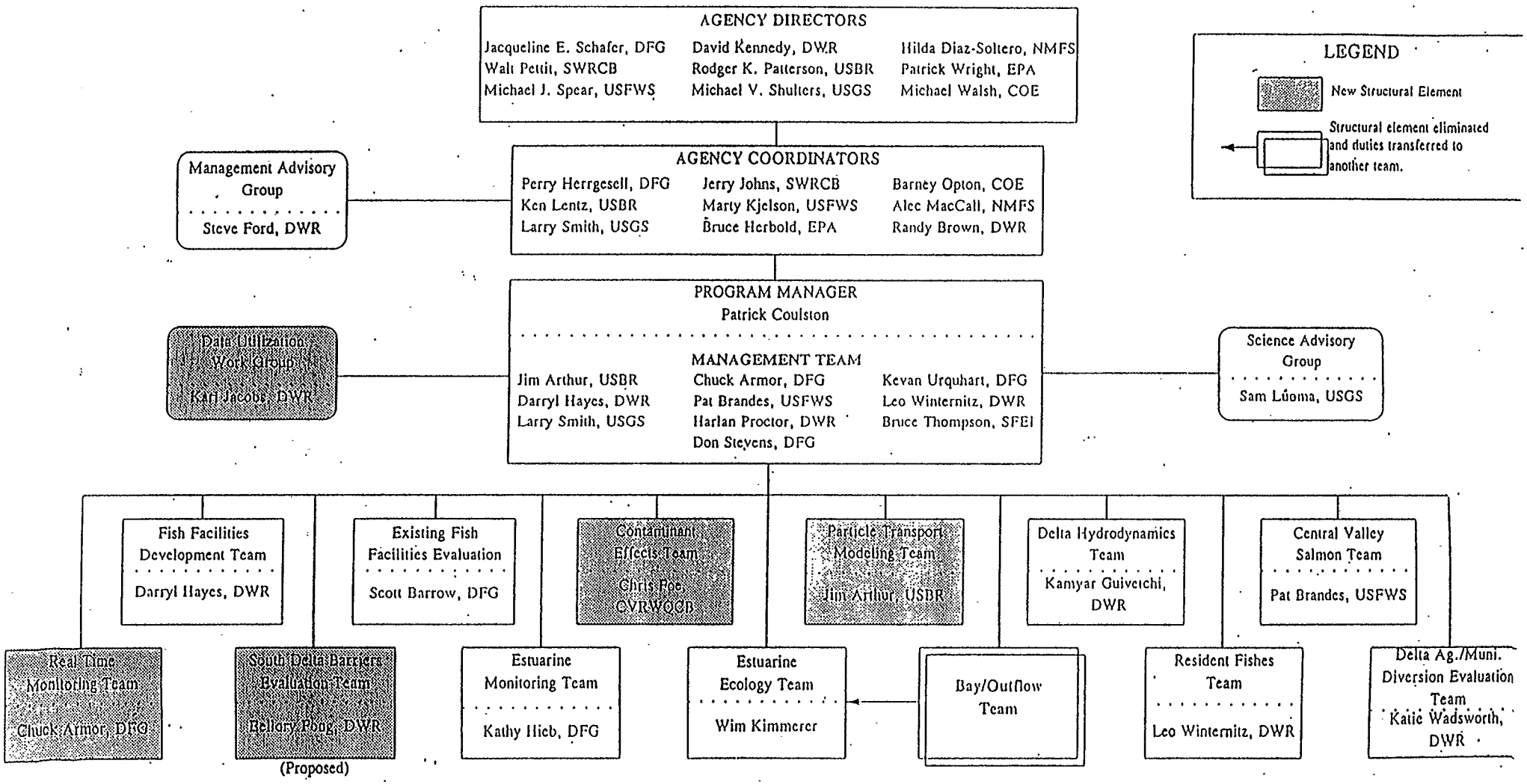
6-19-96 VERSION

1996 Organization of The Interagency Ecological Program for the Sacramento-San Joaquin Estuary



Proposal Review

1. Project Manager prepares Fact Sheet and sends to IEP Manager. The Project Manager may be a member of a PWT, IEP staff or individual outside IEP and the project may be solicited or unsolicited by IEP.

2. IEP Management Team reviews Fact Sheet and determines the completeness, relevance and priority of the project to IEP. Appropriate Fact Sheets are selected for further review.

3. IEP Manager assigns selected Fact Sheets to a PWT or review team for further review.

4. PWT or review team reviews Fact Sheet for technical merit and feasibility and PWT Chair informs the Project Manager and IEP Manager of their finding. The Chair initials Fact Sheet to indicate acceptance by PWT. Appeals go to IEP Manager for resolution.

5. Project Manager prepares QAPP and QAPP checksheet and sends to PWT or review team.

6. PWT or review team reviews QAPP and QAPP checksheet. Evaluation of the QAQC is a vital part of this review. Appeals go to IEP Manager for resolution.

7. PWT or review team members accepting the proposed project plan sign QAQC signatory page (Figure 3) and Chair forwards statement of findings by the committee to IEP Manager. Proposal reviews and signing of signatory page are the responsibility of the team Chair. The Chair

determines the active members of the PWT or review team and their technical qualifications. Acceptance of the proposal requires 2/3 of the team not directly involved in a project. A minimum of 5 people are required, with at least two people with technical expertise in the study area. If this is not available then another team or outside review by two technical experts is needed. Appeal goes to IEP Manager for resolution.

8. IEP Coordinators consider project proposals for funding. IEP Manager is responsible for timely decision and update to PWT or review team chair.

Project Plan

9. The Project Manager begins the program element as described in the QAPP.

10. The Project Manager prepares progress reports and submits them to the PWT or review team for review. Corrective action or adjustments to the QAPP must be thoroughly documented. The frequency and type of progress reports are at the discretion of the PWT or review team.

11. PWT or review team reviews progress reports. The PWT confirms that the QAPP is being followed and that corrective actions or adjustments are appropriate. Corrective actions or adjustments must be approved by mutual agreement. Project Manager continues program element with approval from PWT. A PWT or review team can stop a program element at this stage, by sending a letter describing their reasoning to the IEP Manager. Appeals go to IEP Manager.

PROPOSAL REVIEW

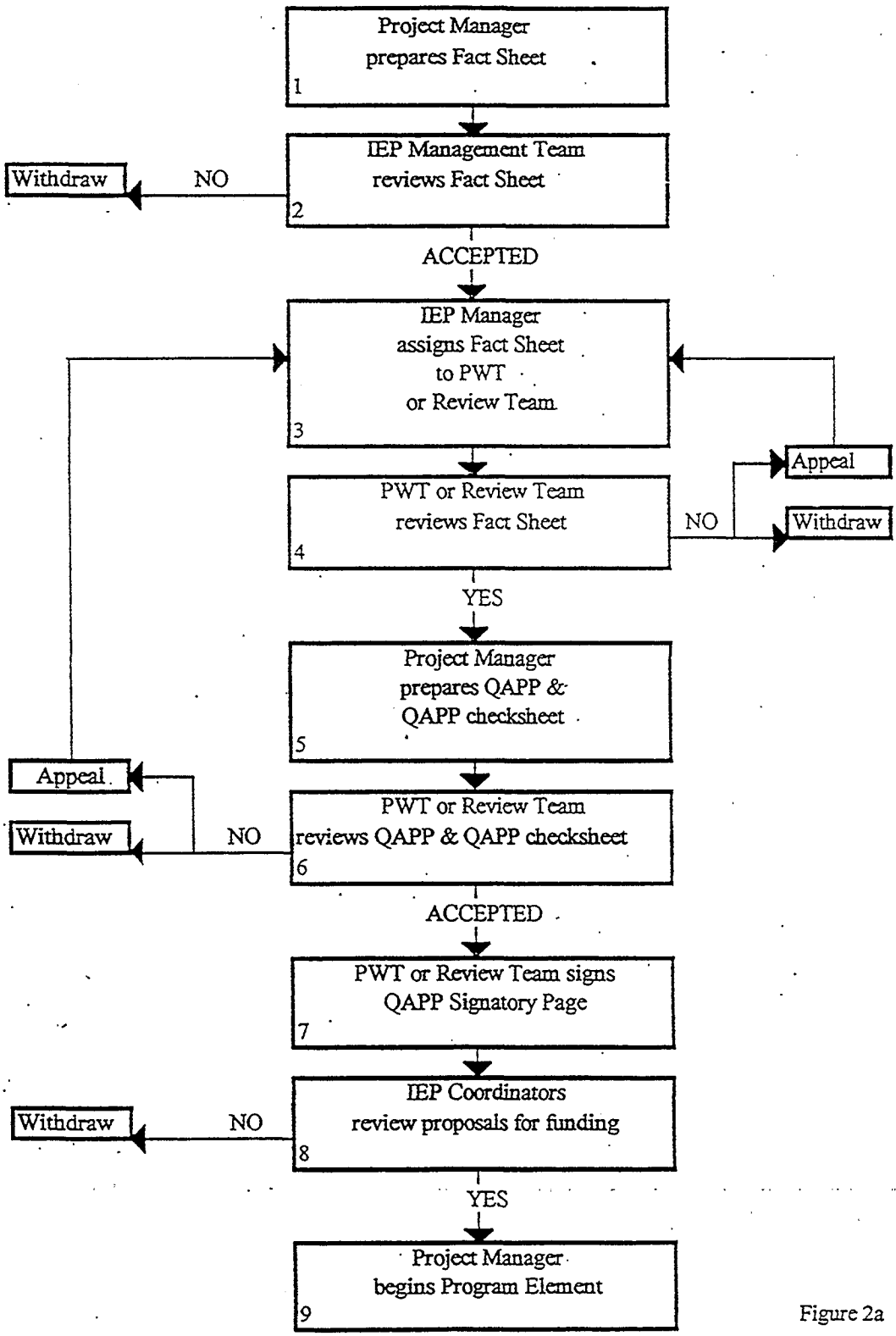


Figure 2a

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PROJECT PLAN

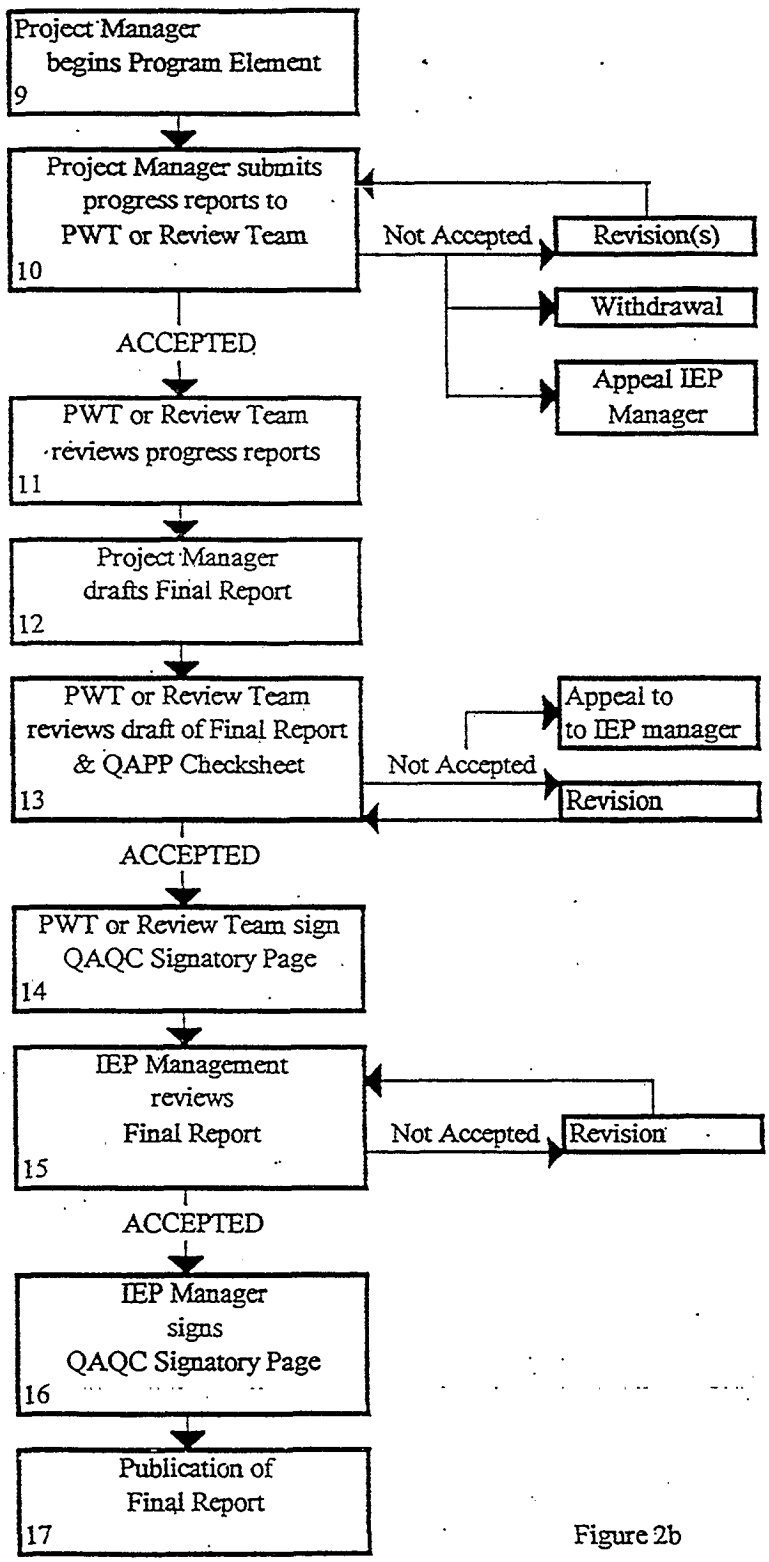

Figure 2b

12. Project Manager drafts final report and forwards to Chair of PWT or review team. The draft final report will include all approved adjustments to the QAPP. Review by at least one outside technical expert is encouraged (feedback : change encouraged to required).

13. PWT or review team reviews draft final report and QAPP checksheet. Deviations from the QAPP must be documented in the final report. The team must confirm in their review that QAPP was followed and that adjustments were appropriate. Appeals go to IEP Manager.

14. PWT or review team sign final report block on QAQC signatory page and forward report to IEP Manager. It is the responsibility of the team Chair to obtain signatures for the QAQC signatory block. The signatory block must have 2/3 of the members of the team not directly involved in the program element. A minimum of 5 people are required with at least two people with technical expertise in the study area. If this is not available than another team or outside review by two technical experts is needed. The Chair determines the active members of the team and their technical qualifications.

15. IEP Management Team reviews final report. Once the report is accepted, the IEP Manager obtains the signatures of the Management Team for the QAQC signatory page. Problems with the process will be resolved by IEP Coordinators.

16. IEP Manager signs QAQC signatory page and informs Project Manager that final report was accepted. The IEP Managers signature indicates the report is complete and that the project

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satisfactorily followed the QAQC Program. Completion of the QAQC signatory page is required for all IEP reports and will be included in each report.

17. Publication of final report. Publication of the final report is at the discretion of the IEP Coordinators. Coordinators sign QAQC signatory page to approve publication. IF there is a dispute over the publication of a report among the Coordinators, then those in the minority may request outside review for resolution. A QAQC signatory page must be included in all published reports.

IV. RESOURCES

1. Personnel qualification and training

It is the responsibility of all IEP agencies to have staff who are qualified and appropriately trained for their assignments in the IEP programs.

2. Procurement of materials and services

It is the responsibility of all IEP agencies to ensure that all materials and services are of acceptable quality for program elements as outlined in this policy document.

5. Documents and records

It is the responsibility of all IEP Agencies to provide and maintain documentation of the QAQC process described in this document.

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6. Facilities and equipment

It is the responsibility of all IEP Agencies to ensure that all facilities and equipment are adequate, maintained and regularly inspected to meet safety and IEP program element needs.

V. ASSESSMENT

1. Continual assessment

The IEP Manager will receive comments and suggestions from all members of the IEP on the QAQC Program at any time and will determine the appropriate course of action.

2. Annual review

The IEP QAQC Group will evaluate the QAQC Program yearly. The evaluation will include a determination of the quality of PWT reviews, whether the Management Plan and Project Plan are working and if the Management Plan is being conducted in a timely fashion. Evaluation will be based on self and independent assessments by management and technical staff. This assessment will include a quality review of at least 10% of the proposals and final reports by a Quality Review Group. The Quality Review Group will be developed by SAG and the IEP Manager will select the project plans and final reports for review. Based on these assessments, the QAQC Group will prepare a report to the IEP Manager evaluating the performance and identifying opportunities for improvement of the Management and Project Plans.

Part II

IEP Quality Assurance Project Plan (QAPP) Checksheet

INTRODUCTION

The QAPP checksheet is intended as a guide for the preparation of proposals or description of existing program elements. It is a list of the information necessary to ensure the quality assurance and quality control of a project. We recommend all proposed projects and existing IEP elements incorporate as many of these items into their project plan as possible. Review of each new project and completed project will be based on the completeness of the plan in relation to the checksheet. A completed checksheet must be included with new project proposals and final reports.

This list is condensed and modified to meet IEP needs and was based on documentation for quality assurance and quality control of project plans developed by IEP agencies. A list of documents used to develop this list are cited in the reference list.

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SIGNATORY PAGE

1. PWT or Review Team approval of proposal and QAPP checksheet

   Signatures by members of PWT or Review Team (at least 5).
   Two signatures must have technical expertise in area of study.

2. PWT or Review Team approval of quarterly reports

   Signature by PWT or Review Team Chair _____

3. PWT or Review Team approval of Final Report and QAQC procedures in accordance with checklist

4. IEP Management Team approval of Final Report and QAQC procedures

5. IEP Manager confirms report is complete and the project was completed through the IEP QAQC Program. _____

6. IEP Coordinators Approval to publish report

QUALITY ASSURANCE QUALITY CONTROL PROJECT PLAN CHECKSHEET

PROJECT NAME:

I. PROJECT MANAGEMENT **COMMENTS**

- ☐ **A. Project Description/ Problem Definition**
  - ☐ 1. Project History
    - ☐ a. The situation
    - ☐ b. The significance of the study
  - ☐ 2. Proposal and Purpose of Study in explicate terms
    - ☐ a. Statement of decision to be made or question to be answered
    - ☐ b. Determination of success
  - ☐ 3. Schedule for completion
  - ☐ 4. Products or Deliverables
  - ☐ 5. Use and Users of Information
  - ☐ 6. Project costs

- ☐ **B. Project Organization and Responsibilities**
  - ☐ 1. Person or persons responsible for each Project Element and its Implementation (names, phone numbers, addresses, e-mail)
  - ☐ 2. Chain of command
  - ☐ 3. Personnel resources required to accomplish project

- ☐ **C. Data Quality Objectives (DQO) and Criteria**
  - ☐ 1. What quantity and quality of data is required to answer the "question"
    - ☐ a. Quantitative objectives: precision, accuracy, completeness (success criteria), appropriate parameter selection
    - ☐ b. Qualitative objectives: representativeness, comparability, credibility, relevancy, clarity, consistency, technical expertise
  - ☐ 2. Legal defensibility of data
  - ☐ 3. Detailed budget

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II. MEASUREMENT AND DATA ACQUISITION COMMENTS

☐ A. Station Selection and Design

- ☐ 1. Description (include map)
- ☐ 2. Statistical and scientific rationale for choosing stations
- ☐ 3. Sample matrix (parameters, frequency, stations and replication)

☐ B. Sampling Procedures

- ☐ 1. Methodology (referenced)
- ☐ 2. Sample preservation, transportation, storage and disposal (SOP)
- ☐ 3. Preparation of equipment: cleaning, reagents, supplies (SOP)
- ☐ 4. Personnel training (SOP)
- ☐ 5. Personnel safety (SOP)
- ☐ 6. Sample and data collection (SOP)
- ☐ 7. Sample and data acceptability (SOP)

☐ C. Sample Custody for Field and Laboratory

- ☐ 1. Identify custodians
- ☐ 2. Tracking forms
- ☐ 3. Sample records: location, time, depth, etc.

☐ D. Calibration Procedures and Frequency

- ☐ 1. Instrument and sample calibration (referenced)
- ☐ 2. Frequency and timing of calibration: analytical system, instruments, devices, etc. (SOP)
- ☐ 3. Documentation of calibration checks
- ☐ 4. Instrument, equipment and supplies inspection and maintenance

☐ E. Sample Processing and Analysis

- ☐ 1. Reference standard methods and appropriateness for measurements
- ☐ 2. Describe non-standard methods and validation procedures
- ☐ 3. Describe SOP's

COMMENTS

- ☐ **F. Data Reduction, Analysis and Reporting**
  - ☐ 1. Responsibility and chain of command
  - ☐ 2. Procedures for calculations and statistics
  - ☐ 3. Assumptions
  - ☐ 4. Products and deliverables
  - ☐ 5. Reporting of QA/QC process results (see III and IV)
  - ☐ 6. Decision/ Conclusions
  - ☐ 7. Upload to IEP Server (refer to File Server instructions)

III. DATA ASSESSMENT AND OVERSIGHT

- ☐ **A. QC data checks (refer to I-C DQO Objectives)**
- ☐ **B. Field and laboratory performance and systems audit**
- ☐ **C. Corrective action (refer to Management Plan)**

IV. DATA VALIDATION AND USABILITY

- ☐ **A. Error checking of raw data (data review)**
- ☐ **B. Data limitations and user needs**
- ☐ **C. Computer file (refer to Data Utilization Work Group guidelines)**

REFERENCE LIST

American Society for Quality Control Standards Committee. January 1994. Specifications and Guidelines for Quality Systems for Environmental Data Collection and Environmental Technology Programs ANSI/ASQC E4-19xx. American Society for Quality Control Energy and Environmental Quality Division.

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GLOSSARY

ACCURACY - Freedom from error.

ASSESSMENT - The evaluation process used to measure the performance or effectiveness of a system and its elements.

AUDIT - A planned and documented investigative evaluation of an item or process to determine its adequacy and effectiveness as well as compliance with established procedures, instructions, drawings, QAPPs, and/or other applicable documents.

CALIBRATION - Comparison of a measurement standard, instrument, or item with a standard or instrument of higher accuracy to detect and quantify inaccuracies and to report or eliminate those inaccuracies by adjustments.

CHAIN OF COMMAND - The relationship between those individuals directly responsible and accountable for planning, implementing, and assessing a project.

CHAIN OF CUSTODY - An unbroken trail of accountability that ensures the physical security of samples, data and records.

CLARITY - Sufficient data of proper quality to unequivocally demonstrate a specified condition or conclusion.

COMPARABILITY - A measure of the confidence with which one data set can be compared to another.

COMPLETENESS - A measure of the amount of valid data obtained from a measurement system compared to the amount that was expected to be obtained under correct, normal conditions.

CORRECTIVE ACTION - Measures taken to rectify conditions adverse to quality and, where possible, to preclude their recurrence.

CREDIBILITY - Condition of believability based on understanding that a project's design and all sampling, analysis, and data processing operations were carried out correctly and without bias by well trained and capable team members.

DATA UTILIZATION WORK GROUP GUIDELINES - A set of guidelines stating criteria used to review and validate data in an objective and consistent manner.

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DATA QUALITY OBJECTIVES (DQOs) - Established quantitative measurement performance criteria (with associated precision and accuracy or acceptable uncertainty) that must be obtained from the environmental data operations in order to demonstrate that the desired and expected result has been achieved.

DELIVERABLE - A report or product specified as one of the requirements of a project.

ENVIRONMENTAL DATA - Any measurements or information that describe environmental processes or conditions, or the performance of environmental technology.

IEP SERVER - A network system linking various IEP program components and permitting communication and information sharing between them.

INDEPENDENT ASSESSMENT - An assessment performed by a qualified individual, group, or organization that is not a part of the organization directly performing and accountable for the work being assessed.

ITEM - An all-inclusive term used in place of the following: facility, sample, component, equipment, material, part, product structure, system, unit, or data.

MANAGEMENT - Those individuals directly responsible and accountable for planning, implementing, and assessing work.

METHOD - A body of procedures and techniques for performing an activity (e.g., sampling, chemical analysis, quantification) systematically presented in the order in which they are to be executed.

PARAMETER - A physical or biological characteristic of an environmental system that can be measured.

PRECISION - A measure of mutual agreement among individual measurements of the same property, usually under prescribed similar conditions, expressed generally in terms of the standard deviation.

PROCESS - An orderly system of actions that are intended to achieve a desired end or result. Examples of processes include analysis, design, data collection, operation, fabrication, and calculation.

PRODUCT - A report, document, model, etc. resulting from an ongoing or completed project.

QUALITY ASSURANCE (QA) - An integrated system of management activities involving planning, implementation, assessment, reporting, and quality improvement to ensure that a process, item or service is of the type and quality needed and expected by the customer.

QUALITY ASSURANCE PROJECT PLAN (QAPP) - A formal document describing in comprehensive detail the necessary QA, QC, and other technical activities that must be implemented to ensure that the results of the work performed will satisfy the stated performance criteria.

QUALITY CONTROL (QC) - The overall system of technical activities that measures the attributes and performance of a process, item, or service against defined standards to verify that they meet the stated requirements established by the customer.

QUALITY MANAGEMENT PLAN (QMP) - A formal document that describes the quality system in terms of the organizational structure, functional responsibilities of management and staff, lines of authority, and required interfaces for those planning, implementing, and assessing all activities conducted.

REPRESENTATIVENESS - A measure of the degree to which data accurately and precisely represent a characteristic of a population, parameter variations at a sampling point, a process condition, or an environmental condition.

STANDARD OPERATING PROCEDURE (SOP) - A written document that details the method for an operation, analysis, or action with thoroughly prescribed techniques and steps, and that is officially approved as the method for performing certain or repetitive tasks.

SUCCESS - A situation in which particular requirements for a specific intended use are fulfilled.

TECHNICAL EXPERTISE - Knowledge and abilities gained as a result of specialized training.

VALIDATION - An activity that demonstrates or confirms that a process, item, data set or service is, in fact, that which is claimed.

WORK - The process of performing a defined task or activity (e.g., research, field sampling, analytical operations).

APPENDIX A
QAQC INFORMATION COMPARISON AMONG IEP AGENCIES

The following table compares QAQC information required by IEP agencies. The table was developed from IEP agency reports and national and international standards. Agency reports and contact persons are listed at the end of the table. Information included within agency documentation is indicated with an X.

In general, agencies that had QAQC guidelines required similar information. This is not surprising since most agencies relied on EPA documentation.

If you have any questions or comments please contact:

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QA/QC POLICY MANUALS REVIEWED FOR COMPARISON AND IEP AGENCY CONTACTS:

DWR Contact: Barry Gump 916-327-1750

- Guidelines for Preparing Quality Assurance Project Plans
- Compendium of Water Quality Investigations in Sacramento-San Joaquin Delta
- Quality Assurance Guidelines for Analytical Laboratories
- Sampling Manual for Environmental Measurement Projects

USGS Contact: Terry Schertz, Leroy Schroader- Denver, CO 303-239-5002

- Quality Assurance Requirements for Water Quality Laboratories Providing Analytical Services for the Water Resources Division of the U. S. Geological Survey (1991)
- Integrating Quality Assurance in Project Work Plans of the USGS (1990)
- (Incomplete) Guidelines for Preparing a Quality Assurance Plan for District Offices of the USGS (1992)
- A guide to the Design of Surface Water Quality Studies (1994)
- A workbook for preparing surface water quality-assurance plans for districts of the U.S. Geological survey, water resources division (1995)
- Technical review of water-quality laboratories providing analytical services for the water resources division of the U.S. Geological survey
- Quality assurance plan for the collection and processing of sediment data by the U.S. Geological survey, water resources division
- Quality assurance guidelines for the analysis of sediment concentration by U.S. Geological survey sediment laboratories

USFWS Contact: Pat Brandes 209-946-6400

- U. S. Fish and Wildlife Service 1996 Field Season Protocol

CDFG Contact: Lisa Lynch 209-942-6105

- Quality Assurance and Quality Control Protocol for the Bay-Delta and Special Water Project's Young Striped Bass Studies
- State of Cal. DFG Environmental Services Div. Laboratory Quality Assurance Program Plan
- State of California Dept. of Fish and Game Environmental Services Div. Laboratory Quality Assurance Program Plan

ANSI/ASQC Contact:

- Specifications and Guidelines for Quality Systems for Environmental Data Collection and Environmental Technology Programs (Jan 1994)

USBR Contact: Sheryl Baughman 916-979-2472

- Standard Operating Procedures of the Quality Assurance Section
- Standard Operating Procedures for Environmental Monitoring (June 1, 1994)
- Quality Control Plan: USBR Water Quality Laboratory (July 21, 1994)
- Quality Assurance Guidelines for Water Quality Investigations (Sept 1991)

EPA Contact: Eugenia McNaughton 415-744-1636/ Bruce Herbold 415-744-1992

- Generic Quality Assurance Project Plan Guidance for Programs Using Community Level Biological Assessment in Wadable Streams and Rivers (July 1995)
- EPA Requirements for Quality Assurance Project Plans for Environmental Data Operations (May and Aug 1994)
- EPA Requirements for Quality Managements Plans (May and Aug 1994)

ACOE Contact? QA Chief of Engineers 916-557-7770

SWRCB Contact: Bill Ray 916-657-1123 (Quality Assurance Program Mgr.)
(Jim Sutton-call for questionnaire input 916-657-2190)

NMFS Contact: Jim Bybee 707-575-6050

IEP QA/QC COMPARISON BETWEEN AGENCIES

	EPA	DWR	USBR	USFWS	ACOE	USGS	CDFG	SWRCB	NMFS
I. Project Management									
A. Project Description/ Problem Definition									
1. Project History	X	X	X	X			X		
a. The situation	X	X	X	X		X	X		
b. The significance of the study	X	X	X	X		X	X		
2. Proposal and Purpose of Study in Explicate Terms									
a. Statement of Decision to be Made or Question to be Answered	X	X	X			X			
b. Determination of success	X	X							
3. Schedule for Completion	X	X	X			X	X		
4. Product or Delivery - Use and users of information	X	X	X			X			
5. Project Costs							X		
B. Project Organization and Responsibilities									
1. Person or persons responsible for each Project Element and it's implementation (names, phone numbers, addresses, e-mail)	X					X			
2. Chain of Command	X	X	X			X	X		
3. Personnel resources required to accomplish project	X					X			
C. Data Quality Objectives (DQO) and Criteria									
1. What quantity and quality of data is required to answer the "question"	X	X				X	X		
a. Quantitative objectives: precision, accuracy, completeness (success criteria), appropriate parameter selection	X	X	X	X		X	X		
b. Qualitative objectives: representativeness, comparability, credility, relevance, clarity, consistency, technical expertise	X	X	X			X	X		
2. Legal defensibility of data			X						
3. Detailed budget				not detailed					

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IEP QA/QC COMPARISON BETWEEN AGENCIES

	EPA	DWR	USBR	USFWS	ACOE	USGS	CDFG	SWRCB	NMFS
II. Measurement and Data Acquisition									
A. Station Selection and Design									
1. Description (include map)	X	X	X	X		X	X		
2. Statistical and scientific rationale for choosing stations							scientific rationale only		
3. Sample matrix (parameters, frequency, stations and replication)	X	X	X	X		X	X		
B. Sampling Procedures									
1. Methodology (referenced)	X	X	X	not referenced		X	X		
2. Sample preservation, transportation, storage and disposal (SOP)	X	X	X			X	X		
3. Preparation of equipment: cleaning, reagents, supplies (SOP)	X	X	X			X	X		
4. Personnel training (SOP)	X	X		X		X	X		
5. Sample and data collection (SOP)	X	X	X	X		X	X		
6. Sample and data acceptability (SOP)	X	X	X	X		X	X		
7. Personnel safety (SOP)			X				X		
C. Sample Custody for Field and Laboratory									
1. Identify custodians	X	X	X			X	X		
2. Tracking forms						X	X		
3. Sample records: location, time, depth, etc.	X	X	X	X		X	X		
D. Calibration Procedures and Frequency									
1. Instrument and sample calibration (referenced)	X	X	X			X	X		
2. Frequency and timing of calibration: analytical system, instruments, devices, etc. (SOP)	X		X			X	X		
3. Documentation of calibration checks	X		X			X	X		
4. Instrument, equipment and supplies inspection and maintenance	X	X	X			X	X		

IEP QA/QC COMPARISON BETWEEN AGENCIES

	EPA	DWR	USBR	USFWS	ACOE	USGS	CDFG	SWRCB	NMFS
E. Sample Processing and Analysis									
1. Reference standard methods and appropriateness for measurement	X	X	X			X	X		
2. Describe non-standard methods and validation procedures							X		
3. Describe SOPs	X	X	X	X		X	X		
F. Data Reduction, Analysis and Reporting									
1. Responsibility and Chain of Command	X					X	X		
2. Procedures for calculations and statistics	X	X	X				X		
3. Assumptions	X								
4. Products and deliverables	X	X	X	X		X	X		
5. Reporting of QA/QC process results (see III and IV)	X	X	X			X	X		
6. Decision/ Conclusions									
7. Upload to IEP Server (refer to File Server Instructions)							X		
III. DATA ASSESSMENT AND OVERSIGHT									
A. QC data checks (refer to I-C DQO Objectives)	X	X	X	X		X	X		
B. Field and Laboratory performance and Systems audit	X	X	X			X	X		
C. Corrective action (refer to Management plan)	X	X	X			X	X		
IV. DATA VALIDATION AND USABILITY									
A. Error checking of raw data (data review)	X	X	X	X		X	X		
B. Data limitations and User needs	X								
C. Computer file (refer to Data Utilization Work Group guidelines)						X			