ATTACHMENT A – CALFED FORMS

Hamilton City Ecosystem Restoration and Flood Damage Reduction: Chico Landing Sub-Reach

Project Information

1. **Proposal Title:**

Hamilton City Ecosystem Restoration and Flood Damage Reduction: Chico Landing Sub-Reach

2. **Proposal applicants:**

Pete Rabbon, The Reclamation Board

3. **Corresponding Contact Person:**

John Passerello
Dept. of Water Resources-Comprehensive Study Group
1325 J Street. Sacramento, CA 95814, Room 1540
916 557-6641
John.B.Passerello@usace.army.mil

4. **Project Keywords:**

Flood Plain Management
Habitat Restoration
Hydrodynamics
Restoration Ecology and Riparian Ecology

5. **Type of project:**

Planning

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

No

7. **Topic Area**:

Floodplain Habitat

8. **Type of applicant:**

State Agency

9. **Location - GIS coordinates:**
Latitude: 39^{0}44'32.04" N
Longitude: 122^{0}00'42.71" W

Datum: NAD 27 (feet)

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

The Project location is approximately 100 miles north of Sacramento and 10 miles west of Chico. Hamilton City lies less than 1 mile to the west of the Sacramento River. The study area is bound on the west by the Glenn-Colusa Irrigation Canal and on the east by the Sacramento River.

10. **Location - Ecozone:**

3.2 Red Bluff Diversion Dam to Chico Landing

11. **Location - County:**

Glenn

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?**

3

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: 51.4%

Total Requested Funds: 420,000

b) Do you have cost share partners already identified?

Yes

If yes, list partners and amount contributed by each:

Corps of Engineers $420,000

c) Do you have potential cost share partners?

No

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

Yes

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?**

No

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

No

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?

No

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

Yes

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

2001 Hamilton City Feasibility Study, Corps of Engineers, Comprehensive Study

Please list suggested reviewers for your proposal. (optional)

21. **Comments:**

Environmental Compliance Checklist

Hamilton City Ecosystem Restoration and Flood Damage Reduction: Chico Landing Sub-Reach

1. **CEQA or NEPA Compliance**
a) Will this project require compliance with CEQA?

Yes

b) Will this project require compliance with NEPA?

Yes

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: CA Reclamation Board
NEPA Lead Agency (or co-lead:) U.S. Corps of Engineers
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
XEIR
-none

NEPA
-Categorical Exclusion
-Environmental Assessment/FONSI
XEIS
-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.

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.

Need Dates

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 Obtained
CWA 401 certification
Coastal Development Permit
Reclamation Board Approval Required
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
X (Obtained) Permission to access city, county or other local agency land.
Agency Name: Glenn County
X (Obtained) Permission to access state land.
Agency Name: DFG

X (Obtained) Permission to access federal land.
Agency Name: FWS
X (Obtained) Permission to access private land.
Landowner Name: The Nature Conservancy, Private Landowners

6. **Comments.**

Conflict of Interest Checklist

Hamilton City Ecosystem Restoration and Flood Damage Reduction: Chico Landing Sub-Reach

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

- Á 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.
- Á Subcontractors listed in the proposal who will perform some tasks listed in the proposal and will benefit financially if the proposal is funded.
- Á 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):
Pete Rabbon, California Reclamation Board

Subcontractor(s):
Are specific subcontractors identified in this proposal? No

Helped with proposal development:
Are there persons who helped with proposal development?

Yes
If yes, please list the name(s) and organization(s):

Liz Mansfield – Dept. Of Water Resources
Gary Lemon - Dept. Of Water Resources
Erin Taylor - U.S. Army Corps
Alicia Kirchner - U.S. Army Corps
Jennifer Martin – The Nature Conservancy

Comments:

Land Use Checklist

Hamilton City Ecosystem Restoration and Flood Damage Reduction: Chico Landing Sub-Reach

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?**

Yes

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).

This is a planning project and work will not include any physical actions to the land

4. **Comments.**

Budget Justification

Hamilton City Ecosystem Restoration and Flood Damage Reduction

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

Ecologist 350, Biologist 775, Economist 650, Engineer 2390, Hydrologist 1500, Project Manager 1105.

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

Biologist $4969/mo, Ecologist $4732/mo, Economist $5987/mo, Engineer $5632/mo, Hydrologist $5632/mo, Project Managers $6810/mo.

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

31 percent for all categories.

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

None

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

None

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.

No specific tasks or consultants have been identified for this study; however, use of consultant is anticipated.

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.

None

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.

The cost of project management is approximately $140,000, which includes all areas mentioned above.

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

None

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.

The overhead rate includes costs for office rent, accounting staff, office supplies, office furniture and equipment, insurance, telephone, postage and taxes.

Budget Summary

Hamilton City Ecosystem Restoration and Flood Damage Reduction: Chico Landing Sub-Reach

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

Fiscal Year 2002-03, Estimated Cost for the Hamilton City Project

Fiscal Year 2002-03, Estimated Cost for the Hamilton City Project												
Task No.	**Task Description**	**Direct Labor Hours**	**Ave. Annual Salary**	**Annual Benefits**	**Travel**	**Supplies or Expendables**	**Services or Consultants**	**Equipment**	**Other Direct Costs**	**Total Direct Costs**	**Indirect Costs**	**Total Cost**
1.0	Problems & Opportunities	850	67,524	0	0	0	5,000	0	0	27,594	7,450	40,044
2.0	Inventory and Forecast Condition using Technical Model	850	67,524	0	0	0	20,000	0	0	27,594	7,450	55,044
3.0	Formulate Alternative Plan	1425	67,524	0	0	0	7,000	0	0	46,260	12,490	65,751
4.0	Evaluate and Screen Alternative Plans	1800	67,524	0	0	0	15,000	0	0	58,434	15,777	89,211
5.0	Compare Plans and Peer Review	775	67,524	0	0	0	10,000	0	0	25,159	6,793	41,952
6.0	Select Recommended Plan	300	67,524	0	0	0	2,500	0	0	9,739	2,630	14,869
	Total	6,000		0	0	0	59,500	0	0	194,781	52,591	306,872

Note: The Army Corps of Engineers will match the State funds at a 100 percent

Budget Summary – Cont'd

Fiscal Year 2003-04, Estimated Cost for the Hamilton City Project												
Task No.	**Task Description**	**Direct Labor Hours**	**Ave. Annual Salary**	**Annual Benefits**	**Travel**	**Supplies or Expendables**	**Services or Consultants**	**Equipment**	**Other Direct Costs**	**Total Direct Costs**	**Indirect Costs**	**Total Cost**
1.0	Problems & Opportunities	425	67,524	0	0	0	5,000	0	0	13,797	3,725	22,522
2.0	Inventory and Forecast Condition using Technical Model	325	67,524	0	0	0	5,000	0	0	10,551	2,849	18,399
3.0	Formulate Alternative Plan	175	67,524	0	0	0	3,000	0	0	5,681	1,563	10,244
4.0	Evaluate and Screen Alternative Plans	650	67,524	0	0	0	10,000	0	0	21,101	5,753	36,854
5.0	Compare Plans and Peer Review	275	67,524	0	0	0	5,000	0	0	8,927	2,437	16,365
6.0	Select Recommended Plan	175	67,524	0	0	0	1,500	0	0	5,681	1,563	8,744
	Total			0	0	0	29,500	0	0	65,739	17,890	113,128

Note: The Army Corps of Engineers will match the State funds at a 100 percent

Executive Summary

Hamilton City Ecosystem Restoration and Flood Damage Reduction: Chico Landing Sub-Reach

The Hamilton City Ecosystem Restoration and Flood Damage Reduction proposal is requesting $420,000 from CALFED to complete the Hamilton City feasibility study, initiated by the Sacramento and San Joaquin River Basin Comprehensive Study. The goals of this proposed study are to: 1. Complete a feasibility study for ecosystem restoration and flood damage reduction in the Hamilton City area. 2. Demonstrate the ability to implement a successful multi-objective project. 3. Integrate and unify a relationship between CALFED and the Comprehensive Study to attain CALFED Ecosystem Restoration Plan (ERP) goals and objectives. 4. Work with Federal and State government, local agencies, stakeholders, and the public in an iterative and consensus-building process. Specific objectives for this proposed study include identification of water and related land resources problems, concerns and opportunities, detailed evaluation of flood damage reduction alternatives and ecosystem restoration plans, development of an ecosystem restoration plan that will restore approximately 2600 acres and benefit ERP priorities for riparian and floodplain habitat, and development of a flood damage reduction and ecosystem restoration plan that is consistent with the goals and objectives of CALFED ERP, Sacramento River Conservation Area, The Nature Conservancy, and local stakeholders. The objectives also include identification of a locally-preferred plan, selection of a recommended plan based upon the most accurate technical and scientific data, and implementation of a process that demonstrates the integrated and cooperative efforts between CALFED and the Comprehensive Study. The expected product of this proposal will be a final Feasibility Report on the evaluation of levee alternatives and ecosystem restoration plans.

Through the planning process outlined for this study, this proposal will support the following CALFED ERP goals as identified in the Strategic Plan. These goals are: 1. Assessment and research to improve understanding of the ecological and physical processes affecting at-risk species (Goal 1: At-Risk Species). 2. Evaluation of the potential for restoring natural flow regimes and biological processes (Goal 2: Ecological Processes). 3. Improved understanding of floodplains as components in restoring habitats, physical processes, and species (Goal 4: Habitats). 4. Management of *Arundo donax*, *Tamarix* spp. and other non-native invasive weedy plant and animal species in upper Sacramento River tributaries (Goal 5: Non-native Invasive Species). The planning efforts involved in the Hamilton City proposal represent a major step forward in implementing multi-objective projects and truly integrating the efforts toward ecosystem restoration and flood damage reduction.

Proposal

The Reclamation Board

Hamilton City Ecosystem Restoration and Flood Damage Reduction

HAMILTON CITY ECOSYSTEM RESTORATION AND FLOOD DAMAGE REDUCTION

The Reclamation Board in Partnership
With the U.S. Corps of Engineers
July 19, 2002

A. Project Description: Project Goals and Scope of Work

1. Problem

Throughout the Sacramento River Valley societies needs for traditional protection projects, agriculture, urban development, hydropower development and firewood collection have destroyed approximately 95% of the historical riparian forests and associated aquatic habitats in the meander belt and on alluvial terraces. Two-thirds of the linear extent of the Sacramento River's banks have been modified and confined by levees. Riprap, and flood damage reduction projects. These factors have caused the Sacramento River to lose its ability to function in a natural manner, by overflowing its banks, connecting with its floodplain and sustaining ecological processes that drive changes in geomorphology and vegetation succession (Gregory et al. 1991, Baker and Walford 1995). Along the Sacramento River corridor near Hamilton City, only remnant riparian habitat exists in patches along the river and in the historic oxbow, and natural flooding patterns no longer occurs. In 1904 a levee was constructed along this portion of the Sacramento River by landowners to contain flows and protect the town of Hamilton. Although effective at separating the river from its floodplain under most conditions, Hamilton City, with a population of about 1,800 (1996), and surrounding agriculture lands are still in danger from peak flows in the Sacramento River. The existing levee does not meet U.S. Army Corps of Engineers (Corps) or any other levee construction standards. The existing levee is largely made of silty sand soils, which are subject to erosion at low velocities. Additionally, the levee is founded on highly degradable foundation soils. An extended duration of even moderately high flows against the existing foundation and levee could cause erosion and levee failure. When flows are sustained against the existing levee and foundation, levee the material essentially dissolves, causing the levee to fail, or break, as experienced in 1970, 1974 and in 1986. Fortunately, in 1986 and 1997, serious levee failure was prevented through flood fighting efforts. In 1995, 1997 and 1998, high flows overtopped the levee and severely damaged levee sections.

One of the priorities for the Ecosystem Restoration Plan (ERP) Stage1 implementation is the restoration of geomorphic processes in stream and riparian corridors, specifically the inclusion of feasibility studies to construct setback levees to restore and improve opportunities for floodplain inundation (CALFED 2001). The Hamilton City feasibility study provides a unique opportunity to investigate the integration of ecosystem restoration actions with flood damage reduction alternatives. This is why the Sacramento and San Joaquin Rivers Basins Comprehensive Study (Comp Study), Federal and State agencies working together with local government and stakeholders to develop a comprehensive plan to reduce flood damage and integrate ecosystem restoration identified the Hamilton City study as an initial project. This Hamilton City study proposal provides a unique opportunity to investigate the integration of ecosystem restoration actions with flood damage reduction alternatives. The study proposal will also address key uncertainties regarding the construction of levee alternatives for flood damage reduction and restoration of the floodplain. It is anticipated that this study will provide valuable data and

modeling tools for restoration of approximately 2600 acres of floodplain habitat in the area. The CALFED Bay-Delta Program and the Comp Study are directed by legal documents, such as the CALFED Record of Decision (CALFED ROD 2000) and Federal Water Resources Development Act (WRDA 2000), to integrate activities to the maximum extent possible. The Hamilton City feasibility study is an ideal process through which such integration and coordination can be implementable. Both programs have overlapping objectives and goals that would benefit from the integration. The coordination would also strengthen the relationship for future cooperative efforts in the Central Valley.

Project Location: The study area is located approximately 100 miles north of Sacramento and 10 miles west of Chico. Hamilton City lies less than 1 mile to the west of the Sacramento River. The study area is bound on the west by the Glenn-Colusa Irrigation Canal and on the east by the Sacramento River. An existing local levee runs along the west bank of the Sacramento River from the northern tip of the study area at River Mile 201 to just south of Dunning Slough, River Mile 194 (**Figure 1, pg 19**). The Reclamation Board, in partnership with the Corps and in coordination with Glenn County, the town of Hamilton, and stakeholders, propose this project to complete the Hamilton City feasibility study initiated by the Comp Study in March 2001. The Hamilton City feasibility study initiated by the Comp Study is approximately 30% complete. The remaining work includes detailed habitat benefit analysis of each levee modification alternative, completion of technical modeling and documentation, the environmental compliance documentation and process; and most critically, continuation of building consensus between local, State, Federal government, residents, and stakeholders regarding a preferred alternative.

Goals and Objectives: The goals of this proposed study are to:

- Complete a feasibility study for ecosystem restoration and flood damage reduction in the Hamilton City area
- Demonstrate the ability to implement a successful multi-objective project
- Integrate and unify a relationship between CALFED and the Comp Study to attain CALFED ERP goals and objectives
- Work with Federal and State government, local agencies, stakeholders and the public in an iterative and consensus-building process

Specific objectives for this proposed study include:

- Identification of water and related land resources problems, concerns and opportunities in the Hamilton area.
- Detailed evaluation of flood damage reduction alternatives and ecosystem restoration plans
- Development of an ecosystem restoration plan that will benefit ERP priorities for riparian and floodplain habitat
- Development of a flood damage reduction and ecosystem restoration plan that is consistent with the goals and objectives of CALFED ERP, Sacramento River Conservation Area Forum, The Nature Conservancy, and local stakeholders
- Identification of a locally preferred plan
- Selection of a recommended plan based upon the most accurate technical and scientific data
- Implementation of a process that demonstrates the integrated and cooperative efforts between CALFED and the Comprehensive Study

Hypothesis:

- The planning process for this feasibility study, which includes the coordinated efforts of Federal, State and local agencies, non-profit environmental organizations and the public, will result in a scientifically sound, publicly acceptable and implementable flood damage reduction and ecosystem restoration plan for the Hamilton City area.

2. Justification

The problems associated with the degrading local levee, its foundation, and the lack of connectivity between the river and the natural floodplain in the Hamilton City area, present a rare opportunity to develop a combined ecosystem restoration and flood damage reduction project. However, there are a number of key uncertainties regarding the evaluation of the levee alternatives, ecosystem restoration planning, implementation and cost of the project that would need to be identified and resolved prior to implementation of a pilot project or recommendation of a preferred plan. Key unknowns include:

1. Will realignment of the levee position and construction improve opportunities for ecosystem restoration while reducing flood damages to Hamilton City and the surrounding area?
2. If the levee needs to be re-aligned, what distance from the river and the city limits would provide the most benefit for the multi-objective project?
3. With the various levee alternatives being evaluated, which ecosystem restoration plan would be most effective in meeting the ERP and Comp Study goals for ecosystem restoration?
4. What are the costs associated with each alternative and will there be enough of a Federal interest to warrant Federal funding of 65% of the project cost?
5. Will the preferred alternative receive enough local support to be acceptable?

The proposed study, considered by CALFED as a research or monitoring project, will take the adaptive approach of the Corps planning process to test the hypothesis of this study and address the key uncertainties identified.

The Planning Process – Conceptual Model

The Corps planning process follows the six-step process as defined in their economic and environmental principals and guidelines. This process is a structured, but adaptive, approach to problem solving which provides a rational framework for sound decision-making. The steps are:

Step 1 - Identifying problems and opportunities
Step 2 - Inventorying and forecasting conditions
Step 3 - Formulating alternative plans
Step 4 - Evaluating alternative plans
Step 5 - Comparing alternative plans and Peer Review
Step 6 - Selecting a plan

A description of each step is presented in subsequent paragraphs. A graphical representation is displayed in **Figure 2, pg. 20.** The Corps decision-making process is generally based on the accomplishment and documentation of all of these steps. However, it is important to stress that this process can and will be adaptively managed to ensure that each step addresses the uncertainties. As more information is acquired and developed, it may be necessary to reiterate some of the previous steps to formulate efficient, effective, complete, and acceptable plans.

Step 1 - Identifying Problems and Opportunities. Proper identification of problems and opportunities is the foundation for initiating the planning process. Additional information on

flooding problems and habitat opportunities will help to identify current as well as future issues that need to be addressed in subsequent steps of the planning process. This will require public involvement, collaboration and coordination with numerous individuals and organizations. Meetings throughout the planning process will be used to maintain open channels of communication with the public and allow full consideration of public views, issues and information.

Step 2 – Inventory and Forecast. The second step of the planning process is to develop an inventory and forecast critical resources (physical, demographic, economic, social, etc.) relevant to the problems and opportunities under consideration in the planning area. Technical models will be used to further define and characterize these problems and opportunities. A quantitative and qualitative description of these resources will be made, for both current and future conditions, and will be used to define existing and future without-project conditions. The forecast of the future without-project condition reflects the conditions expected during the period of analysis. The future without-project condition provides the basis from which the impacts of alternative plans are assessed. Since impact assessment is the basis for plan evaluation, comparison and selection, clear definition, and full documentation of the without-project condition is essential. An inventory of historic and existing conditions information will be developed. Gathering information about potential future conditions requires forecasts, which will be made for selected years over the period of analysis to indicate how changes in economic and other conditions are likely to have an impact on problems and opportunities. Information gathering and forecasts will most likely continue throughout the planning process.

Step 3 - Formulation of Alternative Plans. Alternative plans will be formulated to identify specific ways to achieve planning goals and objectives, address the problems and opportunities identified, and test the key uncertainties. Each plan will consist of levee modifications and ecosystem restoration plans. A range of alternative plans will be identified at the beginning of the planning process, then screened and refined in identified at any time during the process. All plans will be in compliance with existing statutes, subsequent iterations throughout the planning process. Additional alternative plans may be administrative regulations, and common law or include proposals for changes as appropriate. Plans shall not be limited to those the Corps of Engineers could implement directly under current authorities. Plans that could be implemented under the authorities of other Federal agencies, State and local entities and non-government interests will also be considered.

Step 4 – Evaluating Alternative Plans. Evaluation of effects is a comparison of the with-project and without-project conditions for each alternative. Each alternative plan will be evaluated for its effectiveness in meeting ecosystem restoration and flood damage reduction goals. The ERP targets will be incorporated into the feasibility study planning efforts. Coordination efforts with CALFED ERP's regional coordinators will continue throughout the development of this study to ensure CALFED's ERP goals and objectives are integrated into the planning process and ultimately project design and construction. Uncertainties such as levee positioning and maximum benefit to the natural floodplain processes will be assessed. A list of additional criteria used in this step is identified in Section 5 of this proposal. Through an iterative process, the Hamilton City feasibility study will also use technical tools to evaluate alternative plans. The flow of information involves initial evaluation by the hydrologic models, which pass flow data to the hydraulic models, which in turn pass flow frequency information to flood damage assessment (FDA). This process is outlined in **Figure 3, pg. 21.**

Step 5 - Comparing Alternative Plans and Peer Review. In this step, plans are compared against each other, with emphasis on the outputs and effects that will have the most influence in the decision-making process. Beneficial and adverse effects of each plan are compared, including monetary and non-monetary benefits and costs. Identification and documentation of tradeoffs will be required to support the final recommendation. The effects include those identified during the evaluation phase and any other significant effects identified. The comparison step can be defined as a reiteration of the evaluation step, with the exception that in the comparison step plans are compared against each other and not against the without-project condition. The output of the comparison step will be a ranking of plans. There is also an institutional peer review process in place as part of the Corps planning process. To ensure that study assumptions, methodologies, procedures, data and findings are technically sound and appropriate for the level of study and complexity of issues, the Corps requires that an independent technical review team be created in parallel to the study team to review interim, draft and final study products. The peer review team will include experts from interdisciplinary fields and will include both Federal and State technical experts as well as outside experts to ensure adequate review.

Step 6 - Selecting a Plan. A single alternative plan will be selected for recommendation. The recommended plan must be shown to be preferable to taking no action (if no action is not recommended) or to implementing any of the other alternatives considered during the planning process. The culmination of the planning process is the selection of the recommended plan or the decision to take no action.

3. Approach

The Reclamation Board and the Corps are leading the Comp Study to improve flood management and integrate ecosystem restoration in the Sacramento and San Joaquin River Basins. The Hamilton City feasibility study includes all the steps identified in the conceptual model (Planning Process). It is one of the initial Comp Study projects for the Middle Sacramento Region to evaluate the existing levee stability and restore the natural functions and habitats of the Sacramento River floodplain. This project, in cooperation with Federal, State, local agencies and interested stakeholders, represents the next phase for completion of the 2001 Hamilton City feasibility study. A description of preliminary alternatives identified for evaluation in this study is included in **Attachment B.** The proposed planning process will build upon existing scientific knowledge and will support future efforts for flood damage reduction and ecosystem restoration projects. The approach and major tasks identified in this section will also be used to test the proposed study's hypothesis and provide valuable information regarding implementation of the multi-objective project.

Public Involvement. The public involvement task will be accomplished through a coordinated and collaborative process involving the Reclamation Board, the Department of Water Resources (DWR), the Corps, Glenn County, and stakeholders. This task will be specifically designed to obtain public input on ecosystem restoration and flood damage reduction issues and concerns. This task will consist of coordinating and developing the study scope, results, and solutions with the public; conducting public meetings/workshops; and responding to public inquiries. Public meetings include scoping meetings, workshops and as- needed meetings conducted throughout the duration of the study. In addition, a public meeting will be held at the completion of the draft alternatives report and after the draft feasibility report and EIR/EIS are distributed for public review. The Reclamation Board and the Corps will prepare the Notice of Initiation to initiate the feasibility study and Notice of Intent/Notice of Preparation to prepare an EIR/EIS; prepare

materials for public meetings; conduct the public meetings/workshops; prepare status reports to keep interested parties informed; provide necessary local, State, and Federal coordination; and compile and maintain mailing lists. The Reclamation Board and the Corps will also prepare the public involvement plan and document the public meetings. The Reclamation Board will arrange for obtaining a meeting place for all public meetings, inviting the public, and printing and distributing the announcements.

Social Studies. The social studies task will be performed by the Corps as part of the Environmental Studies effort. The social studies section will determine the social environment of the study area and determine the social effects that result from the nonstandard plan. A detailed report will include the applicable information generated during the public meetings/workshops.

Cultural Resources Studies. The Corps will perform the cultural resources task in accordance with Section 106 of the National Historic Preservation Act of 1966, as amended, 36-CFR 800 "Protection of Historic Properties," and Corps ER 1105-2-100. In consultation with the State Historic Preservation Officer (SHPO), the Corps will conduct sufficient archival and field surveys to identify cultural sites within the study's Area of Potential Effects, as defined by SHPO, and evaluate the eligibility of all cultural sites for the National Register of Historic Places. A detailed report will describe all cultural resources within the Area of Potential Effects and assess the effects of alternatives on these resources. The report will describe the range of additional future preservation or mitigation efforts, if required, and the associated costs of these efforts. An archeological survey of the Area of Potential Effects will be conducted. If necessary, a scope of work will be developed and a contract issued and administered for surveys. Coordination with the SHPO will be maintained.

Environmental Studies. Environmental studies will be performed primarily by the Reclamation Board and the Corps and will include the preparation of an EIR/EIS. The Corps will prepare the draft and final EIR/EIS and public notice. The EIR/EIS will evaluate the environmental effects and habitat restoration benefits associated with each alternative. The evaluation and results will be coordinated with Federal, State, and local governments and agencies, and interested groups and individuals. Study tasks include all activities required to comply with the National Environmental Protection Act (NEPA) and the California Environmental Quality Act (CEQA) including literature searches and review of reports and field surveys to establish baseline conditions; identification of future without-project conditions; determination of effects of the alternatives; analysis of mitigation needs, if necessary; coordination with the U.S. Fish and Wildlife Service (FWS) and Department of Fish and Game (DFG); review of in-house reports; response to comments; and support to the project manager and others during the study phase. An Ecosystem Functions Model (EFM) is also being developed to help evaluate how aquatic and terrestrial ecosystems are impacted by components of the Hamilton City proposal. The aquatic element of the EFM focuses its analysis on the seasonal inundation of floodplains and flood bypasses to evaluate potential impacts on the Sacramento split tail and Chinook Smolts. In addition, the aquatic element of the EFM identifies suitable overbank flows that will benefit floodplain spawning, rearing, foraging/migration, and avoidance of stranding, and predicts spatial changes in the extent of suitable floodplain habitat. The terrestrial element or the EFM focuses on the establishment and initial survival of riparian and wetland vegetation. It evaluates criteria for suitable flows and topography to promote seedling establishment and avoid post-establishment losses due to insufficient soil moisture and/or flood scouring.

Economic Studies. The Reclamation Board and the Corps will perform the economic studies task. The Corps' Economics Branch will assist the planner in (1) updating structural inventory data; (2) updating the depth-damage curves; (3) inputting the cost estimating values obtained from cost estimates; and (4) preparing a summary report for inclusion as an appendix in the feasibility study.

Cost Estimates. The Corps will perform the cost estimates which will be evaluated for implementing the project, including ecosystem restoration costs, monitoring, construction costs, easements, rights-of-way, disposal areas, engineering and design, and construction management. Detailed first and annual cost estimates, including an inspection plan, interest during construction, and replacement costs, would be developed for the recommended plan, in accordance with Engineering Circular (EC) 1110-2-538, Civil Works Projects Cost Estimates-Code of Accounts, and EC 110-2-263, Civil Works Project Construction Cost Estimating. A narrative Basis of Cost Estimate would be prepared and included as an appendix in the feasibility study.

Fish and Wildlife Studies. The Reclamation Board and the Corps, in coordination with staff from non-profit organizations and State and Federal agencies, will perform this task. The task includes environmental studies performed by FWS in cooperation with the Corps as required by the Fish and Wildlife Coordination Act.

Engineering/Design Studies. The Corps will make use of existing technical data collected and analyzed from other agencies and non-profit organizations, and perform additional engineering and design studies. The Reclamation Board and DWR may assist. Work will include hydraulic analysis, hydrology, surveying and mapping, soil design, geology, as well as any other necessary engineering and design studies. A Basis of Design will be completed by the Corps Engineering Division to determine engineering criteria necessary for the project.

Real Estate Studies. Although there will be no land acquisition action taken in this phase of the project, there have been preliminary discussions on land acquisition with landowners and an evaluation of the major study products will need to be prepared by the Corps Real Estate Division. The study will include identification of prime agricultural land, property appraisal, values within the study area, obtaining rights of entry for agents of the Federal government participation in Pre-Project Cooperation Agreement activity, preparation of a real estate supplement for inclusion in the feasibility study, preparation of a baseline cost estimate for real estate prepared in the code of accounts format, and preparation of a scope of work outlining real estate input.

Plan Formulation. The Corps will perform the plan formulation task in coordination with the Reclamation Board. The plan formulation task includes scoping the feasibility study, formulating alternatives, evaluating benefits/costs for each nonstandard alternative, identifying the selected plan, coordinating the technical study elements, and preparing the Feasibility Report document of study findings.

Draft and Final Report Preparation. Preparation of the draft and final report will be performed by the Reclamation Board and the Corps and will include collection and assembling of pertinent data for meeting CEQA and NEPA compliance; writing, editing, and word processing; preparing figures and plates; and reviewing, revising, reproducing, and responding to stakeholder requests for documentation; distributing the draft and final alternative reports which include technical appendices.

Technical Review/Quality Control/Quality Assurance. This task will be performed by the Corps interdisciplinary technical review team, which includes the DWR and the Reclamation Board. The technical reviewers will assess quality control, respond to comments, review monitoring data, and assess technical modifications. An independent technical review team made up of experts from Federal, State, and local agencies will also review the Feasibility Report and its findings at times during its development. The goal of this task is to resolve technical and policy level issues as they arise during the course of the feasibility study rather than identifying and resolving issues after the Feasibility Report has been prepared.

Project Management. This task will be conducted by the Reclamation Board and the Corps. The Comp Study project managers will ensure that all required tasks are performed to produce a high-quality Feasibility Report. The project managers will (1) maintain coordination with the multi-disciplinary teams to ensure effective and timely decision making, (2) monitor the scope and progress of study activities to keep the study within budget and on schedule, and (3) take necessary action to resolve potential problems with scope, schedule, cost, and funding. The Comp Study manager will also manage this project as it relates to the Comp Study and CALFED, which include monitoring funds and schedules; managing the project programming, project budget development, execution of congressional and legislative testimony, and preparation of quarterly reports to CALFED and provide presentations as necessary.

Criteria for Hypothesis Testing. In addition to completion of the tasks listed above, there are milestones throughout the planning process that will ensure a scientifically sound, publicly acceptable and implementable flood damage reduction and ecosystem restoration plan for Hamilton City. These milestones are included in the **Milestone table, pg. 22**.

4. Feasibility

The proposed study has addressed the following feasibility issues to demonstrate that the planning approach described in earlier sections is both feasible and appropriate.

Federal Interest. The proposed study has been analyzed to have a federal interest. This analysis included costs, benefits, environmental impacts, and an estimate of the costs of preparing a Feasibility Report. The analysis is used to determine whether or not planning to develop a project should proceed to the feasibility study. The analyses conducted shall be based on existing, readily available data and professional and technical judgment. The determination was positive that there will be a project with a federal interest and the feasibility phase of the study should proceed. This analysis demonstrates potential success of the study in determining a project that demonstrates a federal interest.

Public Outreach. In the past two years, several series of public workshops have been conducted throughout the state, and in the Chico area in particular. These workshops will continue, including a series scheduled for July-August 2002. In addition, the Comp Study public outreach team with staff support as needed will conduct workshops specifically for the Hamilton City project. The Comp Study mailing list is updated regularly and includes agencies, groups and individuals who are known to or thought to have an interest in the Hamilton City area.

Staff Availability. The Comp Study has identified the Hamilton City study as one of their initial projects and has dedicated a team of experts from the Corps and DWR to staff future efforts. The Comp Study is a long-term program that is anticipated to receive funding and resources for the next 30 years.

Permits. There are no permits required to conduct the Feasibility Study.

Land Use. All real estate rights-of-way have already been established for this proposal to conduct the necessary studies in the project area. Data collection does, however, require permission from Federal, State and private landowners to access property. Permission to access property for data collection has been obtained through the Corps Real Estate office from all property owners including the U.S. FWS, DFG, Nature Conservancy, and several local private landowners.

Previous Work. This study, to date, has preliminarily evaluated engineering designs and economic analysis for various levels of flood protection. The 2001 Hamilton City Feasibility Study has identified seven alternative solutions for flood damage reduction and ecosystem restoration and is in the process of completing the economic and engineering evaluations as well as the hydraulic and ecological modeling analysis for each preliminary alternative. In addition, habitat evaluation procedures have already been conducted and baseline conditions established.

Partnership. There has been extensive coordination by local residents for a number of years with the Corps and The Reclamation Board for a flood damage reduction project for this area. Coordination occurs often between the Corps, The Reclamation Board, the Hamilton City Community Services District, and the Nature Conservancy. The Hamilton City project has been regularly discussed at a series of focus group, Technical Advisory Committee, and Executive Committee meetings where coordination with various stakeholders involved in the Comprehensive Study occurs.

Time Frame. The proposed date of completion for the study is necessary due to the Water Resources Development Act (WRDA) 2004 timeline. This may appear as a tight schedule; however, considering that 30% of the work has already been accomplished, the remainder of the work to complete the study can be done with the proposed schedule.

Future Funding. The Hamilton City Feasibility Study is cost-shared 50-50 between the Corps and The Reclamation Board. Approval of this proposal would secure the funding necessary for completing the study. However, additional funds (65% federal, 35% non-federal) will be required for implementation of the project. Although the Comprehensive Study will request federal funding for implementation of this project in WRDA 2004, future project funding is dependent upon State and Federal annual appropriations.

5. Performance Measures

Performance measures are outputs that will be used to evaluate and rank the performance of the alternative plans against another. The following is a list and description of performance criteria.

- Completeness**.** Completeness is the extent to which an alternative plan includes all necessary actions to ensure the realization of the project goals and objectives.
- Effectiveness. Effectiveness is the extent to which an alternative plan accomplishes the identified project goals. The recommended plan must address both flood damage reduction and ecosystem restoration goals.

- Efficiency. Efficiency is a measure of the extent to which an alternative plan is the most cost-effective means of alleviating the identified problems while realizing project goals. One measure of efficiency is the comparison of monetary cost against project benefits. Another measurement of efficiency is how well a particular alternative reduces flood damages and restores the ecosystem in comparison to all other alternatives. The procedures for multiple purpose projects, described in Appendix E, Section IX of the Corps' ER 1105-2-100 (April 2000), will be used to evaluate efficiency. Consistent with this guidance, the recommended plan should be deemed 'best' when it produces the highest net National Economic Development (NED) plus National Ecosystem Restoration (NER) benefits/outputs and is strongly supported by the Corps and Reclamation Board.
- Acceptability. Acceptability is the workability and viability of an alternative plan to other Federal State and local agencies, and the public, given existing laws, regulations, and public policies. Each potential plan must be strongly supported by various interest groups. Plans that are not vigorously supported by a broad spectrum of interest groups will not be considered. Alternative plans that have low acceptability from stakeholders or government officials and/or have detrimental or redirected environmental or hydraulic impacts are ranked low. Plans that have widespread support and/or have no redirected impacts are ranked high.

6. Data Handling and Storage

The Comprehensive Study maintains a website at: <http://www.compstudy.org>. Any/all reports and appendices ready for public review will be available at this website. All technical data (including environmental, engineering, economic, geotechnical) collected for this study will be documented in appendices to the Feasibility Report or in office reports. All computer models (Synthetic hydrology, Reservoir operation models (HEC-5), geotechnical, hydraulic models (UNET, FLO-2D), Project Performance and Economics (FDA)) and written reports for the project will be archived by DWR and the Corps. Both agencies are located in Sacramento, California. All data will be made available to the public upon request, subject to National security concern due to 9/11.

7. Expected Products/Outcomes

1. Progress reports to CALFED. The Reclamation Board will provide CALFED with quarterly programmatic and financial reports, and annual reports that will include progress to date and monitoring results. Presentations to CALFED will also be provided if appropriate.
2. Final Feasibility Report. The Reclamation Board will provide CALFED with the final Feasibility Report on the evaluation of levee alternatives and ecosystem restoration plans. The report will specifically provide the feasibility-level analysis of the following:
   (1) Evaluation of alternative plans;
   (2) Selection of a preferred alternative plan
   (3) Public involvement;
   (4) Engineering design data;
   (5) Detailed economic data;
   (6) Compliance with environmental laws and regulations;
   (7) Real estate appraisal and acquisition plan; and
   (8) Detailed cost estimates.

8. Work Schedule

All project tasks fit into a 15-month timeline. The project tasks are considered a complete package. The study will begin as soon as the funding has been awarded and the contract approved.

Problems and Opportunities

- Task 1. Public Involvement
  - Conduct public meetings and workshops
  - Prepare mailing list for information notices
- Task 2. Project Management
  - Manage budget and schedule activities
  - Prepare and issue project requisition and commitments
  - Manage technical studies
  - Monitor study funds
- Task 3. Plan Formulation
  - Scope feasibility study
  - Formulate alternatives
  - Evaluate benefits/costs for each nonstandard alternative
  - Identify selected plan
  - Coordinate technical study elements
  - Prepare Feasibility Report document of study findings

1 Inventory and Forecast Condition using Technical Models

- Task 4. Social Studies
  - Conduct social environmental studies
  - Determine effects of alternatives
- Task 5. Cultural Resources
  - Perform cultural field survey
  - Perform evaluation for National Register
  - Prepare cultural resources report
- Task 6. Environmental Studies
  - Prepare EIR/EIS
  - Conduct baseline studies
  - Determine environmental effects of alternatives
  - Develop mitigation requirements, if necessary
  - Coordinate with FWS for Biological Assessment
  - Coordinate with FWS for preparation of the Coordination Act Report
  - Prepare draft EIR/EIS
  - Submit draft for public review
  - Respond to comments
  - Write final EIR/EIS
- Task 7. Economics Studies
  - Update inventory of floodplain
  - Prepare economics report
- Task 8. Real Estate Studies
  - Obtain rights-of-entry
  - Prepare preliminary real estate cost estimates
  - Prepare Real Estate Supplement

- Á Continuation of Task 1. (Project Management)
- Á Continuation of Task 2. (Public Involvement)
- Á Continuation of Task 3. (Plan Formulation)

3. Formulate Alternative Plans

- Á Task 9. Engineering and Design Studies
  - Hydraulic Analysis
  - Hydrology Update
  - Surveying
  - Soil Design
  - Design
- Á Task 10. Cost Estimates
  - Prepare nonstructural cost estimate for the alternatives
  - Prepare narrative basis of estimate report
- Á Task 11. Fish & Wildlife Studies
  - Coordinate with, The Nature Conservancy (TNC), DFG and USFWS
  - Design project features, restoration plan, and construction considerations
  - Conduct hydraulic analysis for habitat restoration and flood damage reduction
- Á Continuation of Task 1. (Project Management)
- Á Continuation of Task 2. (Public Involvement)
- Á Continuation of Task 3. (Plan Formulation)

4. Evaluate and Screen Alternative Plans

- Á Continuation of Task 1. (Project Management)
- Á Continuation of Task 2. (Public Involvement)
- Á Continuation of Task 3. (Plan Formulation)

5. Compare Plans and Peer Review

- Á Task 13. Draft and Final Report Preparation
  - Prepare draft Feasibility Report
  - Submit draft report for review
  - Respond to comments
  - Write final Feasibility Report
- Á Task 14. Technical Review/Quality Control/Quality Assurance for Draft Report
  - Review draft and final Feasibility Report
- Á Continuation of Task 1. (Project Management)
- Á Continuation Task 2. (Public Involvement)
- Á Continuation Task 3. (Plan Formulation)

6. Select Recommended Plan

For Schedule See Table 1, pg 23.

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

1. ERP, Science Program, and CVPIA Priorities

Completion of the feasibility study outlined in this proposal will advance several CALFED and CVPIA goals. Subsequent implementation of the final plan has the potential to further advance those goals and others. Detailed analysis and assessment of the habitat restoration alternatives in the project area will support the following CALFED ERP goals as identified in the Strategic Plan.

- Assessment and research to improve understanding of the ecological and physical processes affecting at-risk species (Goal 1 At-Risk Species).
- Evaluation of the potential for restoring natural flow regimes and biological processes (Goal 2 Ecological Processes).
- Improved understanding of floodplains as components in restoring habitats, physical processes, and species (Goal 4 Habitats).
- Management of *Arundo donax, Tamarix* spp. and other non-native invasive weedy plant and animal species in upper Sacramento River tributaries (Goal 5 Non-native Invasive Species).

The importance of undertaking fluviogeomorphic-ecological studies before making large investments in restoration projects is recognized in the CALFED Strategic Plan (pg. 68), and by the parties involved in the feasibility study. The ERP Implementation Plan Stage 1A Actions (Action 7) identifies for the Sacramento River meander corridor the need to, "Continue studies and demonstration projects which address potential changes in hydrology and geomorphology, local economic impacts, and other issues associated with ongoing riparian restoration work." Through this project, constraints and opportunities involved in undertaking floodplain restoration through alteration of levees on a large scale will be identified. Economic and other impacts will be analyzed, and this information will be available to interested parties and others working with similar issues. The Strategic Plan specifically identifies the need for CALFED and the agencies conducting the Comprehensive Study to partner on projects to, "fully integrate river and floodplain ecological restoration with flood management measures" (pg. 69). The project at Hamilton City currently represents the best opportunity to fully develop this partnership. The project has a high likelihood of identifying real ecological and flood management benefits, has strong local involvement and support, and has much of the work already completed. In addition, the ERP Strategic Plan Stage 1 Actions (Action 2, pg. D-17) states, "In conjunction with the USACE and Reclamation Board Comprehensive Study, evaluate the feasibility of setting back levees on the Sacramento River between Chico Landing and Verona." This project will resolve uncertainties likely to be similar throughout this portion of the river, and will develop protocols enabling easier repetition at future sites. A completed feasibility study will lay the groundwork for initiation of a restoration and flood management project. The project area has sufficient high flows to inundate floodplain surfaces and strong possibility of completing easement acquisitions from willing sellers for future successful restoration actions. Implementation of recommended measures are likely to help achieve the following CALFED Goals and Objectives.

- ERP Goal 2 Ecological Processes, Objective 6 - Reestablish floodplain inundation and *channel-floodplain connectivity* of sufficient frequency, timing, duration and magnitude to support the restoration and maintenance of functional natural floodplain, riparian, and riverine habitats.
- ERP Goal 2 Ecological Processes, Objective 8 - Increase the *extent of freely meandering reaches* and other pre-1850 river channel forms to support the restoration and maintenance of functional natural riverine, riparian and floodplain habitats.

- ERP Goal 4 Habitats, Objective 2 - Restore *large expanses of all major aquatic, wetland, and riparian habitats, and sufficient connectivity among habitats*, in the Central Valley and its rivers to support recovery and restoration of native species and biotic communities and rehabilitation of ecological processes. These habitats include riparian and shaded riverine aquatic, instream, fresh emergent wetlands, seasonal wetlands, other floodplain habitats, lacustrine, and other freshwater fish habitats.

Evaluation of the floodplain restoration actions in the study area will meet five restoration priorities in the Sacramento Region, as described in the ERP Stage 1 PSP Priorities (CALFED 2002).

- Á Alternatives for this riparian restoration project will result in continued protection and restoration of stream meander corridors between Red Bluff and Colusa along the Sacramento River (priority SR-1). This project specifically meets the objective listed under this priority for riparian habitat and channel meander. The PSP states, "Projects for riparian habitat restoration should focus on continued protection and restoration of stream meander corridors between Red Bluff and Colusa along the Sacramento River including continued coordination with DWR/Corps Comprehensive Study actions. … Efforts should be designed and sized to provide multiple ecosystem benefits, including habitat for at-risk fish species, insects, reptiles and amphibians, riparian mammals, and migratory songbirds in the riparian zone (Strategic Goal 1 At-Risk Species, Strategic Goal 4 Riparian Habitat)."
- Á The Ecological Functions Model will assist in evaluation of whether or not fish stranding may occur under different proposed alternatives. Project design will be implemented to avoid fish stranding based on these results (priority SR-2
- Á A baseline hydrologic assessment has been made of this section of the Sacramento River to implement a strategy of adaptive assessment and management (priority SR-3).
- Á A floodplain management plan, including a feasibility study for construction of setback levees construction, will be developed to improve floodplain inundation on a seasonal basis (priority SR-4).
- Á Adaptive assessment and management is a key element of the comprehensive plan. Conceptual model development, as an integral element of adaptive assessment, will include both hydrologic analysis and ecological functions model evaluation (priority SR-7).

In addition, this project proposal is consistent with CALFED's Multi Species Conservation Strategy (MSCS), which includes identifying species goals ("Recovery", "contribute to recovery", or "maintain") for each of the 244 evaluated species as well as conservation measures to achieve the goals. An initial evaluation of the special status species of the upper Sacramento River indicates that 30 species evaluated by CALFED may be in the project area. The proposed study is a critical component of the long-term restoration efforts in the Hamilton City area by addressing the uncertainties of restoration with flood damage reduction alternatives. In addition, this proposal will provide additional data and modeling tools for assessing and implementing other planning efforts for floodplain restoration in the Central Valley. Detailed analysis and assessment of the habitat restoration actions in the Hamilton area (Sacramento Corridor) will support several goals identified in the Strategic Plan. These goals are: 1. Conducting assessment and research to improve understanding of the ecological and physical processes affecting at-risk

species (Goal 1 At Risk Species). 2. Evaluating the potential for restoring natural flow regimes and biological processes (Goal 2 Ecosystem Processes). 3. Improving our understanding of floodplains as components in restoring habitats, physical processes, and species (Goal 4 Habitats). 4. Manage *Arundo donax*, *Tamarix* spp. and other non-native invasive weedy plant and animal species in upper Sacramento River tributaries (Goal 5). Evaluation of the floodplain restoration actions in the study area will meet five restoration priorities in the Sacramento Region, as described in the ERP Stage 1. PSP Priorities (CALFED 2002).

- Alternatives for this riparian restoration project will result in continued protection and restoration of stream meander corridors between Red Bluff and Colusa along the Sacramento River (priority 1).
- The Ecological Functions Model will assist in evaluation of whether or not fish stranding may occur under different proposed alternatives. Project design will be implemented to avoid fish stranding based on these results (priority 2).
- A baseline hydrologic assessment has been made of this section of the Sacramento River to implement a strategy of adaptive assessment and management (priority 3).
- A floodplain management plan, including a feasibility study for construction of setback levees construction, will be developed to improve floodplain inundation on a seasonal basis (priority 4).
- Adaptive assessment and management is a key element of the comprehensive plan. Conceptual model development, as an integral element of adaptive assessment, will include both hydrologic analysis and ecological functions model evaluation (priority 7).

In addition, this project proposal is consistent with CALFED's Multi Species Conservation Strategy (MSCS), which includes identifying species goals ("Recovery", "contribute to recovery", or "maintain") for each of the 244 evaluated species as well as conservation measures to achieve the goals. An initial evaluation of the special status species of the upper Sacramento River indicates that 30 species evaluated by CALFED may be in the project area.

2. Relationship to Other Ecosystem Restoration Projects

This study proposal builds upon ongoing restoration activities in the area and provides a number of coordination benefits. This coordination accomplishes the following: (1) allows for an avoidance of duplication of efforts and a collaboration on efforts with other agencies where appropriate; (2) contributes to the definition of the existing conditions with and without project conditions; (3) identifies where work is taking place and helps ensure consistency with CALFED and the Comprehensive Study; and (4) helps identify recent restoration and flood damage reduction trends. Ongoing restoration activities in the area include:

<u>Studies</u>

- **Sacramento River National Wildlife Refuge.** USFWS land acquisition (more than 10,000 acres) and habitat restoration program along the Sacramento River between Colusa and Ord Bend.
- **The Nature Conservancy.** Land Acquisition (498 acres) and habitat restoration of the Westermann property adjacent to Hamilton City on the Sacramento River.

- **The Nature Conservancy, Hamilton City Landscape scale analysis.** Analysis of some key physical attributes of parcels in Hamilton City area previously acquired for conservation.
- **The Nature Conservancy, Flood plain reconnection/limited channel meander investigation.** Two-dimensional hydraulic and hydrologic modeling to (1) evaluate the potential flood damage reduction and ecosystem restoration benefits of a setback levee somewhere southwest of the existing levee, and (2) potentially remove the private levees within and around the USFWS Pine Creek Unit.
- **The Nature Conservancy. Riparian recruitment pilot study.** TNC, in partnership with DWR, has initiated a pilot project to evaluate the current status of cottonwood recruitment with respect to the current, altered flow regime of the Sacramento River.
- **The Nature Conservancy. Integrating floodplain management.** Various ongoing studies will be integrated at the subreach scale to develop an integrated approach to floodplain management in this area.
- **The Nature Conservancy. Restoration/Planning proposal.** TNC has submitted a restoration/planning proposal the to CVPIA Anadromous Fish Restoration Program.

Projects

- **The Nature Conservancy, Sacramento River Project.**
- **Sacramento River Flood Plain Acquisition and Monitoring.**
- **Chico Landing to Red Bluff Project.**

3. Next-Phase Funding

The intent of this project proposal is to continue the Hamilton City feasibility study initiated by the Comprehensive Study. The summary of the existing feasibility study status and next phase funding is provided in the budget justification form. This is not a request for next phase funding.

4. Previous Recipients of CALFED Program or CVPIA Funding

To date, the Comprehensive Study, including the Reclamation Board and Corps, have not been awarded any CALFED or CVPIA grants for the Hamilton City feasibility study.

5. System-Wide Ecosystem Benefits

This project proposal provides system-wide benefits for restoration and floodplain management that will impact the Central Valley and resource management state-wide. One of the most important long-term benefits is the Reclamation Board and the Corps' future work with stakeholders, public agencies and non-profit organizations to implement multi-objective projects for flood protection and ecosystem restoration. Four programmatic phases comprise the Hamilton City proposal synergistic approach to flood damage reduction and ecosystem restoration:

1. Cooperative integrative floodplain management planning;
2. Habitat restoration and baseline assessment;
3. Horticultural and process restoration planning; and
4. Ecosystem response planning with monitoring and research.

This framework furthers the goals of the following programs: Central Valley Project Improvement Act, Central Valley Habitat Joint Venture, Sacramento River National Wildlife Refuge, Department of Fish and Game's Sacramento River Wildlife Area, California Riparian

Habitat Conservation Program, Riparian Habitat Joint Venture (Partners in Flight), and the Comprehensive Study. This planning study offers substantial system wide ecosystem benefits. By assessing both horticultural and natural-process restoration in an adaptive management framework, these collective efforts are successfully reducing the uncertainty of restoring the viability of native species and the proliferation and adverse impacts of non-native invasive species. Specifically, the planning effort to establish a continuous riparian corridor along the Sacramento River will improve the health of local wildlife populations by promoting the recolonization of areas where local extirpations have taken place. Several taxa, including the state threatened yellow-billed cuckoo and the federally threatened Valley Elderberry Longhorn Beetle, have colonized and successfully bred on restoration tracts in the area. The ecological benefits of future restoration activities extend far beyond the reaches of the project area. For many species, the main stem of the Sacramento River is a migratory pathway. By making the habitat in this region more supportive of migratory species, this project will bolster breeding and wintering populations in areas physically removed, but ecologically linked to the Sacramento River. Examples include the habitat benefits to neotropical migratory birds and anadromous fish. Improvements in water quality as a result of restoration efforts have positive impacts down the Sacramento River into the Bay-Delta. The Hamilton City project remains popular with the local community. Land ownership and project development by TNC adds professional expertise to the planning, implementation and adaptive management and monitoring process.

C. Qualifications

The Reclamation Board will be partnering efforts with the Corps and coordinating closely with environmental organizations (**Table 2, pgs 24-25**. The Reclamation Board is a State agency whose mission is to control flooding along the Sacramento and San Joaquin Rivers and their tributaries in cooperation with the U.S. Army Corps of Engineers, cooperate with various agencies of the Federal, State and local governments in establishing, planning, constructing, operating, and maintaining flood damage reduction works, and maintaining the integrity of the existing flood control system and designated floodways through the Board's regulatory authority by issuing permits for encroachments (The Reclamation Board. 2002. Mission Statement). For this project, the Reclamation Board will be using DWR's expert technical staff to manage, coordinate, and assist in the flood damage reduction and ecosystem restoration investigations. The U.S. Army Corps of Engineers (USACE) mission is to provide quality, responsive engineering services to the Army and the nation. The Corps plans, designs, builds, and operates water resources and other civil works projects; manages engineering, construction and real estate programs for the U.S. Army and Air Force; provides design, construction management, and real estate support, other federal agencies and foreign governments; supervises research and development in support of its programs; manages and executes Army installation support programs; and manages and executes civil works programs to develop and maintain capability to mobilize in response to national security emergencies, domestic emergencies, and emergency water planning programs. The Comprehensive Study has a State/Federal combined team dedicated to working on initial projects like the Hamilton City Feasibility Study.

D. Cost

1. Budget

The total cost to finish the feasibility study is approximately $840,000. Funds requested from CALFED for this proposal total **$420,000.** Please see the budget forms for details.

2. Cost Sharing

The cost share of the study is 50% federal and 50% non-federal. The cost share of the project will be 65% federal and 35% non-federal.

E. Local Involvement

This project has been closely coordinated with the Hamilton City Community Services District, Glenn County, and other local stakeholders. This planning study includes a detailed outreach plan to ascertain and include the local opinions and issues. Included in **Attachment A** are letters of support from Glenn County and Sacramento River Conservation Area Forum.

G. Literature Cited

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Figure 1. Project Proposal Study Area

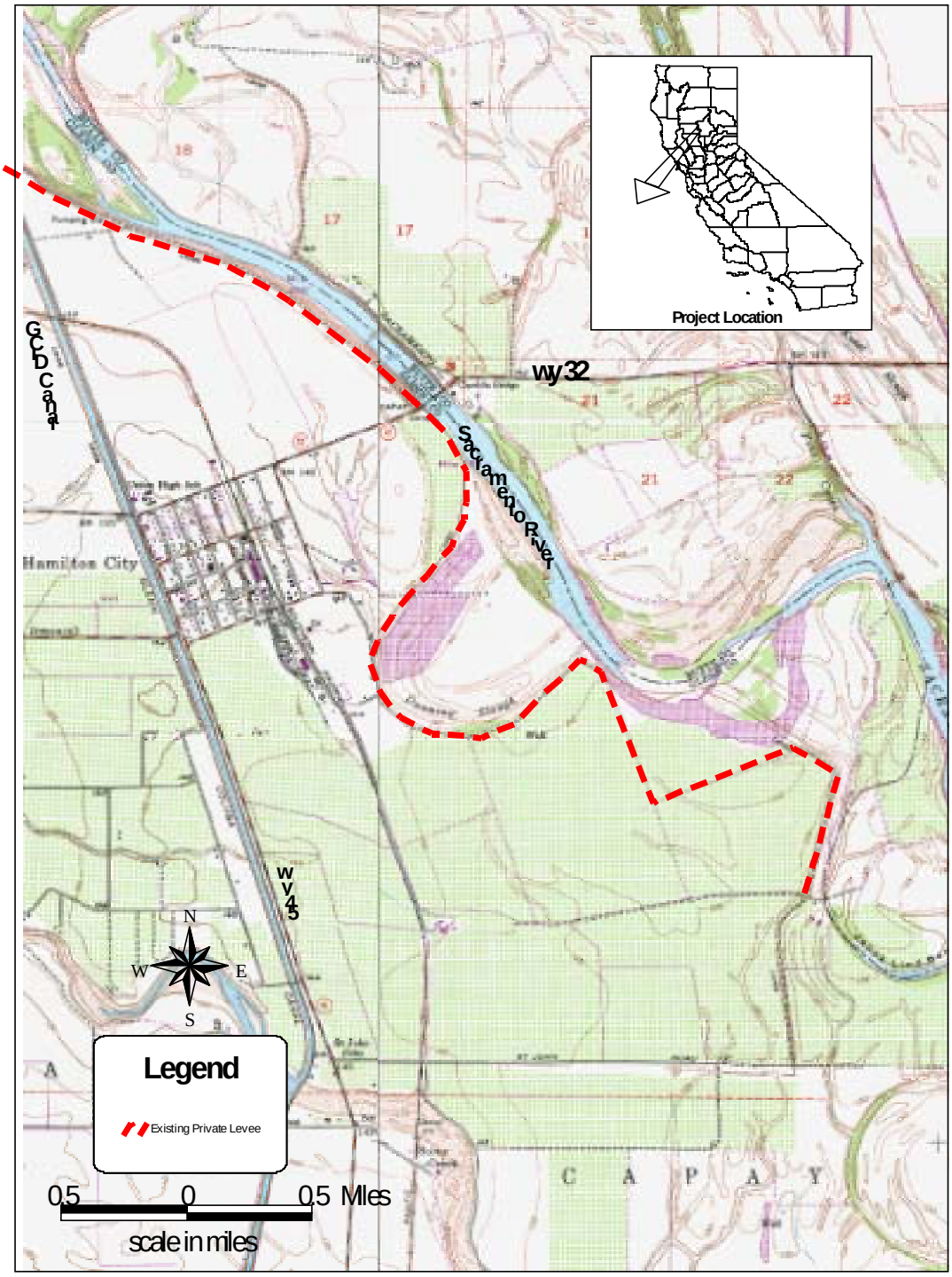


Figure 2-Planning Process

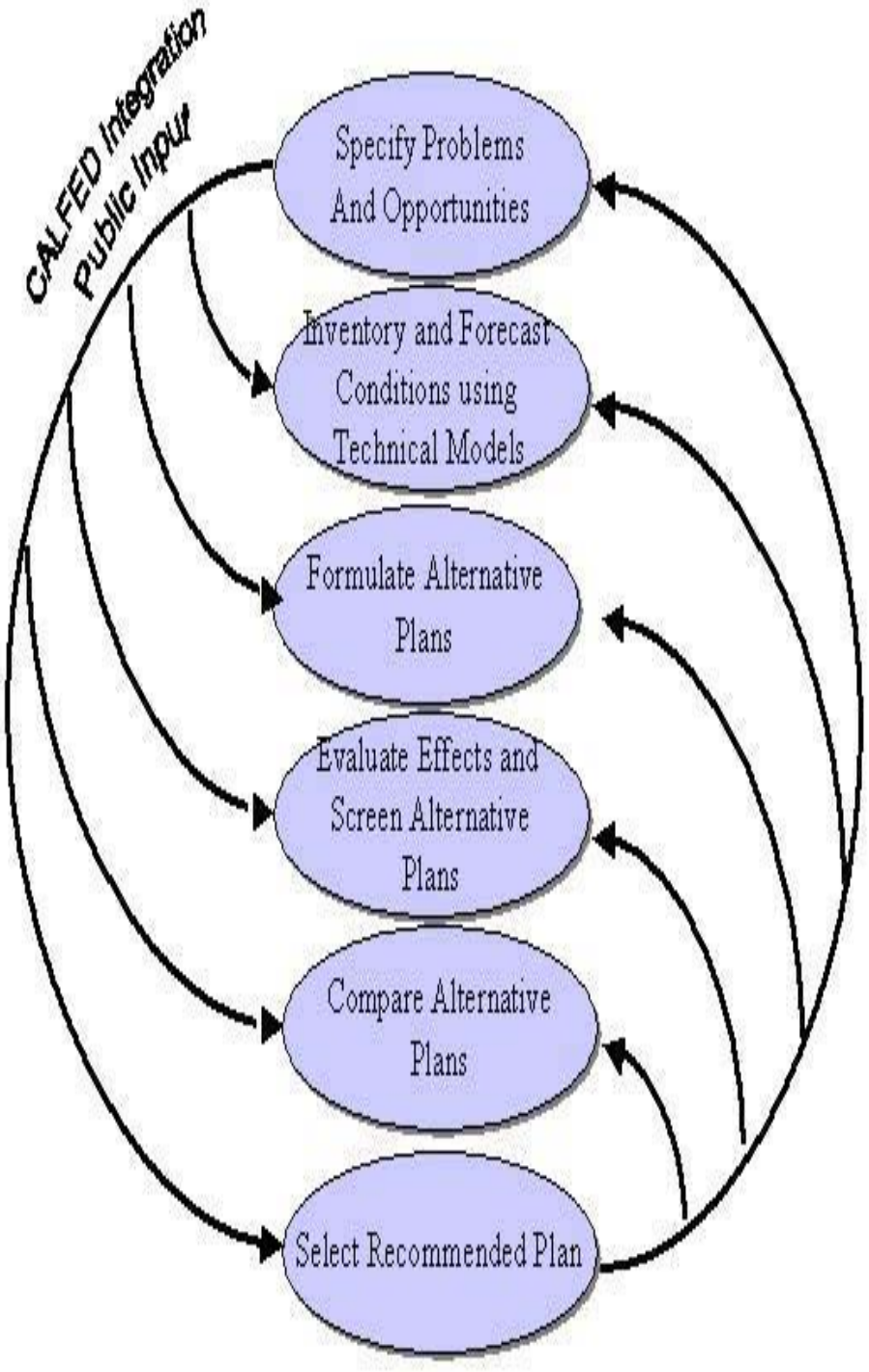
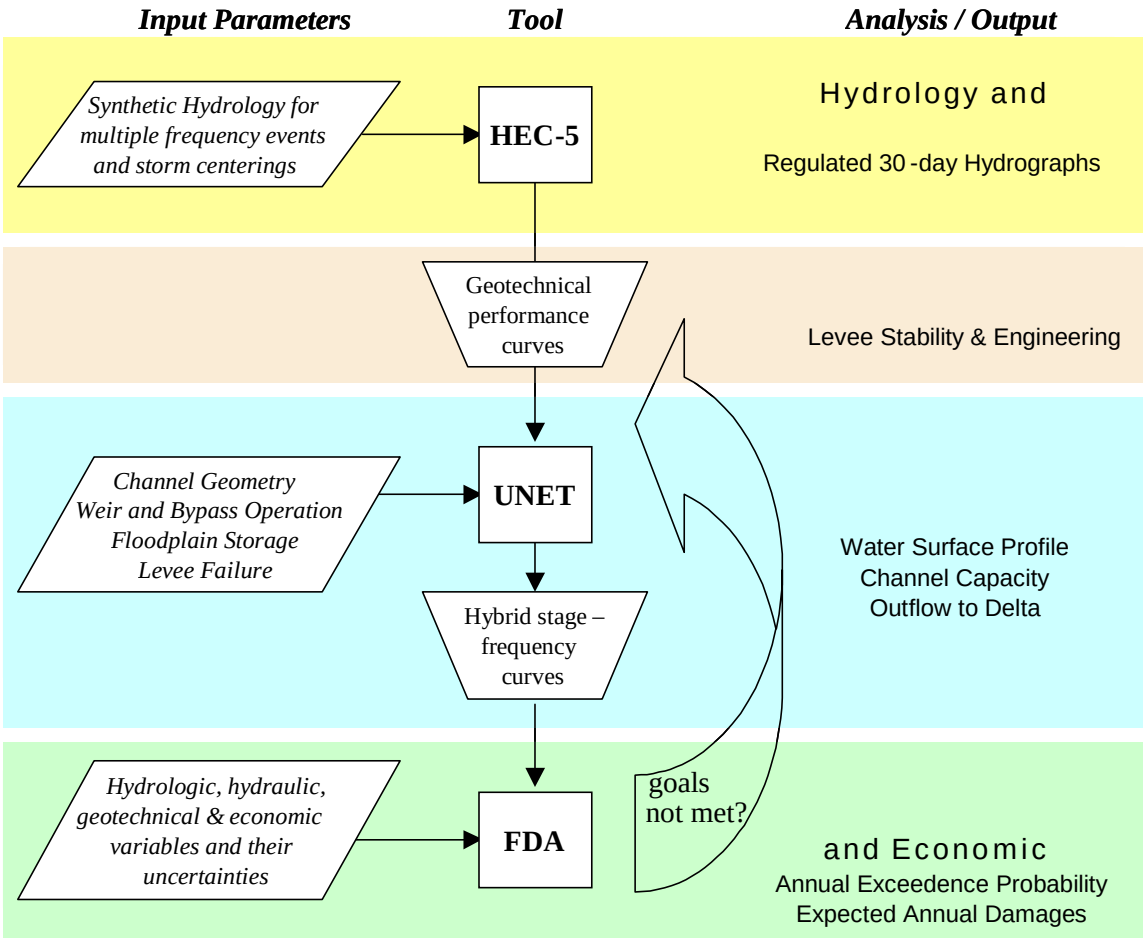


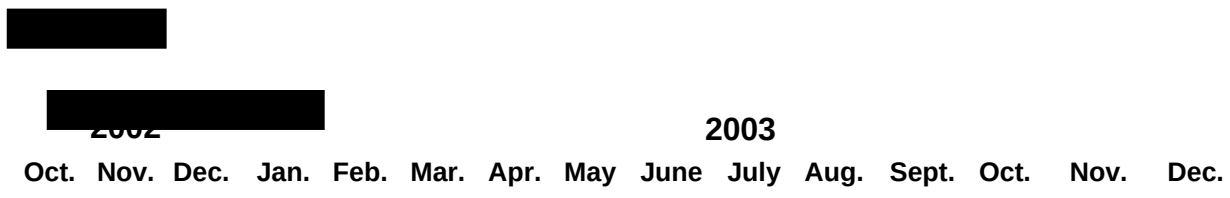
Figure 3 – Flow of Information Between Technical Tools



Milestone Table

Milestone F1	Initiate Study	0	0
Milestone F2	Public Workshop/Scoping	1	4
Milestone F3	Feasibility Scoping Meeting	3	6
Milestone F4	Alternative Review Conference	4	12
Milestone F4A	Alternative Formulation Briefing	2	14
Milestone F5	Draft Feasibility Report	2	14
Milestone F6	Final Public Meeting	1	15
Milestone F7	Feasibility Review Conference	1	17
Milestone F8	Final Report	1	18
Milestone F9	Public Notice	2	20
-	Chief's Report	3	23
-	Project Authorization	5	28

Table 1. Schedule of Activities



Step	Description
1	Problems and Oportunities
2	Inventoryand Forcast Condition using Technical Models
3	Formulate Alternative Plans
4	Evaluate and Screen Alternative Plans
5	Compare Plans and Peer Review
6	Select Recommended Plan

Table 2. - Hamilton City Comprehensive Study Team

Name	Affiliation	Function
Alicia Kirchner	USACE	Planner
Erin Taylor	USACE	Environmental Manager
Gary Lemon	DWR	Project Engineer
Annalena Bronson	DWR	Environmental (CEQA)
Edward Flint	USACE	Geotechnical Engineer
Donald Twiss	USACE	Hydraulic Engineer
Kurt Keilman	USACE	Economist
Dan Mrva	USACE	Real Estate Appraisals
Dan Fodrini	USACE	Real Estate
Judy Fong	USACE	Real Estate Planning
Rod Bradley	USACE	Real Estate Cadastral
Jane Bolton	USACE	Geotechnical Engineer
Cherie Johnston - Waldear	USACE	Cultural Resources
Kim Emerick	USACE	Environmental (HTRW)
Jennifer Bain	USFWS	Environmental

Table 2. (Cont'd) Comprehensive Study Inter Agency Coordination Team

Name	Affiliation	Function
Patricia Fernandez	CALFED	Input/Review
Mathew Reischman	CV Water Control Board	Input/Review
Nick Burmas	CALTRANS	Input/Review
Steve Shaffer	CDFA	Input/Review
Chris Adams	OES	Input/Review
Dale Pierce	USFWS	Input/Review
Pete Rabbon	Reclamation Board	Input/Review
Dwight Sanders	State Lands Commission	Input/Review
Karen Schwinn	EPA	Input/Review
Michael Hoover	USFWS	Input/Review
Shirley Witalis	NMFS	Input/Review
Rosalie del Rosario	NMFS	Input/Review
Walter Sykes	NRCS	Input/Review
Rick Heimes	USGS	Input/Review
John Jordan	BOR	Input/Review
Allan Oto	USBR	Input/Review
Rich Dixon	CA DFG	Input/Review
Becky Miller	CA DFG	Input/Review
David Schaub	CA Parks and Recreation	Input/Review
David Johnson	CA Boating and Waterways	Input/Review
Tim Ramirez	The Resources Agency	Input/Review
Stein Buer	DWR	Input/Review
Jerrett Gianelli	USACE	Input/Review
Rod Mayer	The Reclamation Board	Input/Review

omprehensive Study Executive Committee

Name	Affiliation	Function
Wayne Nastri	U.S.EPA	Direction/Review
Steve Thompson	USFWS	Direction/Review
Mike Aceituno	NMFS	Direction/Review
Henry Wyman	NRCS	Direction/Review
Mike Pool	U.S. Bureau of Land Mgmt.	Direction/Review
John Buffington	USGS	Direction/Review
William J. Lyons	CA Dept. Food and Ag	Direction/Review
Kirk C. Rodgers	USBR	Direction/Review
Mr. Bradley E. Powell	USFS	Direction/Review
Robert C. Hight	CA DFG	Direction/Review
Patrick Wright	CALFED	Direction/Review
Dallas Jones	OES	Direction/Review
Ruth Coleman	CA Parks and Rec.	Direction/Review
Raynor Tsuneyoshi	CA Boating and Waterways	Direction/Review
Paul Thayer	CA Lands Commission	Direction/Review
Mary Nichols	The Resources Agency	Direction/Review
Tom Hannigan	DWR	Direction/Review

ATTACHMENT B - ALTERNATIVE PLANS

The management measures that were retained in the Hamilton City feasibility study for consideration in development of a preliminary array of alternatives are:

- Strengthen existing private levee to pertinent Federal project levee standards
- Remove existing bank protection
- Restore riparian and upland habitat
- Construct new levee along new alignment to widen floodway
- Remove or degrade existing levee to reconnect river to flood plain
- Flood proof by raising structures
- Relocate structures
- Conserve flood compatible agriculture within the flood plain

Strengthening the existing private levee (first measure) would negate the need for construction of a new levee along a new alignment (fourth measure), rendering these two measures uncombinable. Any alternative developed would need to include one or the other of these two measures. Therefore, one of these measure, when used in an alternative, would be considered the primary feature of that alternative. The remaining measures are all combinable with these two measures.

The No-Action and two basic structural alternatives were developed from these measures in sufficient detail to determine the likelihood of cost-effectiveness of each. One alternative focuses on enlarging existing conveyance of the Sacramento River by constructing a new levee along a new alignment further back from the river than the existing private levee. The second alternative focuses on improving the existing conveyance of the river by strengthening the existing levee to pertinent Federal project levee standards. A few variations of both of these alternatives were then developed in order to address local concerns, particularly minimizing affects to the existing sewer treatment facility. The alternatives considered are believed adequate to cover the likely array of options favorable to The Reclamation Board and the Hamilton City Community Service District. These alternatives are described in the following section.

Description of Alternatives

No-Action Alternative. Under this alternative, no future action would be taken by the Federal Government to help reduce the chance of flooding in the Hamilton City. No future action would be taken by the Federal Government to restore native habit along the Sacramento River for the benefit of species. The Sacramento River would continue to convey flows as described in the without-project condition. It was assumed that future population trends, land use, and related urban growth in the study area would continue generally as described in the current General Plan for Glenn County. The study area would continue to be affected by damageable floods for events greater than the one in 30-year event. The town would continue to require developers to flood proof future development within the FEMA 100-year flood plain. The average annual equivalent flood damages are expected to reach about $411,000. The No-Action Alternative serves as the basis against which the adverse affects and benefits of the action plans are evaluated.

Features. There would be no construction and/or restoration efforts, other than existing or currently planned programs to restore native habitat of the Sacramento River. Programs such as the Sacramento River Conservation Area, CVPIA, and CALFED Bay-Delta would continue to support habitat and river meander projects by organizations like TNC in other areas along the Sacramento River.

Accomplishments. The existing private levee provides 5 percent chance of passing the 100-year frequency event. Under the No-Action Alternative, this condition would not would be improved. Native habitat would continue to be sparse and of low value. Agriculture land would continue to provide some foraging habitat, but there would continue to be little associated nesting habitat.

Residual Risk. With this alternative, the community would remain at risk from flooding above the 10-year event and would be at risk of levee failure below the 10-year event. Losses to real property, threats to public health and safety, evacuation of the population, and contamination from hazardous and toxic substances from flooding would be expected.

Effects. The No-Action Alternative would result in continued flood damages and in a continuing, gradual decline of native habitat and associated species.

Operation and Maintenance. No operation and maintenance would be required above and beyond current practices.

Costs. No implementation costs are associated with this alternative. Maintenance of the existing private levee is periodic; in recent years, the private landowner spent $120,000. In 2000, Glenn County provided $70,000 to place revetment along a portion of the existing private levee to protect it for the following flood season.

Alternative 1a – Maximum Expansion of Floodway.

Features. This alternative would widen the existing floodway by constructing about 2.8 miles of new levee. The levee would protect the town from flooding at a 100-year frequency event and ecosystem restoration would be undertaken waterside of the new levee to the Sacramento River to the southern end of the project area. Plate 2 shows major components of Alternative 1a.

The new levee alignment would begin north of the town, just northeast of the intersection of the railroad and the GCID. From there, it would follow a southeasterly alignment, just east of the railroad alignment and it would continue southeast to the point where the railroad intersects

Highway 32 (5,500 feet - 1.04 miles). The portion of Highway 45 north of the intersection of the railroad to the top of the existing private levee (about 3,400 feet) would be exposed to some flows and may need to have bank protection to mitigate for any hydraulic impact. The levee would then veer east just north of Highway 32 for about 1,000 feet (.20 mile) before heading southeastward for along high ground just east of Hamilton City for about 3,000 feet (.59 mile). This area is currently under development for residential housing. The levee would connect to the existing private levee along the northwestern edge of Dunning Slough and then veer west for about 3,300 feet (.6 mile), concluding at Highway 45 at the southwest corner of Hamilton City. The average height of the new levee would be 7.2 feet. The average area would be 274 square feet. Total material would be 141,000 cubic yards. An initial source of borrow material for the new levee may be the degraded portions of the existing private levee; an additional source of borrow is being identified and to be cost-effective, should be within about a 10-mile radius.

As depicted in Plate 2, the new levee would connect (be built into) Highway 45 (feature A); would intersect Highway 32 via a ramp or a stop log (feature B); would intersect the UPRR south of town via a stop log (feature D); and would taper into Highway 45 (feature E). The existing community storm drain outfall channel would be piped through the new levee (feature C). The sewer treatment facility would be relocated from its current location to the west side of the GCID to protect it from flooding and to allow for restoration of the entire Dunning Slough area.

The existing private levee would be degraded by cutting notches into it to connect the land waterside of the new levee with the Sacramento River. A portion of Highway 32 would have to be raised to avoid flooding resulting from degradation of the existing private levee. Potential bank protection may be required on the east side of the GCID to protect it from flows.

Ecosystem restoration would be accomplished on about 2,630 acres. The area waterside of the new levee and north of Dunning Slough is about 530 acres. This area could be restored with up to about 115 acres of riparian habitat and about 415 acres of mixed riparian and oak woodland habitat. It may prove to be more locally acceptable to continue these lands in orchards; if so, consideration would be given to converting to flood and ecosystem compatible agriculture. The remaining 2,100 acres for ecosystem restoration consists of the entire area bound by Dunning Slough, as well as a corridor south that parallels the Sacramento River. This area could be restored with up to about 700 acres of riparian habitat and about 1,400 acres of mixed riparian and oak woodland habitat.

Real Estate. Real estate requirements for this alternative would consist of either purchasing lands in fee title or purchasing levee easements. Lands for ecosystem restoration would be purchased in fee title. Preliminary estimates indicate that about $2 million in real estate interest would be required.

Accomplishment. This alternative would increase the chance of passing a 100-year frequency event from 5 percent to 90 percent. The flood control system reliability would be improved. The new levee would be part of the Federal project levee system and as such would be eligible for emergency repair under Public Law 84-99. 460 acres would be protected by the levee. This alternative would restore about 2,630 acres of native habitat and the entire historic oxbow.

Residual Risk. There would be a 53 percent chance of flooding from a 200-year frequency event. This alternative increases the flood way more than the other action alternatives and is generally considered by locals to bring the river too close to the community for public health and safety.

Costs and Benefits. The estimated first cost of constructing this alternative is approximately $25 million. Annual benefits from inundation reduction are estimated to be about $250,000. Ecosystem benefits are being developed.

Alternative 1b – Moderate Expansion of Floodway.

Features. This alternative would widen the existing floodway by constructing about 3.28 miles of new levee. This levee would protect the town from flooding at a 100-year frequency event and ecosystem restoration would be undertaken waterside of the new levee to the Sacramento River to the southern end of our project area. Plate 3 shows major components of Alternative 1b.

The new levee alignment would begin north of town, halfway between the existing private levee and the UPRR intersection with Canal Road and the GCID. The portion of Highway 45 north of the intersection of the railroad to the top of the existing private levee would be exposed to some flows and may need to have bank protection to mitigate for any hydraulic impact. From there, it would follow a southeasterly alignment, 7,925 feet (1.5 miles), angling towards Highway 32. After intersecting Highway 32, the levee would continue straight towards Dunning Slough about 3,000 feet (.59 mile). This area is currently under development for residential housing. The levee would connect to the existing private levee along the northwestern edge of Dunning Slough and then veer west, concluding at Highway 45 southwest of Hamilton City. The average height of the new levee would be 10 feet. The average area would be 450 square feet. Total material would be 290,300 cubic yards. The initial source of borrow material for the new levee may be the existing local existing private levee. An additional source of borrow is being identified and to be cost-effective, should be within about a 10-mile radius.

As depicted in Plate 3, the new levee would connect (be built into) Highway 45 (feature A); would intersect Highway 32 via a ramp or a stop log (feature B); would intersect the UPRR south of town via a stop log (feature D); and would taper into Highway 45 (feature E). The existing community storm drain outfall channel would be piped through the new levee (feature C). The sewer treatment facility would be relocated from its current location to a point landside of the new levee to allow for restoration of the entire Dunning Slough area.
The existing private levee would be degraded by cutting notches into it to connect the land waterside of the new levee with the Sacramento River. A portion of Highway 32 would have to be raised to avoid flooding resulting from degradation of the existing private levee. Potential bank protection may be required on the east side of the GCID to protect it from flows.

Ecosystem restoration would be accomplished on about 2,440 acres. The area waterside of the new levee and north of Dunning Slough is about 340 acres. This area could be restored with up to about 115 acres of riparian habitat and about 225 acres of mixed riparian and oak woodland habitat. It may prove to be more locally acceptable to continue these lands in orchards; if so, consideration would be given to converting to flood and ecosystem compatible agriculture. The remaining 2,100 acres for ecosystem restoration consists of the entire area bound by Dunning

Slough, as well as a corridor south that parallels the Sacramento River. This area could be restored with up to about 700 acres of riparian habitat and about 1,400 acres of mixed riparian and oak woodland habitat.

Real Estate. Real estate requirements for this alternative would consist of either purchasing lands in fee title or purchasing levee easements. Lands for ecosystem restoration would be purchased in fee title. Preliminary estimates indicate that about $7.5 million in real estate interests would be required.

Accomplishment. This alternative would increase the chance of passing a 100-year frequency event from 5 percent to 90 percent. The flood control system reliability would be improved. The new levee would be part of the Federal project levee system and as such would be eligible for emergency repair under Public Law 84-99. 950 acres would be protected by the levee. This alternative would restore about 2,440 acres of native habitat and the entire historic oxbow.

Residual Risk. There would be a 53 percent chance of flooding from a 200-year frequency event. This alternative increases the flood way more than the other action alternatives and is generally considered by locals to bring the river too close to the community for public health and safety.

Costs and Benefits. The estimated first cost of constructing this alternative is approximately $22 million. Annual benefits from inundation reduction are estimated to be about $280,000. Ecosystem benefits are being developed.

Alternative 1c – Minimum Expansion of Floodway

Features. This alternative would slightly widen the existing floodway by constructing about 4 miles of new levee. This levee would protect the town from flooding at a 100-year frequency event and ecosystem restoration would be undertaken waterside of the new levee to the Sacramento River to the southern end of the project area. Plate 4 shows major components of Alternative 1c.

The new levee alignment would begin north of town where the existing private levee begins. The new levee would be set back westward from the existing private levee by about 200 feet and would essentially parallel the existing private levee alignment to the northeast end of Dunning Slough. The levee would then cut through Dunning Slough, around the existing sewer treatment facility, toward the southwest and continue westward. The new levee would continue west back to the GCIC. Total length of the new levee would be about 20,000 feet (4 miles). The average height of the new levee would be 9.1 feet. The initial source of borrow material for the new levee may be the existing private levee. An additional source of borrow is being identified and to be cost-effective, should be within about a 10-mile radius.

As depicted in Plate 4, the new levee would connect (be built into) Highway 45 (feature A; would connect to Highway 32 via a ramp (feature B); would intersect the UPRR south of town via a stop log (feature C); and would taper into Highway 45 (feature D).

The existing private levee would be degraded by cutting notches into it to connect the land waterside of the new levee with the Sacramento River. A portion of Highway 32 would have to be raised to avoid flooding resulting from degradation of the existing private levee. Potential bank protection may be required on the east side of the GCID to protect it from flows. Potential levee strengthening along the existing levee on the east side of the river is also shown on the map in figure V-4.

Ecosystem restoration would be accomplished on about 2,054 acres. The area waterside of the new levee and north of Dunning Slough is about 54 acres. This area could be restored with some combination mixed riparian habitat. The remaining 2,000 acres for ecosystem restoration consists of the portion of the area bound by Dunning Slough that would be waterside of the new levee, as well as a corridor south that parallels the Sacramento River. This area could be restored with up to about 700 acres of riparian habitat and about 1,300 acres of mixed riparian and oak woodland habitat.

Real Estate. Real estate requirements for this alternative would consist of either purchasing lands in fee title or purchasing levee easements. Lands for ecosystem restoration would be purchased in fee title. Preliminary estimates indicate real estate requirements would be similar to Alternative 1b.

Accomplishment. This alternative would increase the chance of passing a 100-year frequency event from 5 percent to 90 percent. The flood control system reliability would be improved. The new levee would be part of the Federal project levee system and as such would be eligible for emergency repair under Public Law 84-99. 1,280 acres would be protected by the levee. This alternative would restore about 2,054 acres of native habitat and the entire historic oxbow.

Residual Risk. There would be a 53 percent chance of flooding from a 200-year frequency event. This alternative increases the flood way more than the other action alternatives and is generally considered by locals to bring the river too close to the community for public health and safety.

Costs and Benefits. The estimated first cost of constructing this alternative is approximately $10 million. Annual benefits from inundation reduction are estimated to be about $280,000. Ecosystem benefits are being developed.

Alternative 2a – Levee Strengthening (Including Partial Oxbow Restoration).

Features. This alternative would improve the existing floodway by strengthening about 4 miles of existing private levee to pertinent Federal/State project levee standards. This levee would protect the town from flooding at a 100-year frequency event and ecosystem restoration would be undertaken to the southeast of the strengthened levee. Plate 5 shows major components of Alternative 2a.

Levee strengthening would begin north of town at the top of the existing private levee and would continue to the northeast end of Dunning Slough. This levee would likely require a waterside berm and/or revetment to protect it from erosion to ensure project performance. A new levee would then cut through Dunning Slough, around the existing sewer treatment facility, toward the southwest and continue westward back to Highway 45. Total length of the new levee would be about 20,000 feet (4 miles). The average height of the new levee would be 9.1 feet. The initial source of borrow material for the new levee may be the existing private levee. An additional source of borrow is being identified and to be cost-effective, should be within about a 10-mile radius.

As depicted in Plate 5, the strengthened levee would connect (be built into) Highway 45 (feature A); would connect to Highway 32 (feature B); would intersect the UPRR south of town via a stop log (feature C); and would taper into Highway 45 (feature D). Potential levee strengthening along the existing levee on the east side of the river may also be required.

Ecosystem restoration would be accomplished on about 2,000 acres. This area consists of the portion of the area bound by Dunning Slough that would be waterside of the new levee, as well as a corridor south that parallels the Sacramento River. This area could be restored with up to about 700 acres of riparian habitat and about 1,300 acres of mixed riparian and oak woodland.

Real Estate. Real estate requirements for this alternative would consist of either purchasing lands in fee title or purchasing levee easements. Lands for ecosystem restoration would be purchased in fee title. Preliminary estimates indicate that real estate requirements would be similar to Alternative 1b.

Accomplishment. This alternative would increase the chance of passing a 100-year frequency event from 5 percent to 90 percent. The flood control system reliability would be improved. The new levee would be part of the Federal project levee system and as such would be eligible for emergency repair under Public Law 84-99. 1,418 acres would be protected by the levee. This alternative would restore about 2,000 acres of native habitat and the entire historic oxbow.

Residual Risk. There would be a 53 percent chance of flooding from a 200-year frequency event. This alternative increases the flood way more than the other action alternatives and is generally considered by locals to bring the river too close to the community for public health and safety.

Costs and Benefits. The estimated first cost of constructing this alternative is approximately $10 million. Annual benefits from inundation reduction are estimated to be about $280,000. Ecosystem benefits are being developed.

Alternative 2b – Levee Strengthening (Including Entire Oxbow Restoration).

Features. This alternative would improve the existing floodway by strengthening about 4 miles of existing private levee to pertinent Federal/State project levee standards. This levee would protect the town from flooding at a 100-year frequency event and ecosystem restoration would be undertaken to the southeast of the strengthened levee. Plate 6 shows major components of Alternative 2b.

Levee strengthening would begin north of town at the top of the existing private levee and would continue to the northeast end of Dunning Slough. This levee would likely require a waterside berm and/or revetment to protect it from erosion and ensure project performance. Levee strengthening would continue around Dunning Slough to a point on the west side of the sough, where a new levee would continue westward back to Highway 45. Total length of the new levee would be about 20,000 feet (4 miles). The average height of the new levee would be 9.1 feet. The initial source of borrow material for the new levee may be the existing private levee. An additional source of borrow is being identified and to be cost-effective, should be within about a 10-mile radius.

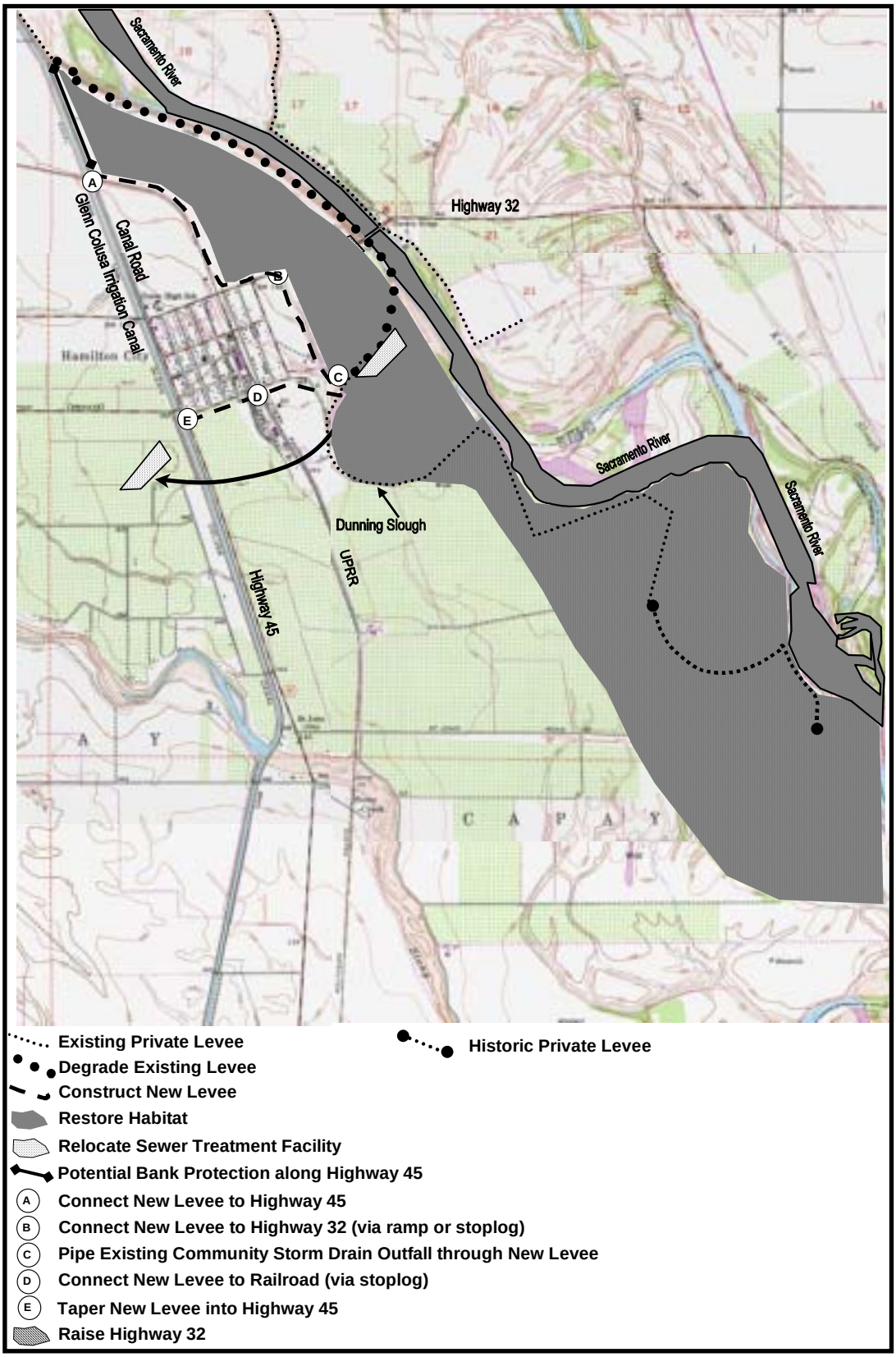
Ecosystem restoration would be accomplished on about 2,100 acres. This area would consist of the entire area bound by Dunning Slough, as well as a corridor south that parallels the Sacramento River. This area could be restored with up to about 700 acres of riparian habitat and about 1,400 acres of mixed riparian and oak woodland habitat.

Real Estate. Real estate requirements for this alternative would consist of either purchasing lands in fee title or purchasing levee easements. Lands for ecosystem restoration would be purchased in fee title. Preliminary estimates indicate that real estate requirements would be similar to Alternative 1b.

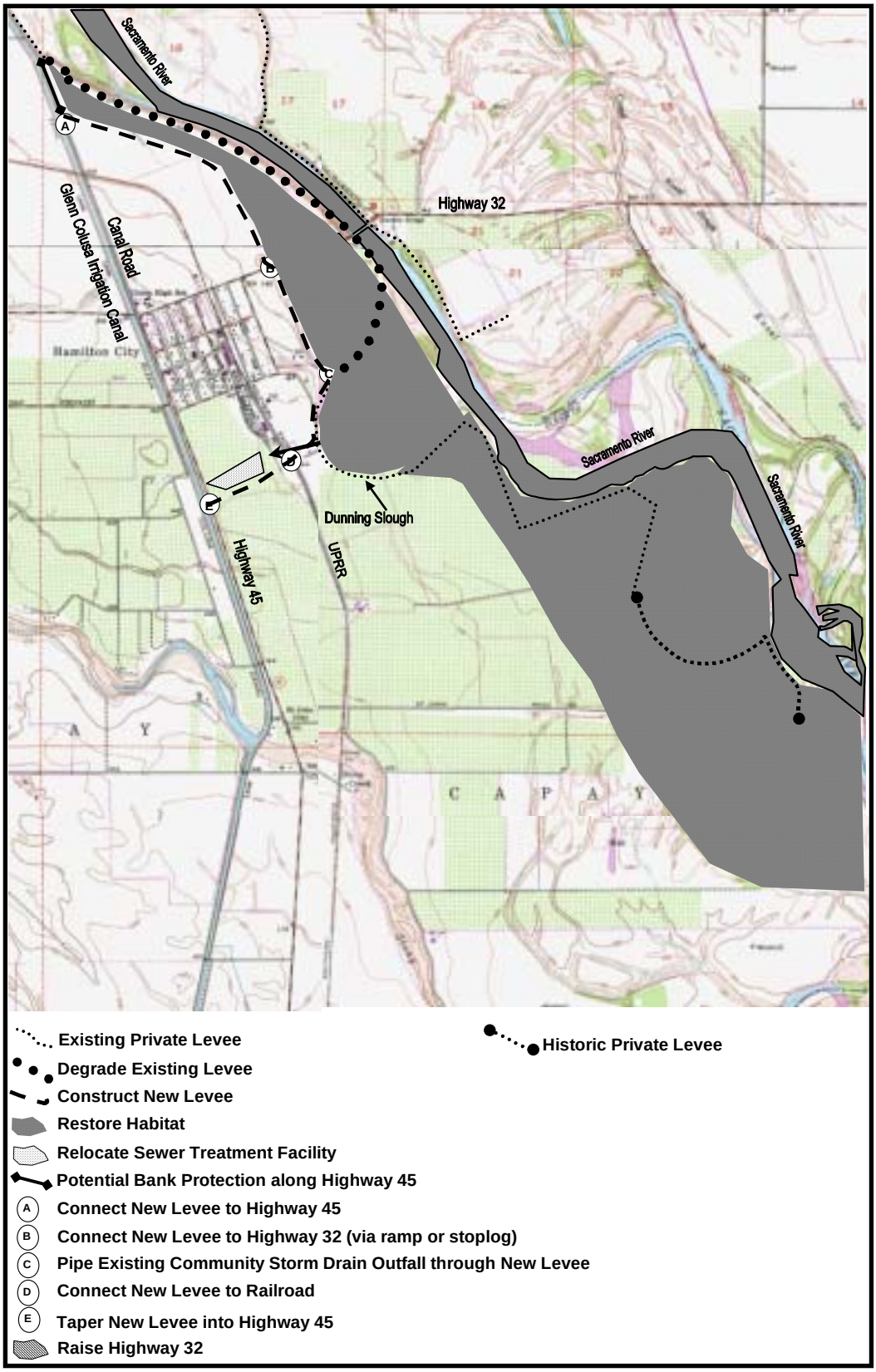
Accomplishment. This alternative would increase the chance of passing a 100-year frequency event from 5 percent to 90 percent. The flood control system reliability would be improved. The new levee would be part of the Federal project levee system and as such would be eligible for emergency repair under Public Law 84-99. 1,339 acres would be protected by the levee. This alternative would restore about 2,100 acres of native habitat and the entire historic oxbow.

Residual Risk. There would be a 53 percent chance of flooding from a 200-year frequency event. This alternative increases the flood way more than the other action alternatives and is generally considered by locals to bring the river too close to the community for public health and safety.

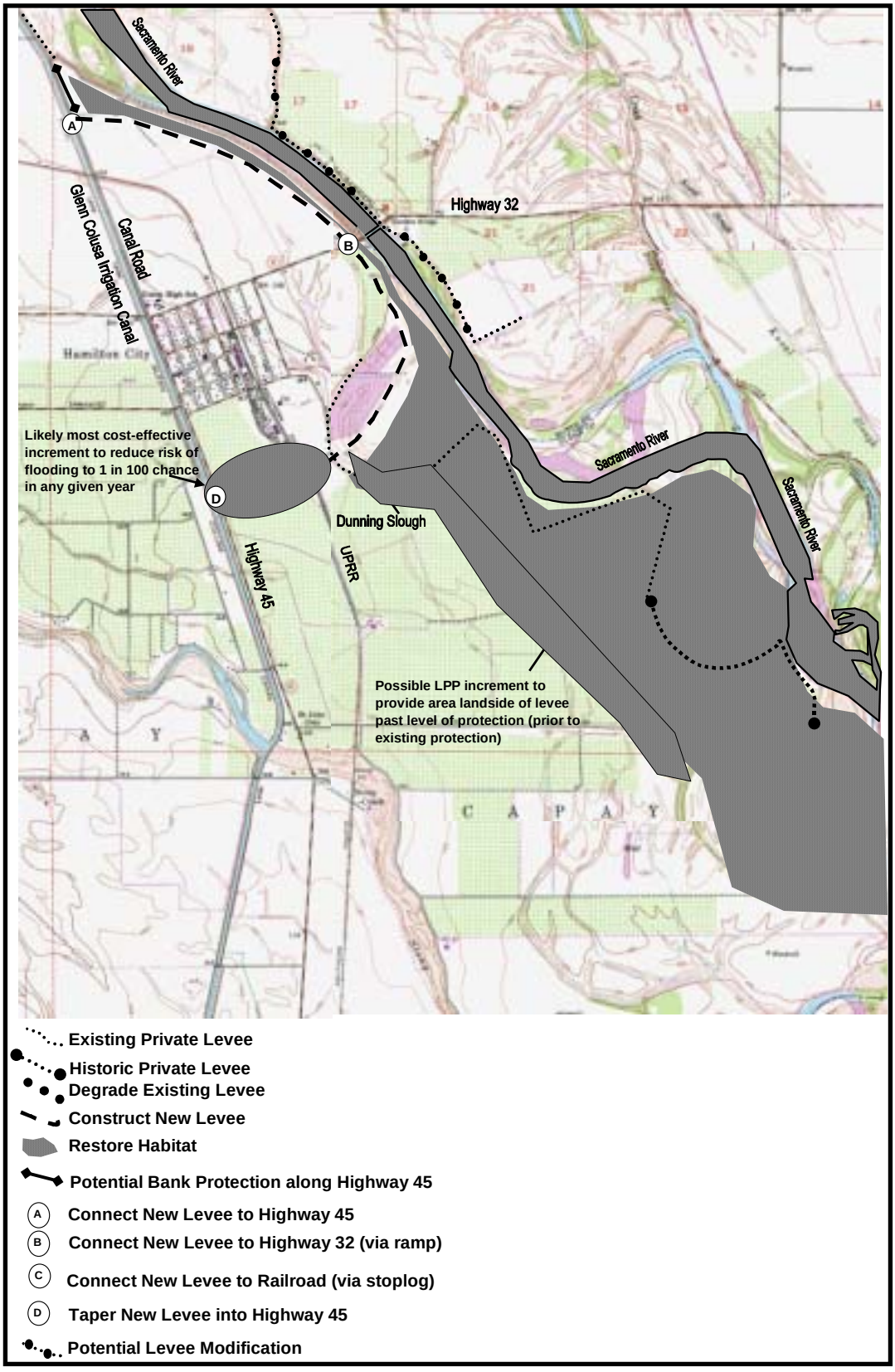
Costs and Benefits. The estimated first cost of constructing this alternative is approximately $17 million. Annual benefits from inundation reduction are estimated to be about $280,000. Ecosystem benefits are being developed.



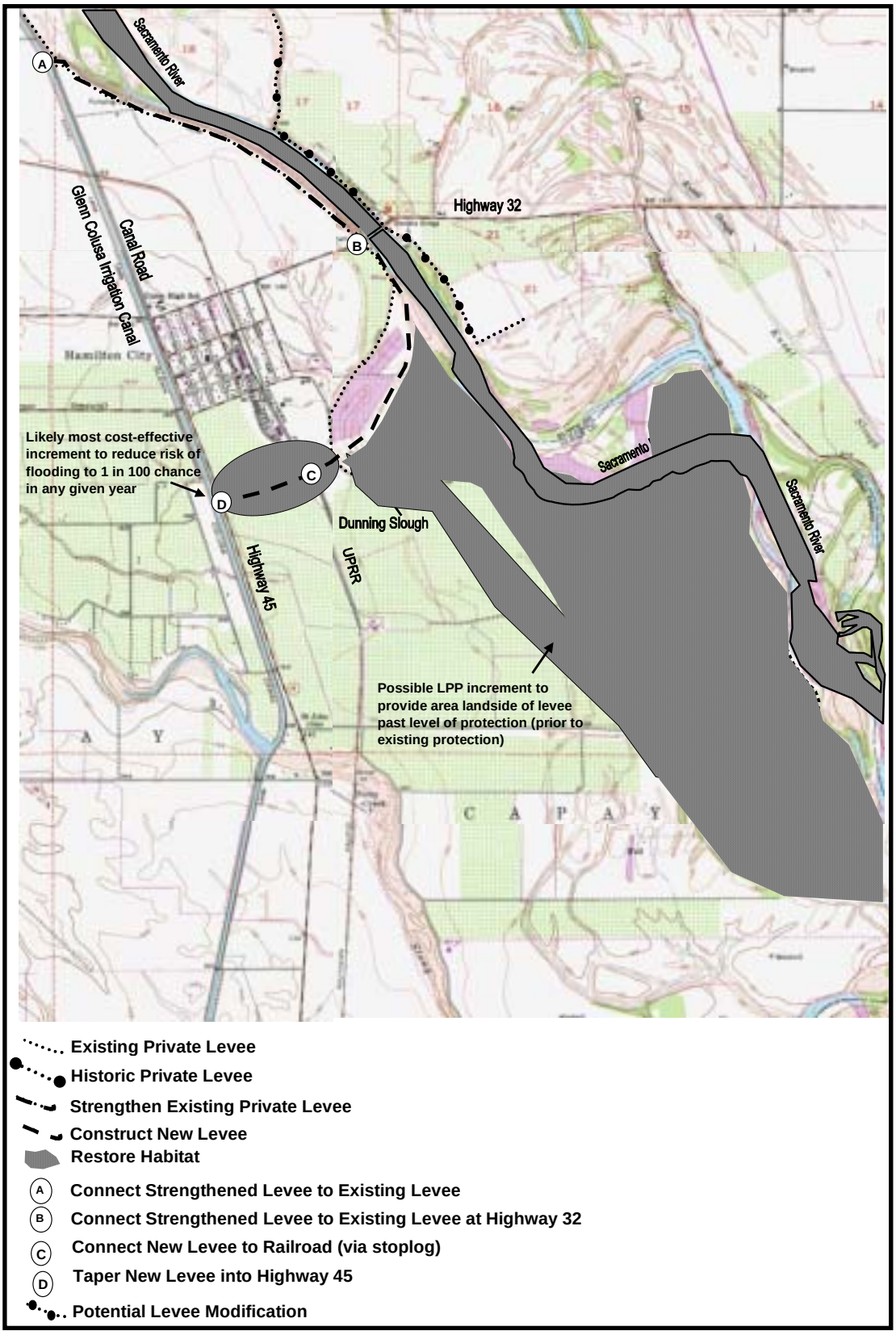
Preliminary Alternative 1a



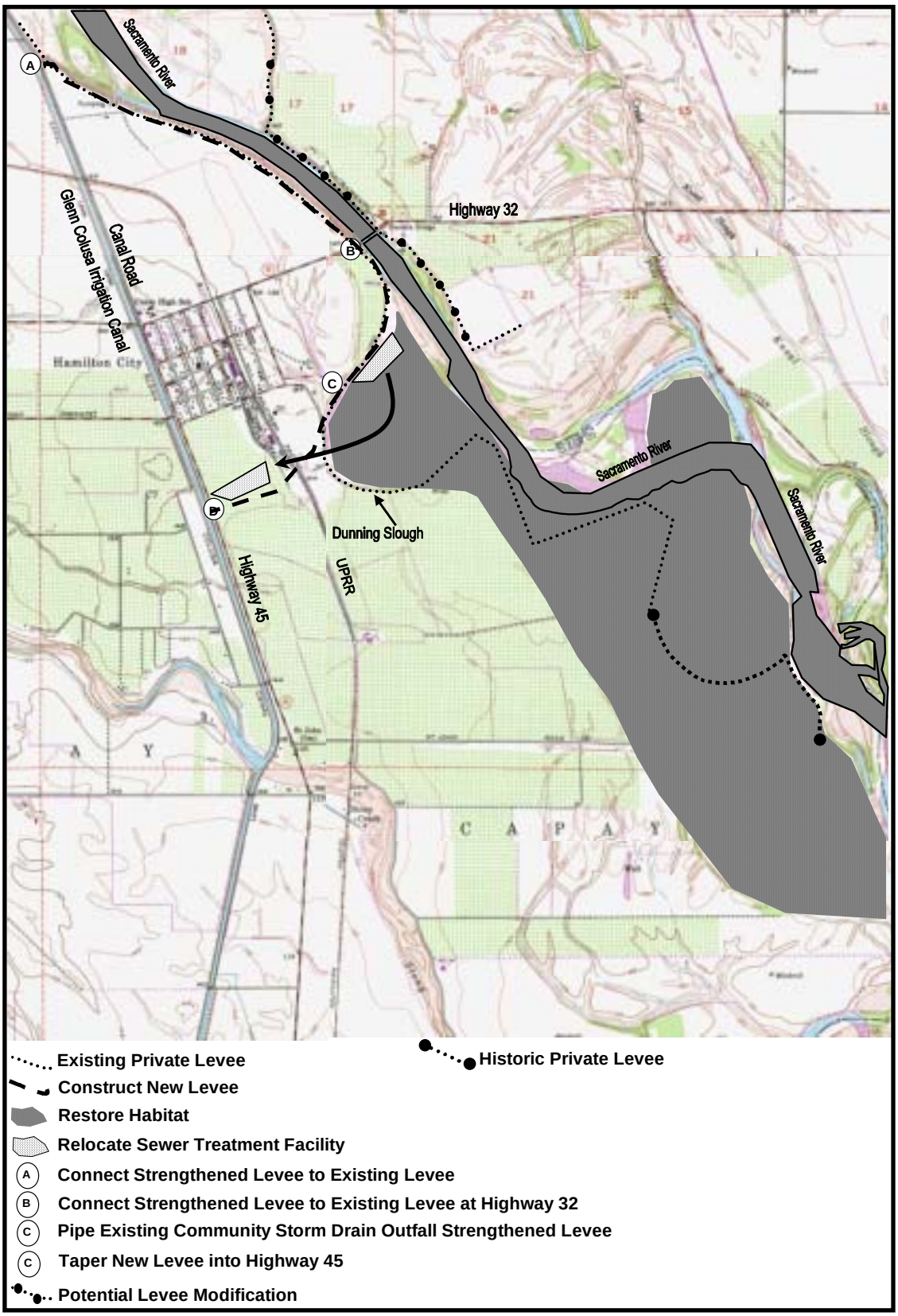
Preliminary Alternative 1b



Preliminary Alternative 1c



Preliminary Alternative 2a



Preliminary Alternative 2b