

Lower Butte Creek Project: Sutter Bypass - Willow Slough Weir Fish Passage Project - Preliminary Engineering Investigation

Project Information

1. Proposal Title:

Lower Butte Creek Project: Sutter Bypass - Willow Slough Weir Fish Passage Project - Preliminary Engineering Investigation

2. Proposal applicants:

Kevin Dossey, California Department of Water Resources
Curtis Anderson, California Department of Water Resources

3. Corresponding Contact Person:

Kevin Dossey
California Department of Water Resources
2440 Main Street Red Bluff, CA 96080
530 529-7362
dossey@water.ca.gov

4. Project Keywords:

Civil Engineering
Fish Passage/Fish Screens
Fish, Anadromous

5. Type of project:

Fish Screen

6. Does the project involve land acquisition, either in fee or through a conservation easement?

No

7. Topic Area:

Fish Passage

8. Type of applicant:

State Agency

9. Location - GIS coordinates:

Latitude: 38.915
Longitude: -121.625
Datum: NAD 83

Describe project location using information such as water bodies, river miles, road intersections, landmarks, and size in acres.

The project site is located along the East Borrow Canal of the Sutter Bypass, at its junction with Willow Slough, upstream of the Feather River, at Sacramento Avenue, approximately 15 miles south of Yuba City in Sutter County (Figure 1). Willow Slough Weir can be identified on the United States Geological Survey, 7.5 minute series, Nicolaus quadrangle.

10. Location - Ecozone:

8.4 Sutter Bypass

11. Location - County:

Sutter

12. Location - City:

Does your project fall within a city jurisdiction?

No

13. Location - Tribal Lands:

Does your project fall on or adjacent to tribal lands?

No

14. Location - Congressional District:

3

15. Location:

California State Senate District Number: 4

California Assembly District Number: 2

16. How many years of funding are you requesting?

2

17. Requested Funds:

a) Are your overhead rates different depending on whether funds are state or federal?

No

If no, list single overhead rate and total requested funds:

Single Overhead Rate: 0

Total Requested Funds: \$155,000

b) Do you have cost share partners already identified?

No

c) Do you have potential cost share partners?

No

d) Are you specifically seeking non-federal cost share funds through this solicitation?

No

If the total non-federal cost share funds requested above does not match the total state funds requested in 17a, please explain the difference:

18. Is this proposal for next-phase funding of an ongoing project funded by CALFED?

Yes

If yes, identify project number(s), title(s) and CALFED program (e.g., ERP, Watershed, WUE, Drinking Water):

Multiple Lower Butte Creek Project Ecosystem Restoration Program

Have you previously received funding from CALFED for other projects not listed above?

Yes

If yes, identify project number(s), title(s) and CALFED program.

A194 Battle Creek Screens and Fish Passage Ecosystem Restoration Program

19. Is this proposal for next-phase funding of an ongoing project funded by CVPIA?

No

Have you previously received funding from CVPIA for other projects not listed above?

Yes

If yes, identify project number(s), title(s) and CVPIA program.

20. Is this proposal for next-phase funding of an ongoing project funded by an entity other than CALFED or CVPIA?

No

Please list suggested reviewers for your proposal. (optional)

21. Comments:

Environmental Compliance Checklist

Lower Butte Creek Project: Sutter Bypass - Willow Slough Weir Fish Passage Project - Preliminary Engineering Investigation

1. CEQA or NEPA Compliance

- a) Will this project require compliance with CEQA?

Yes

- b) Will this project require compliance with NEPA?

No

- c) If neither CEQA or NEPA compliance is required, please explain why compliance is not required for the actions in this proposal.

2. If the project will require CEQA and/or NEPA compliance, identify the lead agency(ies). If not applicable, put "None".

CEQA Lead Agency: California Department of Water Resources

NEPA Lead Agency (or co-lead:) U.S. Bureau of Reclamation

NEPA Co-Lead Agency (if applicable):

3. Please check which type of CEQA/NEPA documentation is anticipated.

CEQA

☒Categorical Exemption

-Negative Declaration or Mitigated Negative Declaration

-EIR

-none

NEPA

☒Categorical Exclusion

-Environmental Assessment/FONSI

-EIS

-none

If you anticipate relying on either the Categorical Exemption or Categorical Exclusion for this project, please specifically identify the exemption and/or exclusion that you believe covers this project.

The site work for this preliminary engineering project only involves surveying and geologic exploration. For the geologic exploration, we will use CEQA categorical exemptions: 15303-Minor alterations of land 15306-Basic data collection Since the Bureau of Reclamation is the federal lead, the categorical exclusion listed in their Department Manual Appendix 9 Subsection B (3), which states that data collection studies that involve drilling investigations for geologic exploration purposes where the impacts will be localized are excluded from NEPA, will apply.

4. CEQA/NEPA Process

- a) Is the CEQA/NEPA process complete?

No

If the CEQA/NEPA process is not complete, please describe the dates for completing draft and/or final CEQA/NEPA documents.

Environmental and cultural resources documentation and an environmental check list, which lists potential permits needed for construction, will be submitted with the final report by March, 2004.

b) If the CEQA/NEPA document has been completed, please list document name(s):

5. **Environmental Permitting and Approvals** (*If a permit is not required, leave both Required? and Obtained? check boxes blank.*)

LOCAL PERMITS AND APPROVALS

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

Scientific Collecting Permit

CESA Compliance: 2081

CESA Compliance: NCCP

1601/03

CWA 401 certification

Coastal Development Permit

Reclamation Board Approval

Notification of DPC or BCDC

Other

FEDERAL PERMITS AND APPROVALS

ESA Compliance Section 7 Consultation

ESA Compliance Section 10 Permit

Rivers and Harbors Act

CWA 404

Other

PERMISSION TO ACCESS PROPERTY

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:

6. Comments.

Land Use Checklist

Lower Butte Creek Project: Sutter Bypass - Willow Slough Weir Fish Passage Project - Preliminary Engineering Investigation

1. **Does the project involve land acquisition, either in fee or through a conservation easement?**

No

2. **Will the applicant require access across public or private property that the applicant does not own to accomplish the activities in the proposal?**

No

3. **Do the actions in the proposal involve physical changes in the land use?**

No

If you answered no to #3, explain what type of actions are involved in the proposal (i.e., research only, planning only).

The site work for this preliminary engineering project only involves surveying and geologic exploration.

4. **Comments.**

Conflict of Interest Checklist

Lower Butte Creek Project: Sutter Bypass - Willow Slough Weir Fish Passage Project - Preliminary Engineering Investigation

Please list below the full names and organizations of all individuals in the following categories:

- Applicants listed in the proposal who wrote the proposal, will be performing the tasks listed in the proposal or who will benefit financially if the proposal is funded.
- Subcontractors listed in the proposal who will perform some tasks listed in the proposal and will benefit financially if the proposal is funded.
- Individuals not listed in the proposal who helped with proposal development, for example by reviewing drafts, or by providing critical suggestions or ideas contained within the proposal.

The information provided on this form will be used to select appropriate and unbiased reviewers for your proposal.

Applicant(s):

Kevin Dossey, California Department of Water Resources
Curtis Anderson, California Department of Water Resources

Subcontractor(s):

Are specific subcontractors identified in this proposal? No

Helped with proposal development:

Are there persons who helped with proposal development?

No

Comments:

Budget Summary

Lower Butte Creek Project: Sutter Bypass - Willow Slough Weir Fish Passage Project - Preliminary Engineering Investigation

Please provide a detailed budget for each year of requested funds, indicating on the form whether the indirect costs are based on the Federal overhead rate, State overhead rate, or are independent of fund source.

Independent of Fund Source

Year 1												
Task No.	Task Description	Direct Labor Hours	Salary (per year)	Benefits (per year)	Travel	Supplies & Expendables	Services or Consultants	Equipment	Other Direct Costs	Total Direct Costs	Indirect Costs	Total Cost
1	Gather data, conduct topographic surveys and flow measurements		18,000	0	0	0	0	0	0	18000.0	0	18000.00
2	Develop contour map and draw existing structural features		9,000	0	0	0	0	0	0	9000.0	0	9000.00
3	Environmental research, site surveys & check list		10,000	0	0	0	0	0	0	10000.0	0	10000.00
4	Geologic site reconnaissance and report		25,000	0	0	0	0	0	0	25000.0	0	25000.00
5	Engineering design and prepare preliminary engineering drawings (includes meetings)		43,000	0	0	0	0	0		43000.0	0	43000.00
		0	105000.00	0.00	0.00	0.00	0.00	0.00	0.00	105000.00	0.00	105000.00

Year 2												
Task No.	Task Description	Direct Labor Hours	Salary (per year)	Benefits (per year)	Travel	Supplies & Expendables	Services or Consultants	Equipment	Other Direct Costs	Total Direct Costs	Indirect Costs	Total Cost
5	Engineering design and prepare preliminary engineering drawings (includes meetings)		20,000	0	0	0	0	0	0	20000.0	0	20000.00
6	Prepare final report (includes cost estimate)		30,000	0	0	0	0	0	0	30000.0	0	30000.00
		0	50000.00	0.00	0.00	0.00	0.00	0.00	0.00	50000.00	0.00	50000.00

Year 3												
Task No.	Task Description	Direct Labor Hours	Salary (per year)	Benefits (per year)	Travel	Supplies & Expendables	Services or Consultants	Equipment	Other Direct Costs	Total Direct Costs	Indirect Costs	Total Cost
		0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

Grand Total=155000.00

Comments.

Budget Justification

Lower Butte Creek Project: Sutter Bypass - Willow Slough Weir Fish Passage Project - Preliminary Engineering Investigation

Direct Labor Hours. Provide estimated hours proposed for each individual.

2006.67

Salary. Provide estimated rate of compensation proposed for each individual.

\$75.00/hr

Benefits. Provide the overall benefit rate applicable to each category of employee proposed in the project.

0%

Travel. Provide purpose and estimate costs for all non-local travel.

\$0

Supplies & Expendables. Indicate separately the amounts proposed for office, laboratory, computing, and field supplies.

\$0

Services or Consultants. Identify the specific tasks for which these services would be used. Estimate amount of time required and the hourly or daily rate.

\$0

Equipment. Identify non-expendable personal property having a useful life of more than one (1) year and an acquisition cost of more than \$5,000 per unit. If fabrication of equipment is proposed, list parts and materials required for each, and show costs separately from the other items.

\$0

Project Management. Describe the specific costs associated with insuring accomplishment of a specific project, such as inspection of work in progress, validation of costs, report preparation, giving presentations, response to project specific questions and necessary costs directly associated with specific project oversight.

\$0

Other Direct Costs. Provide any other direct costs not already covered.

\$0

Indirect Costs. Explain what is encompassed in the overhead rate (indirect costs). Overhead should include costs associated with general office requirements such as rent, phones, furniture, general office staff, etc., generally distributed by a predetermined percentage (or surcharge) of specific costs.

\$0

Executive Summary

Lower Butte Creek Project: Sutter Bypass - Willow Slough Weir Fish Passage Project - Preliminary Engineering Investigation

EXECUTIVE SUMMARY Lower Butte Creek Project: Sutter Bypass - Willow Slough Weir Fish Passage Project - Preliminary Engineering Investigation Project Goals and Scope of Proposed Work Project Location: The Willow Slough Weir proposed project site is located along the East Borrow Canal of the Sutter Bypass at its junction with Willow Slough, upstream of the Feather River. It lies just downstream of the Sacramento Avenue bridge over the East Borrow Canal, approximately 15 miles south of Yuba City in Sutter County (Figure 1). Willow Slough Weir is an earthen dam with two 60-inch corrugated metal pipes and one 60-inch reinforced concrete pipe with slide gates that control flow from the lower end of the Sutter Bypass East Borrow Canal into Willow Slough. A Denil fish ladder was constructed through the weir in the 1980's. The structure is owned, operated, and maintained by the California Department of Water Resources (DWR). Adult Fish Passage Problem: The primary problem with the existing Denil fish ladder is the lack of attraction flow in comparison to the flows being discharged through the culverts into Willow Slough during normal winter and springtime flow regimes. Salmonids are not only delayed by the pipe flows, but waste precious energy jumping at the culverts. Another major problem is the elevation of the entrance into the Denil fish ladder. Salmon have been observed jumping at the entrance to the Denil ladder and over-shooting it. A potential solution to the problems is designing a new, higher flow-capacity fish ladder and diffusing most of the culvert flows into a large, multiple-portal entrance pool in the new ladder. This would greatly improve fish passage past the structure and minimize delays in migration. Juvenile Fish Passage Problem: An improved fish ladder with higher flow-capacity and increased surface-water overflow would improve downstream passage of migrant juvenile salmonids and adult steelhead. Approach Improvement of the existing flow control structure and Denil fish ladder at the Willow Slough Weir is an integral part of the overall restoration efforts in the Butte Creek system as identified in the ERP. The project proposed by the California Department of Water Resources (DWR) would lead to reduced losses of both adult and juvenile salmon and steelhead. The work program would consist of developing preliminary engineering drawings, construction cost estimates, and an environmental check list for structural modifications of the Willow Slough Weir flow control structure and fish ladder. The technical report will present alternatives and solutions for an improved fish ladder and appurtenances meeting current codes and standards. Operational flexibility will be designed into the new structure so that adjustments, based on stream flows, hydraulic criteria, and fish passage performance, can be made to optimize fish passage past the weir structure. The project will be coordinated with overall operations plans for the Sutter Bypass and is supported by local stakeholders involved in the Lower Butte Creek Project evaluation. The proposed plans will be reviewed and approved by DWR, NMFS, CDFG and the stakeholders. This proposal is for funding for DWR staff to complete the preliminary engineering investigation using qualified and experienced staff, existing DWR facilities, computers, and equipment. The primary work product would be a technical report summarizing the investigation and results of the investigation. This report will include preliminary engineering drawings, discussion of the alternative selection process, operational concepts, design and construction cost estimates, permitting requirements, and other data available. The technical report and preliminary engineering drawings included in the report will be adequate for use in seeking funding for final design and construction of the fish passage project.

Proposal

California Department of Water Resources

Lower Butte Creek Project: Sutter Bypass - Willow Slough Weir Fish Passage Project - Preliminary Engineering Investigation

Kevin Dossey, California Department of Water Resources
Curtis Anderson, California Department of Water Resources

Lower Butte Creek Project: Sutter Bypass - Willow Slough Weir Fish Passage Project - Preliminary Engineering Investigation

A. Project Description: Project Goals and Scope of Work

Project Location: The Willow Slough Weir proposed project site is located along the East Borrow Canal of the Sutter Bypass at its junction with Willow Slough, upstream of the Feather River. It lies just downstream of the Sacramento Avenue bridge over the East Borrow Canal, approximately 15 miles south of Yuba City in Sutter County (Figure 1). Willow Slough Weir can be identified on the United States Geological Survey, 7.5 minute series, Nicolaus quadrangle. NAD 83 coordinates at the site are LAT = 38.915°, LONG = -121.625°.

1. Problem

Willow Slough Weir is an earthen dam with two 60-inch corrugated metal pipes and one 60-inch reinforced concrete pipe with slide gates that control flow from the lower end of the Sutter Bypass East Borrow Canal into Willow Slough. The structure was constructed between 1924 and 1925 under the direction of the Reclamation Board to control water levels in the East Borrow Canal so that irrigation water could be supplied to lessees of the state-owned Sutter Bypass. A Denil fish ladder was constructed through the weir in the 1980's. The structure is owned, operated, and maintained by the California Department of Water Resources (DWR).

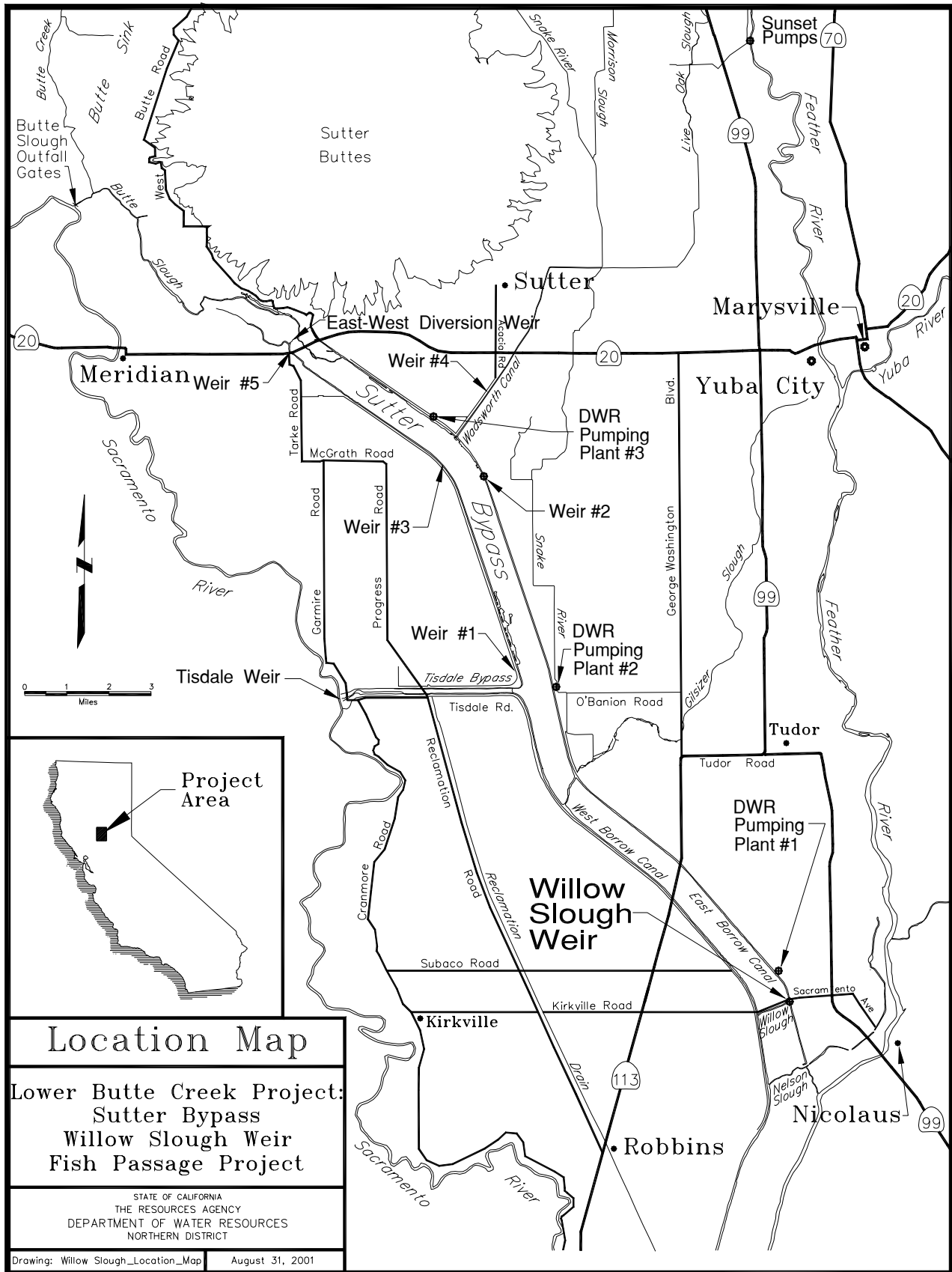
Adult Fish Passage:

The primary problem with the existing Denil fish ladder is the lack of attraction flow in comparison to the flows being discharged through the culverts into Willow Slough during "normal" winter and springtime flow regimes. The relatively high discharge through the culverts causes fish to be attracted to the culverts, which are mostly impassable because of the approximately 15 feet/sec velocity barrier created in the pipes by the 9-foot head differential between the East Borrow Canal and Willow Slough. Salmonids are not only delayed by the pipe flows, but waste precious energy jumping at the culverts. Another major problem is the elevation of the entrance into the Denil fish ladder. Salmon have been observed jumping at the entrance to the Denil ladder, over-shooting it, and ending up on top of the grating covering the fish ladder (P. Ward, DFG, on-site comment).

Limitation of flow through the culverts and ladder in summer and fall of wet years and year round in dry years may hinder upstream passage of salmon and steelhead past the structure into upper Butte Creek. During periods of low flow, the fish ladder may not provide sufficient flow for salmon to reach the weir or openings in the ladder or gates even with all of the water flowing through the ladder. Spring operation would potentially affect spring-run chinook salmon and steelhead that are migrating upstream. Fall and winter operation may affect fall-run chinook salmon and steelhead. Blocking or hindering upstream passage may delay fish reaching spawning grounds and expose fish to poaching, extended periods of water temperatures that range too high for optimum fish habitat, or excessive stress. Poaching of adult fish is also a problem at this weir because it is readily accessible. (Jones & Stokes Associates, 1998)

A potential solution to the problems is designing a new, higher flow-capacity fish ladder and diffusing most of the culvert flows into a large, multiple-portal entrance pool in the new ladder. This would greatly improve fish passage past the structure and minimize delays in migration.

Figure 1



Juvenile Fish Passage:

Presence of the weir and its upstream backwater pool may increase loss of downstream migrating young salmon and steelhead by providing unnatural conditions that favor predators (i.e., birds, fish, and humans) or water temperatures that range too high for optimum fish habitat. Other issues and concerns include poor access to the fish ladder during high flows in the Sutter Bypass and the high seasonal drainage flows in the East Borrow Canal (often exceeding 1,000 cfs) at the Willow Slough Weir outlet (JSA, 1998).

An improved fish ladder with higher flow-capacity and increased surface-water overflow would improve downstream passage of migrant juvenile salmonids and adult steelhead.

General:

Butte Creek hosts the single largest remaining run of spring-run chinook salmon in the Central Valley. In addition, fall-, and late-fall-run chinook salmon and steelhead trout exist in Butte Creek. As late as the 1960's, Butte Creek regularly supported over 4,000 adult spring-run chinook salmon, a lesser number of fall- and late-fall-run, and a small number of steelhead trout (Campbell and Moyle 1990). From the mid-1960's until 1995, the spring-run chinook populations have ranged from fewer than 200 adults to over 1,000 (CDFG 1998). This decline in numbers has resulted in the listing of spring-run chinook salmon as *Threatened* (Federal) and *Threatened* (State). The fall-run chinook salmon population varies between a few fish to as many as 1,000 (CDFG 1993). The decline of Butte Creek's chinook salmon and steelhead is attributed to inadequate flows, unscreened diversions, inadequate passage over diversion dams, unblocked agricultural return drains that attract and strand adult fish, poor water quality, declining availability of adequate spawning gravel and poaching. The major diversion dams and fish passage problems on Butte Creek have been identified by numerous planning efforts (CDFG 1993, JSA 1998, USFWS, 1997) and fish ladders and screens have been installed on several major diversions between the Butte Sink and Chico, including the facilities for which DWR provided preliminary engineering and/or final design and construction.

Improvements to the existing flow control structure and Denil fish ladder at the Willow Slough Weir is an integral part of the overall restoration efforts in the Butte Creek system.

2. Justification N/A per PSP instructions

3. Approach

Program Goals:

The proposed structure would reduce losses of both adult and juvenile salmon and steelhead. The work program will consist of developing preliminary engineering drawings, construction cost estimates, and an environmental check list for structural modifications of the Willow Slough Weir flow control structure and fish ladder (Figure 2). The technical report will present alternatives and solutions for an improved fish ladder and appurtenances meeting current codes and standards. The new fish ladder would be designed with a minimum flow capacity of 40 cfs, as recommended in the JSA 1998 Lower Butte Creek Project Report. Modifying the culverts and introducing auxiliary water into a new fish ladder entrance pool will improve attraction to the fish ladder and decrease attraction to the culverts, thus reducing delays to upstream migrant salmonids. Operational flexibility will be designed into the new structure so that adjustments, based on stream flows, hydraulic criteria, and fish passage performance, can be made to optimize fish passage past the weir structure.

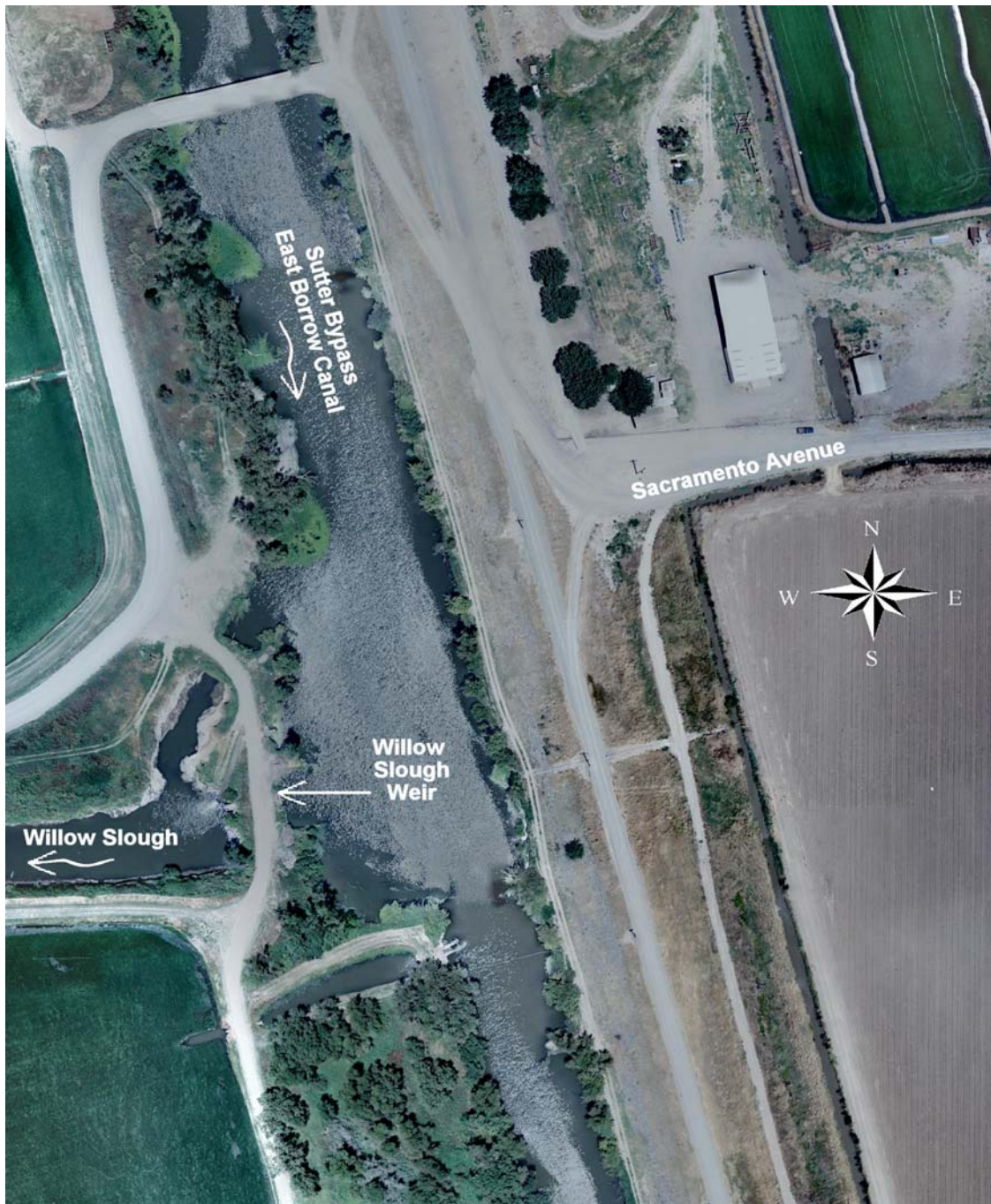


Figure 2. Aerial photograph of the proposed Willow Slough Weir Fish Passage Project site. (DWR Photo)

The DWR Technical Report, including preliminary engineering drawings and cost estimate, will be suitable to allow proponents to seek project funding for final design and construction of the fish passage project. The project will be coordinated with overall operations plans for the Sutter Bypass and is supported by local stakeholders involved in the Lower Butte Creek Project evaluation. The Willow Slough Weir proposed project preliminary design plans will be reviewed and approved by DWR, NMFS, CDFG and the stakeholders.

This project is part of implementation of the Lower Butte Creek Project. Planning and choosing structural alternatives for fish passage and water management on Butte Creek took place during 1997 through 1999 under a partnership between several landowner groups, agencies, and non-governmental organizations. Participants have included the Bureau of Reclamation (BOR), CALFED, US Fish and Wildlife Service-Anadromous Fish Restoration Program (AFRP), Sacramento National Wildlife Refuge (SNWR), California Department of Fish and Game (CDFG), California Department of Water Resources (DWR), Ducks Unlimited, Inc. (DU), California Waterfowl Association (CWA), Butte Sink Waterfowl Association (BSWA), Ensign and Buckley Consulting Engineers, Jones and Stokes Associates (JSA), Borcalli and Associates (BA), National Marine Fisheries Service (NMFS), Reclamation District 1004 (RD 1004) and numerous private landowners.

Cost /Benefit:

This proposal to fund the preliminary engineering investigation in the amount of \$155,000 could potentially lead to savings in the final design and construction phase of much more than that amount. The savings are probable because recent experience has demonstrated that projects of this magnitude require site characterization, stakeholder input, and engineering analysis to develop the most effective and cost efficient remedies. In addition, the complexities of environmental review and permitting require evaluation to develop accurate cost estimates and construction schedules for presentation to potential funding sources.

The proposed work will provide site characterization, conceptual engineering design, and preliminary engineering drawings in sufficient detail to expedite the transition into the final design and construction phase. Data will also be collected to facilitate acquisition of permits. In addition, cost estimates for construction will be developed at a level suitable to prepare funding requests for project implementation. A future funding proposal for the design and construction phase would likely be in the neighborhood of \$800,000 dollars.

This proposal is for funding for DWR Northern District (ND) staff to complete the preliminary engineering investigation using existing DWR facilities, staff, and equipment as described below.

Objectives:

1. Gather topographic data, survey existing structures, and develop contour maps with features suitable for use during engineering design. The topographic maps, with 1-foot contours, will encompass the area potentially affected by construction at the site. AutoCad will be the graphics program used for mapping and drawings. Flows will also be measured at the site for use in hydraulic analysis.
2. Conduct engineering design, prepare preliminary engineering drawings, and estimate costs of final design and construction of selected alternatives. Alternative designs will be developed that meet current codes and standards. The recommended fish ladder design standards listed on the following page will be followed.
3. Conduct environmental and cultural resources site surveys, and prepare an environmental check list for the site. The environmental information collected will be directly usable for permitting requirements, including CEQA/NEPA compliance.
4. Conduct necessary geologic reconnaissance and exploration at the project site for use in

the design process.

5. Coordinate all work with stakeholders through meetings to develop alternatives based on engineering feasibility and stakeholder input, examine and evaluate alternatives, and select the preferred alternative project.
6. Prepare a technical report that summarizes items 1 through 5. This report will include discussion of the alternative selection process, operational concepts, design and construction cost estimates, permitting requirements, and other data available. The technical report and preliminary engineering drawings can be used to seek funding for final design and construction.
7. DWR will also include a technical discussion of the facilities, including history and past maintenance procedures. The discussion will describe how DWR will provide continued maintenance on the new fish passage facilities.

Recommended General Fish Ladder Design Standards that will be followed:

- The design flow is a calculated average daily flow that is equaled or exceeded for three consecutive days with a 1:10 year recurrence interval. This standard may not, however, be appropriate for some streams and this analysis should be followed up with a biological analysis of the specific river system.
- Ten percent or more of the design flow should be discharged from the fish ladder entrance through a combination of ladder water and auxiliary water.
- If auxiliary water is supplied to the entrance pool, it should be diffused so that velocities do not exceed 1-foot per second (fps).
- The water surface elevation should not vary more than 1-foot between any two pools in the fishway.
- In pool and weir type fish ladders, each pool should be of sufficient size to dissipate 4 foot-pounds of energy per second, per cubic foot of volume, except where ladders deviating from this standard have been constructed, proven effective, and generally accepted.
- The minimum suggested orifice size is 15 inches wide by 18 inches tall.
- Minimum water depth over baffles with weir flow should be 6 inches.
- Turning pools should be twice as long as standard pools.
- The entrance pool should be located as close to the barrier as possible without entering the zone of turbulence created by water flowing over the barrier.
- Transit velocities should not exceed 4 fps unless otherwise specified or approved.

All other current DFG and NMFS fishway design standards and recommendations will be adhered to during the design process.

4. Feasibility

The feasibility of completing the preliminary engineering designs and technical report during the proposed timeline and within budget is extremely high. Trained, experienced ND staff will complete the preliminary engineering investigation using existing state-of-the-art computers, software, and surveying equipment.

ND staff that will be working on this project have completed many similar fish passage projects, which included production of preliminary engineering design plans and Technical Reports, over the past eight years. These reports and design plans were used as the basis for soliciting bids for final design and construction of fish passage facilities that have now been constructed at five diversion dams in the Butte Creek system. A summary of DWR Northern District fish facilities projects are listed below.

Planning efforts instituted in earlier phases of the Lower Butte Creek project have received approval from the immediately affected stakeholders and regulating agencies. The site work (on California Reclamation Board land) for this preliminary engineering project only involves surveying and geologic exploration. Since DWR owns and maintains the structure, access for surveying is not an issue. For the current DWR Pumping Plants Fish Screening Project on the Sutter Bypass East Borrow Canal, which we are currently working on, we are proceeding with geologic exploration work after recently filing a Notice of Exemption.

For the proposed Willow Slough Weir project geologic exploration, we would use CEQA categorical exemptions:

15304 - Minor alterations of land

15306 - Basic data collection

For NEPA compliance, since the Bureau of Reclamation will be the federal lead, the categorical exclusion listed in their Department Manual Appendix 9 Subsection B (3), which states that data collection studies that involve drilling investigations for geologic exploration purposes where the impacts will be localized are excluded from NEPA, will apply.

Environmental and cultural resources documentation and an environmental check list, which lists potential permits needed for construction, will be submitted with the final report by March, 2004.

DWR Northern District Fish Passage Projects

The following is a summary of fish passage facilities projects that were completed by DWR Northern District, or that are in-progress, which demonstrate the likelihood that the staff that will be working on the proposed Willow Slough Weir Project will complete the proposed project on-time and within budget.

Butte Creek

ND prepared final designs, and inspected construction of the pool-and-chute fish ladder at the **Parrott Phelan Diversion Dam** near Chico, California. ND completed preliminary engineering investigations for fish passage facilities at **Durham Mutual, Adams, and Gorrill Diversion Dams**. Ice Harbor, step pool, and vertical slot fish ladders and flat plate fish screens have now been constructed at those three sites. ND also completed a preliminary engineering investigation of fish passage and flow control improvements at the **Sanborn Slough/Butte Creek Bifurcation Structure** near Gridley. The flow control and vertical slot fish ladder structure was constructed in 1999, and the overflow dam portion of the structure will be

completed in 2001.

ND staff regularly attend Lower Butte Creek Project meetings and consult with agencies and private engineers regarding current projects. The multi-faceted plan to improve fish passage through the Lower Butte Creek system is now in the design and construction phase. The principal participants that will complete the proposed Willow Slough Weir project are currently conducting preliminary engineering investigations for three fish screens at **DWR Pumping Plants** and for a fish ladder at **Weir 2**, all located along the East Borrow Canal of the Sutter Bypass. These investigations and accompanying Technical Reports will be completed prior to the projected funding date for the proposed project.

Battle Creek

ND conducted reconnaissance level engineering investigations for fish passage at six diversion dam sites on Battle Creek. The dams, owned and operated by PG&E, divert water for power generation. Removal of Coleman, South, and Wildcat Diversion Dams are planned. Ripley Creek and Soap Creek Diversion Dams on the tributaries will also be removed. Construction of fish ladders and fish screens will take place at **Eagle Canyon, Inskip, and North Battle Creek Feeder Diversion Dams**. Twenty-three thermographs and two streamflow gaging stations have been installed and maintained by ND to aid in the planning and monitoring of the project that will improve access to about 42 miles of good anadromous fish habitat.

ND completed preliminary engineering designs for fish passage facilities at the three diversion dams that will remain in place. The proposed fish ladders and fish screens will improve upstream and downstream passage for salmon and steelhead trout. The fish ladders will be vertical slot, Half Ice Harbor, and pool-and-chute types at Eagle Canyon, Inskip, and North Battle Creek Feeder, respectively. The fish screens will be flat-plate wedgewire with brush cleaning systems. Stage sensors and automated flow control gates will ensure minimum instream flow releases are maintained and fish screen and fish ladder design standards are continuously met.

The DWR Division of Engineering (DOE) will complete final designs of the fish passage facilities in 2002 with construction scheduled to begin in late 2002. The U.S. Bureau of Reclamation (USBR) is completing final designs for the five dam removals and for construction of a pipeline at the Coleman site and a tunnel at the Inskip site. All construction is scheduled for completion by 2004.

Mill Creek

ND completed preliminary engineering investigations for removal of **Clough Dam** and replacement with an inverted siphon that will allow unimpeded fish passage while maintaining water deliveries. Water will be diverted through the Los Molinos Mutual Water Company diversion ditch into the Clough ditch. ND will be coordinating with DOE to complete final designs of the inverted siphon. Construction is scheduled for the summer of 2002.

Clear Creek

ND completed a preliminary engineering investigation of fish passage solutions at the nearly impassable **Saeltzer Dam**. Potential solutions included removal of the dam and 1) constructing a side-channel diversion and pipeline, 2) transferring the water rights or 3) selling the water rights. Another potential solution was construction of a fish ladder around the dam. The 15-ft. high diversion dam, owned by the Townsend Flat Water Ditch Company (TFWDC) and lying on

Department of Fish and Game property, was removed by USBR in 2000. TFWDC sold and transferred portions of their Clear Creek water right.

Big Chico Creek

Fish passage problems exist at **Iron Canyon** and **Bear Hole** in Upper Bidwell Park. Under some flow conditions, the existing Iron Canyon fish ladder is not passable and fish are rescued and manually transported upstream. An improved ladder would provide fish passage over a greater range of flows. ND will finish a preliminary engineering investigation of fish passage improvements and distribute the final report in 2001.

Sacramento River

ND conducted surveying and mapping for use in design of two new fish ladders and a fish screen at the **Anderson Cottonwood Irrigation District (ACID) Diversion Dam**. The dam that is owned and operated by ACID in Redding, CA impeded passage to a few miles of prime winter-run salmon habitat. CH2M-Hill completed final designs for the project. Construction of the fish ladders and fish screen was completed in 2001.

5. Performance Measures

Preliminary Engineering Design Documents:

The plans and technical report will be reviewed and approved by NMFS and DFG engineers and biologists. Final documents will be produced and delivered to NMFS, DFG, CALFED, and the stakeholders upon completion of the investigation.

Project Monitoring:

The proposed fishway will be designed so that electronic fish counters can be installed if deemed feasible and necessary by the Agency and Stakeholder Technical Design Team (that will be created at the beginning of the project), or by the CALFED engineering and science review groups. If permanent counting facilities are desired, they will be integrated into the design of the structure.

Based on related projects and experience passed on by others, the more flexibility that is built into the project, the better the chances are of meeting the project goals. Therefore, operational flexibility will be designed into the new structure so that adjustments, based on stream flows, hydraulic criteria, and fish passage performance, can be made to optimize fish passage past the weir structure.

Assuming that final design and construction will follow the proposed preliminary engineering investigation, DWR, DFG and NMFS staff will conduct hydraulic measurements to ensure that the new fishway is performing as designed, within acceptable fish passage standards.

6. Data Handling and Storage

Electronic data and computer generated drawings will be handled and stored on individual PCs, backed up on JAZ drives and a secure network, and will be compiled on CD ROM at the ND office. All pertinent information gathered, evaluated and applied to the project will be kept in a permanent file, and upon completion, will be made available in .pdf format for internet access.

7. Expected Products/Outcomes:

Production of two draft Technical Reports.

Production of a final Technical Report that will include:

- preliminary engineering design drawings
- project background information
- special project notes
- a description of the investigation
- discussion of the alternative selection process
- comparison of alternatives considered
- a summary of findings
- design considerations
- codes and standards used
- operational concepts
- meeting summaries
- discussion of operation and maintenance issues
- cost estimate for final design and construction
- final design criteria
- final design instructions
- proposed construction summary
- permitting requirements check list
- geologic exploration memorandum
- other data available

Quarterly reports beginning 12/30/02 through 3/30/04 detailing task accomplishments and fiscal expenditures.

Presentation of progress reports on a semi-annual basis to stakeholders, which include local landowners, water user groups, and regulatory agencies.

Presentation of progress reports at monthly Spring-run Chinook Salmon Workgroup and quarterly DWR Fish Facilities Coordination Team meetings.

8. Work Schedule

Task No.	Work Items	Deliverables	Start Date	Completion Date
1	Gather existing information, survey topography, conduct flow measurements.	Raw data will be available on an as-needed basis (requested)	Oct 1, 2002	Jan 30, 2003
2	Investigate alternatives, conduct geologic site reconnaissance and environmental site surveys, and document potential permits needed.	Agency and Stakeholder Technical Design Team meeting summaries. Draft design drawings.	Jan 1, 2003	Aug 31, 2003
3	Mapping and engineering design	Draft preliminary engineering design drawings with alternatives identified.	Jan 1, 2003	Sept 30, 2003
4	1 st Draft report, selection of alternative solution	Distribute 1 st draft report for review and comment	June 1, 2003	Nov 1, 2003
5	2 nd Draft report	Distribute 2 nd draft report for review and comment	Dec 1, 2003	Jan 16, 2004
6	Final Technical Report	Distribute Final Technical Report	Feb 15, 2004	March 30, 2004

B. Applicability to CALFED ERP and Science Program Goals and Implementation Plan and CVPIA Priorities

1. ERP, Science Program and CVPIA Priorities

This proposed project, assuming final design and construction will follow, is linked to the following ERP Strategic Goals:

GOAL 1: At-Risk Species - This project will promote recovery of at-risk species in the watershed above the Delta estuary, in particular spring-run chinook salmon, steelhead trout, and other species of concern, and contribute to the reversing of the downward population trends of non-listed native species, by reducing or eliminating delay and injury to Butte Creek salmonids by improving passage conditions for both juvenile and adult fish.

GOAL 3: Harvestable Species - This project will reduce or eliminate delay and injury to Butte Creek salmonids. That, in turn, will benefit the recreational and commercial fishing industries.

GOAL 4: Habitats - Fish passage will be enhanced with the construction of an improved fish ladder on this important migration channel. This will promote recovery of spring-run chinook salmon and steelhead trout, and thus support ecological processes dependent on the salmonid life-cycle.

CALFED Science Program Goals:

Improving fish passage at the weir structure, and thus reducing delays, will create a more natural migratory timeline for the targeted species. This will reduce stress in the salmonids and hopefully help restore the populations to pre-man-made structure levels. Short-term effectiveness of the project can be measured by fish counters installed in the new fish ladder. Long-term effectiveness can be measured through juvenile and adult fish counts conducted by DFG and USFWS along the Butte Creek system.

Central Valley Project Improvement Act Goals. This project addresses the following Section in TITLE 34, PUBLIC LAW 102-575: Section 3402(a) – protect, restore, and enhance fish...and associated habitats in the Central Valley...

The project also address the following CVPIA program goals:

Anadromous Fish Restoration Program – Section 3406(b)(1)

- *Improve habitat for all life stages of anadromous fish by providing flows of suitable quality, quantity, and timing, and improved physical habitat:*
This project improves fish passage and flow management in Butte Creek that greatly increases the spawning success and survival of anadromous fish.
- *Improve the opportunity for adult fish to reach their spawning habitats in a timely manner:*
By reducing delays in upstream migration at the structure, salmonids will reach their historic spawning grounds easier and faster, thus reducing losses of the target species.

2. Relationship to Other Ecosystem Restoration Projects

The CALFED Regional Implementation Plan for the Sacramento Valley identifies Butte Creek Restoration as a priority program. The ERP Draft Stage 1 PSP Priorities SR-1 and SR-2 specifically identify constructing fish passage facilities in the Sutter Bypass as restoration action priorities. This project is an integral part of an overall ecosystem restoration program for the Butte Creek Watershed. Upper watershed restoration activities on public and private lands would be compromised if the lower reach actions described in the California Department of Fish and Game, U.S. Fish and Wildlife Service and CALFED Ecosystem Restoration Program Plan (CDFG, 1993; USFWS, 1997; ERPP, 1999) are not completed. During the period from 1995 to the present, structures in the lower reaches of Butte Creek hindered the connectivity to upstream spawning and rearing habitat essential for survival of native anadromous salmonids resident to Butte Creek. Implementing the upgrades to five structures, including two fish ladders on Butte Sink water control structures, will contribute significantly to the overall ecosystem health and abundance. Five dams have been removed along upper Butte Creek. Another five dams have been improved with state-of-art fish ladders, and four of those with state-of-the-art fish screens (All five were DWR Northern District projects).

Two other Lower Butte Creek Projects, Sutter Bypass West Side and White Mallard Dam & Associated Diversions are ready for construction. The Sutter Bypass Project is funded under the

CALFED 2001 PSP. Dedicated instream flows of 45 cubic feet per second have been acquired and ten real-time internet accessible telemetry stations have been installed to protect and manage the instream flows from the headwaters to the Sacramento River at the lower end of the Sutter Bypass. In addition, nine major technical and environmental evaluations of additional restoration plans and implementation actions in the Butte Sink and Sutter Bypass reaches of Butte Creek and the watershed have been completed (JSA, 1998; JSA, 1999 a-h). A next-phase of technical and environmental evaluations are in progress in the Sutter Bypass (Jones & Stokes 2001 and CDWR, 2001).

The Butte Creek Watershed Conservancy, a local stakeholder organized watershed group has completed a draft Existing Conditions Report (BCWC, 2000) and is in the process of completing a Watershed Management Strategy Report. A total of more than \$30 million has been spent to date on Butte Creek Restoration. The effectiveness of those project dollars is dependent upon the completion of projects in the lower watershed, among which is the structure included in this fish passage project proposal. Sources of funding for the previously completed projects include CALFED Category III (Metropolitan Water District), BOR, CVPIA, AFRP and AFSP.

3. Requests for Next-Phase Funding

The Sutter Bypass Project is funded under the CALFED 2001 PSP. This project is a part of implementation of that project.

4. Previous CALFED Funding

DWR Northern District projects previously funded through CALFED include:

CALFED Program No. A194 - Battle Creek Screens and Fish Passage

ND conducted reconnaissance level engineering investigations for fish passage at six diversion dam sites on Battle Creek. The dams, owned and operated by PG&E, divert water for power generation. Removal of Coleman, South, and Wildcat Diversion Dams are planned. Ripley Creek and Soap Creek Diversion Dams on the tributaries will also be removed. Construction of fish ladders and fish screens will take place at Eagle Canyon, Inskip, and North Battle Creek Feeder Diversion Dams. Twenty-three thermographs and two streamflow gaging stations have been installed and maintained by ND to aid in the planning and monitoring of the project that will improve access to about 42 miles of good anadromous fish habitat.

ND completed preliminary engineering designs for fish passage facilities at the three diversion dams that will remain in place. The proposed fish ladders and fish screens will improve upstream and downstream passage for salmon and steelhead trout. The fish ladders will be vertical slot, Half Ice Harbor, and pool-and-chute types at Eagle Canyon, Inskip, and North Battle Creek Feeder, respectively. The fish screens will be flat-plate wedgewire with brush cleaning systems. Stage sensors and automated flow control gates will ensure minimum instream flow releases are maintained and fish screen and fish ladder design standards are continuously met.

The DWR Division of Engineering (DOE) will complete final designs of the fish passage facilities in 2002. Construction is scheduled to begin in late 2002. The U.S. Bureau of Reclamation (USBR) is completing final designs for the five dam removals and for construction of a pipeline at the Coleman site and a tunnel at the Inskip site. All construction is scheduled for completion by 2004.

CALFED Program No. 98 – B1000 – Anadromous Fish Passage at Clough Dam on Mill Creek
ND completed a preliminary engineering investigation for removal of Clough Dam and replacement with an inverted siphon that will allow unimpeded fish passage while maintaining water deliveries. Water will be diverted through the Los Molinos Mutual Water Company diversion ditch into the Clough ditch.

ND will be coordinating with DOE to complete final designs of the inverted siphon. Construction is scheduled for the summer of 2002.

Project technical reports, which contain information as listed in Section A. 7. of this proposal, were produced for the above preliminary engineering projects funded through CALFED.

5. System-Wide Ecosystem Benefits

The Lower Butte Creek Project will improve fish passage for and enhance wetland habitat values on approximately 30,000 acres of public and private lands within the Butte Basin by improving water management capabilities throughout the Lower Butte Creek system. The Willow Slough Weir fish passage improvement project is an integral part of the Lower Butte Creek Project.

The new fish passage facilities at the structures and gaging stations installed throughout the system will allow more effective management and control of instream flows dedicated for fish and wildlife, specifically the 40 cfs acquired for instream use in Butte Creek from the M&T water exchange agreement. The control structures will also improve operations and maintenance and reduce long-term costs to the USFWS refuge and private wetland managers responsible for the operation of the Butte Sink under the Cooperative Management Plan.

6. Land Acquisition No land will be acquired for this project.

C. Qualifications

This program manager for the proposed project will be Mr. Curtis Anderson, Chief of the Engineering Studies Section of the Northern District Department of Water Resources. Mr. Kevin Dossey will be the lead engineer. They will be assisted by qualified and experienced engineers, surveyors, technicians, and office support staff as necessary to complete the project.

Curtis Anderson

Mr. Anderson earned his B.S. degree in Civil Engineering from California State University, Chico in 1990. He is registered in California as a Professional Engineer in the Civil Branch.

He has been directly involved with fishery restoration work since 1991. Mr. Anderson has provided engineering support for: Greenhorn Creek - Restorations and Stabilization, Feather River - Instream Flow Study, Wolf Creek - Restoration and Stabilization, Butte Creek - Site surveying for Gorrill Dam.

He has been the program manager for Mill Creek - Clough Dam Siphon and Dam Removal Project, (current), Battle Creek - Eagle Canyon, Inskip, and North Battle Creek Feeder Fish Ladder and Fish Screen Project,. Trinity River - Habitat Restoration Projects.

He has completed numerous hydraulic design, habitat modeling, and fish structure design courses including Fish Passageways and Diversion Structures, Applied Fluvial Geomorphology, and HEC-2.

Kevin Dossey

Mr. Dossey earned his B.S. degree in Civil Engineering from California State University, Chico in 1985. He is registered in California as a Professional Engineer in the Civil Branch.

He has been directly involved with fishery restoration work since 1986. He has provided engineering support for: Trinity River - Sediment Removal Project, Sacramento River - Salmon Spawning Channel Project. He was a design engineer on Clear Creek - Saeltzer Dam Fish Passage Project, Battle Creek - Eagle Canyon Fish Ladder and Fish Screen Project.

He served as lead engineer for Butte Creek - Parrott Phelan Fish Ladder final design and construction project, Durham Mutual Water Company Fish Ladder and Screen Project, Adams Dam Fish Ladder and Screen Project, Gorrell Dam Fish Ladder and Screen Project, Sanborn Slough Fish Passage Project, Sutter Bypass DWR Pumping Plants Fish Screen Project (current), Sutter Bypass Weir 2 Fish Passage Project (current).

He has also received training in numerous hydraulic design, habitat modeling, and fish structure design courses including Fish Passageways and Diversion Structures, Applied Fluvial Geomorphology, HEC-RAS.

William McLaughlin

Mr. McLaughlin earned his B.S. degree in Civil Engineering from California State University, Chico in 1995. He is registered in California as a Professional Engineer in the Civil Branch.

He has been directly involved with fishery restoration work since 1997. He has provided engineering support with increasing levels of responsibility for: Trinity River - Habitat Restoration Projects, Battle Creek - Eagle Canyon Fish Ladder and Fish Screen and North Battle Creek Feeder Fish Ladder and Fish Screen Projects, Clear Creek - Saeltzer Dam Fish Passage Project, Mill Creek - Clough Dam Siphon and Dam Removal Project (current), and Big Chico Creek - Iron Canyon and Bear Hole Fish Passage Project (current).

He has received training in hydraulic design and fish structure design courses including HEC-RAS, Applied River Morphology, Instream Habitat for Regulated Rivers, and Fish Passageways and Diversion Structures.

Scott Kennedy

Mr. Kennedy earned his B.S. degree in Civil Engineering from California State University, Chico in 1998.

He has been directly involved with fishery restoration work since 1998. He has provided engineering support with increasing levels of responsibility for: Trinity River – Habitat Restoration Projects, Battle Creek - Inskip Fish Ladder and Screen Project, Big Chico Creek - Iron Canyon and Bear Hole Fish Passage Project (current), and Butte Creek - Sutter Bypass Bypass DWR Pumping Plants Fish Screen Project (current). This fishery restoration work included engineering design of fish ladders and fish screens and report preparation.

He has received training in hydraulic design and hydraulic modeling, and in the design of fish passageways and bypass facilities including HEC-RAS and Fish Passageways and Diversion Structures.

David J. Bogener

Mr. Bogener earned his B.A. Degree in Natural Science and Masters Degree in Wildlife/Resource Management and Planning from California State University, Chico in 1977 and 1985.

He has been directly involved with numerous wildlife and fisheries habitat improvement and mitigation projects, threatened and endangered species surveys, environmental permitting and compliance with CEQA/NEPA, State and Federal Endangered Species Acts, 404 permits, 401 water quality certifications, stormwater permits, and 1601 agreements and hazardous waste regulations.

Recent environmental permitting projects he has been involved with are:

- Indian Creek Stream Gaging Station installation project (Plumas County)
- Stone Corral Creek hazardous material spill investigation (Colusa County)
- Deer Creek Water Exchange Program (Tehama County)
- Power Canal Boat Ramp parking lot expansion (Butte County)
- Oroville Bike Path parking lot construction (Butte County)
- Klamath Basin Drought Remediation Program (Modoc and Siskiyou counties)
- Hamilton Ranch Stream Diversion Installation (Trinity County)
- Funks Reservoir geologic exploration (Colusa County)
- Frenchman Reservoir seismic investigation (Plumas County)
- Butte/Glenn County Groundwater Monitoring Well Installation Program (Butte and Glenn counties)
- Sutter Bypass Fish Screen Investigation (Sutter County)
- New Canal geologic investigation (Colusa County)
- Sites Reservoir Damsite geologic exploration (Colusa County)
- J Levee geologic exploration (Glenn County)
- Feather River Temperature Gage Station Installation (Butte County)
- Annual DWR Stream Gage Network maintenance activities (Tehama, Glenn, Butte, Colusa, and Sutter counties)
- Hunters Creek geologic exploration (Glenn County)
- Sites/Colusa Reservoir Saddle Dam geologic exploration
- Golden Gate Damsite geologic exploration
- Clough Dam Removal and Siphon Construction Project (Tehama County)
- Diversion Pool parking lot and boat ramp construction project (Butte County)
- Salt Lake Fault Seismic Investigation Glenn County)
- Lime Saddle Campground Construction Project (Butte County)
- Lime Saddle Boat Ramp parking lot expansion project (Butte County)
- Weaver Creek Stream Gage Station Installation (Trinity County)

D. Cost

1. Budget for the Preliminary Engineering Investigation:

To perform this investigation, DWR Northern District will use existing DWR facilities, equipment, and the following staff: Engineers, Land Surveyors, Engineering Technicians, Geologists, Environmental Specialists, Office Technicians, and Student Assistants.

Willow Slough Weir Project Tasks	Estimated Cost
Gather data, conduct topographic surveys and flow measurements	\$ 18,000
Develop contour map and draw existing structural features	\$ 9,000
Environmental research, site surveys & check list	\$ 10,000
Geologic site reconnaissance and report	\$ 25,000
Engineering design and prepare preliminary engineering drawings (includes meetings)	\$ 63,000
Prepare final report (includes cost estimate)	\$ 30,000
TOTAL COST	\$ 155,000

2. Cost-Sharing Other than funding for overall planning and implementation of the Lower Butte Creek Project, no cost sharing for this specific proposed project is anticipated.

E. Local Involvement

All activities in the Sutter Bypass Project have been coordinated through the Lower Butte Creek Project Steering Committee and the Butte Sink Action Committee. Local support for the completion of this structure is high because of the benefits to anadromous fish and increases in water management capabilities of the operators throughout the Butte Creek system.

F. Compliance with Standard Terms and Conditions

The Applicant has reviewed and understands the standard terms contained in Attachments D (State) and E (Federal) that were included in the ERP 2002 Proposal Solicitation Package, and agrees to comply with these state and federal standard terms.

G. Literature Cited

CALFED Ecosystem Restoration Program, Draft Stage 1 Implementation Plan. August 2001. Pages 9-16. Restoration Program Strategic Goals.

CALFED Ecosystem Restoration Program, Draft Stage 1 Implementation Plan. August 2001. Pages 57-59. Restore fish habitat and fish passage particularly for spring-run chinook salmon and steel head trout and conduct passage studies.- *Facilities improvements and fish passage programs.*

Campbell, E. A., and P. B. Moyle. 1990. Historical and recent population of spring-run chinook salmon in California. Pages 155-216 in: Proceedings, 1990 Northeast Pacific Chinook and Coho Salmon Workshop.

- CDFG (California Department of Fish and Game). 1993. Restoring Central Valley Streams: a plan for action. Inland Fisheries Division Sacramento.
- CDFG (California Department of Fish and Game). 1998. A status review of the spring-run chinook salmon in the Sacramento River drainage. Candidate species status report 98-01.
- JSA (Jones and Stokes Associates, Inc). 1998. Lower Butte Creek Project final project report. June 30, 1998 (JSA 97-248). Sacramento, Calif. Prepared for the Nature Conservancy, Sacramento, Calif.
- JSA (Jones and Stokes Associates, Inc). 1999. Evaluation of Fish Passage Conditions in the Butte Sink. August 27, 1999. Sacramento CA.
- JSA (Jones and Stokes) 2001 Butte Sink Cooperative Management Plan. July. Sacramento, CA. Prepared in association with MBK Engineers and Lennihan Law. Prepared for California Waterfowl Association, Sacramento, CA.
- USFWS (U.S. Fish and Wildlife Service). 1997. Revised draft restoration plan for the anadromous fish restoration program. May 30, 1997. Prepared for the Secretary of the Interior by the U.S. Fish and Wildlife Service with assistance from the Anadromous Fish Restoration Program Core Group. Stockton, Calif.
- USFWS (U.S. Fish and Wildlife Service). 2000. Draft Programmatic Environmental Assessment for Anadromous Fish Restoration Actions in the Butte Creek Watershed. Prepared for the Sacramento-San Joaquin Estuary Fishery Resource Office, U.S. Fish and Wildlife Service. Stockton, Calif. by the Sacramento Fish and Wildlife Office. U.S. Fish and Wildlife Service. Sacramento, Calif.