Summary Information

California Department of Water Resources

Real−Time Flow Monitoring

Amount sought: $330,000

Duration: 36 months

Lead investigator: Mr. John Clements, CA Dept. of Water Resources

Short Description

This project funds the continued operation and maintenance of flow monitoring stations that are part of an effort to assess, acquire, and manage minimum base instream flows in four eastside Sacramento River tributaries,(Big Chico, Butte, Deer and Mill creeks). Additional efforts to determine appropriate instream flows are currently in progress and will require a long−term record of the daily hydrograph for the various reaches of each tributary. Installation and operation of flow monitoring stations specifically targeted for the management of anadromous fish migration will provide the necessary long−term time series data for determination of minimum base flows. Installation and operation of flow monitoring stations specifically targeted for the management of anadromous fish migration will ensure the presence of, and facilitate the management of, dedicated instream flows acquired for anadromous fish.

Executive Summary

EXECUTIVE SUMMARY

Title of Project: Real−Time Flow Monitoring

Requested Amount: $330,000

Applicant: California Department of Water Resources

John Clements, Senior Water Resources Engineer

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Red Bluff, CA 96080 Email: clements@water.ca.gov

Project Summary − This project funds the continued operation and maintenance of flow monitoring stations that are part of an effort to assess, acquire, and manage minimum base instream flows in four eastside Sacramento River tributaries. Each of the four tributaries (Big Chico, Butte, Deer and Mill creeks) support at−risk species (including spring−run salmon and steelhead) and each has significantly impaired flows that have been detrimental to the survival of the at−risk species. Flows in each of the four tributaries have been significantly altered and recent restoration plans have identified the need to provide adequate base flows dedicated for instream use. Analysis of flows and diversions shows that the exercise of legal water rights (appropriative, adjudicated, and riparian) often exceeds instream flows critical for spring−run salmon and steelhead migration. Several recent water acquisition projects have been implemented including pumped groundwater exchanges on Mill and Deer creeks, a water exchange and water right purchase on Butte Creek, and a diversion removal on Big Chico Creek. Each of the acquisitions has provided some proportion of a minimum base flow. Additional efforts to determine appropriate instream flows are currently in progress and will require a long−term record of the daily hydrograph for the various reaches of each tributary. This project specifically addresses CALFED Ecosystem Restoration Strategic Goal #1 − At Risk Species, and secondarily Goal #4− Habitats. It also addresses the Central Valley Project Improvement Act (CVPIA) priority focus on actions for recovery of Sacramento River spring−nm chinook salmon and steelhead.

Approach − Base flows that are within the range of the minimum flow range of the natural hydrograph are essential to the restoration and future survival of these spring−run chinook salmon and steelhead populations. Flow monitoring stations have historically been operated on each of the tributaries by water management agencies. However, these data are generally inadequate for determination or management of minimum base flows. Installation and operation of flow monitoring stations specifically targeted for the management of anadromous fish migration will provide the necessary long−term time series data for determination of minimum base flows. Installation and operation of flow monitoring stations specifically targeted for the management of anadromous fish migration will ensure the presence of, and facilitate the management of, dedicated instream flows acquired for anadromous fish.

Location −_Project sites are located on Big Chico, Butte, Deer and Mill creeks encompassing the Butte Basin, and Feather River and Sutter Basin Ecological Management Zones.

Hypothesis − Installation and long−term operation of flow monitoring stations, including sensors for temperature, will significantly contribute to the recovery and long−term survival of spring−run chinook salmon and steelhead in Big Chico, Butte, Deer and Mill creeks.

Uncertainties − It is without question that anadromous fish require minimum instream flows for migration and rearing. However, due to the multitude of lethal and sub−lethal stressors in the migratory pathway, it is impossible to accurately predict the incremental benefit of eliminating a single stressor such as inadequate instream flows.

Expected Outcome − Minimum base flows dedicated for instream use will significantly contribute to the recovery of spring−run chinook salmon and steelhead in Antelope, Mill, Deer, Big Chico, and Butte creeks.

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A. PROJECT DESCRIPTION

1. Problem, Goals, and Objectives

Flows in east-side tributaries to the Sacramento River that support sustaining or sporadic populations of spring-run chinook salmon and steelhead are inadequate during key adult and juvenile migration periods (Hallock, R., and W. Van Woert. 1959; Alley, D.W., and Associates, 1996; CDFG, 1998; CH2M Hill, 1998). Various flow acquisition projects have been, or are being implemented to provide minimum base flows (CDFG, 1994a, 1994b; M&T Ranch, 1996). Flow monitoring stations have been operated on each of the tributaries by water resource agencies. However, the historic record is insufficient to effectively analyze flow-related impacts to fish migration (CH2M Hill, 1998). Additionally, the historic physical gage placement and management objective of the responsible water resource agencies does not effectively monitor minimum base flows acquired for instream use for fish (CH2M Hill, 1998).

Spring run chinook salmon once inhabited most of the east-side tributaries of the Sacramento-San Joaquin Valley and may have numbered 600,000 adults (CDFG, 1998). Access to much of the original holding and spawning habitat has been permanently eliminated, initially by early hydropower and agricultural diversion dams, and later by the major water supply and flood control dams. Within the last decade, wild persistent spring-nm adult populations have declined to less than 1,300 fish, approximately 0.3% of their historic run sizes. Only three small east-side tributaries to the Sacramento River (Mill, Deer, and Butte creeks) continue to harbor wild persistent populations, while two others (Antelope and Big Chico creeks) support sporadic populations. Additionally, Mill, Deer, and Antelope creeks each harbor small sustaining population of steelhead, and are considered to have the greatest potential for restoration of steelhead in the entire Central Valley (CDFG, 1996). Butte and Big Chico creeks are also believed to support small steelhead populations.

Flows in each of the five tributaries have been significantly altered and recent restoration plans have identified the need to provide adequate base flows dedicated for instream use (CDFG, 1993; USFWS, 1997; ERPP, 1999). Analysis of flows and diversions shows that the exercise of legal water rights (appropriative, adjudicated, and riparian) often exceeds instream flows critical for spring-nm salmon and steelhead migration (CH2M Hill, 1998). Several recent water acquisition projects have been implemented including pumped groundwater exchanges on Mill and Deer creeks (CDFG 1994a, 1994b), a water exchange and water right purchase on Butte Creek (M&T Ranch, 1996), and a diversion removal on Big Chico Creek. Each of the acquisitions has provided some proportion of a minimum base flow (Alley and Assoc., 1996). Additional efforts to determine appropriate instream flows are currently in progress, and will require a long-term record of the daily hydrograph for the various reaches of each tributary.

Various flow-monitoring stations have been in place on each of the five tributaries since about 1930. These stations have been operated at various times and locations by the U. S. Geological Survey (USGS), (California Department of Water Resources (CDWR), and Pacific Gas and Electric Company (PG&E), and have generally not provided a consistent enough record for analysis or management of instream flows for fish migration. In addition, needed flow

monitoring for the recent instream flow acquisitions, including a need for temperature monitoring for some tributaries and reaches, have required entirely new rnonitoring stations or the addition of sensors and changes in the operation of existing stations.

The Real-Time Flow Monitoring project was initially funded by the CVPIA AFRP (FY 96 and FY 97) to install new or modify existing monitoring stations and to operate and maintain these stations which were to be located on Antelope, Mill, Deer, Big Chico, and Butte creeks. The two grants (FY 96, $331,000 and FY 97, $60,000; Document Control Number 11332-6-0186) were to install two new monitoring stations and five sensors on Antelope Creek; modify one and install one new station with a total of three new sensors on Mill Creek; modify one and install two new stations with a total of six new sensors on Deer Creek; modify one station with two new sensors on Big Chico Creek; modify six stations with a total of seven new sensors on Butte Creek; install satellite radio telemetry at 16 stations for all new and existing sensors; develop stage vs. discharge relationships for the three new stations and the existing Big Chico Creek station; and operate and maintain all new stations, sensors, and telemetry systems. As of January 1, 2000, all new stations, sensors, and telemetry systems were installed and operating except those for Antelope Creek. Station installation and operation on Antelope Creek did not occur due to the refusal of landowners to grant access permission. An additional CVPIA AFRP grant (FY 2000, $122,500; Document Control Number 11332-0-J011) was provided for ongoing operation and maintenance of the monitoring stations through September 30, 2001 as an interim measure until long-term funding was secured. A CALFED grant (FY 2001, $418,000; Project Number ERP-01-C02) was awarded to continue the operation and maintenance of the stations for a three year period from October 2001 through September 2004 (Water Years 2002 through 2004). An Amendment Request to continue funding for the operation and maintenance of the stations for the period form October 2004 through September 2005 (Water Year 2005) was granted as an additional interim measure in the spring of 2004. During the 9-year course of the project, DFG staff has continually evaluated its functionality and have added or deleted sites and/or sensors. Funding for the operation and maintenance for the next three year period (Water Years 2006 through 2008) is now requested.

As a direct result of the implementation of the Real-Time Flow Monitoring project, (1) Flow measurements at the newly installed or modified gaging stations on Butte Creek are being incorporated into conditions of a Bureau of Reclamation water right exchange agreement, and a permanent filing with the State Water Resources Control Board for dedication for instream use under Water Code sections 1707 and 1725 et seq. for the newly acquired 40 cubic feet per second for anadromous fish passage. (2) Flow measurements at the newly installed or modified gaging stations on Butte Creek have been and are being incorporated into management agreements with landowners and water districts that have installed fish screens and fish ladders throughout the entire anadromous reach. (3) Flow measurements at the newly installed or modified gaging stations on Mill and Deer creeks are being used to provide real-time flow management input to the completed Mill Creek Water Exchange agreement and to the interim Deer Creek Water Exchange Agreement. (4) Flow measurements at the newly installed or modified gages on Mill, Deer, Big Chico, and Butte creeks were used by the Delta Operations Sacramento River Spring-Run Protection Plan for the period 1997-2004, and were instrumental in the operation and management of the Delta Cross Channel gates.

Expected future objectives of the Real-Time Flow Monitoring project include (1) Long-term reach specific flow and temperature measurements for each tributary will provide a basis for future flow acquisitions and flow management for anadromous fish. (2) Long-term reach specific flow and temperature measurements for each tributary will significantly contribute to the recovery and future survival of spring-run salmon and steelhead populations in Big Chico, Butte, Deer, and Mill creeks.

2.) Justification

Conceptual Model – (1) Spring-run chinook salmon and or steelhead populations historically existed in Antelope, Mill, Deer, Big Chico, and Butte creeks prior to anthropogenic alterations to the natural hydrograph (CDFG, 1996; CDFG, 1998). (2) Base flows that are within the minimum flow range of the natural hydrograph are essential to the restoration and future survival of these spring-run chinook salmon and steelhead populations (CDFG, 1993; Alley and Assoc., 1996; USFWS, 1997; CH2M Hill, 1998). (3) Flow monitoring stations have historically been operated on each of the tributaries by water management agencies. However, the data are generally inadequate for determination or management of minimum base flows (CH2M Hill, 1998). (4) Installation and operation of flow monitoring stations specifically targeted for the management of anadromous fish migration will provide the necessary long-term time series data for determination of minimum base flows (CH2M Hill, 1998). (5) Installation and operation of flow monitoring stations specifically targeted for the management of anadromous fish migration will ensure the presence of, and facilitate the management of, dedicated instream flows acquired for anadromous fish (CDFG, l994a, 1994b; M&T Ranch, 1996). (6) Minimum base flows dedicated for instream use will significantly contribute to the recovery of spring-nm chinook salmon and steelhead in Antelope, Mill, Deer, Big Chico, and Butte creeks (CDFG, 1993; CDFG, 1996; USFWS, 1997; CDFG, 1998; ERPP, 1999).

This project specifically addresses CALFED Ecosystem Restoration Strategic Goal #1 – At Risk Species, and secondarily Goal #4— Habitats, and CVPIA Limiting Factor #2, Instream Flows and Temperatures.

Known - 1) Big Chico, Butte, Deer and Mill creeks harbor populations of state and federally listed salmon and steelhead (CDFG, 1996; CDFG, 1998). (2) Instream flows in each of the tributaries are often inadequate or non-existent during key migration periods for the listed salmon and steelhead (dH2M Hill, 1998). (3) Legal water rights in each of the tributaries at key times exceed stream flows or exceed minimum instream flow requirements for passage of anadromous fish (Alley and Assoc., 1996; CH2M Hill, 1998). (4) Instream dedicated flows for passage of anadromous fish have been acquired through various agreements in Big Chico, Butte, Mill, and Deer creeks (CDFG, 1 994a, 1 994b; M&T Ranch, 1996). (5) The hydrographic records for each of the tributaries are inadequate to accurately assess the total minimum instream flow necessary for anadromous fish passage (CH2M Hill, 1998). (6) Existing management and measurement of flows, as provided by the USGS or CDWR in key reaches of each tributary, are not sufficient to consistently monitor flows to ensure passage of anadromous fish (CH2M Hill, 1998). (7) Flow measurement stations have either been modified or new stations installed in key reaches of each tributary for the management of anadromous fish passage. (8) Changes in flow as

predictive cues for migration of yearling spring-run salmon in Big Chico, Butte, Deer, and Mill creeks were incorporated into the Delta Operations Sacramento River spring-run Salmon Protection Plan for the period 1997-2004, and will likely continue as a requirement of subsequent State and federal incidental take permits (CALFED, 1998).

Hypothesis - Installation and long-term operation of flow monitoring stations, including sensors for temperature, will significantly contribute to the recovery and long-term survival of spring-run chinook salmon and steelhead in Big Chico, Butte, Deer, and Mill creeks.

Adaptive Management – (1) Evaluation of the long-term reach specific flow and temperature measurements for each tributary will allow for the addition, elimination, or relocation of monitoring stations or sensors to better manage flows for anadromous fish passage. (2) Long-term reach specific flow and temperature measurements will allow for more discrete flow management decisions.

3. Previously Funded Monitoring

The Real-Time Flow Monitoring project was initially funded by the CVPIA AFRP (FY 96 and FY 97) to install new or modify existing monitoring stations and to operate and maintain these stations which were to be located on Antelope, Mill, Deer, Big Chico, and Butte creeks. The two grants (FY 96, $331,000 and FY 97, $60,000; Document Control Number 11332-6-0186) were to install two new monitoring stations and five sensors on Antelope Creek; modify one and install one new station with a total of three new sensors on Mill Creek; modify one and install two new stations with a total of six new sensors on Deer Creek; modify one station with two new sensors on Big Chico Creek; modify six stations with a total of seven new sensors on Butte Creek; install satellite radio telemetry at 16 stations for all new and existing sensors; develop stage vs. discharge relationships for the three new stations and the existing Big Chico Creek station; and operate and maintain all new stations, sensors, and telemetry systems. As of January 1, 2000, all new stations, sensors, and telemetry systems were installed and operating except those for Antelope Creek. Station installation and operation on Antelope Creek did not occur due to the refusal of landowners to grant access permission. An additional CVPIA AFRP grant (FY 2000, $122,500; Document Control Number 11332-0-J011) was provided for ongoing operation and maintenance of the monitoring stations through September 30, 2001 as an interim measure until long-term funding was secured. A CALFED grant (FY 2001, $418,000; Project Number ERP-01-C02) was awarded to continue the operation and maintenance of the stations for a three year period from October 2001 through September 2004 (Water Years 2002 through 2004). An Amendment Request to continue funding for the operation and maintenance of the stations for the period form October 2004 through September 2005 (Water Year 2005) was granted as an additional interim measure in the spring of 2004. During the 9-year course of the project, DFG staff has continually evaluated its functionality and have added or deleted sites and/or sensors.

As a direct result of the implementation of the Real-Time Flow Monitoring project, (1) Flow measurements at the newly installed or modified gaging stations on Butte Creek are being incorporated into conditions of a Bureau of Reclamation water right exchange agreement, and a

permanent filing with the State Water Resources Control Board for dedication for instream use under Water Code sections 1707 and 1725 et seq. for the newly acquired 40 cubic feet per second for anadromous fish passage. (2) Flow measurements at the newly installed or modified gaging stations on Butte Creek have been and are being incorporated into management agreements with landowners and water districts that have installed fish screens and fish ladders throughout the entire anadromous reach. (3) Flow measurements at the newly installed or modified gaging stations on Mill and Deer creeks are being used to provide real-time flow management input to the completed Mill Creek Water Exchange agreement and to the interim Deer Creek Water Exchange Agreement. (4) Flow measurements at the newly installed or modified gages on Mill, Deer, Big Chico, and Butte creeks were used by the Delta Operations Sacramento River Spring-Run Protection Plan for the period 1997-2004, and were instrumental in the operation and management of the Delta Cross Channel gates.

4. Approach and Scope of Work

Location of Project(s). The existing gaging stations on Mill and Deer creek are located entirely within Tehama County, and ecozone 7, Butte Basin. The gaging station on Big Chico Creek is located within Butte County, ecozone 7, Butte Basin. The gaging stations on Butte Creek are located within Butte, Colusa, and Sutter counties and ecozone 7, Butte Basin, and ecozone 8, Feather River and Sutter Bypass. (See Table 1 for a list of the stations, data type, and latitudes and longitudes, and Map 1 for the general location.)

Approach. This grant will provide for the continued partial or complete operation and maintenance of 13 stream gaging stations and associated telemetry equipment. Operation and maintenance will include the following. (1) Perform periodic station visits to inspect, maintain, calibrate, and replace station equipment as necessary, and to download all data-logger recorded sensor time series data. (2) Perform monthly discharge measurements, when stream conditions allow, to establish and maintain stage vs. discharge relationships (rating curves). Discharge measurements and rating curves will be performed by wading the stream only. High flow (discharge) data is expensive is are not necessary for the goals of this project. (3) Process field collected data after each station visit including uploading recorded time series data to a computer database, inspection and correction of recorded data caused by sensor drift or malfunction, verification of discharge measurements and rating curve shifts, and relaying of shift data to the California Data Exchange Center (CDEC). (4) Perform annual review and updating of discharge rating curves. (5) Perform annual computation of discharge time series data and certification of all collected time series data including water stage and temperature (6) Perform maintenance of long-term database for all collected time-series data.

CDWR has adopted the USGS standards established for stream gaging. The USGS has published numerous technical manuals describing their field and office task quality assurance procedures (USGS, 1967-1981, 1982, 1996).

There are three criteria for testing the effectiveness of the Real-Time Flow Monitoring porject: (1) in the short-term (3 to *5* years) do the gage records demonstrate compliance with water acquisition and management agreements, (2) in the medium term (3 to 10 years) do the

J. Clements
4/13/2004

TABLE 1

PROPOSED CALFED PROJECT
REAL TIME FLOW MONITORING

LIST OF STREAM GAGING STATIONS AND DATA TYPE

No.	Stream	Name / Site	Operating Agency	ID Number	1/ Data Type	2/ Telemetry Type	County	3/ Latitude	Longitude
1	Mill Creek	Near Los Molinos	USGS	11381500	S - D - **TP**	**CDEC**	Tehama	40-03-17	122-01-23
2	Mill Creek	Below Highway 99	DWR	A04420	**S - D - TP**	**CDEC**	Tehama	40-02-26	122-06-12
3	Deer Creek	Near Vina	USGS	11383500	S - D - **TP**	**CDEC**	Tehama	40-00-51	121-56-50
4	Deer Creek	Below Stanford-Vina Dam	DWR	A04325	**S - D - TP**	**CDEC**	Tehama	39-57-48	122-02-01
5	Big Chico Creek	Near Chico	DWR	A42105	**S - D - TP**	**CDEC**	Butte	39-46-06	121-46-38
6	Butte Creek	Toadtown Canal 4/	PG&E	BW-12	S - D - **TP**	**CDEC**	Butte	39-53-09	121-36-35
7	Butte Creek	Near Chico	USGS	11390000	S - D - **TP**	**CDEC**	Butte	39-43-34	121-42-28
8	Butte Creek	Parrott Diversion 5/	DWR	A41105	S - D	**CDEC**	Butte	39-42-35	121-45-01
9	Butte Creek	Near Durham	DWR	A04265	S - D - **TP**	CDEC	Butte	39-40-41	121-46-35
10	Butte Creek	Below Western Canal	DWR	A04158	**S - D - TP**	**CDEC**	Butte	39-33-26	121-50-03
11	Butte Slough	At Outfall Gates 6/	DWR	A02967	**S - TP**	**CDEC**	Colusa	39-11-44	121-56-04
12	Willow Slough	Near Nicolaus	DWR	A02943	**S - D**	**CDEC**	Sutter	38-54-53	121-37-36
13	Sacramento Slough	Near Karnak 7/	DWR	A02925	**S - D**	**CDEC**	Sutter	38-46-45	121-38-15

Notes:

1/ Data Type: S = Stage, D = Discharge (flow), TP = Temperature.
Data in **bold red** font are proposed to be funded by CALFED as extension to Project Number ERP-01-C02.

2/ California Data Exchange Center via GOES satellite radios. Telemetry in **bold red** font are proposed to be funded by CALFED as extension to Project Number ERP-01-C02.

3/ Source of latitude and longitude: MAPTECH software.

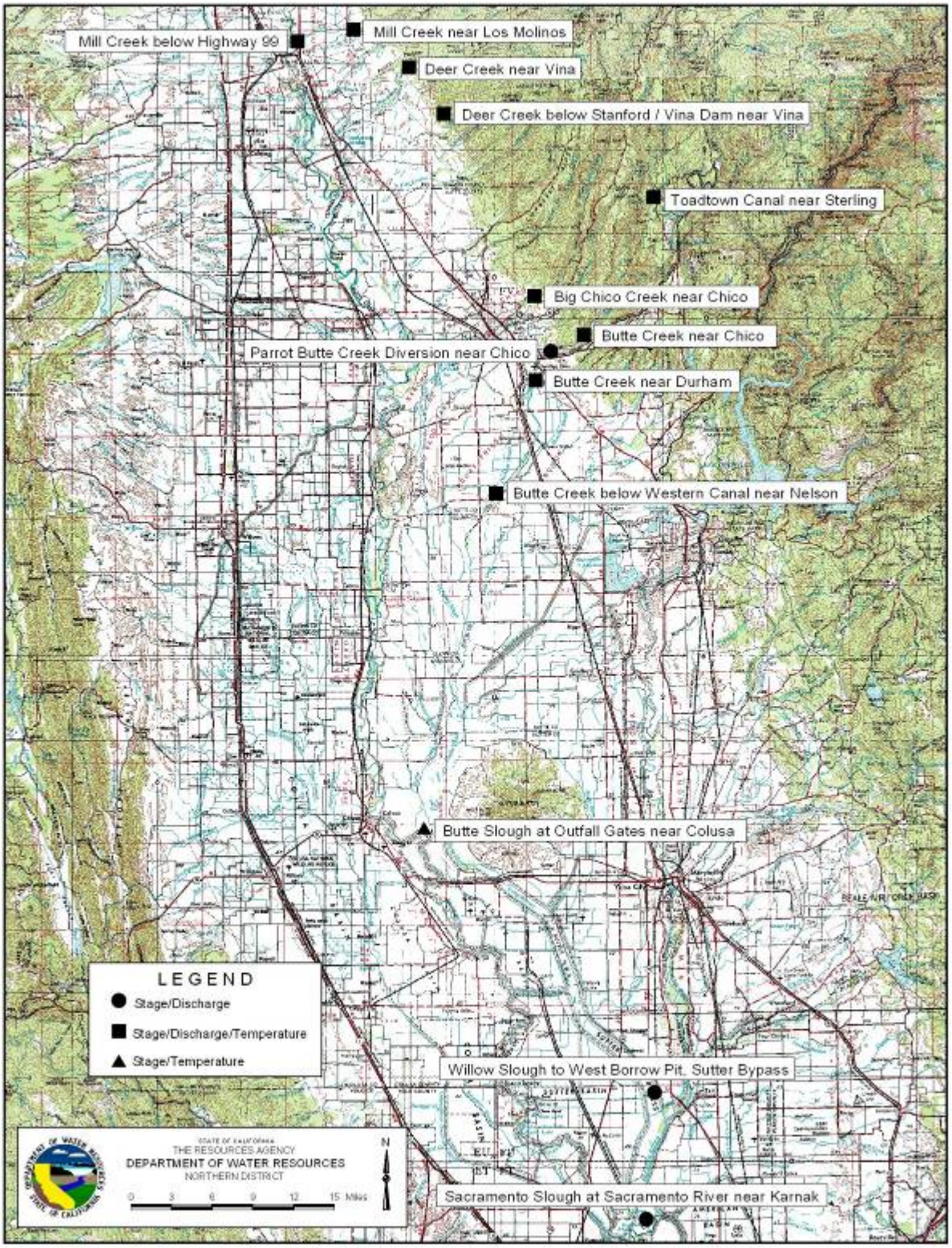
4/ Station is located on PG&E import canal from the West Branch Feather River. This station is operated by PG&E, and reviewed and published by the USGS as Toadtown Canal near Sterling. USGS ID Number is 11389800.

5/ Station is located on M&T / Parrott diversion from Butte Creek.

6/ Butte Slough Outfall Gates structure allows Butte Creek water to be discharged to the Sacramento River during periods of high flows.

7/ Currently requires two stage recording devices and special computations to determine discharge. During State FY 2004-2005, contingent on CALFED funding, it is proposed to install and calibrate a Doppler velocity meter at this site to replace the current streamflow gaging method.

MAP 1: Location of Stations



gage records provide the time series information necessary for more specific flow acquisition volumes, (3) in the long-term (5 to 50 years) does the telemetry data contribute to the long-term survival of spring-nm chinook salmon and steelhead.

Measures of future success of this project are: (1) flows acquired for instream use are intact as demonstrated by the real-time telemetry, and as summarized in the long-term database, (2) telemetry time series data are being utilized for additional flow acquisitions, (3) spring-run chinook salmon and steelhead populations in each of the watersheds have recovered and long-term survival is insured.

5. Feasibility

The project was originally funded by the CVPIA AFRP in 1996 and 1997 to provide for station, sensor, and telemetry installation, and operation and maintenance for three years A fourth year of funding for operation and maintenance was provided m 1999. A Subsequent water acquisition and flow management agreements (CDFG, 1994a, 1994b, M&T Ranch, 1996, CALFED, 1998) have demonstrated the feasibility and absolute need for continued funding for this project. All environmental compliance, permitting, and access issues were addressed during initial installation.

6.) Expected Outcomes and Products

This project will provide continuous real-time flow and water temperature data for all monitoring sites via the California Data Exchange Center (CDEC) website. A long-term database containing all finalized time-series data will be maintained by CDWR and made available to all interested parties upon request to CDWR.

7. Data Handling, Storage, and Dissemination

All time series data from the 13 existing gaging stations are currently being telemetered on a real-time basis to the California Data Exchange Center (CDEC) website where they can be viewed or downloaded. Telemetered data available through CDEC is not reviewed or edited and is considered preliminary and subject to revision. All time series data is normally downloaded in the field from the gaging station data-loggers on a monthly basis and is then reviewed and corrected, if necessary, for sensor drift or malfunction. Reviewed and corrected data is then stored in the Department of Water Resources surface water computer database. Final publishable time series data for the entire water year (October – September) is usually available to interested parties in hard copy or electronic format three to six months after the end of the water year.

Once the time series data has been finalized, CDWR will prepare an annual report presenting average daily value tables for the entire water year for all time series data including water stage, discharge, and temperature. More detailed final data (15-minute recording interval for stage, discharge, and temperature) will be available by request to CDWR.

8. Local Involvement

This project was initiated with, and continues to have the full support of organized watershed groups including the Mill Creek Watershed Conservancy, Deer Creek Watershed Conservancy, Butte Creek Watershed Conservancy, and the Big Chico Creek Watershed Alliance. Additionally, local water diverters including individual landowners, water districts, irrigation districts, reclamation districts, duck clubs, and water management agencies support this project. Included are the Los Molinos Mutual Water Company on Mill and Deer creeks, the Deer Creek Irrigation District and Stanford Vina Irrigation Company on Deer Creek, and the City of Chico and M&T Ranch on Big Chico Creek. Along Butte Creek, supporters include PG&E, M&T Ranch, Parrott-Investment Company, Durham Mutual Irrigation Company, Rancho Esquon Partners, Gorrill Ranch, Western Canal Water District, Reclamation District 1004, Butte Sink Waterfowl Association, White Mallard Duck Club, Reclamation District 70, Butte Slough Irrigation Company, and the U.S Fish and Wildlife Service Sacramento Refuge Complex.

Public outreach has been and continues to be primarily the public availability of the real-time telemetry information.

9. Work Schedule

This proposal is for the continued operation and maintenance of the stream gaging stations and sensors previously installed for a three-year period. The starting date will be October 1, 2006 and end September 30, 2008. An annual report will be prepared by March 1 of each year summarizing the stream gaging data. If the entire project cannot be funded, it is recommended to decrease the years of funding rather than delete sensors or stations. The need for the continued operation and maintenance of the stations is expected to continue beyond the end of three year duration of the ERP grant agreements.

B. APPLICABILITY TO CALFED ERP GOALS AND IMPLEMENTATION PLAN AND CVPIA PRIORITIES

1. ERP Goals and CVPIA Priorities

This project specifically address Ecosystem Restoration Strategic Goal #1 - At Risk Species, and secondarily Goal # 4 - Habitats. It also addresses the CVPIA priority focus on actions for recovery of Sacramento River spring-run chinook salmon and steelhead. Each of the four tributaries (Big Chico, Butte, Deer, and Mill creeks) support either sustaining or remnant populations of the State and federally listed spring-nm chinook salmon and the federally listed steelhead. Additionally, each of the tributaries support fall-run chinook salmon, and potentially late fall-run chinook salmon. Recent studies in the lower reaches of Butte and Big Chico creeks

have identified rearing of juvenile chinook salmon (all races) and steelhead, not natal to either tributary (Maslin et al., 1997, 1998, 1999 CDFG, 1999). These studies have demonstrated that juvenile salmon (all races) and steelhead frequently enter and rear in the lower reaches of tributaries other than where they were spawned (non-natal rearing). A key bottleneck is the human altered flow regime, particularly in the valley reach of each of the tributaries, which affects adult migration and juvenile rearing and migration. This project provides needed long-term real-time discrete reach monitoring for management and protection of existing flow acquisitions, as we11 as long-term time series data for additional flow acquisitions.

2. Relationship to Other Ecosystem Restoration Projects, Monitoring Programs, or System-wide Ecosystem Benefits

This project was originally implemented, and continues to function to provide accurate real-time monitoring of various recently implemented flow acquisitions, and for more definitive analysis of flow versus fish passage for future instream flow acquisitions. The three most recent restoration plans (Restoring Central Valley Streams: A Plan hr Action, CDFG 1993; Revised Draft Restoration Plan for the Anadromous Fish Restoration Program: A Plan to Increase Natural Production of Anadromous Fish in the Central Valley of California, USF VS 1997; and Ecosystem Restoration Program Plan, CALFED 1999) have identified instream flows for anadromous fish passage as a priority action for the five tributaries included in this project. Management and protection of recent flow acquisitions on Mill Creek (CDFG, 1994b), Deer Creek (CDFG, 1994a) and Butte Creek/Big Chico Creeks (M&T Ranch, 1996) are dependent upon monitoring as provided by this project. Additionally, recent fish screen and fish ladder projects on Mill, Deer, Big Chico, and Butte creeks are dependent upon flow acquisition and flow monitoring to ensure effective operation of each structure.

This project will also provide system-wide ecosystem benefits. Each of the tributaries included in this project have numerous man-made diversion structures that impact anadromous fish migration. Each of the diversions was either previously modified with adult and juvenile passage structures (fish ladders and/or fish screens), or is included in current restoration plans for installation of these passage structures. Function of each of the passage structures is dependent upon adequate base instream flows, and is equally dependent upon the ability to accurately measure and monitor flows on a real-time basis. This project provides the real-time monitoring and assurance that passage structures are functioning. Additionally, each of the tributaries included in this proposal has a variety of associated water rights (adjudicated, appropriative, riparian) which are variously monitored and enforced by the respective legal entity (local superior court or State Water Resources Control Board Division of Water Rights). Recent experience has demonstrated that local water right holders regularly monitor instream flows and the availability of their respective water rights through the use of the real-time monitoring stations provided by this project. An ancillary benefit of the public availability of telemetry information is that water right holders, as well as other interested stakeholders, can monitor flows and thus provide a less confrontational incentive for all right holders to comply with their respective rights. Another benefit of this project has been the use of real-time flow telemetry information on Mill, Dear, Big Chico, and Butte creeks as a key component of the CALFED Operations Group Sacramento River Spring-run Chinook Salmon Protection Plan. That plan,

which was in effect from 1997- 2004, used the real-time telemetry to identify migration cues for the onset of fall/winter yearling spring run salmon migration to guide Delta operations.

3. **Additional Information for Proposals Containing Land Acquisition.**

No land acquisition is required for this project. All environmental compliance, permitting, and access issues were addressed during initial installation.

C. QUALIFICATIONS

The following are brief biographical sketches of the principal participants in this project and their current duties. This group has demonstrated its ability by successfully installing and maintaining the highly technical sensor, recording, and telemetry systems required during the first 9 years of this project.

John Clements (Proposal/Project Manager):
Senior Water Resources Engineer
Thirty years of state service with the California Department of Water Resources, last eleven years as chief of the DWR Northern District Watermaster and Surface Water Unit. Current duties include managing the District‘s Watermaster and Surface Water Investigation Programs and Supervising a staff of eight employees including those responsible for operating and maintaining the Real-Time Flow Monitoring stations .
Bachelor of Science Degree, CSU Chico, Civil Engineering. CA Professional Engineering License.

Lester Grade:
Water Resources Engineer, Range C
Six years of state service with the California Department of Water Resources, Northern District Watermaster and Surface Water Unit. Current duties include acting as lead person in operating 28 stream gaging stations (Red Bluff group).
Bachelor of Science Degree, Cal-Poly State University San Luis Obispo, Agricultural Engineering. CA Professional Engineering License.

Trudy Payne:
Water Resources Technician II
Twenty-four years of state service, last seven years with the California Department of Water Resources,
Northern District Watermaster and Surface Water Unit, Sutter Field Office. Current duties include acting as lead person in operating 23 stream gaging stations (Sutter group).

Kevin Taylor:
Water Resources Technician II
Six years of state service with the California Department of Water Resources, Northern District Watermaster and Surface Water Unit. Current duties include serving as Watermaster for Butte

Creek and assisting lead person in operating 28 stream gaging stations (Red Bluff group). Bachelor of Science Degree, U. C. Davis, Soil and Water Science.

During the first 9 years of this project, Paul Ward, CDFG Fisheries Biologist, and his staff have provided continuous input on the need and effectiveness of the various sites and data collection types and will continue in the future if this proposal is accepted.

D. COSTS

1. Budget

This proposal is requesting funding for the continued complete or partial operation of 13 stream gaging stations for a three-year period (Federal Fiscal and Water Years 2005-06 through 2007-08). Table 1 lists the 13 stations and includes columns for Data and Telemetry Type for each station. Various agencies are funding certain station sensors and telemetry under their own stream gaging programs. These are identified in the Data and Telemetry Type columns by regular fonts. Proposed funding by CALFED for specific sensors and telemetry are identified by bold red fonts. Proposed CALFED funding for the first year is $105,000. Since the operation of the stations and sensors requires about the same labor hours, equipment, and supplies from year to year, proposed funding for the following years was estimated as the cost of the first year plus 5% inflation each year. Total proposed funding for the three year period is $330,000. See the PSP budget form for a detailed budget.

2. Cost Sharing

A significant portion of the data being collected from the 13 stream gaging stations is currently being funded by other agencies and funding sources. Many of the stations and sensors were operating prior to the initiation of the Real-Time Flow Monitoring Program. Estimated annual funding for the stations from other agencies under their own stream gaging programs is as follows:

Agency	Funding
CDWR	$24,000
USGS	$48,000
PG&E	$8,000
Total	$80,000

Other existing real-time stream gaging stations operated by DWR and funded by other sources but used by fish restoration groups to monitor flow conditions on the eastside tributaries include Butte Slough near Meridian and Butte Creek at Colusa/Gridley Road. Annual cost for the operation of these gages is about $25,000.

The cooperating agencies can not provide assurance of the future funding for the continued operation and maintenance of any given station or sensor at this time.

3. Long-term funding strategy

The long-term funding strategy is to continue to seek funding from CALFED of other fish restoration programs.

E. COMPLIANCE WITH STANDARD TERMS AND CONDITIONS

The California Department of Water Resources will comply with all state and federal standard terms. According to Table D-1 of the CALFED 2001 Proposal Solicitation Package, no state proposal or contract forms from the California Department of Water Resources are required at this time. Federal Form 424 is attached to the back of this proposal.

F. LITERATURE CITED

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G. NONPROFIT VERIFICATION

As an agency of the State of California, CDWR is not required to provide a nonprofit verification.

Tasks And Deliverables

Real−Time Flow Monitoring

Task ID	Task Name	Start Month	End Month	Deliverables
1	Project Management	1	36	**Semiannual and final reports. Periodic invoices**
2	**Periodic station visits**	**1**	**36**	**Perform periodic station visits to inspect, maintain, calibrate, and replace station equipment as necessary, and to download all dat−logger recorded sensor time−series data.**
3	**Periodic discharge measurements**	**1**	**36**	**Perform monthly discharge measurements, when stream conditions allow, to establish and maintian stage vs. discharge relationships (rating Curves).**
4	**Process field data**	**1**	**36**	**Process field collected data after each station visitincluding uplaoding recorded time−series data to a computer database, inspectiona dn correction of recorded data**

				caused by senor drift or malfunction, verification of discharge measurements and rating curve shifts, and relaying of shift and rating curve information to the California DSata Exchange Center (CDEC).
5	Annual rating curve update	1	36	Perform annual review and updating of discharge rating curves.
6	Certification of data	1	36	Perform annual computation of discharge time−series data and certification of all collected time−series data including water stage and temperture.
7	Maintenace of database	1	36	Perform maintenance of long−term database for all collected time−series data

Comments

If you have comments about budget justification that do not fit elsewhere, enter them here.

Budget Summary

Project Totals

Labor	Benefits	Travel	Supplies And Expendables	Services And Consultants	Equipment	Lands And Rights Of Way	Other Direct Costs	Direct Total	Indirect Costs	Total
$81,000	**$40,500**	**$0**	**$24,000**	**$24,000**	**$39,000**	**$0**	**$0**	**$208,500**	**$121,500**	**$330,000**

Do you have cost share partners already identified?
No.

If yes, list partners and amount contributed by each:

Do you have potential cost share partners?
No.

If yes, list partners and amount contributed by each:

Are you specifically seeking non−federal cost share funds through this solicitation?

Real−Time Flow Monitoring

Real−Time Flow Monitoring

Year 1 (Months 1 To 12)

Task	Labor	Benefits	Travel	Supplies And Expendables	Services And Consultants	Equipment	Lands And Rights Of Way	Other Direct Costs	Direct Total	Indirect Costs	Total
	2000	**1000**	**0**	**0**	**7000**	**0**	**0**	**0**	$10,000	**3000**	$13,000

1: project management (12 months)											
2: Periodic station visits (12 months)	**8000**	**4000**	**0**	**3000**	**0**	**3000**	**0**	**0**	$18,000	**12000**	$30,000
3: Periodic discharge measurements (12 months)	**8000**	**4000**	**0**	**1000**	**0**	**2000**	**0**	**0**	$15,000	**12000**	$27,000
4: Process field data (12 months)	**4000**	**2000**	**0**	**1000**	**0**	**1000**	**0**	**0**	$8,000	**6000**	$14,000
5: Annual rating curve update (12 months)	**2000**	**1000**	**0**	**1000**	**0**	**1000**	**0**	**0**	$5,000	**3000**	$8,000
6: Certification of data (12 months)	**2000**	**1000**	**0**	**1000**	**0**	**1000**	**0**	**0**	$5,000	**3000**	$8,000
7: Maintenace of database (12 months)	**1000**	**500**	**0**	**1000**	**0**	**1000**	**0**	**0**	$3,500	**1500**	$5,000
Totals	**$27,000**	**$13,500**	**$0**	**$8,000**	**$7,000**	**$9,000**	**$0**	**$0**	**$64,500**	**$40,500**	**$105,000**

Year 2 (Months 13 To 24)

Task	Labor	Benefits	Travel	Supplies And Expendables	Services And Consultants	Equipment	Lands And Rights Of Way	Other Direct Costs	Direct Total	Indirect Costs	Total

1: project management (12 months)	2000	1000	0	0	8000	0	0	0	$11,000	3000	$14,000
2: Periodic station visits (12 months)	8000	4000	0	3000	0	4000	0	0	$19,000	12000	$31,000
3: Periodic discharge measurements (12 months)	8000	4000	0	1000	0	3000	0	0	$16,000	12000	$28,000
4: Process field data (12 months)	4000	2000	0	1000	0	1500	0	0	$8,500	6000	$14,500
5: Annual rating curve update (12 months)	2000	1000	0	1000	0	1500	0	0	$5,500	3000	$8,500
6: Certification of data (12 months)	2000	1000	0	1000	0	1500	0	0	$5,500	3000	$8,500
7: Maintenace of database (12 months)	1000	500	0	1000	0	1500	0	0	$4,000	1500	$5,500
Totals	**$27,000**	**$13,500**	**$0**	**$8,000**	**$8,000**	**$13,000**	**$0**	**$0**	**$69,500**	**$40,500**	**$110,000**

Year 3 (Months 25 To 36)

Task	Labor	Benefits	Travel	Supplies And Expendables	Services And Consultants	Equipment	Lands And Rights Of Way	Other Direct Costs	Direct Total	Indirect Costs	Total

1: project management (12 months)	**2000**	**1000**	**0**	**0**	**9000**	**0**	**0**	**0**	$12,000	**3000**	$15,000
2: Periodic station visits (12 months)	**8000**	**4000**	**0**	**3000**	**0**	**5000**	**0**	**0**	$20,000	**12000**	$32,000
3: Periodic discharge measurements (12 months)	**8000**	**4000**	**0**	**1000**	**0**	**4000**	**0**	**0**	$17,000	**12000**	$29,000
4: Process field data (12 months)	**4000**	**2000**	**0**	**1000**	**0**	**2000**	**0**	**0**	$9,000	**6000**	$15,000
5: Annual rating curve update (12 months)	**2000**	**1000**	**0**	**1000**	**0**	**2000**	**0**	**0**	$6,000	**3000**	$9,000
6: Certification of data (12 months)	**2000**	**1000**	**0**	**1000**	**0**	**2000**	**0**	**0**	$6,000	**3000**	$9,000
7: Maintenace of database (12 months)	**1000**	**500**	**0**	**1000**	**0**	**2000**	**0**	**0**	$4,500	**1500**	$6,000
Totals	**$27,000**	**$13,500**	**$0**	**$8,000**	**$9,000**	**$17,000**	**$0**	**$0**	**$74,500**	**$40,500**	**$115,000**

Budget Justification

Real−Time Flow Monitoring

Labor

CDWR does not use a labor rate for each employee and instead uses an average labor rate for each organizational section or unit. The labor rate including benefits and indirect costs for the participating section for State FY 2004−05 is about $83.00 per hour. For the following years of the project, it is assumed the labor rate and all other cost categories will increase at about 5% per year. Since the opeartion and maintenance of the stations and sensors requires about the same amount of labor hours for each year of the project, a breakdown of labor hours for each task is provided for the first year only as follows: Task Hours 1 72 2 290 3 290 4 145 5 72 6 72 7 36

Benefits

CDWR does not use a labor rate for each employee and instead uses an average labor rate for each organizational section or unit. The labor rate including benefits and indirect costs for the participating section for State FY 2004−05 is about $83.00 per hour. Employee benefits including health, retiremnt, holidays, vacation, and sick leave are about 17% of the total labor rate of $83.00 per hour.

Travel

None is expected.

Supplies And Expendables

Supplies and expendables includes such itesm as office and computer supplies and field supplies such as batteries, staff gages, solar panels etc. and other items costing $100 or less.

Services And Consultants

Three of the stations are currently operated by the USGS for water stage and discharge. The cost estimate for Services and Consultants includes the fixed lump sum cost, as determined by the USGS, to operate and maintain three water temperature sensors at the Butte Creek near Chico, Deer Creek near Vina, and Mill Creek near Los Molinos. These costs are expected to increase 5% each year.

Equipment

Since the opeartion and maintenance of the stations and sensors rquires about the same amount of replacement equipment each year, a breakdown of equipment for each task is provided for the first year only as follows: Task Item Cost 1 none 0 2 Datalogger and telemetry radio $4000 3 Currrent meters and AQUACALC data recorder $3,000 4 Partial computer/software upgrade/replacement $1,500 5 Partial computer/software upgrade/replacement $1,500 6 Partial computer/software upgrade/replacement $1,500 7 Partial computer/software upgrade/replacement $1,500

Lands And Rights Of Way

None is expected

Other Direct Costs

None is expected

Indirect Costs/Overhead

CDWR does not use a fixed indirect rate and instead uses an average labor rate for each organizational section or unit. The labor rate including benefits and indirect costs for the participating section for State FY 2004−05 is about $83.00 per hour. THe indirect rate is estimated at 100% of the sum of labor and benifit costs. The indirect cost includes rent,

phones, and adminsitraive, services, and headquarters staff.

Comments

Environmental Compliance

Real−Time Flow Monitoring

CEQA Compliance

Which type of CEQA documentation do you anticipate?
X none
− negative declaration or mitigated negative declaration
− EIR
− categorical exemption

If you are using a categorical exemption, choose all of the applicable classes below.
− Class 1. Operation, repair, maintenance, permitting, leasing, licensing, or minor alteration of existing public or private structures, facilities, mechanical equipment, or topographical features, involving negligible or no expansion of use beyond that existing at the time of the lead agency's determination. The types of "existing facilities" itemized above are not intended to be all−inclusive of the types of projects which might fall within Class 1. The key consideration is whether the project involves negligible or no expansion of an existing use.
− Class 2. Replacement or reconstruction of existing structures and facilities where the new structure will be located on the same site as the structure replaced and will have substantially the same purpose and capacity as the structure replaced.
− Class 3. Construction and location of limited numbers of new, small facilities or structures; installation of small new equipment and facilities in small structures; and the conversion of existing small structures from one use to another where only minor modifications are made in the exterior of the structure. The numbers of structures described in this section are the maximum allowable on any legal parcel, except where the project may impact on an environmental resource of hazardous or critical concern where designated, precisely mapped, and officially adopted pursuant to law by federal, state, or local agencies.
− Class 4. Minor public or private alterations in the condition of land, water, and/or vegetation which do not involve removal of healthy, mature, scenic trees except for forestry or agricultural purposes, except where the project may impact on an environmental resource of hazardous or critical concern where designated, precisely mapped, and officially adopted pursuant to law by federal, state, or local agencies.
− Class 6. Basic data collection, research, experimental management, and resource evaluation activities which do not result in a serious or major disturbance to an environmental resource, except where the project may impact on an environmental resource of hazardous or critical concern where designated, precisely mapped, and officially adopted pursuant to law by federal, state, or local agencies. These may be strictly for information gathering purposes, or as part of a study leading to an action which a public agency has not

yet approved, adopted, or funded.
− Class 11. Construction, or placement of minor structures accessory to (appurtenant to) existing commercial, industrial, or institutional facilities, except where the project may impact on an environmental resource of hazardous or critical concern where designated, precisely mapped, and officially adopted pursuant to law by federal, state, or local agencies.

Identify the lead agency.

Is the CEQA environmental impact assessment complete?

If the CEQA environmental impact assessment process is complete, provide the following information about the resulting document.

Document Name
State Clearinghouse Number

If the CEQA environmental impact assessment process is not complete, describe the plan for completing draft and/or final CEQA documents.

NEPA Compliance

Which type of NEPA documentation do you anticipate?
X none
− environmental assessment/FONSI
− EIS
− categorical exclusion

Identify the lead agency or agencies.

If the NEPA environmental impact assessment process is complete, provide the name of the resulting document.

If the NEPA environmental impact assessment process is not complete, describe the plan for completing draft and/or final NEPA documents.

Successful applicants must tier their project's permitting from the CALFED Record of

Decision and attachments providing programmatic guidance on complying with the state and federal endangered species acts, the Coastal Zone Management Act, and sections 404 and 401 of the Clean Water Act.

Please indicate what permits or other approvals may be required for the activities contained in your proposal and also which have already been obtained. Please check all that apply. If a permit is *not* required, leave both Required? and Obtained? check boxes blank.

Local Permits And Approvals	Required?	Obtained?	Permit Number (If Applicable)
conditional Use Permit	–	–	
variance	–	–	
Subdivision Map Act	–	–	
grading Permit	–	–	
general Plan Amendment	–	–	
specific Plan Approval	–	–	
rezone	–	–	
Williamson Act Contract Cancellation	–	–	
other	–	–	

State Permits And Approvals	Required?	Obtained?	Permit Number (If Applicable)
scientific Collecting Permit	–	–	
CESA Compliance: 2081	–	–	
CESA Complance: NCCP	–	–	
1602	–	–	
CWA 401 Certification	–	–	
Bay Conservation And Development Commission Permit	–	–	
reclamation Board Approval	–	–	
Delta Protection Commission Notification	–	–	
state Lands Commission Lease Or Permit	–	–	
action Specific Implementation Plan	–	–	

other	**–**	**–**	

Federal Permits And Approvals	Required?	Obtained?	Permit Number (If Applicable)
ESA Compliance Section 7 Consultation	**–**	**–**	
ESA Compliance Section 10 Permit	**–**	**–**	
Rivers And Harbors Act	**–**	**–**	
CWA 404	**–**	**–**	
other	**–**	**–**	

Permission To Access Property	Required?	Obtained?	Permit Number (If Applicable)
permission To Access City, County Or Other Local Agency Land Agency Name	**–**	**–**	
permission To Access State Land Agency Name	**–**	**–**	
permission To Access Federal Land Agency Name	**–**	**–**	
permission To Access Private Land Landowner Name	**–**	**–**	

If you have comments about any of these questions, enter them here.

All enviromental permits and landowner access documents were completed during the initial installation of the various monitoring facilities in prior years.

Land Use

Real−Time Flow Monitoring

Does the project involve land acquisition, either in fee or through easements, to secure sites for monitoring?
X No.
− Yes.

How many acres will be acquired by fee?

How many acres will be acquired by easement?

Describe the entity or organization that will manage the property and provide operations and maintenance services.

Is there an existing plan describing how the land and water will be managed?
− No.
− Yes.

Will the applicant require access across public or private property that the applicant does not own to accomplish the activities in the proposal?
− No.
X Yes.

Describe briefly the provisions made to secure this access.

All agreements with the various landowners for DWR to access all the monitoring sites for intallation, operations, and maintenance purposes have been secured in prior years.

Do the actions in the proposal involve physical changes in the current land use?
X No.
− Yes.

Describe the current zoning, including the zoning designation and the principal permitted uses permitted in the zone.

Describe the general plan land use element designation, including the purpose and uses allowed in the designation.

Describe relevant provisions in other general plan elements affecting the site, if any.

Is the land mapped as Prime Farmland, Farmland of Statewide Importance, Unique Farmland, or Farmland of Local Importance under the California Department of Conservation's Farmland Mapping and Monitoring Program?
X No.
– Yes.

Land Designation	Acres	Currently In Production?
Prime Farmland		–
Farmland Of Statewide Importance		–
Unique Farmland		–
Farmland Of Local Importance		–

Is the land affected by the project currently in an agricultural preserve established under the Williamson Act?
X No.
– Yes.

Is the land affected by the project currently under a Williamson Act contract?
X No.
– Yes.

Why is the land use proposed consistent with the contract's terms?

Describe any additional comments you have about the projects land use.