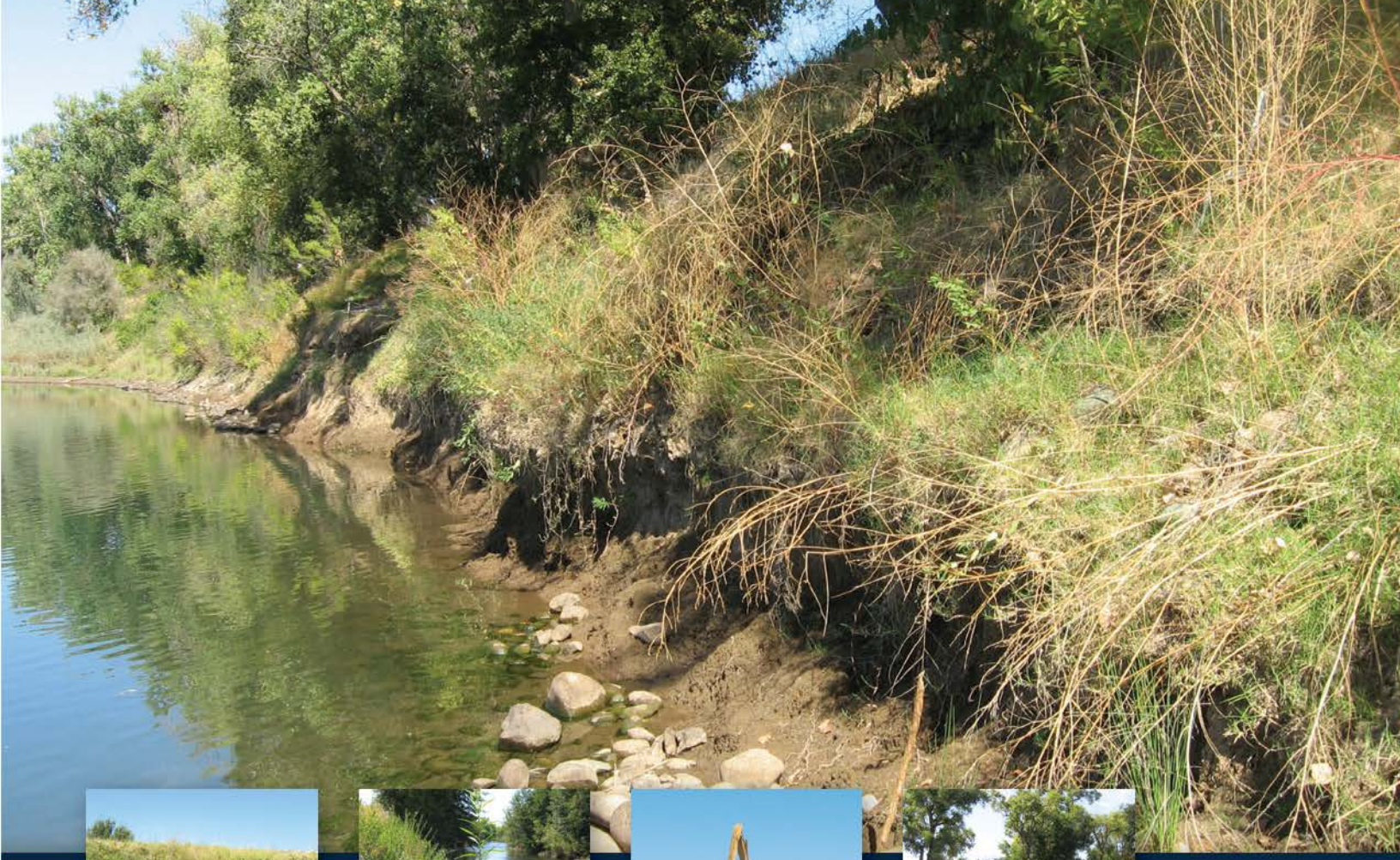

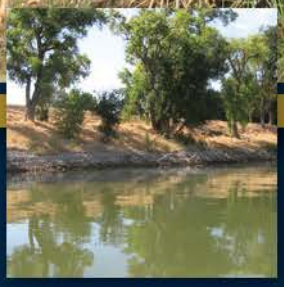

Draft Post Authorization Change Report Draft Environmental Impact Statement/ Environmental Impact Report (EIS/EIR)

Sacramento River Bank Protection Project
Sacramento River Basin, California

December 2014

US Army Corps
of Engineers
Sacramento District

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EXECUTIVE SUMMARY

This Post Authorization Change Report (PACR) for the Sacramento River Bank Protection Project (SRBPP) identifies the Federal interest in the SRBPP as modified by the Water Resources Development Act, Pub. L. 110-114, § 3031, 121 Stat. 1113 (2007) (WRDA 2007), which added 80,000 linear feet (LF) of bank protection to the original SRBPP Phase II project authorization. It recommends a policy compliant program for implementation of those 80,000 LF within economically justified sub-basins on sites chosen based upon the Site Selection and Implementation Process (see **Appendix B**) for bank repairs. Construction would be subsequent to future site specific Design Documentation Reports (DDRs), site-specific environmental compliance documentation, and site specific real estate addendums. Federal interest has already been determined by Congress. Future economic updates will be included in Economic Reevaluation Reports (ERR). Future cost updates will be included in Site Selection Reports (See **Appendix B**).

Erosion sites would be identified using engineering criteria. Repairs would be implemented following site-specific engineering design in accordance with the order of priority established during the site selection process, subject to real estate acquisition by the non-Federal sponsor, the Central Valley Flood Protection Board (CVFPB) of the State of California and with Federal cost-sharing.

Finally, the PACR recommends that the identification of floodplains resulting from levee failures in various sub-basins continue to be refined through further analysis of the hydrologic/hydraulic connectivity between sub-basins within the flood control system. On that basis, the economic analysis for the SRBPP would be updated to potentially identify additional sub-basins in which erosion protection work would be economically justified. If additional economically justified sub-basins are identified, then erosion sites in those sub-basins may be included in the Site Selection and Implementation Process (see **Appendix B**) with potential Federal cost-sharing.

The PACR also recommends that the non-Federal sponsor construct erosion protection features within the sub-basins that are not currently economically justified on sites that are identified based on engineering factors without Federal cost-sharing.

The programmatic bank protection plan (PBPP) cost estimate for the 80,000 LF is $420.5 million at the October 2013 price level. This cost was extrapolated from the detailed cost estimate of bank protection at the 16 erosion sites located in the economically justified sub-basins.

The General Revaluation Report (GRR) is separate from Phase II 80,000 LF PACR. A Project Management Plan and Federal Cost Share Agreement are being developed for approval and execution.

CONTENTS

APPENDICES

Environmental Impact Statement/Environmental Impact Report (Under Separate Cover)

FIGURES

TABLES

COVER PHOTO SOURCES

Large photo:
Feather River 7.0L (9/21/2009)

Small photos left to right:
Steamboat Slough 18.8R (9/18/2009), Butte Creek 0.7L (9/19/2009, Bear River 9.8R (9/24/2009), Sacramento River 53.3L (9/17/2009)

ACRONYMS AND ABBREVIATIONS

ASA (CW)	Assistant Secretary to the Army for Civil Works
AEP	Annual Exceedance Probability
BO	Biological Opinion
CEQA	California Environmental Quality Act
CVFPB	Central Valley Flood Protection Board
DDR	Design Documentation Report
Delta	Sacramento-San Joaquin Delta
DA	Department of the Army
DWR	California Department of Water Resources
EA / IS	Environmental Assessment/Initial Studies
EC	Engineer Circular
EIR	Environmental Impact Report
EIS	Environmental Impact Statement
EM	Engineer Manual
ER	Engineer Regulation
ERR	Economic Evaluation Report
ERDC	Engineer Research and Development Center
ESA	Endangered Species Act of 1973
ETL	Engineer Technical Letter 1110-2-583
GRR	General Reevaluation Report
HTRW	Hazardous, toxic, radioactive waste
IWG	Interagency Working Groups
IWM	In-stream Woody Material
LCA	Local Cooperation Agreement
LF	Linear Feet
LERRD	Lands, Easements, Rights-of- Way, Relocations and Disposals areas
MND	Mitigated Negative Declaration
MSWL	Mean Summer Water Level
NED	National Economic Development
NEPA	National Environmental Policy Act
NHPA	National Historic Preservation Act
NMFS	National Marine Fisheries Service
NOI	Notice of Intent
NOP	Notice of Preparation
O&M	Operation and maintenance
PA	Programmatic Agreement
PACR	Post Authorization Change Report
PBPP	Programmatic Bank Protection Plan
Pub. L.	Public Law

PPA	Project Partnership Agreement
RD	Reclamation District
REP	Real Estate Plan
Pub. L. 93-252	River Basin Monetary Authorization Act of 1974
88 Stat. 49	River Basin Monetary Authorization Act of 1974
RM	River Mile
SAM	Standard Assessment Methodology
SHPO	State Historic Preservation Office
SPK	Sacramento District of the USACE
SRBPP	Sacramento River Bank Protection Project
SRFCP	Sacramento River Flood Control Project
Stat.	Statute
State	State of California
TSP	Tentatively Selected Plan
USACE	United States Army Corps of Engineers
U.S.C.	United States Code
USFWS	United States Fish and Wildlife Service
VFZ	Vegetation Free Zone
WRDA	Water Resources Development Act

1.0 **INTRODUCTION**

1.1 PURPOSE

The purpose of the SRBPP is flood risk management. There are three basic purposes of this PACR. They are: 1) Document the history and status of the originally authorized Phase II 405,000 LF of the SRBPP; 2) Report on significant changes in scope of the Phase II that are the result of modifications of the project authorized by Congress; and 3) Provide for implementation of the additional authorized work.

This PACR is a decision document that identifies the Federal interest in the SRBPP as modified by the Water Resources Development Act, Pub. L. 110-114, § 3031, 121 Stat. 1113 (2007) (WRDA 2007), which added 80,000 LF of bank protection to the original SRBPP Phase II project authorization. Approval of this PACR is delegated to the South Pacific Division per the Implementation Guidance Memorandum for Section 3031 of WRDA 2007 from U.S. Army Corps of Engineers (USACE) Headquarters dated June 6, 2008. No additional Congressional project authorization is required to construct the 80,000 LF. This PACR also provides implementation recommendations and supports future budget requests.

The study objectives for the Phase II 80,000 LF PACR are as follows:

* Assess potential Federal interest in the 80,000 LF authorized in Section 3031 of WRDA 2007;
* Develop a programmatic Environmental Impact Statement / Environmental Impact Report (EIS/EIR) and demonstrate that significant environmental impacts from bank protection can be avoided or offset;
* Support preparation of a new Project Partnership Agreement (PPA) for construction of the project with the non-Federal Sponsor;
* Provide a framework to supply data and information to support inclusion of SRBPP sites in future budgets;
* Propose a program to complete 80,000 LF of bank protection within the scope authorized by Section 3031 WRDA 2007 to reflect compliance with laws, regulations and policy. (This PACR is not a plan formulation document leading to a recommendation for additional authorization.)

1.2 STUDY INFORMATION

The SRBPP is a long-range construction project to identify significant erosion problems, prioritize sites and design and construct bank protection. Corrective measures are applied only to affected banks and levees that are part of the Federal Sacramento River Flood Control Project (SRFCP).

The PACR is considered a decision document that describes the Phase II 80,000 LF of bank protection and ensures compliance with USACE policy. Accompanying the PACR is a programmatic EIS/EIR that complies with the National Environmental Policy Act (NEPA) and the California Environmental Quality Act (CEQA) (See **Draft EIS/EIR)**.

The SRBPP has been a responsive and effective tool for non-emergency erosion protection for the SRFCP facilities. Annual inspections monitor bank erosion that could threaten levees. The observations are used to rank erosion sites and design and construct bank protection to preserve the viability and integrity of the SRFCP levees. The SRBPP has the flexibility to periodically prioritize bank protection, and construct bank protection at those sites where erosion protection is essential.

The PACR uses a priority site inventory of 106 existing erosion sites located throughout the project area to evaluate the authorized project. Of the more than 200 known sites, comprising approximately 200,000 LF, 106 sites, comprising 80,000 LF, were selected for evaluation in the priority site inventory. These sites were selected based on the 2009 USACE inventory of erosion sites. These sites were used as a representative sample set for the composition of the 80,000 LF, and to conduct programmatic assessments of costs, economic benefits and environmental impacts of the Phase II 80,000 LF. The development of the priority site inventory is described in detail in **Appendix A**.

For the purpose of economic analysis, the floodplains of the SRFCP were divided into 50 basins, 24 of which were evaluated. Currently, erosion protection work in seven of the 24 evaluated basins is economically justified. In those seven economically justified basins, there are approximately 8,086 LF of erosion protection work from the priority site inventory of erosion sites. The 16 sites included in that 8,086 LF are referred to in this PACR as the justified priority site inventory. A detailed cost estimate of the 16 sites was prepared. The estimated cost is $42.5 million. The programmatic costs and benefits for the authorized 80,000 LF were estimated by extrapolating from the detailed cost estimates and benefits for the justified priority site inventory. The priority site inventory was used to assess environmental impacts for the programmatic EIS/ EIR associated with the PACR to encompass potential future work outside of the current justified sub-basins. As actual sites and measures are identified during project implementation, site specific NEPA documents will be prepared for each DDR (See **Appendix B**).

The PBPP is the proposed implementation plan for the SRBPP Phase II 80,000 LF. The PBPP is the total series of procedures employed to identify, evaluate, select, design, approve and construct bank protection sites. Procedures include site

reconnaissance, site selection, compliance with environmental laws, economic justification and real estate acquisition.

The PBPP consists, in summary, of the following major actions:

* Construct up to the authorized 80,000 LF of erosion protection features within the economically justified basins on sites chosen based upon the Site Selection and Implementation Procedure for Bank Repairs (see **Appendix B**). Construction would be subsequent to future site specific DDRs, site-specific environmental compliance documentation. Erosion sites would be identified using engineering criteria. Repairs would be implemented following site-specific engineering design in accordance with the order of priority established during the site selection process, subject to real estate acquisition by the State of California, and with Federal cost-sharing.

* Recommend that the non-Federal partners construct erosion protection features within the sub-basins that are not currently economically justified on sites that are identified based on engineering factors. Sites should be implemented in the order of priority determined by the Site Selection and Implementation Process (see **Appendix B**), subject to real estate acquisition constraints, following site-specific environmental compliance documentation and engineering design. Any work the non-Federal partner decides to complete that is not within an economically justified sub-basin will require USACE approval through a Section 408 action and will not be eligible for SRBPP Federal cost-sharing.

* Continue to refine the identification of floodplains resulting from levee failures in various sub-basins through further analysis of the hydrologic/hydraulic connectivity between sub-basins within the flood control system. On that basis, update the economic analysis for the SRBPP to potentially identify additional sub-basins in which erosion protection work would be economically justified. If additional economically justified sub-basins are identified, then erosion sites in those sub-basins may be included in the Site Selection and Implementation Process (see **Appendix B**) with potential Federal cost-sharing.

  Once specific sites are identified for construction, USACE real estate will update the information listed in the Real Estate Plan, Exhibit D - Site Specific Real Estate Inventory Check-List. The updated addendum will be reviewed and approved at the District Level; however, Division will be notified which specific sites will be worked. This addendum will better define the impacted parcels, costs of acquisition, schedule, etc. (see **Appendix C**).

The SRBPP Phase II 80,000 LF will begin implementation upon approval of the PACR, execution of a cost-sharing agreement and receipt of Federal and non-Federal funding. The cost-sharing agreement will be a new PPA executed between USACE and the CVFPB, the non-Federal sponsor. Maintaining a responsive site selection, design and construction program is vital to effective implementation of the SRBPP. This site selection-implementation process will be used to identify erosion sites, prioritize sites and design and construct bank protection on an annual basis. Site-specific documents to support implementation will be initiated each year, or less frequently based on the need for repair work and availability of funding. These documents include site-specific environmental compliance documentation, DDRs, site-specific Real Estate Plans and reporting on economic justification and Federal interest.

A main challenge to the project is the management of riparian vegetation that exists on levees and banks. The preliminary designs for the priority site inventory demonstrate that bank protection can be compliant with USACE vegetation policy described in Engineer Technical Letter (ETL) 1110-2-583: Guidelines for Landscape Planting and Vegetation Management at Levees, Floodwalls, Embankment Dams and Appurtenant Structures. The environmental evaluation of the priority site inventory shows that significant biological impacts, including loss of habitat for endangered migratory fish species present in the Sacramento River system, can be mitigated. Thus, the PACR demonstrates, on a programmatic level, the amount of impacts that could be expected from 80,000 LF of bank protection, and how the SRBPP could comply with environmental regulations and meet Endangered Species Act requirements.

2.0 **AUTHORIZATION**

Table 1 summarizes the different authorities of the SRBPP.

The SRFCP was authorized in 1917 by the Flood Control Act of 1917, Pub. L. 64-367, § 2, 39 Stat. 948, 949 (1917) and provides appropriations for rectification and enlargement of river channels and the construction of weirs.

The SRFCP is located along the Sacramento River from Elder Creek near Tehama to its confluence with the San Joaquin River in the Sacramento-San Joaquin Delta (Delta). The SRFCP includes a number of tributaries, sloughs and bypass channels. **Figure 1** shows the extents of the SRFCP. The SRBPP area coincides with the levees and other features of the SRFCP. **Figure 2,** a map of the SRFCP levees, indicates the potential extent of bank protection. The SRBPP area extends south to north along the Sacramento River from the town of Collinsville at River Mile (RM) 0 upstream to Chico at RM 194, and includes reaches of the lower Elder and Deer Creeks. The SRBPP project area also includes Cache Creek, the lower reaches of the American

River (RM 0-23), Feather River (RM 0-61), Yuba (RM 0-11) and Bear River (RM 0-21) as well as portions of the Three Mile, Steamboat, Sutter, Miner, Georgiana and Cache Sloughs.

A Chief of Engineers' Report dated 9 May 1960 (Senate Doc. 86-103) recommended a program of remedial bank protection work as a modification of the SRFCP. The initial portion (Phase I) of the SRBPP was authorized by Congress in the Flood Control Act of 1960, Pub. L. 86-645, § 203, 74 Stat. 498 (1960). It was authorized as a long-range program for construction of bank erosion control works and setback levees to protect the SRFCP levees from failures due to erosion. Construction of the 430,000 LF in the Phase I authority was completed in 1974. Phase I also included recreation facilities.

A Chief's Report dated 21 September 1972 recommended a second phase consisting of 405,000 LF of bank protection works (H. Doc. 93-151). Phase II was authorized by the River Basin Monetary Authorization Act of 1974, Pub. L. 93-252, § 202, 88 Stat. 49. Construction began in 1975 and is nearly completed. The 1974 Phase II authority is the baseline for changes to the SRBPP as reported in this PACR.

In 1982, Congress specifically authorized extension of the SRBPP from the upstream end of the levee system to Chico Landing (RM 176 left/ 184 right to RM 194 (Continuing Appropriations Resolution, Pub. L. 97-377 § 140, 96 Stat. 1916 (1982)). This was done to include the Butte Basin reach. A Chief's Report dated 1 September 1981 recommended a fish and wildlife program to provide habitat mitigation for Phase I of SRBPP. The 1981 Chief's Report was supplemented and modified by a Chief's Report dated 2 June 1983 to exclude mitigation for removal of vegetation that is deferred maintenance of SRFCP levees and, therefore, a non-Federal responsibility. The project for mitigation of fish and wildlife losses was authorized at a total cost of $1,410,000 by the Water Resources Development Act of 1986, Pub. L. 99-662, § 601, 100 Stat. 4140. The authorized mitigation for Phase I is complete.

The authority for Phase II was modified by Congress by WRDA 2007, which modified the existing SRBPP to authorize bank erosion and setback levee work as follows:

> "SEC. 3031. Section 202 of the River Monetary Authorization Act of 1974 (88 Stat. 49) is amended by striking "and the monetary authorization" and all that follows through the period at the end and inserting "; except that the lineal feet in the second phase shall be increased from 405,000 lineal feet to 485,000 lineal feet."

Table 1 – History of Sacramento River Bank Protection Project

Project Phase	Authorizing Act, Year, Public Law	Authorized Length of Improvements (Linear Feet)	Number of Bank Protection Sites[1]	Status
Phase I	Flood Control Act of 1960, Pub. L. 86-645, § 203, 74 Stat. 498	430,000	412	Complete
Phase II	River Basin Monetary Authorization Act of 1974, Pub. L. 93-252, § 202, 88 Stat. 49	405,000	420+	In progress
Amendment to Phase II	Water Resources Development Act of 2007, Pub. L. 110-114, § 3031, 121 Stat. 1113	80,000	106[2]	Work is dependent upon approval of this PACR and the signing of the PPA

1. The number of bank protection sites within the authorized footprint.
2. Priority site inventory (16 sites in current justified priority site inventory).

3.0 **DESCRIPTION OF AUTHORIZED PROJECT**

3.1 SACRAMENTO RIVER BANK PROTECTION PROJECT BACKGROUND

Responsibility for implementation is shared between the USACE and non-Federal Sponsor. The USACE is responsible for planning, design and construction of the bank protection. The CVFPB is responsible for providing all lands, easements, rights-of-way, relocations and for operation and maintenance of the completed project.

The project protects against erosion that occurs throughout the project area (**Figure 2**). To illustrate the extent of erosion, **Figure 3** is a map of bank erosion sites from the 2012 inventory. Bank protection is either on the waterside bank (also referred to as "berm", the two terms are, for this report synonymous) or the levee if there is no bank. Critical sites, which are eroded so that there is a risk of a levee breach at the next large flood event, must continue to be protected to maintain the safety of the SRFCP. For bank protection that is fix-in-place stone placement, the SRBPP does not include other levee corrective measures such as seepage and cutoff walls, raising low spots along the levee crests, improving slope stability, correcting seismic deficiencies or reducing risk of overtopping. Any new setback levees, however, are constructed to current design standards.

The Baseline Accomplishments Report, Sacramento River Bank Protection Project Phase I and II Summaries, dated May 2011 summarizes all work done on Phase I and Phase II of the SRBPP. The vast majority of bank protection consisted of stone protection and rip-rap with various forms of environmental mitigation with some setback levees. Sponsor and USACE amended the Local Cooperation Agreement to allow Sponsor to construct levees and seek credit against future SRBPP contributions. One exception to this is a setback levee constructed in West Sacramento in 2012. The Baseline Report is available from the USACE Sacramento District upon request.

Figure 1 – Sacramento River Watershed Map

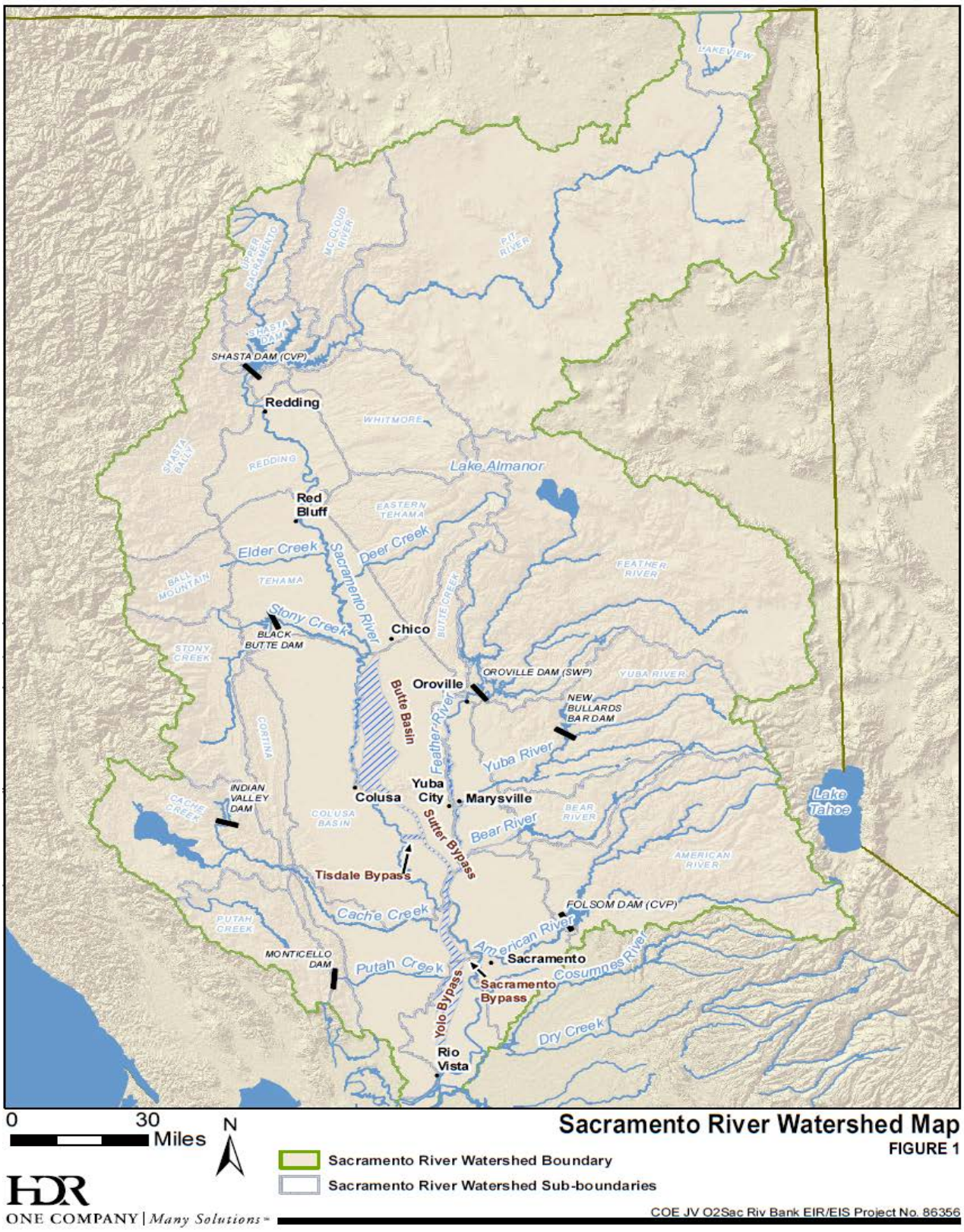


Figure 2– Sacramento River Flood Control Project Levees

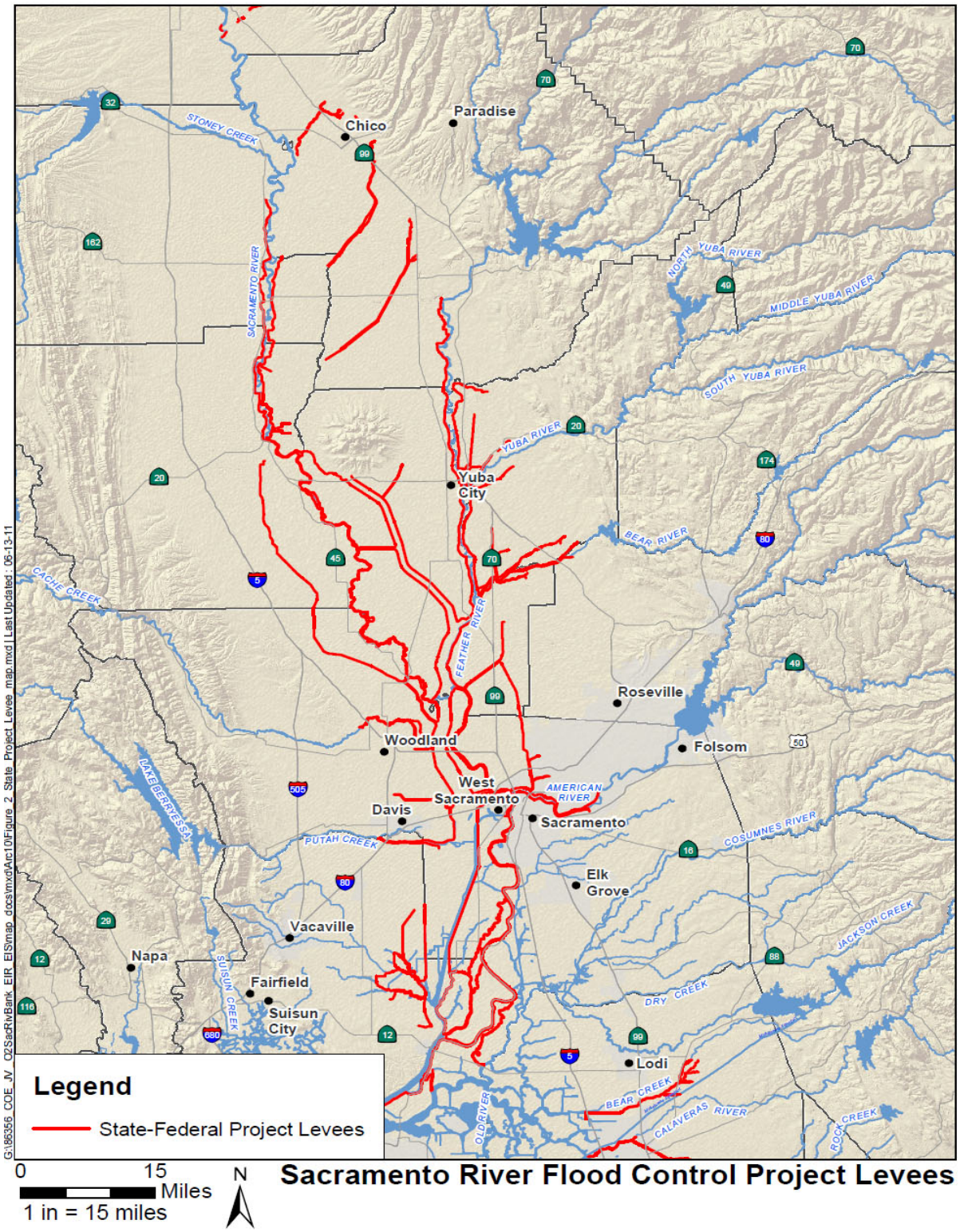
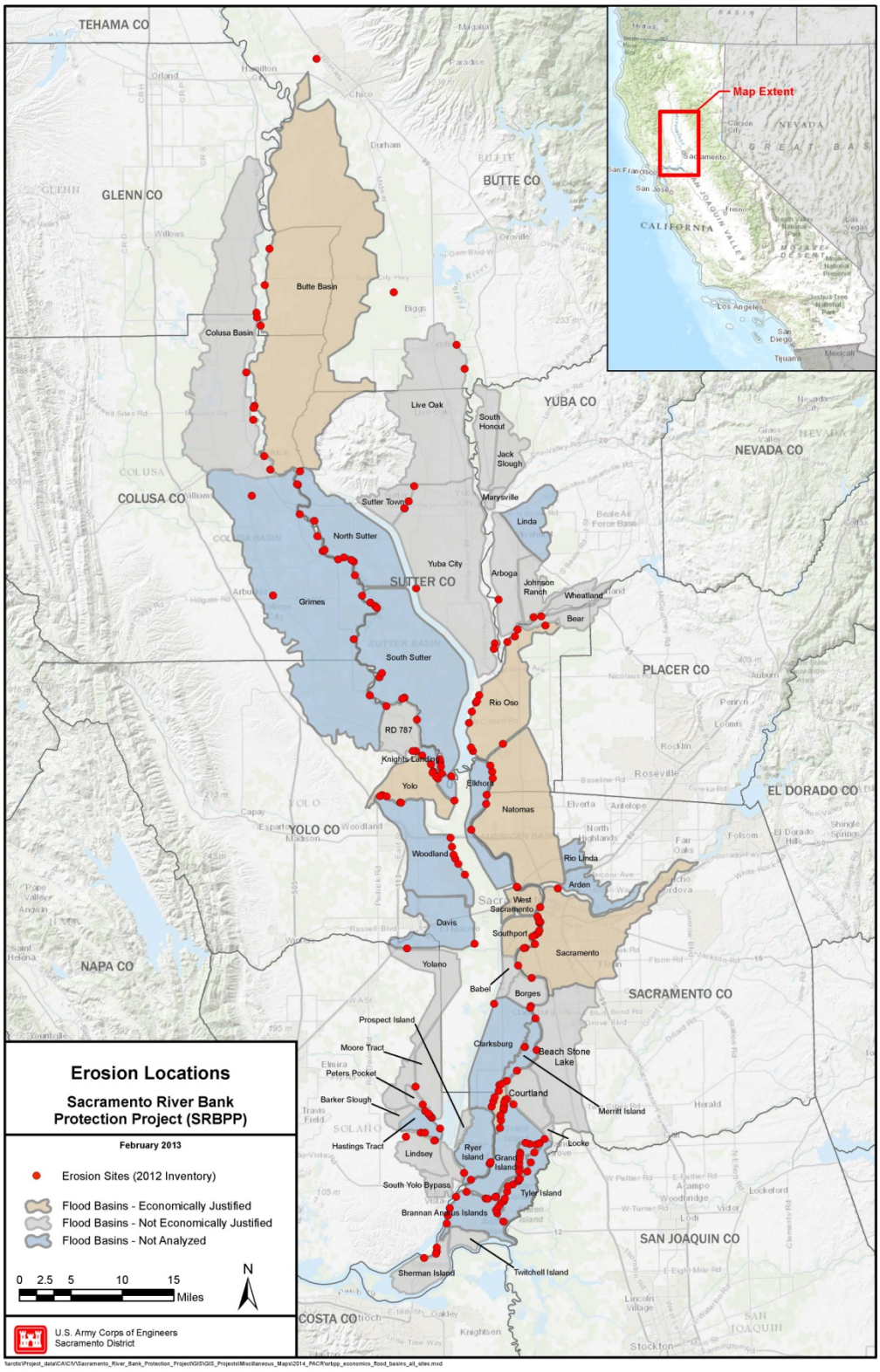


Figure 3 – Identified Erosion Sites within the Sacramento River Flood Control Project



3.2 DESCRIPTION OF THE PHASE II 80,000 LF PROGRAMMATIC BANK PROTECTION PLAN

3.2.1 Overall SRBPP Programmatic Documents

The priority site inventory identifies 106 erosion sites on the SRFCP that total 77,436 LF. These 106 erosion sites, called the priority site inventory, are used as a representative sample for economic and environmental evaluation of the Phase II 80,000 LF. Each of the sites in the priority site inventory was evaluated to determine the most technically sound repair measure for that specific site. The technical evaluation included aspects such as hydrology, levee stability, available real estate, repair footprint for a vegetation free zone, impacts to the levee profile and the measure that is most sensitive to the existing environment and associated features that would enhance habitat value. A design and cost estimate was then developed for each site.

It is not possible to describe a definitive plan that specifies which bank protection measures will be constructed at which locations. This is because erosion is a dynamic function such that critical erosion sites change with each flood season in an unpredictable fashion. Erosive flows may reduce banks, increasing the risk of flooding from levee failure, and increasing the urgency of bank protection for that location. Some sites may become less critical due to changes in hydraulics and sedimentation, bank repair and for other reasons. The priority site inventory is considered a reliable representation of what could be constructed. The specific sites may change, but the overall breadth and scope of the project and measures used should not change. Development of the priority site inventory and a more detailed description is presented in **Appendix A**.

Based on available data, however, the economic analysis could only justify 16 of the 106 sites. The 16 justified sites are referred to as the justified priority site inventory. The justified priority site inventory was used to estimate the costs and benefits of implementing the PBPP in the seven economic impact areas (sub-basins) that have quantifiable economic damages to justify bank protection. The estimated cost for implementing the Phase II 80,000 LF is based on the average cost per LF for the bank protection at the 16 sites in the justified priority site inventory. Specific bank protection selection, analysis, design and construction will be done on an annual basis and reported in site specific supplemental DDRs and site-specific tiered environmental documentation to be approved at the Sacramento District. The Site Selection and Implementation Process is described in **Appendix B**. The implementation process provides the flexibility to respond to year-to-year changes to the erosion problems along the SRFCP. Historically, about 8,000 LF were constructed each year on average. At this rate, the program would last 10 years.

The SRBPP is defined and described using programmatic products. The products are described and listed below.

3.2.2 Programmatic EIS/EIR

This PACR/EIS/EIR and the associated Appendices describe a programmatic bank protection plan to implement the 80,000 LF and evaluates the economic and environmental effects of the projects. The PACR recommends one implementation process with multiple design options. Selection of particular designs for specific erosion sites will be determined in the future. NEPA and CEQA generally require that an EIS/EIR, respectively, consider a range of alternatives that would attain most of the basic project purpose, need and objectives while avoiding or substantially lessening project effects. The NEPA alternatives present a range of possible outcomes depending upon the specific decisions to be made using the implementation process. The NEPA and CEQA analysis also analyzes a no-action or no-project alternative.

Five alternatives are analyzed in addition to a no-action alternative. The five action alternatives, or "NEPA/CEQA alternatives," apply site-specific bank protection measures (design solutions) to the 106 sites in the priority site inventory. The site-specific bank protection measure applied to each site will, in most cases, vary from one NEPA/CEQA alternative to another.

Please see the EIS/EIR for more details.

3.2.3 Site Selection and Implementation Process

The site selection and implementation process describes the process by which bank protection sites will be identified, prioritized and selected; and bank protection for those sites designed and constructed. The process includes annual erosion surveys and rankings, and the preparation of site-specific DDRs; site-specific tiered environmental documentation; and a site-specific Real Estate Addendums. Once specific sites are identified for construction, USACE real estate will update the information listed in the Real Estate Plan, Exhibit D - Site Specific Real Estate Inventory Check-List. The updated addendum will be reviewed and approved at the District Level; however, Division will be notified which specific sites will be worked. This addendum will better define the impacted parcels, costs of acquisition, schedule, etc. (see **Appendix C**). Per coordination with USACE Headquarters Real Estate, approval level for the Real Estate Addendums will be at the District. Implementation will be on-going throughout the duration of the 80,000 LF. The process is further described in **Appendix B** and **Appendix C.**

3.2.4 Real Estate Plan

The Real Estate Plan describes the process that will be used to acquire the necessary ROWs and relocations. The REP is **Appendix C.**

3.3 DEVELOPMENT OF THE PRIORITY SITE INVENTORY

Development of the priority site inventory followed a rational process to achieve a technically sound and complete analysis. The priority site inventory development and description is provided in **Appendix A**. This section provides a less detailed description of the components of the priority site inventory.

The building blocks of the priority site inventory are bank protection measures applied to the erosion sites throughout the project area, taking into account the unique characteristics of each site. These measures are described in the next section.

3.3.1 Bank Protection Measures

Bank protection measures are generic, conceptual designs to accomplish objectives. Historically, the primary, most often employed measure is stone protection. Measures have increased and evolved through the many years of bank protection. Additional measures have been developed to avoid or minimize significant environmental impacts such as reduction in riparian vegetation and loss of fish habitat.

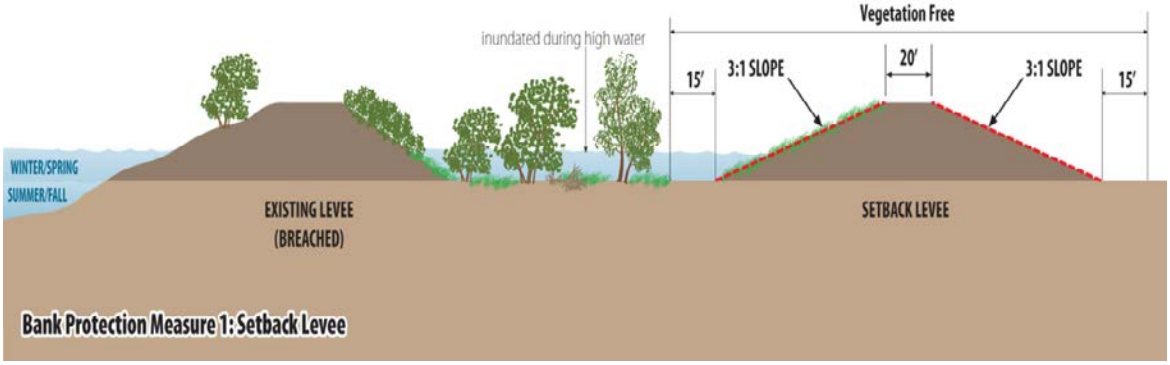
The existing bank and levee conditions and availability of land helped determine the most appropriate and least-cost measures for each site (See **Appendix A,** Section 4**,** and **EIS/EIR** for Analysis).

Measures are described below. **Figures 4 through 10** show graphical cross sections of the bank protection measures. Other measures, or variations, may be formulated and constructed during implementation.

Measure 1: Setback Levee

The Setback Levee (**Figure 4**) entails constructing a new levee landward of the existing levee to avoid construction in the channel or riparian areas. The setback levee is ideal for locations where a large number of erosion sites are located near each other. In these instances multiple sites can be repaired by a setback levee. Ten sites were selected to be repaired by a setback levee.

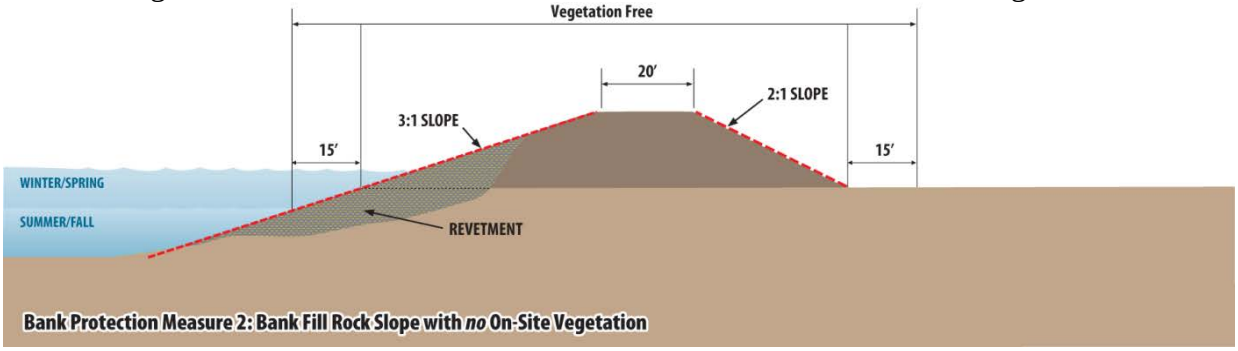
Figure 4 – Measure 1 Setback Levee



Measure 2: Bank Fill Stone Protection with No On-Site Vegetation

This measure (**Figure 5**) involves repairing erosion along the banks and/or levees with stone protection. Vegetation is limited to grass within the vegetation free zone (VFZ). This measure is most applicable in areas with a large amount of constraints or little space for construction and vegetation. For the purposes of the PBPP Engineering Appendix, 12 sites were selected to be repaired by stone protection with no on-site vegetation.

Figure 5 – Measure 2 Bank Fill Stone Protection with No On-Site Vegetation

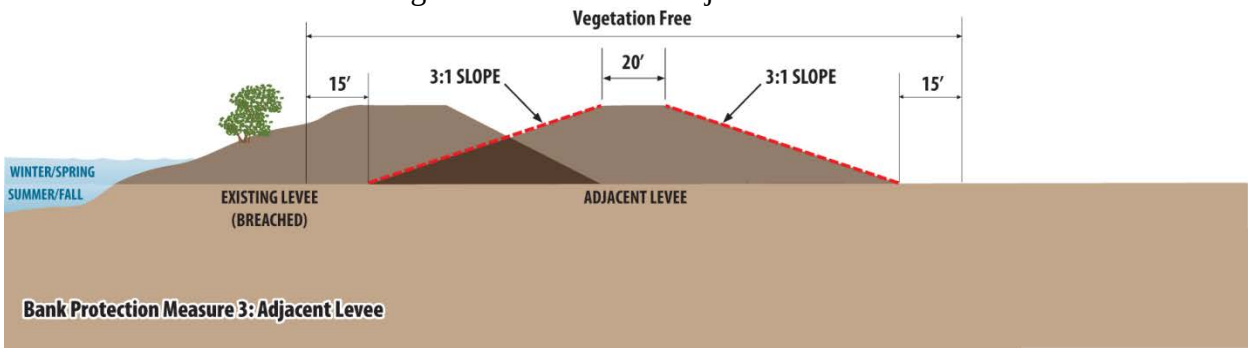


Measure 3: Adjacent Levee

This measure (**Figure 6**) involves constructing an adjacent levee and utilizing the landward portion of the existing levee. This would allow for installation of in-stream woody material (IWM) and riparian vegetation outside of the VFZ on the existing levee and/or bank. This measure is most applicable to areas where the bench is narrow or

non-existent. Like the setback levee, the adjacent levee can be used for areas where a large number of erosion sites are located close to each other. For the purposes of the PBPP Engineering Appendix, 15 sites were selected to be repaired by an adjacent levee. The SRBPP authorization includes bank protection and setback levees; adjacent levees are a subcategory of setback levees.

Figure 6 – Measure 3 Adjacent Levee



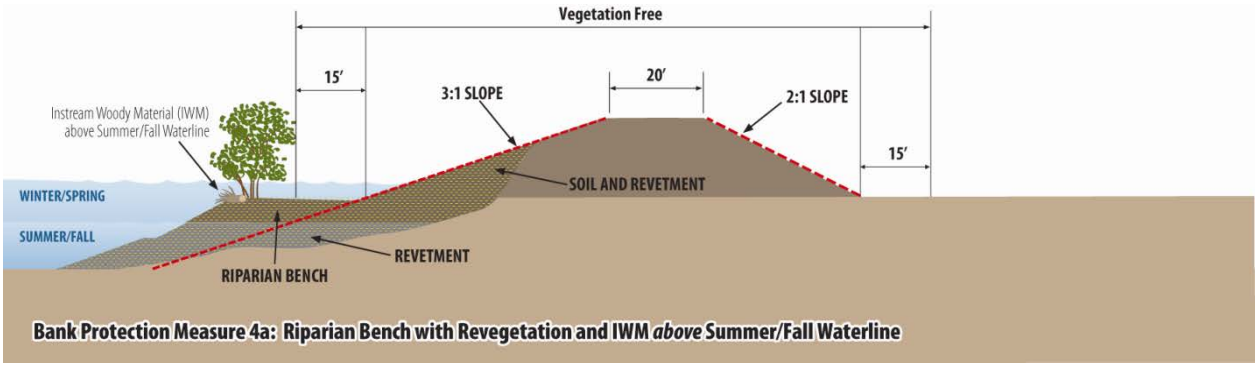
Measure 4: Riparian and Wetland Banks with Re-vegetation

This measure consists of three variations as described below. These measures involve placing clean stone protection to repair erosion and construction of a waterside berm.

Measure 4a: Riparian Bank with Re-vegetation and In-stream Woody Material above Summer/Fall Waterline

This measure (**Figure 7**) installs a waterside berm with soil-filled stone protection in the areas of erosion to above the mean summer water level (MSWL). Stone protection would be installed on areas of the levee slope above the MSWL. The berm would support riparian vegetation and would allow placement of IWM above the MSWL. No sites have been selected to be repaired by Measure 4a.

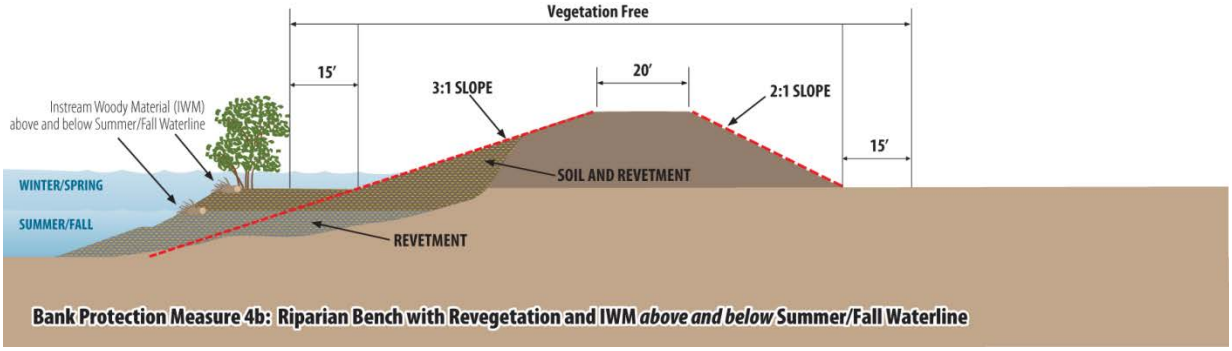
Figure 7 – Measure 4a – Riparian Bench with Re-vegetation and IWM above Summer/Fall Waterline



Measure 4b: Riparian Bench with Re-vegetation and In-stream Woody Material above and below Summer/Fall Waterline

This measure (**Figure 8**) installs a waterside berm with soil-filled stone protection in the areas of erosion to above the MSWL. Stone protection would be installed on areas of the levee slope above the MSWL. The berm would support riparian vegetation and would allow placement of IWM above and below the MSWL. No sites were selected to be repaired by Measure 4b.

Figure 8 – Measure 4b – Riparian Bench with Re-vegetation and IWM above and below Summer/Fall Waterline

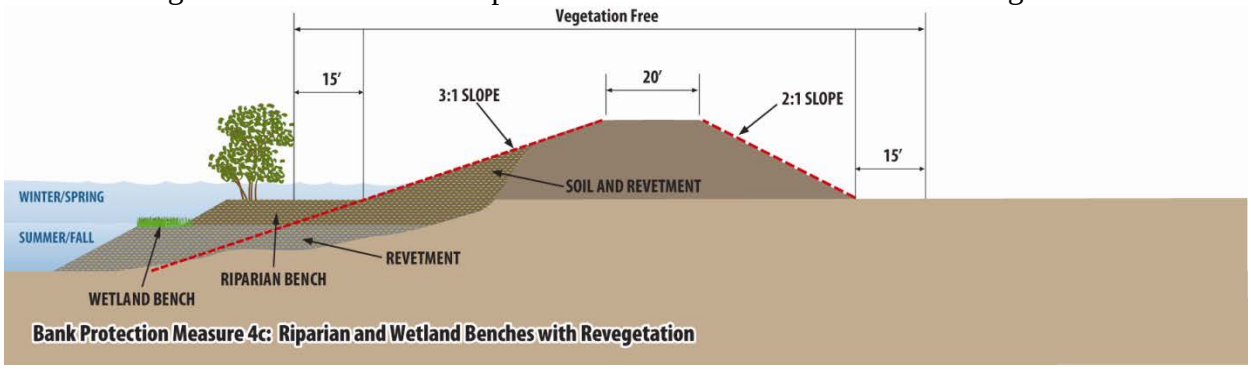


Measure 4c: Riparian and Wetland Benches with Re-vegetation

This measure (**Figure 9**) involves installing a wetland bench and a riparian bench with soil-filled stone protection in the areas of erosion. The riparian bench would be installed to above the MSWL. The wetland bench would be installed to below the

MSWL. For the purposes of the PBPP Engineering Appendix, two sites have been selected to be repaired by riparian and wetland benches with re-vegetation and IWM above and below the Summer/Fall waterline.

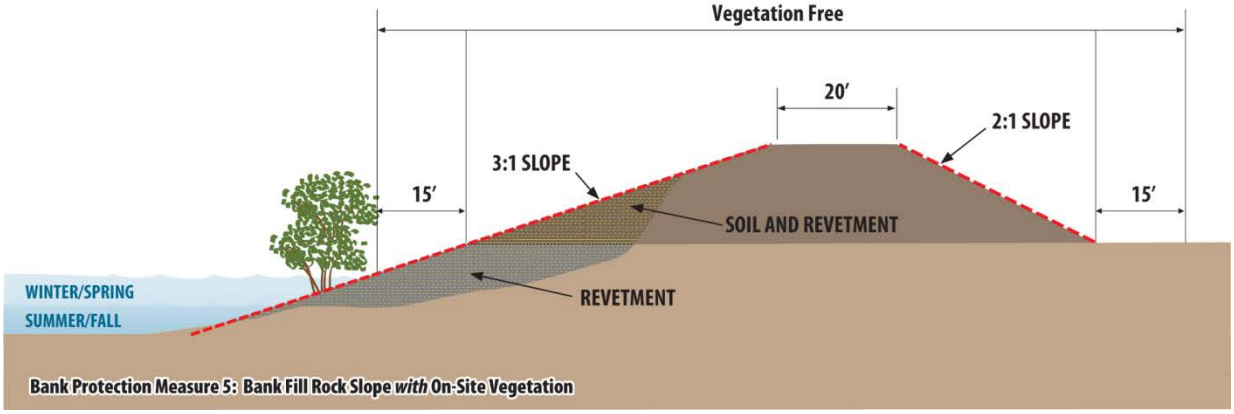
Figure 9 – Measure 4c – Riparian and Wetland Benches with Re-vegetation



Measure 5: Bank Fill Stone Protection with On-Site Vegetation

This measure (**Figure 10**) involves filling the eroded portion of the bank with stone protection along the levee and/or bank slope. Vegetation would be limited to grass within the VFZ. Six inches of soil cover would be placed on the stone protection to promote on-site vegetation. No sites were selected to be repaired by Measure 5.

Figure 10 – Measure 5 – Bank Fill Stone Protection with On-Site Vegetation



3.3.2 Mitigation for Environmental Effects

The EIS/EIR uses the priority site inventory to identify potential programmatic environmental effects of the PBPP based on a worst-case approach that facilitates potential future work outside the current justified sub-basins. In the lower Delta regions, the setback and adjacent levees provide a gain of environmental value so that, when the impact of neighboring rocked bank protection is considered, there is no net loss of habitat.

Environmentally-sustainable design will be used for the bank protection measures in accordance with USACE's Environmental Operating Principles. Use of environmentally-sustainable design will avoid and minimize adverse effects and reduce the need for compensatory mitigation. In those instances where such onsite design efforts are insufficient and a significant habitat deficit still remains, additional off-site mitigation features will be added to the plans to the extent necessary to comply with requirements of the project's Biological Opinions, pursuant to the Endangered Species Act.

4.0 **FUNDING SINCE AUTHORIZATION**

Table 2 shows the history of Federal funding for the SRBPP Phase II for 405,000 LF.

Table 2 – SRBPP Phase II Federal Funding for Construction Since Authorization

Fiscal Years	Phase II Funding ($1,000)
1976	3,802
1977	2,850
1978	2,225
1979	1,450
1980	1,710
1981	3,200
1982	2,700
1983	679
1984	2,500
1985	3,500
1986	3,462
1987	6,727
1988	9,131

Fiscal Years	Phase II Funding ($1,000)
1989	4,450
1990	3,550
1991	1,101
1992	1,251
1993	2,201
1994	2,654
1995	3,900
1996	3,251
1997	4,870
1998	4,315
1999	5,400
2000	2,803
2001	3,929
2002	3,546
2003	1,837
2004	1,065
2005	3,979
2006	292,081
2007	21,000
2008	14,932
2009	22,967
2010	14,171
2011 [1]	8,878
2012 [2]	9,797
2013	2,905
Total	$248,625,986

1. $1,100,751 rescinded for USACE emergency operation in September 2011.
2. $2,864 rescinded for USACE emergency operations in December 2011.

5.0 **CHANGES IN SCOPE OF AUTHORIZED PROJECT**

"Changes in scope" are defined as increases or decreases in the outputs for the authorized purposes of a project (ER 1105-2-100, Appendix G, G-12.c.). Outputs are the project's physical effects, which usually have associated benefits. Design and project implementation changes are within the Chief of Engineer's discretionary

authority, per ER 1105-2-100 Appendix G, G-13.WRDA 2007 authorized a change in scope consisting of the addition of the 80,000 LF to Phase II and the resulting cost and output increases. There is no change in project purpose or geographical extent. The additional 80,000 LF will be constructed within the same project area as the original authority. This PACR documents the change in scope from the addition of the 80,000 LF to Phase II. In keeping with guidance, this PACR discusses changes since the original Phase II authorization in 1974.

Revisions to policy and physical changes have modified some other aspects of the SRBPP. These changes are within the Chief of Engineer's discretionary authority, per ER 1105-2-100 Appendix G, G-13. These are discussed below.

* There are changes to the approach to vegetation management. The 1972 Chief of Engineers Report (House Document 93-151) allowed for incorporation of existing vegetation into bank protection. Existing vegetation is, per the vegetation management ETL 1110-2-583 and previous policy, not incorporated in bank protection, in the VFZ. Vegetation restrictions can obligate the use of setback levees (including adjacent levees) to avoid removal of vegetation that is protected as habitat for endangered species.
* Many project levees have been improved by local, State and Federal agencies. In some cases, levees have been replaced with setback levees. Improvements, primarily in the form of cutoff walls to mitigate under-seepage, have been made along the following levees:
    a) Feather River east bank from the Yuba River to the Bear River; Bear River north bank setback levee from the Western Pacific Interceptor Channel to the Yuba River; and Yuba River south bank upstream of the Feather River to increase protection to the mutual floodplain. The improvements were made by the Three Rivers Levee Improvement Agency. Improvements may be included in the USACE Yuba River Basin Project.
    b) Marysville Ring Levee to protect the City of Marysville; this levee is part of the Yuba River Basin Project.
    c) Sacramento River east bank from Natomas Cross Canal to the American River; and the Natomas Cross Canal, south levee. The improvements protect the Natomas Basin. Improvements are part of the Natomas Local Protection Project and were constructed by the Sacramento Area Flood Control Agency. These levees are also part of the USACE American River Common Features Project.

d) American River (both banks) and portions of the Sacramento River east bank levee below the American River, to protect the City of Sacramento; the improvements are part of the American Common Features SRBPP.

These levees are still part of the SRFCP and eligible for protection under the SRBPP. Erosion problems, however, could be repaired as part of the operation and maintenance (O&M) of the new projects. This, however, does not materially affect the scope of the SRBPP. Design and project implementation changes are within the Chief of Engineer's discretionary authority, per ER 1105-2-100 Appendix G, G-13.

6.0 **CHANGES IN PROJECT PURPOSE**

There are no changes in project purpose for the SRBPP, which continues to be flood risk management (with some completed recreation features). The 1972 Chief's Report (House Doc. 93-151) states bank protection is beneficial to navigation, recreation and fish and wildlife. Benefits from these other purposes are considered incidental and not quantified.

7.0 **CHANGES IN LOCAL COOPERATION REQUIREMENTS**

Construction of Phase II initially adopted the requirements in the 1962 LCA for the original Phase I work. A new LCA signed on April 20, 1984 contained updated local cooperation requirements and specified cost sharing at two-thirds Federal – one-third non-Federal. In response to the 1986 WRDA, two LCAs dated August 15, 1988 and December 7, 1988 revised local cost sharing to 75-25 percent for a total of 141,415 LF of bank protection. At the end of 2006, when work specific to the two LCAs executed in 1988 was completed, the cost share and local cooperation requirements reverted back to the 1984 LCA, and cost share changed to two-thirds Federal – one third non-Federal.

The current local cooperation requirements for SRBPP are included in the LCA that was signed in 1984. The standard requirements have changed since 1984. The current standard local cooperation requirements are listed in **Section 10**. Changes to local cooperation requirements will be applied to a new PPA consistent with the current approved model agreement.

The LCA dated April 20, 1984 lists the following major items of non-federal sponsor responsibilities:

* Provide, without cost to the Government, all real estate interests necessary for the Project;

- Hold and save the Government free from damages due to the construction, operation and maintenance of the Project, except damages due to the fault or negligence of the Government or its Contactors;
- Operate and maintain the Project, or integral parts thereof, in accordance with regulations prescribed by the Secretary of the Army;
- Contribute an amount in cash which, when added to the cost of lands, easements, rights-of-way and utility changes, equals one-third of the cost of each unit of the remedial work, this contribution will be based on the cost of the improvements shown by estimates approved by the Chief of Engineers to have economic superiority over possible alternative measures [note that "unit" is interpreted to mean linear feet];
- For reaches where local interests prefer bank stabilization to the setbacks recommended by the Chief of Engineers, contribute the costs over and above the costs of setbacks, and provide the local contribution as indicated above.

8.0 **CHANGES IN LOCATION OF PROJECT**

In 1982, Congress specifically authorized extension of the SRBPP upstream of the levee system from RM 176 left/184 right to RM 194 (See **Section 3.0**). This extension ties into the northern end of the SRBPP levees and extends to the vicinity of Big Chico Creek (see **Figure 2)**.

9.0 **DESIGN CHANGES**

There are two major sources of design changes for the Phase II 80,000 LF; these are vegetation management and sea level rise. Hydrology is a basis for design, and has undergone revisions as described in **Appendix A,** Hydrology**.** A potential future change to hydrology is discussed below.

9.1 HYDROLOGY AND CLIMATE CHANGE

There could be future changes to flow, possibly higher flows, due to climate change. Due to uncertainty in the science, revised flows due to climate change are not quantified or reflected in the hydrology. Future condition hydrology for this project is equal to existing condition hydrology. Thus, there are no changes in design in response to a new future condition hydrology.

9.1.1 Relative Sea Level Rise

EC 1165-2-212 "Incorporating Sea-Level Change Considerations in Civil Works Programs" was issued July 2009 to provide guidance for "…incorporating the direct

and indirect physical effects of projected future sea-level change in managing, planning, engineering, designing, constructing, operating, and maintaining USACE projects and systems of projects." EC 1165-2-212 requires all USACE coastal activity within the extent of the estimated tidal influence be considered for relative sea-level change effects.

As a result of anticipated future sea level rise, setback levee designs may need to be changed so that the levees are taller and wider with more robust design features.

Relative sea level rise includes the motion of the land in relation to the water as well as increase in the water surface level. **Appendix A,** Hydraulics provides additional detail concerning relative sea level rise and the SRBPP.

9.1.2 Vegetation Management

The USACE, through ETL 1110-2-583, has re-issued guidance for management of vegetation on levees. This supersedes ETL 1110-2-571 (which expired), and Engineer Manual (EM) 1110-2-301, Landscape Planting at Floodwalls, Levees and Embankment Dams. ETL 1110-2-583 severely restricts vegetation on levees. Bank protection measures incorporate vegetation to avoid or minimize adverse impacts on significant fish and wildlife habitat. The Programmatic Framework Memorandum (**Appendix A**) applies ETL 1110-2-583 rules to different bank conditions encountered along the SRFCP. This resulted in modifications to bank protection measures as they are applied to erosion sites, and results in increased off-site mitigation, and/or use of setback (including adjacent) levees.

10.0 **CHANGES IN TOTAL PROJECT FIRST COSTS**

This PACR provides an estimate of the first cost of the 80,000 LF. This cost estimate is extrapolated from the average cost per LF for the 8,086 LF in the justified priority site inventory. The first cost is $420.5 million, at October 2013 price level. The development of the justified priority site inventory is described in **Appendix A**.

This cost estimate is required so that the PACR may show the changes in project first cost, which is a USACE requirement. The cost estimate is also necessary to show an approximation of the Federal and non-Federal cost share responsibilities.

Table 3 shows available information on project first costs. Neither of the two Phase II authorities provided a project cost. Therefore, authorized project cost is not noted.

Table 3 – SRBPP Phase II Changes to Project First Costs ($1,000)

Phase	Estimated Cost of Current Project[1]	Authorized Cost[2]	Authorized Project Updated to Current Price Level[3]	Project Cost Last Presented to Congress 1972 Price Level[4]	Project Cost Last Presented to Congress Updated to Oct 2013 Price Level
Phase II, 405,000 LF	$256,129	N/A	N/A	48,000	271,400[3]
Phase II, 80,000 LF	$420,513	N/A	N/A	N/A	N/A
Total Phase II	$676,642	N/A	N/A	N/A	N/A

1. Costs are at October 2013 price level.
2. No costs were included in the authorized language.
3. Cost updated using Civil Work Construction Cost Index System, Revised September 30, 2011.
4. Chiefs Report: May 26, 1972 price level assumed from date of report.

Cost Engineering is certifying the costs for the sites in the current economically justified basins as part of the programmatic document. As additional economically justified basins are identified or current ones changed in future iterations, Cost Engineering will certify the costs supporting the economic analysis.

11.0 **CHANGES IN PROJECT BENEFITS**

The 1972 Chief's Report (H Doc. No. 93-151) for Phase II does not provide benefit information for the first 405,000 LF of Phase II bank protection. The report cites the 1960 findings of the Board of Engineers for Rivers and Harbors regarding justification. The Board's findings were:

> "The Board considers it impractical to assign a monetary value to the benefits which would result from the removal of threats of eventual levee breaks when there are hundreds of vulnerable locations in various states of deterioration."

Thus, benefits were not calculated for this Phase II work. Flood risk management benefits for the Phase II 80,000 LF are estimated as described in **Appendix D**. The analysis estimated the reduction in flood damages in economic impact areas as a result of bank protection. Economic impact areas are discrete floodplains protected by a

SRFCP levee or set of SRFCP levees. Economic impact areas are shown in **Figure 11**. Economic impact areas (sub-basins) were developed by the 2002 Sacramento and San Joaquin Basins Comprehensive Study. There are a total of 50 economic impact areas in the study area. Twenty four economic impact areas have bank erosions sites and were included in this study. For the economic analysis, 101 of the 106 sites in the priority site inventory were used. Five of the sites dropped out due to a lack of data. The exclusion of the five sites does not significantly change the results of the economic analysis. The without – and with – project flood damages, and the economic benefits were calculated for each of the 24 economic impact areas. **Table 4** lists the 24 economic impact areas and shows annual exceedance probabilities (AEP) reflecting no bank protection and full bank protection to the 106 erosion sites in the priority site inventory. In some cases, the "with-project" AEP is greater than the "without-project" AEP, implying that the levee performance gets worse with improvements to the erosion site. This is not expected to occur, but is mainly an effect of the difficulty of distinguishing levee failure due to erosion from other levee failure modes (such as over topping). In order to show performance improvements post erosion fixes, more current data (before and after erosion fixes) for those sub-basins/sites affected may need to be developed.

The assumption that all known erosion problems will be fixed is based upon taking all precautions to ensure that the recommendations are comprehensive in nature.

It is important to note that for many reaches, the assumption regarding the maximum attainable AEP value as listed in Table 4 is greater (lower performing) than the without-project AEP estimate from a contractor-prepared report, which appears to imply that the levee performance in these areas gets worse with repairs to the erosions site. This would not actually occur, but is mainly an effect of: 1) there are worse performance conditions for other potential failure modes, and that the AEP for the impact area is not governed by the erosion performance and/or 2) using data from different sources (i.e. the URS AEP vs. Comp study/recent District studies). In impact areas where this anomaly occurred, no benefits were claimed for that particular basin/impact area. However, in future assessments when more current data/information (e.g. geotechnical fragility curves) becomes available which would allow for a more accurate measurement of pre-repair and post-repair performance, the estimate of benefits for these impact areas will be re-assessed. It is expected that additional sub-basins will be economically justified in the future. Though the approach used for this non-standard study can also be viewed as non-standard, the bottom line is that the basins being recommended at this time are primarily those within heavily urbanized and populated areas where risk is unarguably high considering the identified erosion sites and potential for catastrophic life and property consequences. Annual exceedance probability measures the chance of having a damaging flood in any given year from a full range of frequency events.

Figure 11 – Economic Impact Areas

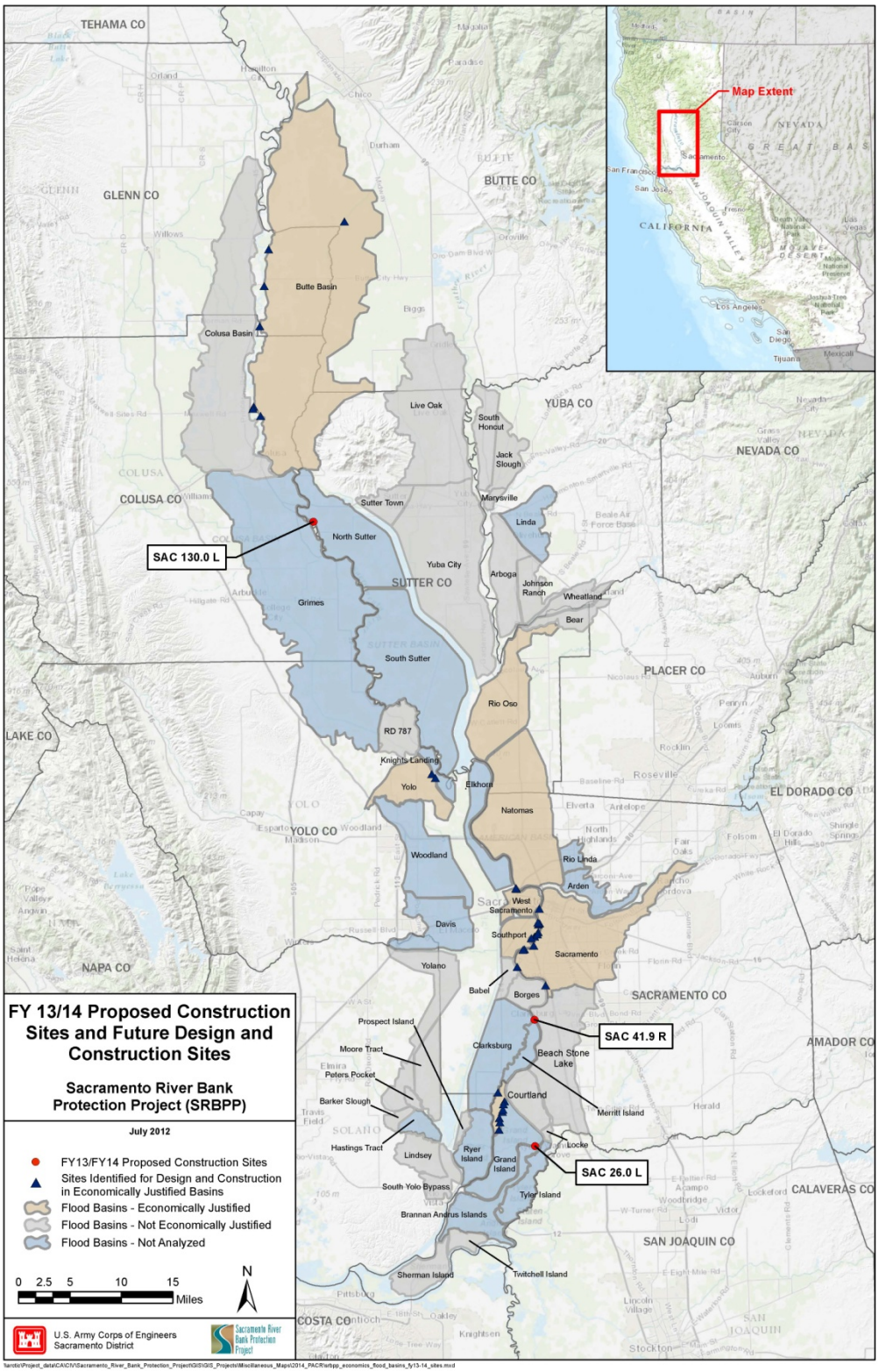


Table 4 – Economic Impact Areas Annual Exceedance Probabilities

Economic Impact Area	AEP Value: Without-Project Conditions	AEP Value: With Project Condition "Maximum Attainable Based on Available AEP Information"
Butte Basin	0.500	0.280
Grimes	0.040	0.533
South Sutter	0.500	0.255
Knights Landing	0.040	0.070
Yolo	0.500	0.074
Woodland	0.040	0.090
Davis	0.040	0.040
Linda	0.010	0.008
Rio Oso	0.200	0.086
North Sutter	0.040	0.050
Elkhorn	0.040	0.500
Natomas	0.010	0.007
Arden/Rio Linda	0.010	0.010
West Sacramento	0.040	0.009
Southport	0.040	0.011
Sacramento	0.040	0.008
Clarksburg	0.020	0.131
Merritt Island	0.040	0.156
Sutter Island	0.500	0.103
Grand Island	0.040	0.108
Tyler Island	0.200	0.805
Brannan Andrus	0.040	0.552
Ryer Island	0.100	0.124
Hastings Tract	0.500	0.329

11.1 INCIDENTAL BENEFITS

Bank protection will result in incidental benefit categories in addition to flood risk management. The SRBPP Phase II 80,000 LF results in potential incidental benefits to water supply, ecosystem restoration and navigation. This evaluation does not quantify these benefits; however, some examples of these different benefits are provided below.

* Ecosystem benefit example:

- Increase in floodplain for riparian vegetation and wetlands due to construction of setback levees. The setback levees included in the preliminary designs for the priority site inventory provide lands for environmental mitigation only. Setback levees actually constructed could provide lands that will present ecosystem restoration opportunities.

* Water supply benefit examples:
  - Improvement to water quality by avoidance of pesticide contamination from flooding agricultural areas.
  - Reduction in risk of salt water intrusion in the Delta through avoidance of levee failure due to erosion.
* Navigation benefit examples:
  - Reduction in obstacles to boat traffic in the Sacramento River due to reduction in bank erosion.
  - Reduction in sediment load and O&M dredging of the channel and harbors.
* Recreational benefit examples:
  - Reduction in damages to boating facilities due to erosion protection measures.
  - Reduction in damages to hiking trails due to erosion protection measures.

12.0 **BENEFIT-TO-COST RATIO**

Benefit-to-cost ratios (BCR) were not developed for the original Phase II SRBPP. See changes in project benefits above.

Table 5 shows the average annual benefits of bank protection in the seven economic impact areas (sub-basins) that contain enough damageable property to justify bank protection.

The feasibility of bank protection in the other 43 basins is inconclusive due to lack of data. As part of the PBPP, sites that are currently not justified will undergo future economic analyses. These analyses will be conducted with updated data and information, and may result in justification of sites.

Table 5 – Justified Economic Impact Areas ($1,000s)

Impact Area	Annual Benefit (75 percent Confidence Level)	Annual Cost[1]	Net Benefits	Benefit-to-Cost Ratio (BCR)
Butte Basin	1,028	548	480	1.9 to 1
Natomas	17,524	121	17,403	145 to 1
Rio Oso	796	334	462	2.4 to 1
Sacramento	18,577	56	18,521	332 to 1
Southport	13,345	448	12,897	30 to 1
West Sacramento	13,995	95	13,900	147 to 1
Yolo	770	244	526	3.2 to 1
TOTAL	66,035	1,846	64,189	36 to 1

1. Costs are at October 2013 Price Level, 3.5 percent discount rate, 50-year period of analysis, in $1,000

Seven of the 24 economic impact areas analyzed are currently economically justified as shown in **Table 5**. Results are based on levee and hydraulic data available. Adequacy of data throughout the study area varies. Sites in the 17 impact areas that are currently not justified lack site-specific information that is pertinent to their justification. Analyses that will occur later, as the SRBPP is implemented, may provide sufficient data to demonstrate that more sites are economically justified. As erosion sites are identified they will be evaluated with site specific information. Sites that are located in sub-basins that are currently identified as unjustified could be justified if additional information and analysis show higher benefits and/or lower costs. The USACE Sacramento District will prepare Economic Reevaluation Reports (ERRs)[1] that will be approved by South Pacific Division. The Risk Assessment methodology will be revised for the Sacramento River Bank Protection project and applied to future Sacramento River Bank Protection project Economic updates with a focus on revised geotechnical fragility curves. Economically justified erosion site repairs will be designed and approved by the District for construction.

The benefit areas under the SRBPP coincide with those areas being assessed under the Natomas, American River Common Features, and West Sacramento studies. (For this SRBPP assessment there were no justified sub-basins within the Sutter Basin Study area.) Benefits estimated for the SRBPP only include those benefits associated with repairing erosion sites, and do NOT include benefits associated with addressing other failure modes such as levee stability, underseepage, and/or through seepage. While Tentatively Selected Plans of the Common Features and West Sacramento Studies do

[1] An ERR is a planning document that describes the economics of a project. An ERR is typically undertaken if there are significant changes to the economics of a project. An ERR does not include plan formulation, but rather focuses on verifying economic feasibility of an already proposed/authorized project.

not include erosion repair, erosion repair on the Sacramento River is not a primary risk driver and does not drive plan selection or the economic feasibility of these plans. The SRBPP assessment assumed that these erosion improvements were not in place yet as these other studies are still in the study phase whereas SRBPP is in construction and ready to act.

13.0 **CHANGES IN COST ALLOCATION**

There are no changes to cost allocation. All costs are allocated to flood risk management.

14.0 **CHANGES IN COST APPORTIONMENT**

Cost sharing of the Phase II 80,000 LF will be in accordance with WRDA 1986, as amended, that specifies cost apportionment. The following is quoted from WRDA 1986:

"(a) Flood control
(1) General rule
The non-Federal interests for a project with costs assigned to flood control (other than a nonstructural project) shall—

(A) pay 5 percent of the cost of the project assigned to flood control during construction of the project;

(B) provide all lands, easements, rights-of-way, and dredged material disposal areas required only for flood control and perform all related necessary relocations; and

(C) provide that portion of the joint costs of lands, easements, rights-of-way, dredged material disposal areas, and relocations which is assigned to flood control.

(2) 35 percent minimum contribution
If the value of the contributions required under paragraph (1) of this subsection is less than 35 percent of the cost of the project assigned to flood control, the non-Federal interest shall pay during construction of the project such additional amounts as are necessary so that the total contribution of the non-Federal interests under this subsection is equal to 35 percent of the cost of the project assigned to flood control.

(3) 50 percent maximum
The non-Federal share under paragraph (1) shall not exceed 50 percent of the cost of the project assigned to flood control. The preceding sentence does not modify the requirement of paragraph (1)(A) of this subsection.

> (4) Deferred payment of amount exceeding 30 percent
> If the total amount of the contribution required under paragraph (1) of this subsection exceeds 30 percent of the cost of the project assigned to flood control, the non-Federal interests may pay the amount of the excess to the Secretary over a 15-year period (or such shorter period as may be agreed to by the Secretary and the non-Federal interests) beginning on the date construction of the project or separable element is completed, at an interest rate determined pursuant to section 2216 of this title. The preceding sentence does not modify the requirement of paragraph (1)(A) of this subsection. 33 U.S.C. § 2213."

Some of the Phase II 405,000 LF was cost shared according to the original authorization that required a non-Federal share of one-third of the total costs. See Flood Control Act of 1960, Pub. L. 86-645, § 203, 74 Stat. 498 (1960). This was specified in the Phase II LCA of April 20, 1984. Two amendments to the project LCA in 1988 covering a total of 141,414 LF provided that specified separable elements (erosion repair sites) were cost shared in accordance with WRDA 1986, which required a minimum non-Federal share of 25 percent for new separable elements. The Water Resources Development Act of 1996, Pub. L. 104-303, § 202, 110 Stat. 3673 (1996) (WRDA 1996) increased the minimum non-Federal share for new separable elements to 35 percent. At the end of 2006, when the work specific for the two LCAs executed in 1988 was completed, the cost share reverted back to two-thirds Federal and one-third non-Federal, as prescribed in the 1984 agreement.

For the Phase II 80,000 LF, the cost share will be in accordance with WRDA 1986, codified at 33 U.S.C. § 2213 (quoted above), and current USACE policy. **Table 6** provides data relating to the cost apportionment of the 80,000 LF. Of the total project cost of $420.5 million for the Phase II 80,000 LF, $274.3 million is the Federal share, and $146.3 million is the non-Federal share. The cost is based on the justified priority site inventory, and is only an approximation of future actual costs. As the 80,000 LF is implemented, detailed costs of bank protection at selected sites will be developed.

Table 7 provides data related to apportionment of estimated first cost.

Table 6 – 80,000 LF Estimated First Cost ($1,000s)

Cost Estimate Account	Amount [1]
01 Lands and Damages	73,928
02 Relocations	3,735
06 Fish and Wildlife Facilities	14,111
11 Levees and Channels	25,607
16 Bank Stabilization	206,666
18 Cultural Resources Data Recovery	2,640
30 Planning, Engineering, and Design (PED)	57,551
31 Construction Management (CM)	36,275
Total First Cost	420,513

1. Costs are at an October 2013 price level.

Table 7 – Apportionment of Estimated First Cost ($1,000s)

Cost Component	Federal	Non-Federal	Total [1]
Lands, Damages, and Relocations	0	77,663	77,663
PED, Construction, CM, Fish and Wildlife	340,210	0	340,210
Subtotal	340,210	77,663	417,873
5 Percent Cash Adjustment	-20,894	20,894	
Subtotal	319,317	98,557	417,873
Adjust to 65% Fed, 35% Non-Fed	-47,699	47,699	
Subtotal	271,617	146,256	417,873
Cultural Resources Data Recovery	2,640	0	
Total Contributions	274,257	146,256	420,513
Contribution Percent	65.22%	34.78%	100.00%

1. Costs are at an October 2013 price level.

15.0 **ENVIRONMENTAL CONSIDERATIONS IN RECOMMENDED DESIGN CHANGES**

The vegetation management ETL 1110-2-583 “provides guidelines to assure that landscape planting and vegetation management provide aesthetic and environmental benefits without compromising the reliability of levees, flood walls, embankment dams, and appurtenant structures. It is important to note that all minimum guidelines presented herein are just that-minimums. The dimensions of the vegetation-free and root-free zones defined in this document provide the minimum acceptable buffer between vegetation and flood damage reduction structures. For each individual project, the design team must consider whether these minimum are adequate to the specific needs and conditions of the project.” In some instances, a variance is appropriate and can be requested.

The PBPP for Phase II 80,000 LF integrated fish habitat and vegetation cover considerations along with engineering considerations. Where in-place bank protection resulted in unavoidable losses to vegetation and fish habitat, setback levees (including adjacent levees) were specified as the appropriate measure. Off-site mitigation would be provided to offset lost vegetation that cannot be replaced on-site.

Actual impacts and mitigation will be developed and reported in site-specific tiered environmental documents once individual sites are selected and site specific bank protection measures are designed. This will be done during the implementation phase, anticipated to begin in 2016 and extend through approximately 2026.

15.1 ENVIRONMENTAL ISSUES

When Phase II was initiated, mitigation was based on a percentage of the total construction cost. The Phase II authorization provided that an estimated 10 percent of total construction costs could be spent on measures to mitigate adverse environmental impacts. Resource agencies annually reviewed plans for construction and recommended measures to avoid or compensate for adverse impacts. The two primary mitigation measures were purchase of environmental easements at work sites and build out of eroding banks using rock fill to preserve vegetation growing on banks.

In the mid-1980's, impact analysis and mitigation planning became more quantitative with the advent of habitat modeling. In addition, the United States Fish and Wildlife Service (USFWS) opposed any loss of woody riparian vegetation, which resulted in a more comprehensive mitigation effort.

In 2000, the USFWS and National Marine Fisheries Service (NMFS) issued draft jeopardy (BO), under the Endangered Species Act (ESA), for the SRBPP. The draft jeopardy BO was prompted by the potential effects of imminent erosion protection construction that was found to likely jeopardize several fish and wildlife species by destroying habitat. A non-jeopardy opinion was issued in 2001 after the USACE agreed to incorporate a Reasonable and Prudent Alternative into their existing project description, which contained several additional conservation measures. Only limited work proceeded over the next several years. A programmatic BO was issued in 2008 for the remainder of the Phase II 405,000 LF.

15.2 CULTURAL RESOURCES PROGRAMMATIC AGREEMENT

The cultural programmatic agreement (PA) between the USACE, CVFPB and the State Historic Preservation Office (SHPO) was developed as the process by which Section 106 of the National Historic Preservation Act (NHPA) would be fulfilled. Due to the nature of the project, the PA was developed to streamline the process by which the USACE would identify, evaluate and consult with the SHPO and any concurring

parties, including Native American Tribes, concerning any historic properties that may be impacted by the project.

16.0 **PUBLIC INVOLVEMENT**

In connection with the EIS/EIR and this PACR, a number of public involvement activities were held. These are described below.

16.1 SCOPING MEETINGS

A Notice of Preparation (NOP) of an EIR and a Notice of Intent (NOI) to prepare an EIS were issued informing agencies and the general public that an EIS/EIR was being prepared. These notices were published in the January 30, 2009 issue of the Federal Register on pages 5649 to 5650. To allow for public involvement, a series of four scoping meetings were held in the cities of Colusa, Chico, Sacramento and Walnut Grove in February 2009.

The meetings were held with the goal of introducing the public to the proposed project and requesting that they provide input regarding preparation of the EIS/EIR for Phase II work and its compliance with environmental requirements such as NEPA and CEQA. The scoping meetings were held in an open house format and concluded with a period for comments.

A total of 15 written comments were received. Other verbal comments were noted in transcripts. The comments are provided in the **EIS/EIR.** Comments received related to vegetation on levees, flood control issues and related programs, coordination with agencies and public involvement, as well as other issues. Comments were received from NMFS, California Department of Transportation, The Nature Conservancy, the Delta Protection Commission, California State Lands Commission, Sacramento Regional County Sanitation District and the Audubon Society. Comments were also received from Reclamation District (RD) 1001, Butte County Public Works, California State Parks, the City of West Sacramento, as well as local individuals.

16.2 AGENCY INVOLVEMENT

16.2.1 Inter-Agency Working Group

The Inter-Agency Working Group (IWG) was established in the fall of 2001 to support the work of the SRBPP. The IWG's primary goals are to identify, evaluate, design and endorse conservation measures that are consistent with the BOs and the USACE mandate to provide flood protection. Actions taken by the SRBPP must fully compensate for effects to endangered species. The IWG includes representatives from the USACE, the CVFPB, the USFWS, the NMFS, the California Department of Water Resources (DWR), and the California Department of Fish and Wildlife (CDFW). The IWG evaluates the potential use of setback levees, large woody materials, rock

removal, flood easements/land acquisition and inter-levee land restoration efforts. The IWG may also consider other measures that restore fluvial function and address the requirements of BOs. As prescribed in the August 23, 2001 BO regarding the IWG, "*the IWG shall consider the economic, endangered species, engineering, environmental, public safety, and real estate issues when recommending potential solutions*" related to each project. IWG meetings are held monthly, are facilitated and are meant to coordinate activities of the SRBPP with State and Federal resource agencies. This group's purview includes all phases of the SRBPP since issuance of the August 23, 2001 BO. The BO recommends the IWG continue during implementation of the 80,000 LF.

16.2.2 Conferences Sponsored by the SRBPP Team

The Sacramento River Watershed Symposium was held in August 2009. The symposium was held to educate the public on different projects and programs in the Sacramento River Watershed. Topics discussed included the SRBPP Phase II and the potential future Phase III, the Central Valley Integrated Flood Management Study and the West Sacramento Project General Reevaluation Report, among others. Also discussed was the NMFS perspective on species protection and recovery and the SRBPP.

The USACE Engineer Research and Development Center (ERDC) and the USACE Institute for Water Resources held a conference in February 2010. The purpose was to review current work and studies being performed, and identify other technical studies to be developed to implement the SRBPP. The goal of the conference was to gather information that could be used to develop a five year plan of study to prioritize technical studies in determining the effects of past projects and developing future with- and without-projects. The conference succeeded in identifying several needed studies.

16.3 NATIVE AMERICAN OUTREACH

A Native American outreach and consultation process was established to identify Native American groups or individuals that may have interests or concerns about sensitive sites, areas or archaeological investigations associated with implementation of the SRBPP. The process helps assure compliance with state and Federal cultural resource protection laws.

The process developed a list of tribes and other Native American organizations and individuals who have documented their interest in cultural resources management within California. Meetings were held to provide project information and organize a consultation process during SRBPP implementation.

16.3.1 Public Review and Comment

As part of the NEPA/CEQA process, the Draft EIS/EIR will be available for public comment.

The SRBPP Website provides opportunity for the public to view materials and the status of the project. The public can view the description and history of the overall project, related programs, the project's environmental impacts, and status of construction activities and monitoring. The address of the web site is:

http://www.spk.usace.army.mil/Missions/CivilWorks/SacramentoRiverBankProtection.aspx

17.0 **COMPARISON OF THE RECOMMENDED PLAN TO THE SECTION 902 LIMITATIONS**

Section 902, WRDA 1986, codified at 33 U.S.C. § 2280, establishes a maximum cost for most projects authorized in WRDA 1986 or subsequent Acts. USACE Counsel has advised that the Section 902 maximum cost depends on the incorporation of a total project cost figure in the statutory authority for a project. Prior authorizations for the SRBPP pre-date WRDA 1986, and WRDA 2007 modification did not establish an authorized cost for the total project or the Phase II 80,000 LF portion. Therefore, Section 902 does not apply to any authorized phase of the project.

18.0 **HISTORY OF PROJECT**

The following is a summary description of project events since the SRBPP Phase II was authorized in 1974. The events are organized as stated in the headings.

18.1 GEOGRAPHIC EXTENT

In 1982, Pub. L. 97-377 added approximately 28 river miles to the geographic extent of the SRBPP. This addition extends upstream of the SRFCP Sacramento River Levees up to Big Chico Creek, in Butte County. However, no SRBPP project levees were added in this reach.

18.2 CONSTRUCTION

Phase II repair of 405,000 LF was authorized in 1974. Construction began in 1975, and is currently on-going. **Figures 12** and **13** respectively show the number of Phase II erosion sites that have been constructed by year and the linear footage that has been repaired by year. The rate of work was drastically reduced in the 1990s and early 2000s before picking back up at a lesser pace in 2006. Work slowdown was largely due to BOs issued between 1998 and 2005.

Figure 12 – Number of Sites Repaired by Year

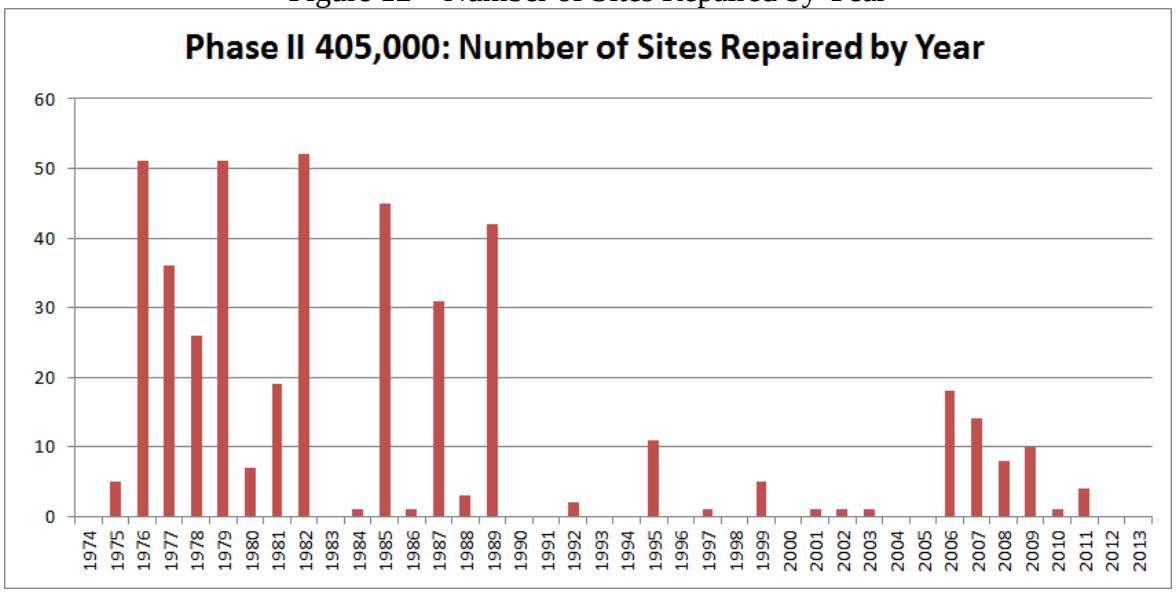
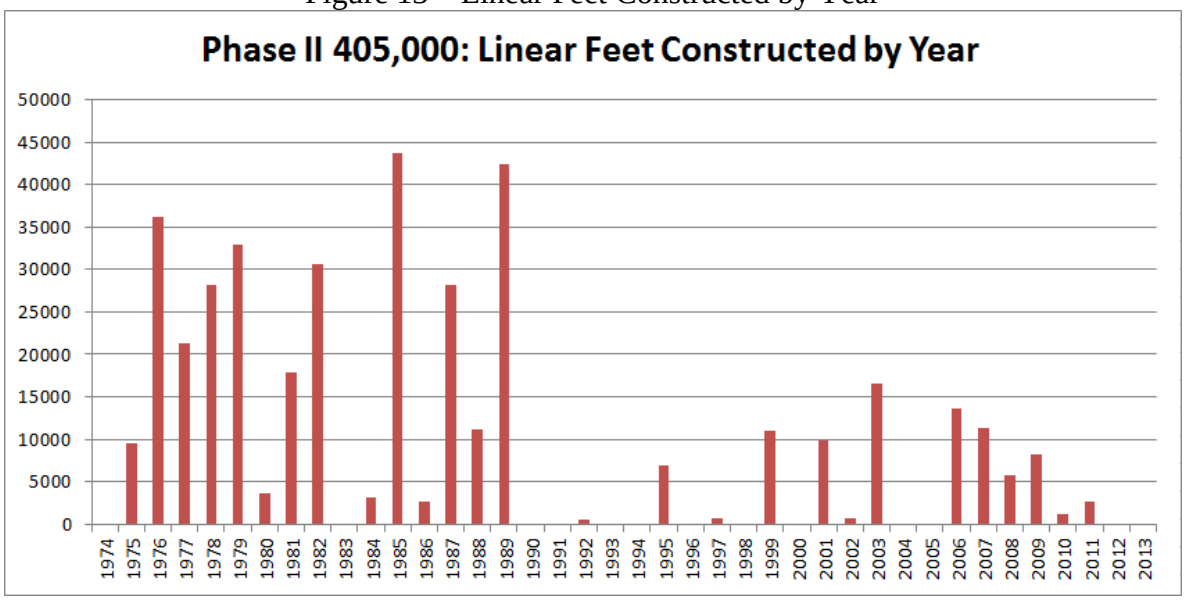


Figure 13 – Linear Feet Constructed by Year



As the SRBPP has proceeded, bank and levee erosion sites were identified and monitored through field surveys in cooperation with the State of California. Following the 1996 and 1997 large flood events that resulted in multiple levee breaches and many flood fighting efforts throughout the system, the USACE inventoried all the erosion within the system so that repairs could be directed towards the sites most in need of repair.

In 1997, the first annual erosion field reconnaissance occurred, and a list of erosion sites was developed. The USACE Sacramento District conducts these field reconnaissance trips on an annual basis to inventory the new erosion sites and update the existing erosion sites. The number of erosion sites continues to grow at a steady pace. However, the number of sites that were being repaired declined to only seven sites between 1998 and 2005. The sites repaired included two sites at the Colusa Basin /Colusa Basin Drain, one on the Sacramento River (RM 149.0L) and five sites on the Lower American River (RM 4.4L, 3.8L, 2.9L, 6.8L and 8.7R). Bank repairs were limited during this time due to a number of factors, including limited funding, difficulty acquiring rights-of-way and concerns over the environment and potential impacts to endangered species and their associated habitat. With limited construction, the banks of the system continued to erode and many of the previously identified erosion sites became critical, meaning there was concern that a breach might occur from the next large flood event.

On February 24, 2006, following sustained heavy rainfall and runoff, Governor Arnold Schwarzenegger declared a State of Emergency for California's levee system. Following this declaration, the USACE and the DWR repaired the critical erosion sites. Repairs of non-critical erosion sites continue, but with an existing backlog and new sites identified each year, the number of erosion sites is outpacing the repairs.

In 2004, a set of four ranking methodologies was developed as part of the annual erosion inventory to assist with prioritizing and selecting bank repair sites. These methodologies served the intended purpose, but a better procedure incorporating new guidance and addressing all disciplines was developed for the Phase II 80,000 LF and is described in **Appendix B**.

Recreation facilities were constructed in association with both Phases I and II. The 1972 Chief's Report for Phase II described the recreation facilities in Phase I and included $780,000 in estimated construction costs for recreation facilities in Phase II. There is no authorization language for SRBPP that specifically addresses recreation, and no specific recreation authority was cited in the 1972 Chief's Report. So, it appears that USACE may have relied on a general recreation authority (e.g., Section 4 of the Flood Control Act of 1944 and/or the Federal Water Project Recreation Act of 1965) under policy in effect at the time.

Two recreation facilities have been constructed as part of Phase II. Summaries of the recreational facilities are as follows:

1. Elkhorn Boat Facility – A recreational facility near RM 68.5 on the right bank of the Sacramento River in Yolo County was constructed to provide river access and boating docks. Also, riparian vegetation was planted.

2. River Front Park – A recreational facility near RM 28.7 on the left bank of the Feather River in Marysville was constructed to include River access, boating docks and a nature area.

18.3 STATUS OF PHASE II 405,000 LF

On April 20, 1984, an LCA for the SRBPP was executed between the Department of the Army (DA) and the CVFPB (then called the Reclamation Board).

On August 1988, the CVFPB and the Assistant Secretary of the Army for Civil Works (ASA(CW)) signed a LCA for Separable Element 41. This agreement provided for cost sharing in accordance with WRDA 1986, which effectively reduced the State share to 25 percent.

On December 7, 1988, the Board and the ASA(CW) signed the LCA for Separable Elements 38B, 40 and 42, also in accordance with WRDA 1986.

The LCA was amended on March 26, 2006 to establish the maximum length of bank erosion repair at 405,000 LF.

On May 5, 2006, the LCA was amended to allow the state to accelerate its cash contribution, allow credit for state cash contributions and increase the total project cost estimate for the remaining authorization.

On June 20, 2006, the LCA was further amended to account for design changes and costs associated with the Flood Control Act of 1958, Pub. L. 85-500, § 215, 72 Stat. 305 (1958). This amendment concerned bank protection constructed by the State at three Cache Creek (Yolo County) critical emergency erosion sites.

Approximately 4,966 LF of construction remain under the original Phase II authority. Four sites on the Sacramento River (RM 26.0L, 16.8L, 41.9R and/or 71.3R) were identified for construction and may exhaust the remaining LF. Sacramento River RM 26.0L is expected to be constructed in 2015, and will consist of 1,626 LF of work. The other sites will be constructed as real estate is certified.

There are 53 constructed sites that still have to be turned over to the non-Federal Sponsor. Levee maintenance and management of vegetation are issues to be resolved before sites are turned over.

18.4 STATUS OF PHASE II, 80,000 LF

In 2007, the authority was modified to include another 80,000 LF. As provided in guidance from USACE Headquarters, this PACR and supporting documents were prepared to document conformance to the USACE civil works policy.

19.0 CONCLUSIONS

- By assigning bank protection measures to actual erosion sites, applying vegetation management guidance and through the Standard Assessment Methodology (SAM) analysis, this evaluation demonstrates that 80,000 LF of bank protection throughout the project area is technically feasible and effective, and minimizes impacts to riparian vegetation and fish and wildlife habitat. Where impacts cannot be avoided, off-site mitigation may be necessary.
- The estimated total first cost of the Phase II 80,000 LF bank protection is $420.5 million (October 2013 price level). This is the extrapolated cost of the justified priority site inventory, which provides for bank protection in the following economically justified sub-basins: Butte Basin, Yolo, Rio Oso, Natomas, West Sacramento, Southport and Sacramento.
- There are no additional Federal O&M costs due to bank protection. O&M costs for repair sites will be borne by the Non-Federal Sponsor. This is because the levees banks, and vegetation on levees and banks are already inspected and maintained by local interests.
- Since there was no project cost specified in the SRBPP authorizing language, and Phase II authorization pre-dates WRDA 1986, there is no limit to the project cost as defined by Section 902 of WRDA 1986.
- Seven economic impact areas will provide substantial economic benefits and are economically justified. There are 17 additional sub-basins that were evaluated, but justification was inconclusive due to lack of data. There are 26 additional sub-basins were not evaluated. Erosion sites in unjustified economic impact areas will require further data and analysis in order to demonstrate economic justification. Concurrent with the site selection process, economic reevaluation reports that identify justified sites will be prepared by the District and approved at the Division level.
- Current budgetary requirements mandate a more detailed economic justification of bank protection than in the past. This results in funding being limited to sites with benefits greater than costs. Bank protection will result in incidental benefits in benefit categories in addition to flood risk management. Potential ecosystem benefits include increase in floodplain when constructing setback levees, which allows for increase in riparian vegetation; water supply benefits may include avoidance of pesticide contamination from flooding agricultural areas; and navigation benefits include reduction in obstacles to boat traffic. These benefits are considered incidental to the project purpose of flood risk management. This evaluation does not quantify these benefits.

- Site selection is an important component of implementation. The site selection process is a refinement of the process currently in use for the Phase II 405,000 LF.
- Bank protection would be implemented on an annual basis. Periodic, site specific DDRs and addendums to the REP will be prepared to supplement this programmatic document. Site-specific tiered environmental documentation will also be prepared.
- The non-Federal sponsor, the State CVFPB, supports the project. The CVFPB understands and is able to carry out non-Federal sponsor responsibilities.
- Based on these findings, and non-Federal sponsor support, the District recommends implementation of the SRBPP Phase II additional 80,000 LF authorized by Congress through the process laid out in **Appendix B**.

  Once specific sites are identified for construction, USACE real estate will update the information listed in **Appendix C,** Exhibit D - Site Specific Real Estate Inventory Check-List. The updated addendum will be reviewed and approved at the District Level; however, Division will be notified which specific sites will be worked. This addendum will better define the impacted parcels, costs of acquisition, schedule, etc.

20.0 **SUMMARY OF PROGRAMMATIC BANK PROTECTION PLAN RECOMMENDATION**

Following are recommendations for implementation of the additional 80,000 LF of erosion protection work authorized by Congress in WRDA 2007:

* Construct up to the authorized 80,000 LF of erosion protection features within the economically justified sub-basins on sites chosen based upon the Site Implementation Process for Bank Repairs (described in **Appendix B**). Construction would be subsequent to future site specific DDRs, site-specific tiered environmental compliance documentation and site specific real estate plans. Erosion sites would be identified using engineering criteria. Repairs would be implemented following site specific engineering design in accordance with the order established during the site selection process, subject to real estate acquisition by the State of California and with Federal cost-sharing. Selection of sites for implementation will include consideration of consequences as only those sites within previously identified economically justified basins will be implemented. Investigate modification of the SRBPP to address concerns related to flood risk management (including the risk to the system due to erosion), the riverine ecosystem and other river-oriented purposes in the SRBPP Phase III General Re-evaluation Report.

* Recommend that the non-Federal partners construct erosion protection features within the sub-basins that are not currently economically justified on sites that have been identified based on engineering factors. Sites should be implemented in the order determined by the Site Implementation Process, subject to real estate acquisition constraints, following site-specific environmental compliance documentation and engineering design. Any work the non-Federal partners decide to complete that is not within the current (or future) economically justified sub-basins, or not considered to be routine maintenance, will need to be permitted under Section 408, without Federal cost-sharing.

* Continue to refine the definition of sub-basins through further analysis of the hydrologic/hydraulic connectivity between sub-basins within the flood control system. On that basis, update the economic analysis for the SRBPP to potentially identify additional economically justified sub-basins, if appropriate.

* Investigate modification of the SRBPP to address concerns related to flood risk management (including the risk to the system due to erosion), the riverine ecosystem and other river-oriented purposes in the SRBPP Phase III General Re-Evaluation Report. A Project Management Plan and Feasibility Cost Sharing Agreement are being developed for approval and execution.