US Army Corps of Engineers

Prepared by:

South Pacific Division
Sacramento District

Sacramento River Bank Protection Project, Phase II

Review Plan

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Acronyms and Abbreviations

A-E – Architect-Engineer
ATR - Agency Technical Review
CEQA – California Environmental Quality Act
CSRA – Cost & Schedule Risk Analysis
CW – Civil Works
DDR – Design Documentation Report
DE – District Engineer/ Division Engineer
DIST – District
DIV – Division
DQC – District Quality Control
EA – Environmental Assessment
EC – Engineering Circular
ECB – Engineering & Construction Bulletin
EIR – Environmental Impact Report
EIS – Environmental Impact Statement
EM – Engineering Manual
EP – Engineering Pamphlet
ER – Engineering Regulation
ESA Endangered Species Act
FONSI – Finding of No Significant Impact
FY – Fiscal Year
GIS – Geographic Information Systems
H&H – Hydrology and Hydraulics
HEC – Hydrologic Engineering Center
HQUSACE – Headquarters, U. S. Army Corps of Engineers
IEPR – Independent External Peer Review
LERRD – Lands, Easements, Rights-of-Way, Relocations, and Disposal
LSO – Levee Safety Officer
MCACES – Micro-computer Aided Cost Engineering System
MCX – Mandatory Center of Expertise
MFR – Memorandum for Record
MII – MCACES 2nd Generation
MOA – Memorandum of Agreement
MOU – Memorandum of Understanding
NEPA –National Environmental Protection Act
NMFS – National Marine Fisheries Service
NOAA – National Oceanographic and Atmospheric Administration
O&M – Operations and Maintenance
OC – Office of Counsel
OMRR&R – Operations, Maintenance, Repair, Replacement and Rehabilitation
PACR – Post-authorization Change Report
PCX – Planning Center of Expertise
PDT – Project Delivery Team
PE – Professional Engineer
PED – Pre-construction Engineering and Design
PL – Public Law
PM – Project Manager
PMP – Project Management Plan
PPA – Project Partnership Agreement
QA/QC – Quality Assurance / Quality Control
QMP –Quality Management Plan
QMS – Quality Management System
REP – Real Estate Plan
RP – Review Plan
RMC – Risk Management Center
RMO – Review Management Organization/Resource Management Office
ROD – Record of Decision
SAR – Safety Assurance Review
SPD – South Pacific Division
SPK – Sacramento District
TBA – To be Announced
TBD – To be Determined
TPCS - Total Project Cost Summary
USACE – U. S. Army Corps of Engineers
USFWS – United States Fish and Wildlife Service
VE – Value Engineering
WRDA – Water Resources Development Act

1.0 Introduction

1.1 Purpose

This Review Plan (RP) defines the levels and scopes of review for the Sacramento River Bank Protection Project (SRBPP), Phase II (P2: 105606), and will ensure a quality engineering project is developed by the U.S. Army Corps of Engineers (USACE). As part of the Project Management Plan, the RP establishes an accountable, comprehensive, life-cycle review strategy and describes the scope of review for the current phase of work. This RP describes technical review processes to be used during the ongoing completion and fiscal closeout of the initially authorized 405,000 (405K) linear feet (LF) portion of Phase II, as well as the future implementation of an additional 80,000 (80K) LF of bank protection addressed by the project's Post Authorization Change Report (PACR), approved in 2020. Work products discussed in this RP will be developed and reviewed in a manner consistent with the approved PACR and with current USACE policy.

ER 1165-2-217, "Review Policy for Civil Works," outlines five general levels of review: District Quality Control (DQC); Agency Technical Review (ATR); Biddability, Constructability, Operability, Environmental, and Sustainability (BCOES) Review; Independent External Peer Review (IEPR) and/or Safety Assurance Review (SAR); and policy and legal compliance reviews. This RP focuses on technical reviews, and it will be provided to Project Delivery Team (PDT), DQC, ATR, BCOES, and IEPR / SAR Teams to help guide their reviews. These technical reviews augment and complement policy review processes. Policy and legal reviews are discussed briefly under Section 9.0, Approvals.

This RP replaces the SRBPP RP that was approved in January 2013. This new version is built from a review plan template for pre-construction, engineering, and design (PED) and construction projects provided by the Risk Management Center (RMC). The plan's authors are Stephen Osgood, Project Manager, Fernando Gonzalez, Project Management Specialist, and Chance Foley, former intern. The RP is a "living document" that will be updated as needed during continued implementation of the project.

1.2 References

- ER 1165-2-217, Review Policy for Civil Works, 01 May 2021
- ECB 2018-15 Rev 1, Technical Lead for E&C Deliverables 10 September 2020
- ECB 2019-15, Interim Approach for Risk-Informed Designs for Dam and Levee Projects, 08 October 2019
- ER 415-1-11, Biddability, Constructability, Operability, Environmental and Sustainability (BCOES) Reviews, 1 January 2013
- ER 1110-2-1150, Engineering and Design for Civil Works Projects, 31 Aug 1999
- ER 1105-2-100, Planning Guidance Notebook, 20 Nov 2007
- ER 11-1-321, Army Programs Value Engineering
- WRDA 2007, H. R. 1495, Public Law 110-114, 8 Nov 2007
- ER 1105-2-101, Risk Assessment for Flood Risk Management Studies. 17 July 2017
- EP 1110-2-18, "Guidelines for Landscape Planting and Vegetation Management at Levees, Floodwalls, Embankment Dams, and Appurtenant Structures," USACE, DoD, 1 May 2019

- Army Regulation 15–1, Committee Management, 27 November 1992 (Federal Advisory Committee Act Requirements)
- National Academy of Sciences, Background Information and Confidential Conflict of Interest Disclosure, BI/COI FORM 3, May 2003
- EM 1110-2-1913, Design, Construction, and Evaluation of Levees, 30 April 2000
- Post-Authorization Change Report, Sacramento River Bank Protection Project, California, June 2020
- Project Management Plan for SRBPP
- SRBPP Project Level Review Plan (Nov 2012)
- South Pacific Division Quality Management Plan, CESPD R 1110-1-8

1.3 Review Management Organizations

The Risk Management Center will be the Review Management Organization (RMO) for products where the Sacramento District's (SPK) Chief of Engineering determines that a Safety Assurance Review (SAR), is required due to significant risk to human life, or for other reasons. For all other work products, the USACE South Pacific Division (SPD) will serve as the RMO. (SPD is the Major Subordinate Command [MSC] for SPK.) The RMO is responsible for managing the review activities described in this RP. The RMO will also coordinate with the Risk Informed Design Coordination Group and Levee Safety Senior Oversight Group (LSOG) as needed.

2.0 Project Description

2.1 SRBPP

The SRBPP is a continuing construction project, authorized by the Flood Control Act of 1960, that provides protection from erosion to the levees and flood control facilities of the Sacramento River Flood Control Project (SRFCP). The SRFCP consists of approximately 1,100 miles of levees plus overflow weirs, pumping plants, and bypass channels that reduce flood risk for communities and agricultural lands in the Sacramento Valley and Sacramento-San Joaquin Delta. The purpose of the SRBPP is to manage flood risk by maintaining the integrity of the SRFCP through identification of erosion damage to levees, installing works to address the damage, and protect the levees from further erosion.

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 also extends to several tributaries, sloughs, and bypass channels. The SRBPP area coincides with the leveed portions of the SRFCP. 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 it 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. Figure 1 is a map of the SRFCP levees and indicates the potential extent of bank protection.

The SRBPP is a long-range construction project that identifies significant erosion problems of the SRFCP, prioritizes erosion sites, and designs and constructs bank protection to preserve the viability and integrity of the SRFCP levees. The SRBPP has been a useful tool for non-emergency erosion protection for SRFCP facilities. Annual inspections monitor bank erosion that threatens levees. The observations made during the annual inspections are used to rank erosion sites to assist in prioritization and to support initial design of bank protection measures and other mitigation features.

The SRBPP usually addresses erosion damage by placement of quarried stone on the eroded bank or levee. This typically is conducted during a single construction season. In a few cases, the project has constructed setback levees. Setback levees were constructed in 2006 – 2008 under the project's authority by the NFS at lower Cache Creek, and one was constructed by a contractor to USACE in 2010 – 2015 at SAC RM 57.2R in West Sacramento.

In this RP, the phrase "bank protection" encompasses both erosion control works and setback levees, both of which are within the project's authority. The SRBPP does not, however, focus its efforts on other types of levee improvements such as cutoff walls, raising low spots along the levee crests, or other measures to reduce overtopping risk, to correct seismic deficiencies, or to address slope stability or seepage problems not caused by erosion.

The SRBPP has progressed in two phases. Phase I was initially authorized by the Flood Control Act of 1960 and consisted of 430,000 LF of bank protection. Phase I construction was completed in 1975. Phase II consists of 405K LF of erosion control works and setback levees authorized by the River Basin Monetary Authorization Act of 1974, and an additional 80K LF authorized by the Water Resources Development Act (WRDA) of 2007. See Table 1.

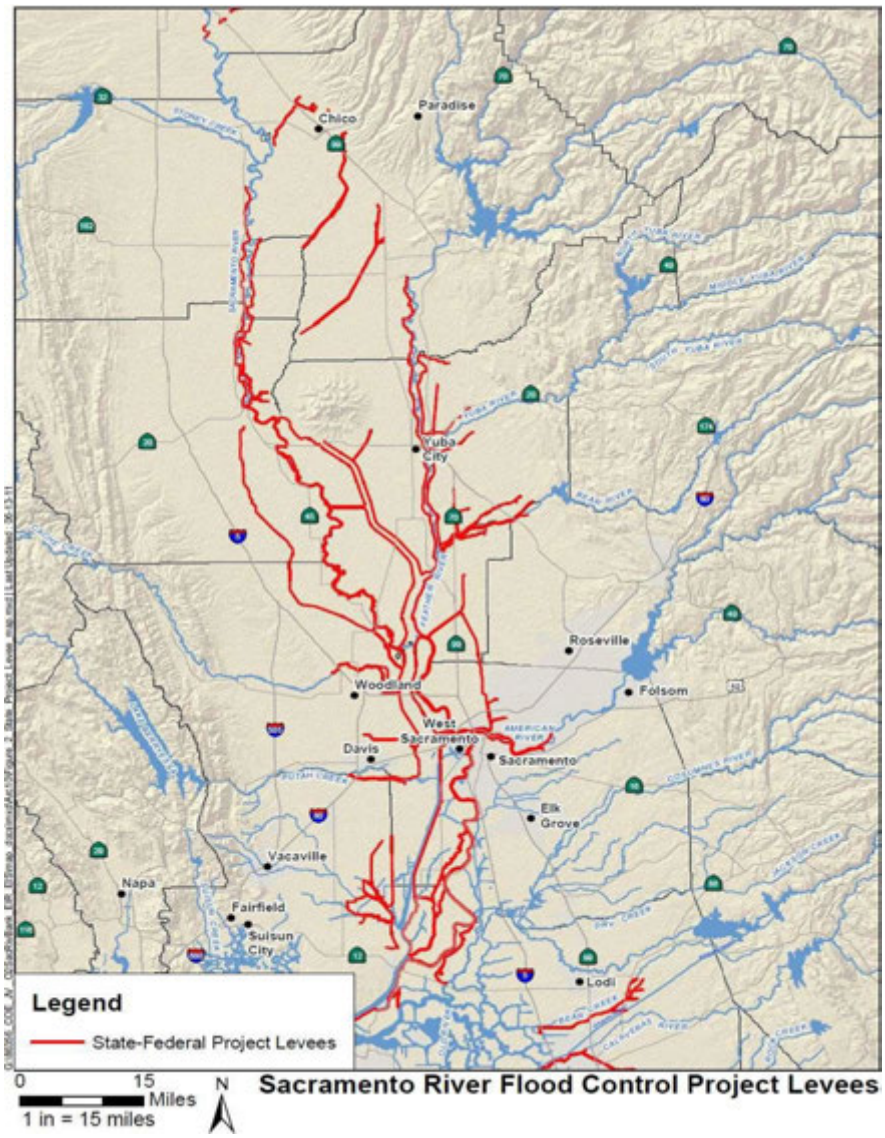


Figure 1: SRFCP Levees

Table 1: SRBPP Authorizations

Project Phase	Authorizing Act, Year, Public Law	Length of Authorized Improvements (Linear Feet)	Number of Bank Protection Sites	Status
Phase I	Flood Control Act of 1960, Pub. L. 86-645, § 203, 74 Stat. 498	430,000	412	Physically completed.
Phase II	River Basin Monetary Authorization Act of 1974, Pub. L. 93-251, § 202, 88 Stat. 49	405,000	420+	Working toward Close-Out
Addition to Phase II	Water Resources Development Act of 2007, Pub. L. 110-114, § 3031, 121 Stat. 1113	80,000	TBD	Requires New Project Partnership Agreement (PPA)

2.1.1 Project Risk Information

As indicated above, the SRBPP addresses flood risks in the Sacramento region by constructing bank protection, i.e. erosion control works and setback levees, where riverine erosion threatens the integrity of the SRFCP. Levees of the SRFCP reduce flood risk for an area of over 1 million acres that contains approximately 2.3 million people, 50 communities, and $100 billion of property vulnerable to flood damage. The project reduces risks from flooding by armoring eroding levee system sites with quarry stone (QS) or moving the line of protection further back from the watercourse.

Fundamentally, the greatest risks posed by the project during its implementation are those associated with inaction and protecting too little of the system relative to the magnitude of the problem. The project's most recent field reconnaissance identified approximately 338,000 LF of erosion within the project area at 181 sites where future levee integrity is at risk, i.e. where riverine erosion cuts into the projection of the levee slope. Thirty of the erosion sites are considered critical, in terms of potential for levee failure, representing approximately 66,000 LF of erosion.

Nevertheless, poor design or improper construction of bank protection can also pose risks, which is why the project's application of USACE quality control and quality assurance processes are important.

Generally, risks posed by inadequate design and construction would be expected to be greater for setback levees than for more typical QS bank protection. This is because the project's QS bank protection is robust and typically installed within a single season. Construction of a setback levee would likely be more complex and have greater chance of extending across one or more flood seasons.

(The construction season is limited to 3-4 months, depending upon the location of the erosion repair within the flood control system. Due to concerns for potential water quality impacts to threatened fish species during low flow months, construction may start no earlier than Aug 1 downstream of SAC RM 60 and no earlier than Jul 1 elsewhere. Throughout the flood control system, construction should be completed before the Nov 1 start of the flood season.)

See sections 7.2 and 7.3 of this RP for related discussion of when Safety Assurance Review is considered warranted for the project. Section 9.0 addresses how risks involved with the project's future engineering and construction activities at specific levee sites will be considered and documented.

2.1.2 405K LF

Construction of Phase I was completed in 1975. As of December 2020, approximately 1,300 LF of bank protection remained to be constructed of the 405K LF initially authorized for Phase II. Federal funds to complete construction and fiscally close out the project were allocated in the FY19 Work Plan. In 2019,

"the project" referred to Phase I of the SRBPP plus the 405K LF of Phase II authorized in 1974, both governed by existing cost sharing agreements. "The project" did not include the additional 80K LF of bank protection authorized in 2007, as they were not yet approved for implementation.

Since 2008, there has been a backlog of bank protection sites constructed by the SRBPP for which USACE has not yet issued NoCs. In 2020, the backlog contained approximately forty (40) sites. Almost all of these were constructed between 2006 and 2009 under an emergency declaration by California Governor Arnold Schwarzenegger and with federal support to help fix critical erosion on the SRFCP system. Fifteen (15) of these sites may need design deviations approved before their NoCs can be issued. The NoCs, in turn, must be issued before the 405K LF of Phase II can be closed out.

2.1.3 80K LF

The Water Resources Development Act (WRDA) of 2007 authorized an additional 80K LF of bank protection for Phase II. To support the expanded authority and in conformance with USACE implementation guidance for the legislation, USACE developed a Post-Authorization Change Report (PACR) and supporting documentation that includes a programmatic Environmental Impact Statement and Environmental Impact Report (EIS/EIR). The Final PACR was approved on 30 June 2020, and it provides the basis for a new Project Partnership Agreement, with work to be cost shared 65% federal and 35% non-federal. The PACR also provides a foundation for future federal budgeting decisions for its implementation. The PACR, EIS/EIR, and other supporting appendices are available at the project's public web page:
https://www.spk.usace.army.mil/Missions/Civil-Works/Sacramento-River-Bank-Protection/

To deliver the additional 80K LF of bank protection, SPK will apply SRBPP funds to address erosion within the portions of the SRFCP where it is economically justified, as indicated by economic analysis. Figure 2 shows the location of sub-basins that were identified as likely to be economically justified based on the preliminary economic analysis in the 2020 Final PACR.

Specific erosion sites to be addressed will be identified during field reconnaissance using engineering criteria and prioritized using a site selection process described briefly below in subsection 2.3.5. (The Site Selection and Implementation Process, SSIP, is fully described in Appendix B of the PACR, available at the web site linked above in this subsection.) The SSIP is the process by which bank protection sites will be identified, prioritized, and selected, and how bank protection for those sites will be designed and constructed. Implementation will be on-going throughout the duration of the 80,000 LF.

2.2 Project Sponsor

The project's non-federal sponsor (NFS) is the Central Valley Flood Protection Board (CVFPB) of the State of California. CVFPB is the State regulatory agency that ensures appropriate standards are met by landowners, local agencies, and others for the construction, maintenance, and protection of the flood control system that protects life, property, and wildlife habitat in California's Central Valley from the effects of flooding. CVFPB is supported by a limited number of its own professional staff and by the much larger staff of the California Department of Water Resources (DWR).

Responsibility for implementation of the SRBPP is shared between USACE and the NFS. USACE is primarily responsible for planning, design, and construction of the bank protection in coordination with the NFS. DWR staff representatives for the NFS are members of the PDT and participate in its activities. The NFS is responsible for providing all lands, easements, rights-of-way, relocations, and disposal (LERRDs) for the project, and for operation and maintenance (O&M) of the project's improvements to the SRFCP. Project costs for the 405K LF component of the SRBPP are shared 2/3 federal and 1/3 non-federal. WRDA 1986 cost-sharing will apply to the 80K LF component, which is a minimum cost-share of 35% non-federal and a potential maximum cost-share of 50%, depending upon LERRD costs. The cost share and NFS responsibilities are detailed in the project's 1984 local cooperation agreement (LCA), amended in 2006 and in the PACR.

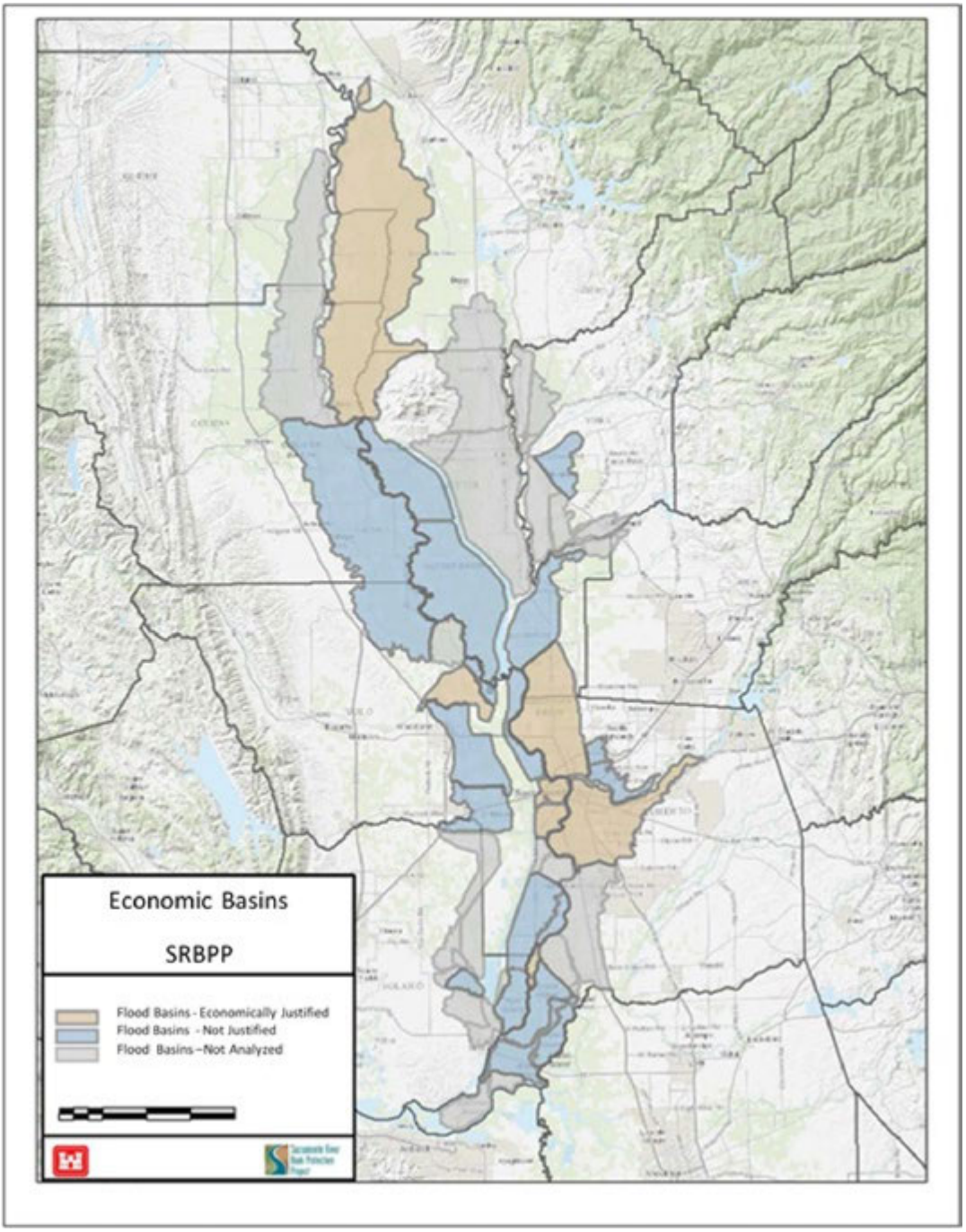


Figure 2: SRBPP Sub-Basins

NFS contributions of work that would require technical review are discussed at the end of the following section of the RP.

2.3 Work Products Requiring Technical Review

The types of documents to be produced for the SRBPP differ between the ongoing 405K LF close-out and the future implementation of the PACR for the 80K LF. For close-out of the 405K LF, the PDT primarily will be producing Notices of Completion (NoCs) accompanied by updates to operations and maintenance (O&M) manual supplements and design deviation (DD) documents.

For the additional 80K LF, NoCs with O&M supplement updates and, potentially, DD documents will be needed eventually as well, but other types of documents associated with design and construction of new bank protection will be required earlier in the project cycle.

Documents needed for project execution are listed in Table 2 and described in the following subsections.

Table 2: Types of SRBPP Technical Documents to be Developed and Reviewed

Products	RMO		Formal Technical Reviews				Approval	
	SPD	RMC	DQC	ATR	BCOES	SAR / IEPR	SPK	SPD
Products for Site Specific Construction								
Designs	X*	X*	X	X	X	TBD*	X	
Design Deviations	X*	X*	X	X	X**	TBD*	X**	X**
EAs, FONSIs	X		X	X	X		X	
EIS (if needed)	X*	X*	X	X	X	TBD*		X
NoCs w/ O&M Updates	X		X				X	
Programmatic Products								
Project Cost Estimate (TPCS)***	X		X	X				
Site Selection Reports	X		X				X	
Economic Reevaluation Reports and Economic Updates	X		X	X				X

* RMC will be the RMO for documents requiring SAR. SPD will be the RMO for all other documents. The District's Chief of Engineering determines whether SAR is needed. See Section 7 for details.
** Design deviations (DDs) for future bank protection construction would be included in BCOES reviews. DDs for previously constructed bank protection would not. DDs are recommended by SPK and SPD LSOs, endorsed by LSOG, and submitted to HQ for final approval.
*** TPCS is certified by USACE Cost Engineering Center of Expertise.
Note: Supervisory, LSPM, LSO, LSOG, model certification, cost certification, policy, and legal reviews are not displayed in the table, but discussed in the body of this Review Plan.

2.3.1 Notices of Completion

After completing construction of bank protection at an eroded site, SPK provides a NoC to the CVFPB with an update to the SRFCP standard O&M manual supplement pertaining to the associated unit of the flood control system. This ensures that the CVFPB is aware of the specific changes made to the SRFCP that might affect its O&M activities.

A NoC package for the SRBPP typically consists of a letter from the District's commander to the CVFPB's Executive Officer, notifying the CVFPB that the District completed construction of erosion control works within a particular unit of the SRFCP and that the CVFPB should continue to exercise its responsibilities to operate and maintain the SRFCP at the site(s) of the completed work. The notice references the contract, specifications, and drawings that governed the construction, and it is transmitted with an updated supplement to the Standard O&M Manual for the relevant unit of the SRFCP. The update includes a table listing all revisions made to the supplement, as-built drawings of the completed construction, and a summary of federal resource agencies' requirements pertaining to O&M at the site(s). In cases where revegetation work has been performed separately from the bank protection construction, details identifying the revegetation contract also are included in the notice and O&M supplement, as well as "as-built" drawings of the planted riparian habitat.

The PDT is working to compile NoCs, as-built information, and O&M supplement updates for previously constructed bank protection sites mentioned above in Section 2.1.2. During future implementation of the additional 80K LF, NoCs will be delivered after completion of construction of bank protection and mitigation features.

2.3.2 Design Deviations

Approximately one third of the previously constructed backlog sites mentioned above have trees located within the mandatory vegetation free zone (VFZ) defined by EP 1110-2-18. For these sites, levee safety risks potentially posed by the trees must be assessed to determine if their retention would constitute an acceptable deviation from engineering standards for management of vegetation on levees.

The PDT is conducting these risk assessments in cooperation with the USACE Risk Management Center and the non-federal sponsor. Where a semi-quantitative risk assessment (SQRA) indicates that deviation from the engineering standards is warranted and acceptable, a report justifying the design deviation (DD) is developed by the PDT, including details of the SQRA. As detailed in Section 8, DDs undergo special levee safety reviews beyond those required for standard designs. Appendix 2, Table 2 lists DD packages currently in progress or planned by the PDT.

For new bank protection to be designed and constructed in the future, any deviations from mandatory design standards will be clearly identified in the design report, in updates to this RP, and in the quality control plan (QCP) or quality assurance plan (QAP) for each design package. The QCP (or QAP) will also explicitly address determination by the District's Chief of Engineering whether a Safety Assurance Review is required for the design. Such determinations also will be documented in the project's decision log and in updates to the Review Plan. Appendix 2, Table 4, identifies milestones at which technical reviews are planned to occur for design deviations. SQRA would be conducted between 30% and 60% designs. Levee safety reviews of the resulting DD/SQRA report would occur between 60% and 90% designs.

2.3.3 Project Cost Estimates

The District will update and seek certification of the estimate of the project's cost every 2 years, as required by program development and cost engineering guidance. The information is summarized in the Total Project Cost Summary (TPCS), which displays the year of prices used in the analysis and the dates of completion of the estimate and its reviews. The TPCS supports the District's requests for funds through the federal budget process.

2.3.4 Economic Analyses

An economic analysis for the additional 80K LF was completed for the PACR. Based on available data, the analysis identified seven economic impact areas (sub-basins) where erosion repairs are economically justified (i.e., have a benefit-to-cost ratio above unity). These are primarily urban areas where there is potential for significant loss of life and property damage. The economic analysis was performed in accordance with the USACE Engineer Regulations ER 1105-2-100 (Planning Guidance Notebook) and ER 1105-2-101 (Risk Analysis for Flood Risk Management Studies).

Consistent with USACE policy for budget development for continuing construction projects, the District will develop updates to the economic analysis for the project every five years. As costs of bank protection and avoided consequences of levee failures change over time, some sub-basins identified as economically justified basins (EJBs) may change. In addition, as recommended by the PACR, the District will conduct further analysis of the hydrologic/hydraulic connectivity between sub-basins within the flood control system to refine the identification of floodplains resulting from potential levee failures. If additional economically justified sub-basins are identified, then erosion sites in those sub-basins could be selected for bank protection by the project.

An Economic Reevaluation Report (ERR) using additional site-specific data (e.g., geotechnical levee fragility curves) will be developed using standard USACE methods outlined in ER 1105-2-100 and ER 1105-2-101 prior to completion of each draft DDR for implementation of the additional 80K LF. These ERRs will be used to: (1) verify that the sub-basins which have been determined to be economically justified are still justified; (2) estimate benefits for sub-basins not previously evaluated (due to insufficient data or absence of erosion sites); and (3) re-estimate benefits for sub-basins previously evaluated and not currently identified as EJBs where changes in conditions or improvements in available data suggest that they may be economically justified.

2.3.5 Site Selection Reports

Since the inception of the SRBPP, annual surveys of erosion within the SRFCP have provided a basis for assessing the amount of erosion threatening the integrity of the SRFCP levee system and locations where bank protection is needed. The Chief's Report which led to the original authorization of the SRBPP in 1960 relied in part upon such surveys conducted by USACE and the California DWR. The project's first design memorandum established an annual joint inspection of the system's riverbanks by representatives of the State and USACE to reassess erosion site priorities where bank protection work has not yet been accomplished, and to identify new sites subject to critical erosion.

Under current practice, erosion in the leveed portions of the Sacramento River and tributaries sustaining perennial flow is inventoried annually, while the remainder of the SRFCP levee system is assessed at five-year intervals or sooner if warranted, after high flow events. The extents of these efforts are shown in Figure 3. The field survey work is conducted during the fall when flows typically are low and riverbanks and levees are most exposed to visual observation. The District's staff typically carries out the field work, but an opportunity is provided for State staff to participate. The field data is compiled into an erosion inventory report that is made available to the public after District quality reviews are complete. The most recent inventory report is available on the project's public web page at:
https://www.spk.usace.army.mil/Missions/Civil-Works/Sacramento-River-Bank-Protection/

The District will use the Site Selection and Implementation Process (SSIP) to prioritize erosion sites for bank protection. This first involves ranking the sites that are in the erosion inventory according to physical factors related to severity of erosion and likelihood of a levee breach. An Engineering Ranking Report will be produced and reviewed for quality within the District.

Where bank protection investments are economically justified, the PDT will gather site specific information relevant to the potential to construct erosion control works. This information will be considered in conjunction with the engineering ranking to prioritize sites. The selection and prioritization process involves considering the potential for setback levees as well as conceptual alternative designs and costs.

The PDT will develop a Site Selection Report to document site prioritization. The report is intended primarily for USACE use and to keep a historical record of the process. It will, however, be shared with NFS representatives.

Sites where erosion poses an imminent threat of levee breach are identified by erosion survey personnel as critical erosion sites and documented in a Critical Sites Memorandum that is shared with the NFS. Critical sites located in portions of the Sacramento River Basin where federal investment in bank protection has been determined to be economically justified will be expedited for design, construction, and environmental compliance without waiting for ranking and site selection processes and reports to be completed. Critical sites located outside of the EJBs will be brought to the attention of the NFS and local agencies involved in maintenance of the applicable portions of the SRFCP.

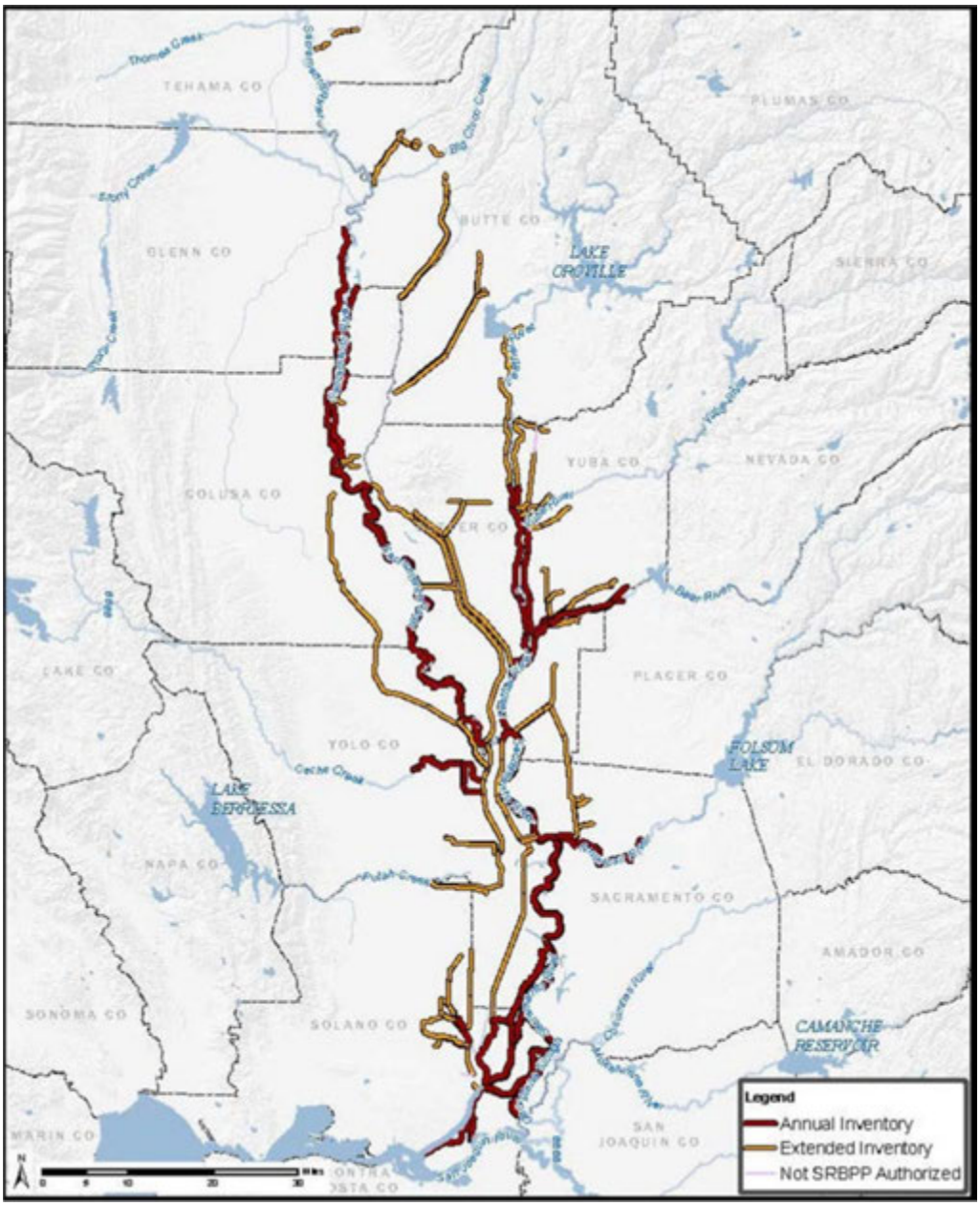


Figure 3: Extents of Annual and Extended Erosion Field Surveys

2.3.6 Designs

Designs for bank protection include design drawings (plans), specifications, design documentation reports (DDRs), and engineering considerations and instructions for field personnel (ECIFP). DDRs provide the basis for design, typically summarizing site conditions, design purposes, selection of measures, construction materials to be employed, methods of data collection, analysis, and design, including criteria and assumptions, technical analyses from disciplines that influenced the design (e.g. geotechnical, hydraulic), and construction considerations (e.g. access, staging, sequencing).

Under the SSIP, a DDR would be prepared for a cohort of erosion sites prioritized for bank protection in the same year of construction. As needed, follow-on DDRs that address an individual site or sites, or addenda or updates to the cohort DDR may be produced. Each DDR will address and comply with the most current applicable USACE engineering guidance at the time that it is prepared, including the most recent guidance regarding risk-informed decision-making, climate change, and relative sea level rise. The most appropriate hydrology available will be used in developing each DDR. Each DDR will be subject to technical review to ensure compliance with the current guidance.

Appendix 2, Table 3 shows the design milestones at which design packages for future construction will typically be reviewed. Each design package for a specific site or group of sites will be reviewed according to an engineering QCP prepared specifically for it. If a design is developed by an engineering firm or the NFS, a QAP would be prepared. The QCP (or QAP) will detail the District's quality control (or assurance) processes that will be applied to the engineering documents, as well as the formal technical reviews to be conducted outside of the District, including ATR and, where warranted, SAR. The QCP (or QAP) will be provided to the RMO and to the review teams to guide those reviews, and this RP, including Table 3 in Appendix 2, will be updated when new QCP's are developed or revised.

As envisioned by the SSIP, designs would be developed for prioritized sites at 30% (preliminary), 60%, 90% (draft final), and 100% (final) stages. Hydraulic modeling would begin after 30% designs are prepared and will be adjusted as needed from 90% designs. In the past, the project's ECIFP document has been prepared after 90% plans, specifications, and DDR have benefited from ATR. The ECIFP document is included in the final design package submitted for BCOES review and for subsequent contracting. Schedules of reviews at design milestones are provided in Appendix 2.

The remainder of this subsection describes real estate (RE) and cost engineering products to be produced in conjunction with the plans and specifications. These documents will support the DDR and will be included in the final design package that is reviewed for BCOES. The RE and cost products will be included in earlier design reviews, as well, unless the workflow requires them to be reviewed separately on a parallel track.

Real Estate
The project's Real Estate Plan (REP), prepared and approved in support of the PACR, is programmatic. It describes the process that will be used to acquire LERRDs that may be needed to implement the PACR.

Prior to construction of future bank protection under the additional 80K LF authority, the District will prepare site specific addenda to the REP, as well as subsequent take letters and review documentation. The RE addenda will further define affected parcels, costs of acquisition, acquisition schedule, and similar details. Specifically, information listed in the REP, Exhibit D - Site Specific Real Estate Inventory Checklist will be updated by USACE as sites are identified for construction. As envisioned by the SSIP, addenda for relevant sites would be developed in conjunction with 30% designs.

Take letters provide details to the NFS regarding LERRDs needed for construction at specific sites. The SSIP indicates that take letters would be developed based on 60% designs and adjusted as needed following 90% design. However, take letters issued at 60% design would need to obtain a waiver that includes a Risk Memorandum signed by the technical lead and a Memorandum for Record (MFR) from Programs and Project Management Division (PPMD). Based on the take letters, the NFS acquires any needed LERRDs not already in its possession, then provides certification to the USACE that it has done

so. The District's RE Division then reviews the documentation and records their adequacy. The RE certifications and District review documentation are included in the design package of documents reviewed for BCOES. No construction contract solicitation is issued without such certification unless an explicit waiver is obtained.

Cost Estimates for Construction Contracts
Prior to issuing a solicitation for proposals or bids to construct bank protection at a specific site, the District prepares a Current Working Estimate (CWE) followed by an Independent Government Estimate (IGE). The IGE evolves from a CWE that is prepared from the PDT's design. The CWE is developed using MII, the second generation of the Micro-Computer Aided Cost Engineering System (MCACES). As outlined by the SSIP, site specific cost estimates (e.g. CWEs) for future bank protection would be developed at 30% design and updated based on 60% and 90% designs.

2.3.7 Environmental Documents

As mentioned above, an EIS/EIR was prepared and extensively reviewed to support the PACR and its future implementation. Conducted reviews included DQC, ATR, IEPR, public, policy compliance, and legal reviews. Along with a memorandum of approval of the PACR, a record of decision (ROD) approving the EIS/EIR was signed by SPD's commander on 30 June 2020, in compliance with the National Environmental Policy Act (NEPA). In turn, the CVFPB certified the EIR and issued a notice of determination in compliance with the California Environmental Quality Act (CEQA).

In implementing the PACR, the District and State of California will develop future site-specific environmental documents that are tiered from the approved EIS/EIR. USACE is the lead agency for NEPA compliance, and the State leads CEQA compliance. In cases where anticipated environmental consequences of construction of bank protection at specific sites have been adequately addressed at a programmatic level by the PACR's EIS/EIR, environmental assessments (EAs) under NEPA and initial studies (ISs) under CEQA may be sufficient, tiered from the programmatic EIS/EIR. In such cases, site specific EA/IS documents typically would be followed by findings of no significant impact (FONSIs) and mitigated negative declarations, respectively. However, if it is determined that there likely will be significant environmental consequences not yet adequately disclosed, then a new or supplemental EIS may be required. Similarly, if the NFS determines that a new or supplemental EIR is required, the District will coordinate with it to ensure CEQA compliance is satisfied. As envisioned by the SSIP, the appropriate NEPA/CEQA document will be initiated based upon 30% designs and made available to the public, as needed, following completion of 60% designs. The FONSI or ROD (in the case of an EIS) shall be included in the BCOES review.

To comply with the federal Endangered Species Act (ESA), the District also developed a programmatic biological assessment (BA) for the PACR and obtained programmatic biological opinions (BOs or BiOps) from the National Marine Fisheries Service (NMFS) and US Fish and Wildlife Service (USFWS). Neither programmatic BO included an incidental take statement under the ESA.

As it implements the PACR, the PDT will sustain communication with the resource agencies through monthly Interagency Working Group (IWG) meetings and other means. Input from the Services will inform site selection and design. During the design process, the District will request site-specific consultation with the Services. The District would develop site-specific BAs to support the consultation and will request permission for any forecasted incidental take of protected species individuals.

Prior to bank protection construction, the District will also develop applications to the Central Valley Regional Water Quality Control Board (RWQCB) for certification of consistency with the State's water quality plans under section 401c of the federal Clean Water Act. Review by the RWQCB may influence the design of bank protection or associated mitigation measures.

All site-specific environmental compliance documents will accompany the design package that is reviewed for BCOES. They also will be included in earlier design reviews, unless the workflow requires them to be reviewed separately on a parallel track.

2.3.8 External Products

Products developed by the NFS or by other external organizations under an agreement or contract with USACE will be subject to the same technical reviews as products developed in-house, except that the external organization will be responsible for controlling the quality of its products, and the District's quality process will become one of quality assurance.

A 2006 amendment to the project's LCA allowed the NFS to obtain financial credit for three setback levees that it subsequently constructed at Cache Creek. No other in-kind contributions from the NFS are provided for in the existing LCA. However, a new project partnership agreement will be developed for implementation of the 80K LF, and it could include provisions for in-kind contributions.

3.0 Engineering Models

The use of certified, validated, or agency approved engineering models is required for all activities to ensure the models are technically and theoretically sound, compliant with USACE policy, computationally accurate, and based on reasonable assumptions. The responsible use of well-known and proven USACE developed and commercial engineering software will continue, and the professional practice of documenting the application of the software and modeling results will be followed. The selection and application of the model and the input and output data is still the responsibility of the users and is subject to DQC, ATR, BCOES, policy and legal review, and IEPR or SAR (if required). Where such approvals have not been completed, appropriate independent checks of critical calculations will be performed and documented. The following engineering models, software, and tools are anticipated to be used:

Model Name	Version	Validation Date
GeoStudio 2019	10.0.0.17401	DEC 2018
HEC RAS	5.0.7	MAR 2019
SAM		
HEC FDA		
HEC LifeSim		
SCARCE		

GeoStudio
GeoStudio is an integrated software suite for modeling slope stability, ground deformation, and heat and mass transfer in soil and rock.

HEC RAS
Hydrologic Engineering Center's (CEIWR-HEC) River Analysis System (HEC-RAS) software allows the user to perform one-dimensional steady flow, one and two-dimensional unsteady flow calculations, sediment transport/mobile bed computations, and water temperature/water quality modeling.

Standard Assessment Methodology (SAM)
SAM is a computational modeling and tracking tool that allows agencies to: quantitatively assess the potential effects of bank protection and stream restoration projects; inform them of compensation requirements to offset impacts; and to ensure that these activities do not jeopardize chinook salmon, steelhead, and green sturgeon or destroy or adversely modify their critical habitat. It is expected to be replaced by a new model now being developed, the Fish Habitat Assessment and Simulation Tool (FHAST).

HEC-FDA
The Hydrologic Engineering Center Flood Damage Reduction Analysis (HEC-FDA) software provides the capability to perform an integrated hydrologic engineering and economic analysis during the formulation and evaluation of flood risk management plans.

HEC-LifeSim
HEC-LifeSim is an agent-based simulation system for estimating life loss with the fundamental intent to simulate population redistribution during an evacuation.

SCARCE
SCARCE is an agricultural flood damage estimation model.

4.0 District Quality Control

4.1 Requirements

All SRBPP work products identified in Table 2 above (including supporting data, analyses, reports, environmental compliance documents, etc.) will undergo DQC in accordance with current guidance, this RP, and, for engineering products, the relevant site-specific QCP. The District will perform these minimum required reviews in accordance with the SPD Quality Management Plan (QMP) and the SPK QMP. All draft products and deliverables will be reviewed within the district as they are developed by the PDT to ensure they meet project objectives, comply with regulatory and engineering guidance, and meet USACE and sponsor expectations of quality. The focus of the DQC review will be framed by current agency guidance, SPD and SPK QMPs, this RP, and any applicable QCP.

The District's quality control processes include reviews by PDT members from multiple disciplines to ensure consistency of the overall work product. This may involve a representative from SPK's Office of Counsel (OC) who functions as a liaison between the PDT and OC. The processes also include reviews by qualified District personnel that were not directly responsible for the PDT contributions to ensure the accuracy and appropriateness of their disciplines' contributions and compliance with current policies and standards. The latter type of review is what is most commonly referred to as DQC. The District's quality control processes may also include representatives from the NFS. The processes also encompass supervisory reviews by the section or branch chief to which PDT contributors report.

Within SPK, supervisory review most commonly is conducted for Planning Division products.

See Appendix 1 for the DQC roster, including DQC Lead, reviewers, and their disciplines. When a reviewer is not available or if a product requires a different set of expertise, the technical lead in coordination with the discipline lead and the resource provider will find a replacement and document it in updates to the RP and QCP.

4.2 Documentation

DrChecks review software may be used to document all DQC comments, responses, and associated resolutions accomplished throughout the review process. DrChecks will be used for DQC of SPK Engineering Division work products, as required by its QMP, and is highly recommended for recording DQC of the PDT's other work products as well. Once a record of the review has been developed, DQC completion will be certified.

Documentation will be in accordance with Qualtrax procedures for Civil Works; all drawings, computations, quantity estimates, and analyses provided to the DQC team for review will be annotated to show the designer's initials, the checker's initials, and the dates of the review actions.

4.3 DQC Schedule and Estimated Cost

DQC schedule and cost information can be found in Appendix 2.

5.0 Agency Technical Review

5.1 Requirements

ATR is undertaken to ensure the quality and credibility of scientific information. It assesses whether analyses are technically correct and comply with published USACE guidance and whether the documents being reviewed explain the analyses and results in a clear manner. It also involves a comprehensive review of conclusions to ensure that results and decisions are clearly supported by the information presented and comply with current agency policy and procedures.

Relevant DQC records will be reviewed during each ATR, and the ATR team will provide comments as to the adequacy of the DQC effort for the associated product. Any necessary NEPA documents, other environmental compliance products, in-kind services provided by local sponsors or their Architect-Engineers (A-E), and other supporting documents are also part of the scope of the ATR.

ATR is managed within USACE by the designated RMO and is conducted by a qualified team from outside the home district that is not directly involved in the development of the documents being reviewed. ATR teams should be comprised of senior USACE personnel selected by the RMO. Close coordination between the ATR Lead and RMO is needed to ensure qualified reviewers are available for different work products and distinct stages of project development. Over time, ATR Team members may need to be replaced based on availability and project needs.

ATR will be scaled to a level commensurate with the significance, associated risk, and complexity of the products to be reviewed. The RMO will develop the charge to reviewers with input from the PDT. The charge should call out for special attention any design deviation involved in the review. The charge also should indicate whether any reviewers need to be certified at CERCAP Level 2 due to the level of risk associated with the specific product(s) being reviewed.

The schedule and budget for ATR review can be found in Appendix 2.

5.2 Documentation

DrChecks review software will be used to document all substantive ATR comments, responses, and associated resolutions accomplished throughout the review process. Comments should be limited to those that are required to ensure adequacy of the product. The four key parts of a quality review comment will normally include:

(i) The review concern – identify the product's information deficiency or incorrect application of policy, guidance, or procedures;
(ii) The basis for the concern – cite the appropriate law, ASA (CW)/USACE policy, guidance or procedure that has not been properly followed;
(iii) The significance of the concern – indicate the importance of the concern with regard to its potential impact on the plan selection, recommended plan components, efficiency (cost), effectiveness (function/outputs), implementation responsibilities, safety, federal interest, or public acceptability; and
(iv) The probable specific action needed to resolve the concern – identify the action(s) that must be taken to resolve the concern.

Editorial comments reflecting a reviewer's writing preferences or grammatical corrections should be made outside of DrChecks. Alternatively, for convenience and ease of tracking, a reviewer may submit such comments through a single DrChecks comment with an attached file that tracks suggested changes, with the understanding that non-substantive issues shall not prevent completion of ATR.

In some situations, especially addressing incomplete or unclear information, comments may seek clarification in order to then assess whether further specific concerns may exist. The ATR documentation in DrChecks will include the text of each expressed concern, the PDT response, a brief summary of the

pertinent points in any discussion, and, lastly, the agreed upon resolution. The ATR team will prepare a Review Report which includes a summary of each unresolved issue; each unresolved issue will be raised to the vertical team for resolution. Review Reports will be considered an integral part of the ATR documentation.

ATR may be certified when all ATR concerns are either resolved or elevated for resolution, and the ATR documentation is complete.

5.3 Products to Undergo ATR

A list of products that will undergo ATR can be found in Table 2.

Designs for future construction will undergo ATR, as will all design deviation documents. As indicated in the project's PACR, ATR of design documentation reports for bank protection at a cohort of erosion sites will consider climate change, relative sea level rise, and risk informed decision-making. (See ER 1100-2-8162 for guidance on sea level change.) Depending upon the stage of design, site specific addenda to the PACR Real Estate Plan, take letters, and/or District documentation of the adequacy of the non-federal sponsor's certified real estate should be included in ATR. Design packages to be reviewed for construction also should include the current working estimate of construction cost.

EAs and associated FONSIs will be included as supporting documentation in design packages that receive ATR. If, during implementation of Phase II, an EIS or supplemental EIS needs to be developed due to significant environmental impacts not previously disclosed, the EIS will also receive ATR.

NoCs are correspondence regarding the status of completed construction activity. The notices themselves do not warrant ATR. The O&M manual supplement updates that accompany the NoCs typically do not warrant ATR because they amend existing manuals with updated construction data and supply as-built drawings. They are not new manuals, and they do not change the operation and maintenance of the flood control infrastructure from the existing O&M manual in a significant way.

Total project cost estimates must be certified every two years to support federal budget requests. These updates or revisions will undergo ATR prior to certification in accordance with current guidance (e.g. annual programs development guidance, ER 1110-2-1302, and ATR Guidance for Cost Engineering Products, May 2011). In intervening years, DQC reviews will suffice.

Economic analyses to support budget requests must be updated every five years for continuing construction projects such as SRBPP. SPD or another district within SPD will perform ATR on such updates or economic reevaluations in accordance with current guidance (e.g. annual programs development guidance and CWPM 12-001, 8 March 2012).

Site selection reports are primarily intended to document the PDT's prioritization of erosion sites where bank protection is needed, to help focus the scheduling of the PDT's activities. As the reports are intended primarily to assist the PDT and are not a standard civil works product, ATR is not warranted. However, designs for prioritized bank protection will undergo ATR, as indicated above.

5.4 Required Team Expertise and Requirements

ATR teams will be established in accordance with ER 1165-2-217. The members should mirror the composition of the PDT when possible and reside outside of SPK. All ATR reviewers must be certified to perform ATR by USACE. Engineering and Construction (E&C) ATR reviewers must be certified in accordance with ECB 2020-12. For high-risk work products that will require a SAR, E&C ATR personnel must be certified at Level 2 in Corps of Engineers Reviewer Certification and Access Program (CERCAP). Level 1 certification may be sufficient for most other E&C ATR reviewers. Multiple disciplines may be covered by a single reviewer based on appropriate experience, expertise, and certification. ATR reviewers are subject to change based on availability and workload.

The following disciplines will be required for ATR of this project. Not all disciplines listed below will be needed for every type of work product:

ATR Lead: The ATR team lead is a senior professional outside SPD with extensive experience in preparing Civil Works documents and conducting ATRs. The lead has the necessary skills and experience to lead a virtual team through the ATR process. The ATR lead may also serve as a reviewer for a specific discipline, typically Civil Design.

Geotechnical Engineer: This reviewer must have experience in the field of geotechnical engineering, analysis, design, and construction of levees. The geotechnical engineer must have experience in subsurface investigations, rock and soil mechanics, internal erosion (seepage and piping), slope stability evaluations, erosion protection design, and earthwork construction. The geotechnical engineer must have knowledge and experience in the forensic investigation of seepage, settlement, stability, and deformation problems associated with levees and appurtenances constructed on rock and soil foundations.

Engineering Geologist: The engineering geologist must have experience in assessing internal erosion (seepage and piping) beneath and within levees. The engineering geologist must be familiar with identification of geological hazards, exploration techniques, field and laboratory testing, and instrumentation.

Hydraulic Engineer: The hydraulic engineer must have experience in the analysis and design of hydraulic structures related to levees. The hydraulic engineer must be knowledgeable and experienced with USACE application of risk and uncertainty analyses in flood damage reduction studies, standard USACE hydrologic and hydraulic computer models, and various types hydraulic analyses including drawdown, levee breach/floodplain mapping, water surface profiles for levee safety investigations, and vegetation effects on the waterside of levees.

Cost Engineering: The reviewer for cost estimating must be a registered or certified cost engineer with a BS degree or higher in engineering or construction management, and must have experience estimating complex, phased multi-year civil works construction projects and hydraulic retention structures. The reviewer must have extensive knowledge of MII software and the Total Project Cost Summary (TPCS) if applicable to the specific product being reviewed. A certification from the Mandatory Center of Expertise (MCX) / Cost Directorate of Expertise (DX) in Walla Walla District may be required.

Construction Engineer: This reviewer must be a senior level, professionally registered engineer with extensive experience in the engineering construction field with emphasis on levee safety projects. The Construction reviewer must have a minimum of 10 years of experience.

Environmental: The environmental reviewer must be experienced in NEPA process and have broad experience with environmental compliance for USACE civil works construction projects, including water quality, air quality, sensitive species, and cultural resources.

Economist: The economics reviewer must be an economist with experience in levee risk analysis.

Climate and Resilience: Any studies developed in Phase II of the project require an ATR team member certified by the Climate and Resilience Community of Practice.

Real Estate: A real estate expert will be needed to review relevant elements of construction design packages, as described above in subsection 5.3.

The project's current ATR team is listed in Appendix 1.

5.5 Statement of Technical Review Report

At the conclusion of each ATR effort, the ATR team will prepare a review report with completion and certification memoranda. The report will be prepared in accordance with ER 1165-2-217.

6.0 BCOES Review

6.1 Requirements

All final design documents for future construction shall undergo Biddability, Constructability, Operability, Environmental, and Sustainability (BCOES) review in accordance with ER 415-1-11, ER 1110-1-12, and the SPK Engineering Division's QMP. BCOES reviews are done during design for a project using the design-bid-build (D-B-B) method or during development of the request for proposal (RFP) for a design-build (D-B) project. The review will cover supporting data, analyses, technical reports, design cost effectiveness, and environmental compliance documents. If the design includes any deviations from mandatory design standards, the supporting DD and risk assessment documents will be included. The BCOES review results are to be incorporated into the procurement documents for all construction projects.

6.2 Implementation of BCOES Review

The BCOES review will be documented using DrChecks. To improve the BCOES aspects of designs and ensure that necessary compliance activities have been completed, BCOES reviewers will include USACE construction, operations, and environmental staff, and should include the local sponsors' facility operations and maintenance representative. The BCOES roster is provided in Appendix 1, and cost and schedule information are found in Appendix 2.

7.0 IEPR / SAR

7.1 IEPR and SAR

Independent External Peer Review is conducted for USACE projects in the planning and study phase. Safety Assurance Review, also formerly known as IEPR Type II, applies to PED and construction activities. SPK will apply current guidance in determining whether it is appropriate to conduct IEPR for specific studies and SAR for design and construction activities.

As provided for by the prior SRBPP Phase II Review Plan, an IEPR was performed on the PACR prior to it being finalized and approved. For the foreseeable future, the project does not plan to conduct any new studies that would require an IEPR. However, should it become necessary for the SRBPP to prepare an EIS or conduct a study that leads to a new decision document, the RP will be revised to address whether an IEPR will be needed, and if so, provide required details. Determinations of need for SAR are discussed in the following subsections.

7.2 Decision on SAR

For design and construction activities, SPK's Chief of Engineering Division (ED) determines whether SAR is required, consistent with current guidance (ER 1165-2-217). This decision will consider a variety of factors, such as a significant threat to human life, use of innovative materials or techniques and if the engineering is based on novel methods, complex challenges for interpretations, precedent setting methods or models, or conclusions that are likely to change prevailing practices.

ER 1165-2-217 makes clear that USACE should apply IEPR and SAR resources where the need is greatest. The ER states, "USACE must focus IEPR implementation on the most complex, highest cost projects, as well as those that pose a high risk to public safety and the economy."

The SRBPP Review Plan approved in January 2013 provided that decisions to conduct or not conduct SAR would vary by location and type of works to be constructed, as not all sites and measures in the project footprint will pose a risk to public safety. Further, because bank protection work is performed over time on numerous sites, previous determinations can help inform if a SAR is necessary.

The process that the project will use for determining when a SAR is necessary is outlined below.

SAR will be conducted for design and construction of new setback levees because failure of the construction would be expected to put human life at risk. Generally, for SRBPP, however, SAR will not be conducted where traditional quarry stone (QS) bank protection is to be placed at an existing levee. This includes situations where the QS protection restores minimum prism geometry to an eroded levee as well as those where QS is placed on the water side berm of a levee that exceeds the minimum geometry. (The minimum prism geometry for SRFCP is 20 ft levee crown width, 3H:1V water side slope and 2H:1V land side slope.)

For the situations just described, this RP serves as documentation of the decision by SPK's Chief of Engineering whether SAR will be conducted and the rationale for the decision.

The PDT may encounter situations beyond those described above where it perceives that a SAR would be prudent. This RP does not bar the PDT from proposing to conduct SAR in additional situations or at specific erosion sites. If the bank protection design or manner of construction changes from past practice, and involves innovative materials or techniques, novel engineering methods, precedent setting methods or models, or if temporal or site-specific conditions contribute to complex challenges for interpretations, or conclusions that are likely to change prevailing practices, then the PDT should consider whether to recommend to the District's Chief of Engineering that a SAR be conducted.

In developing a recommendation in a particular case, the PDT will consider the circumstances at the specific erosion site(s) where design and construction activities are to be conducted, as well as the factors identified above. Situations that suggest a SAR may be warranted include:

- Major rehabilitation of a levee within its prism, near a densely populated area.
- Modifications to the flood risk reduction line of defense
- Modifications that could introduce new failure modes
- Construction expected to occur over multiple construction seasons

Conversely, if a situation arises where the PDT anticipates that a SAR would be unnecessary, then the PDT may consider developing a recommendation to not conduct SAR when it normally would be done. An example might be a short adjacent levee that could be constructed in a single construction season, but which, due to vegetation to be retained in the VFZ, requires a design deviation, and would therefore undergo an explicit risk assessment and special set of levee safety reviews (LSOs, LSOG, etc.)

The situations listed immediately above are merely examples. The PDT's recommendation, including rationale for the recommendation, should be reviewed by the District's Levee Safety Program Managers (LSPMs) prior to submission to the District's Chief of Engineering. The decision will be documented in the relevant QCP and signed by the ED Chief, entered into the project's decision log, and the Review Plan will be updated accordingly.

It may be worth emphasizing that intra-USACE technical review processes provide check points for circumstances where a SAR might be advisable, but the PDT does not plan to conduct one. If a DQC or ATR results in direction that SAR should be conducted, but the PDT does not concur, the review comment would not be closed and the review would not be certified as complete until the issue is resolved, either through dialog between the reviewers and PDT, or through elevation. The review, approval, and update processes for the RP itself, described in Section 10.1, also provide safeguards.

7.3 Products to Undergo SAR or IEPR

Table 2 lists SRBPP products that may undergo IEPR or SAR, with additional explanation below.

In light of current Civil Works review guidance, as discussed above in Section 7.2, work products that do not lead to construction or modification of features of the flood control system are not good candidates for IEPR or SAR. This is the case for updates to project cost estimates and economic analyses that support budget requests and for notices of completion with updates to O&M manual supplements. This also is the case for Economic Reevaluation Reports (ERRs) and Site Selection Reports (SSRs). (Although ERRs and SSRs play a role in determining where future bank protection will be conducted, they do not determine how bank protection will be designed and constructed.) For this reason, Table 2 indicates that these types of work products will not undergo SAR.

SAR resources would not be well used for DDs for QS bank protection that already has been constructed but is not in compliance with EP 1110-2-18. Such DDs do not lead to new construction or modification of the flood system. They also are screened by the Risk-Informed Design Team (RIDT) and evaluated closely by the Levees Senior Oversight Group (LSOG) prior to approval.

All DDs, in fact, undergo a risk assessment to determine if the deviation poses an unacceptable risk. The assessment must adhere to the principle, "Do no harm. Risk-informed designs should not increase the risk to the population and property above the risk the population currently experiences." (ECB 2019-15) Accordingly, if the risk assessment indicates that the DD will violate tolerable risk guidelines (TRGs) detailed in ECB 2019-15 (e.g. if the DD were to elevate the risk beyond existing levels), it will be rejected and not incorporated into a design for construction. For this reason and because DDs for levee projects are subject to DQC, ATR, and special levee safety review (District and MSC LSPMs and LSOs, RIDT, and LSOG), SAR will not be conducted for DDs for future QS bank protection, unless, as discussed in Section 7.2, there are unusual circumstances that lead the SPK ED Chief to determine that SAR is needed in a special case. In addition to the documentation of SAR determination discussed in Section

7.2, DD reports and their approval memoranda provide additional detailed documentation and analysis that support the above rationale for not conducting SAR for QS bank protection DDs.

Proposed construction whose impacts have been assessed by an EA that leads to a FONSI, by definition, do not pose a significant threat to the environment. Therefore, an EA with FONSI will not undergo IEPR on its own. An EA would undergo SAR,as part of a design package only if it is determined that the design requires SAR. If in the future an EIS needs to be developed for SRBPP, a determination will be made at that time whether the EIS requires IEPR. The RP is to be updated when a new determination is made that a particular work product requires IEPR or SAR.

7.4 SAR / IEPR Implementation

Once the PDT foresees that a SAR is needed, this RP will be updated with details for planning the SAR, and the details will be included in the relevant QCP. The updated RP and QCP will indicate the milestone(s) at which the SAR will occur. The RP also will be updated with the planning details if a need for IEPR develops for any other reason (e.g. EIS). A roster for any IEPR or SAR to be conducted will be included in Appendix 1, and its cost and schedule information in Appendix 2.

The USACE RMC will be the RMO for all SARs. To manage the SAR, RMC will obtain the services of a qualified outside eligible organization (OEO). Costs for any SAR or IEPR will be included in project costs shared with the NFS.

7.5 Required Expertise

All SAR or IEPR panels will be established in accordance with ER 1165-2-217. The following is a recommended list of required disciplines and related expertise for a SAR. This list is not exhaustive, as other disciplines and expertise may be included as well:

Geotechnical Engineer: The Geotechnical Engineering panel member must be a senior-level geotechnical engineer with experience in the field of geotechnical engineering, analysis, design, and construction of embankment dams or levees. The Panel Member must have knowledge and experience in the forensic investigation and evaluation of seepage and piping, settlement, slope stability, and deformations problems associated with embankments constructed on weathered and jointed rock and alluvial soils. The Panel Member must have experience with bank protection projects and preferably levee bank stabilization and building new setback levees (including seepage analysis, slope stability etc.). The Panel Member must have experience in failure mode analysis, levee risk assessment of levees or embankment dams, and evaluating risk reduction measures for safety assurance projects.

Hydrologic and Hydraulic Engineering: The team member must be a registered professional with a minimum of five years' experience in discipline specific features of similar projects, as stated within this document. The team member must be an expert in the field of urban hydrology & hydraulics, have a thorough understanding of the dynamics of both open channel flow systems and enclosed systems, application of detention/retention basins, effects of best management practices and low impact development on hydrology, approaches that can benefit water quality, application of levees and flood walls in an urban environment with space constraints, non-structural measures (especially as related to multipurpose alternatives including ecosystem restoration), non-structural solutions involving flood warning systems, and non-structural alternatives related to flood proofing. A certified flood plain manager is recommended but not required. The team member must understand computer modeling techniques that may be used for this project, such as RMA2, ADH, HEC-RAS, and FLO-2D.

Civil Engineering: The team member must be a registered professional with a minimum of five years' experience in discipline specific elements on projects similar in scope and complexity to the project, as stated within this document. The team member must be experienced in levee and floodwall design, post-construction evaluation, rehabilitation, earthwork operations, construction phasing, utility relocations, positive closure requirements and internal drainage for levee construction, and application of non-structural flood damage reduction (specifically, flood proofing).

7.6 Documentation of SAR

Documentation of any SAR will be prepared in accordance with ER 1165-2-217. The review will be documented in DrChecks. The technical project leader will facilitate the creation of a project portfolio in the system to allow access by the OEO. The District will consult the vertical team and outside resources as needed to evaluate the panel's comments and prepare responses.

PDT members shall not contact SAR panel members directly. All communication shall occur through the OEO. The PDT may seek clarification of a comment's intent or provide clarification of the information contained in the reviewed document. The SAR comment record and recommendations from the panel will be provided to the RMC as soon as they become available. The panel shall prepare a SAR Milestone Review Summary report for submission to the Corps as required by Section 7.6 of ER 1165-2-217.

8.0 Levee Safety Review

Some SRBPP products will be provided to the District's LSPMs and Levee Safety Officer (LSO) for concurrence prior to submission for ATR. A memorandum approving such reports (e.g. DD reports) will be developed for the District LSO's approval at the conclusion of DQC. The Levee Safety Senior Oversight Group (LSOG) will be requested to concur with the approval memorandum, signed by the district LSO. SPK and SPD LSPMs and LSOs are listed in Appendix 1, Table 6.

8.1 LSOG Review

All proposed deviations from mandatory design standards (including rationale) must be documented in a memorandum approved by the district and division LSO and concurred by the LSOG. (The Risk-Informed Design Team [RIDT] screens submissions prior to LSOG review.) The LSOG will ensure the appropriate Community of Practice (CoP) leaders or their designated representatives are included in the concurrence process. Review documentation will account for all decisions and rationale for deviations, including the memorandum documenting approval and concurrence. SPK will coordinate with the RMO and, as appropriate, other CoP leaders when considering a design deviation.

The RMO will coordinate with appropriate USACE centers of expertise and LSOG, as needed for decisions. LSOG members from relevant disciplines will participate as members of the vertical team, technical review, or policy review, as appropriate.

9.0 Site Specific Risks

This RP's project description (Section 2) includes a general discussion of potential risk posed by the project's engineering and construction activities. The present section explains how risks at specific sites will be addressed by the project during its technical review processes and documented.

Risks posed by the project's future engineering design and construction activities, especially risks to public safety, will be considered on a case-by-case basis, taking account of the specific circumstances and characteristics of the relevant erosion sites and units of the flood system where bank protection is proposed to be constructed. Risks will be considered not only when construction of a setback levee is planned, but also when bank protection involves placement of quarry stone at the point of erosion.

Risks specific to a site or group of sites will be summarized in the QCP for the relevant engineering product, making use of the most current available levee safety assessment, levee screening fact sheet, and levee screening tool data. It is expected that DDRs will discuss the risks at a greater level of detail, informed by the development of the design and associated analyses. As discussed in the RP's Work Products section, design deviations are special cases where potential risks arising from the deviation are required to be explicitly evaluated with a high degree of rigor and documented accordingly. Documentation of determinations whether SAR is needed is discussed in Section 7.

10.0 Approvals

10.1 Review Plan Approval and Updates

The MSC Commander or delegated official is responsible for approving this RP. The Commander's approval reflects vertical team input (involving the District, MSC, and RMC) as to the appropriate scope, level of review, and endorsement by the RMOs. This includes the Sacramento District Chief of Engineering's risk-informed decision whether the project would benefit from a SAR, with the rationale for whether to conduct or not conduct a SAR documented in Section 7 of this RP. The approved RP will be provided to the RMOs.

The RP is a living document and should be updated in accordance with current civil works review guidance (ER 1165-2-217) within three years of approval or sooner. All changes made to the approved RP will be documented in a table of RP revisions to be attached to the RP. Significant changes to the RP, e.g. scope of project or levels of review, will require the revised RP to be resubmitted for RMO endorsement and MSC approval.

10.2 Reviewed Product Approvals

After technical reviews are completed, SRBPP work products will be approved at the district or MSC level, as indicated in Table 2. The approval responsibilities identified in the table are based upon policy guidance and commitments made in the PACR. NoCs will be reviewed by Operations, Project Management, and Civil Design supervisors before being forwarded to the district commander for approval and signature.

Adherence to current policy guidance is included in the scope of DQC and ATR reviews. PDT or DQC reviews may involve the SPK Office of Counsel. Documents that are signed by the District Engineer (i.e. SPK Commander) are first reviewed by SPK OC as a matter of regular practice. For documents approved at a level above that of the District, SPD fulfils a quality assurance role that also ensures adherence to policy. Documents that are approved by the SPD Commander are first reviewed by SPD's OC.

11.0 Review Plan Points of Contact

Inquiries or comments from the public regarding this RP should be directed to: SacRiverBank@usace.army.mil or 916-557-5100. The District's Public Affairs office will forward the communication to the project manager for consideration by the PDT.

Current points of contact are identified for purposes of agency use in Appendix 1, Table 7.

Appendix 1 Team Rosters (CUI)

Table 1: Project Delivery Team

Name	Role	Phone	Email
USACE Sacramento District			
Steve Osgood	Project Manager	916-557-6955	Stephen.M.Osgood@usace.army.mil
Fernando Gonzalez	Project Mgmt. Specialist	916-557-7698	Fernando.Gonzalez@usace.army.mil
George Preston	Hydraulic Design	916-557-7587	George.H.Preston@usace.army.mil
Cyrus Yaghobi	Geotechnical Lead	916 -557-6681	Cyrus.M.Yaghobi@usace.army.mil
Emily Greene	Operations	916-557-7906	Emily.K.Greene@usace.army.mil
Nick Stauber	Real Estate	916-557-7861	Nicholas.A.Stauber@usace.army.mil
Eric Yang	Cost Engineering	916-557-6723	Eric.Yang@usace.army.mil
Ashley Lopez	Environmental Lead	916-557-7004	Ashley.K.Lopez@usace.army.mil
Lorena Guerrero	Environmental	(916) 557-7134	Lorena.G.Guerrero@usace.army.mil
Darin Rummel	Environmental	916-557-6629	Darin.L.Rummel@usace.army.mil
Robert Gudino	Cultural Resources	916-557-5104	Robert.Gudino@usace.army.mil
Jessica Agajan	Environmental	(916) 557-6862	Jessica.L.Agajan@usace.army.mil
Robert Chase	Fisheries Biologist	(916) 557-7630	Robert.D.Chase@usace.army.mil
David Colby	Fisheries Biologist	(916) 557-7463	David.J.Colby@usace.army.mil
Brian Mulvey	Fisheries Biologist	(707) 478-3202	Brian.M.Mulvey@usace.army.mil
Vanessa Nino-Tapia	Civil Design Lead	(916) 557-7908	Vanessa.M.Nino@usace.army.mil
Thomas Carron	Construction	(916) 827-5313	Thomas.A.Carron@usace.army.mil
Brad Johnson	Landscape Architect	(916) 557-7812	Bradley.C.Johnson@usace.army.mil
Morgan Marlatt	Hydraulic Analysis	(916) 557-7120	Morgan.K.Marlatt@usace.army.mil
Jim Mars	Hydrology (GIS)	(916) 557-7138	James.S.Mars@usace.army.mil
Michael Arles	SQRA Facilitator	(916) 557-7441	Michael.A.Arles@usace.army.mi
Sarah Ross Arrouzet	Planning Lead	(916) 557-5256	Sarah.R.RossArrouzet@usace.army.mil
Dean McLeod	Economist	(916) 557-5313	Dean.M.McLeod@usace.army.mil
Rickey Oskey	Economics	(916) 557-7496	Richard.L.Oskey@usace.army.mil
Joe Hernandez	Economics	916-557-7475	Joe.A.Hernandez@usace.army.mil
Cristina Thao	Economics	(916) 557-7285	Christina.F.Thao@usace.army.mil
Darin Rummel	Biologist	(916) 557-7026	Darin.L.Rummel@usace.army.mil
Dylan Van Dyne	PM	(916) 557-7666	Dylan.R.VanDyne@usace.army.mil
Casey Young	Geomatics	(916) 557-7158	Casey.C.Young@usace.army.mil
Chelsea Fuentes	Office of Counsel	(916) 557-5293	Chelsea.M.Fuentes@usace.army.mil
Tom Pao	Geomatics (GIS)	(916) 557-6929	Thomas.Pao@usace.army.mil
Juan Gonzalez	Operations	(916) 557-7936	Juan.M.Gonzalez@usace.army.mil
Department of Water Resources			
Kip Young	DWR - Environmental	916-574-1437	kip.young@water.ca.gov
Bob Clarke	DWR – Project Manager	916-574-1300	Robert.Clarke@water.ca.gov
Sassan Soltani	DWR – Hydraulic Engineer	(916) 671-1314	Sassan.Soltani@water.ca.gov
David Smith	DWR - Real Estate	(916) 671-1314	David.Smith@water.ca.gov
Resource Agencies			
Allison Lane	NOAA Coordinator	916-930-3656	Allison.Lane@noaa.gov
Jennifer Hobbs	USFWS Coordinator	916-414-4400	Jennifer_Hobbs@fws.gov

Table 2: District Quality Control Team

Name	Discipline (Activity)	Phone	Email
Jimmy Pan	Hydraulic Analysis	(916) 557-6714	Jimmy.J.Pan@usace.army.mil
Sidney I. Jones	Landscape Architect	(916) 557-7273	Sidney.I.Jones@usace.army.mil
Glen Johnson	Levee Safety	(775) 326-1017	Glen.A.Johnson@usace.army.mil
Yari Johnson	Environmental Planning	(916) 557-6937	Yari.B.Johnson@usace.army.mil
Aaron Schlein	Economics	(916) 557-7440	Aaron.P.Schlein@usace.army.mil
Juan Gonzalez	Operations	(916) 557-7936	Juan.M.Gonzalez@usace.army.mil
TBD	Cultural Resources		
Rick Torbik	Civil Design	(916) 557-6698	Richard.A.Torbik@usace.army.mil
LeAnne Jett	Real Estate	(916) 557-6829	LeAnne.J.Jett@usace.army.mil
TBD	Cost Engineering		
TBD	Construction		
TBD	Levee Safety		
TBD	Geotech		
TBD	H&H		

Table 3: Agency Technical Review Team

Name	District	Discipline	Phone	Email	Product
Ben Caldwell	MVK-EC-PC	Lead/Civil Design	(601) 631-5593	Ben.S.Caldwell@usace.army.mil	*Design Deviations
Charles Ifft	CENWS-END-G	Vegetation	(206) 764-6938	Charles.H.Ifft@usace.army.mil	*Design Deviations
Heather Sibley	MVK-EC-GA	Geotech	(601) 631-5917	Heather.M.Sibley@usace.army.mil	*Design Deviations
John Remus	CENWD-PDR	H&H	(402) 996-3840	John.I.Remus@usace.army.mil	*Design Deviations
Michael Gonia	CEMWS-END-G	O&M	(206) 619-3982	Michael.J.Gonia@usace.army.mil	*Design Deviations
Kurt Buchanan	CELRH-NC	Economics	(304) 399-5187	Kurt.L.Buchanan@usace.army.mil	*Design Deviations
Andrew Sander	CEMVP-EC-H	H&H (pre-SQRA)	(651) 290-5466	Andrew.R.Sander@usace.army.mil	*Design Deviations
Jason Farmer	CENWK-PMP-R	Environmental Planning	(816) 389-3097	Jason.W.Farmer@usace.army.mil	*Design Deviations
Bill Bolte	MCX	Cost Engineering[1]	(509) 527-7585	William.G.Bolte@usace.army.mil	TPCS

[1]The cost engineering team member nomination will be coordinated with the NWW Cost Estimating Mandatory Center of Expertise as required. The MCX will determine if the cost estimate will need to be reviewed by its staff.

Table 4: BCOES Review Personnel

Name	Discipline (Activity)	Phone	Email
Jimmy Pan	Hydraulic Analysis	(916) 557-6714	Jimmy.J.Pan@usace.army.mil
Sidney I. Jones	Landscape Architect	(916) 557-7273	Sidney.I.Jones@usace.army.mil
Glen Johnson	Geotech	(775) 326-1017	Glen.A.Johnson@usace.army.mil
Yari Johnson	Environmental Planning	(916) 557-6937	Yari.B.Johnson@usace.army.mil
Aaron Schlein	Economics	(916) 557-7440	Aaron.P.Schlein@usace.army.mil
Juan Gonzalez	Operations	(916) 557-7936	Juan.M.Gonzalez@usace.army.mil
Justin Puffer	Construction (tentative)	(916) 557-7043	Justin.L.Puffer@usace.army.mil

Table 5: Vertical Team

Name	Discipline	Phone	Email
Jessie Burton Evans	District Support Team	(415) 503-6736	Jessica.L.Burton-Evans@usace.army.mil
Cynthia Fowler	Environmental Lead SPD	(415) 503-6858	Cynthia.J.Fowler@usace.army.mil

Table 6: SPK and SPD LSPMs and LSOs

Name	Role	Phone	Email
James, Erik	SPK LSPM	(916) 557-5259	Erik.W.James@usace.army.mil
Larson, Ryan	SPK LSPM	(916) 557-7568	Ryan.T.Larson2@usace.army.mil
Bigornia, Boni	SPD LSPM	(415) 503-6567	Boniface.G.Bigornia@usace.army.mil
Poeppelman, Rick	SPK LSO	(916) 557-7301	Rick.L.Poeppelman@usace.army.mil
Moreno, John	SPD LSO	(415) 503-6510	John.D.Moreno@usace.army.mil

Table 7: SRBPP Review Plan Points of Contact

Name	Role	Phone	Email
Stephen Osgood	Project Manager	(916) 557-6955	Stephen.M.Osgood@usace.army.mil
Jessica Burton-Evans	SPD District Support Team Lead	(415) 503-6736	Jessica.L.Burton-Evans@usace.army.mil
Emily Calla	RMC Levees Quality Manager	(412) 667-6633	Emily.K.Calla@usace.army.mil

Appendix 2 Schedule and Cost Information

Schedule and cost information for technical reviews of project work products for the 405K LF portion of Phase II is provided in this appendix. After federal funds are received to begin implementing the 80K LF portion and a new partnership agreement is established for it, the appendix will be updated to include schedule and cost information for technical reviews of work products for future bank protection. A tentative review schedule for anticipated 80K LF products can be found below.

Cost information

DQC costs are estimated to range from $20K - $100K per package depending upon the scale and complexity of the package of documents being reviewed and the number of iterations or stages of product development required. For example, a programmatic document produced at the District level with no public review may require only one set of technical reviews before it is finalized as a permanent record. Bank protection to be constructed will require review at multiple stages of design. (A single iteration of a technical review involves all three basic steps of comment, respond, back-check. Back-checks may require multiple rounds during a single review at a given stage.)

ATR costs will vary greatly depending upon the type of product to be reviewed and number of iterations required. ATR for a straight forward TPCS update could cost as little as $5K. ATR for a design deviation (DD) package for vegetation on levees is currently estimated to cost approximately $20K. These DDs are for sites already constructed, involving a single post-construction stage of development. Costs for a future design package with no DD are estimated in the range of $60K - $100K through five stages of design and construction. (See Tables 3 and 4, below, for planned stages.)

Costs for SAR are anticipated to range between $30K - $50K per stage of design and construction, or up to $150K per construction contract.

BCOES costs are expected to average roughly $10K per iteration, or $30K per contract.

Schedule

The schedule for development, review, and approval of Notices of Completion with updates to O&M manual supplements for the project's backlog of previously constructed bank protection is displayed in Table 1.

Table 1: Notice of Completion Schedule

Unit #	Site(s)	Manual Revision Start	End (Notice Issued)	DQC Completed	NoC Issued
141.1	FR 1.0L, FR 5.5L	12/8/2020	5/26/2021	Yes	In Progress
115	SR: 47L, 49.6L, 49.7L, 49.9L, 50.4L, 50.8L, 52.4L, 53.1L, 52.3L	1/15/2021	6/20/2021	No	No
124	SR: 68.9L, 73.5L, 78.0L	2/19/2021	7/30/2021	No	No
128	SR: 87.0L, 93.7L	4/9/2021	9/10/2021	No	No
131	SR: 136.7R, 136.9R	6/14/2021	11/26/2021		
113	SR 42.7R	09/13/2021	02/11/2022	No	No
130	SR 114.5R	11/8/2021	04/29/2022	No	No
134	SR 123.5L	02/18/2022	07/18/2022	No	No
135	SB 0.4E	05/16/2022	10/07/2022	No	No
136	SR 149L	07/11/2021	12/16/2022	No	No

The schedule for development, review, and approval of design deviations for backlog sites that are not in compliance with the USACE EP for management of vegetation on levees is shown in Table 2.

Table 2: Design Deviations Review Schedule

Unit	Group of Sites	Report Start	DQC Complete	ATR Start	ATR Complete	LSOG Review Complete	SPD/HQ Approval
102	Brannan Andrus Levee Maint Dist. (Sac 16.8 L)	10/1/2019	4/13/2020	5/4/2020	9/16/2020	10/19/2020	11/10/2021
114	Lisbon Island, RD 307 (Sac 43.7R, 44.7R, 47.9R, 48.2R)	3/20/2020	1/4/2021	1/15/2021	5/5/2021	7/1/2021	2/11/2022
105 102	Ryer Island, RD 501; SAC 16.9L BALMD (STM 16.6R, 19.0R, 19.4R; SAC 16.9L)	6/22/2020	7/30/2021	8/30/2021	11/5/2021	1/28/2022	7/29/2022
110	Sutter Island, RD 349 (STM 22.7R, SAC 33.0R, 33.3R)	5/10/2021	11/5/2021	11/8/2021	1/14/2022	5/6/2022	11/4/2022
111 117	Miscellaneous Sites (SAC 26.9L, 56.7L) RD 554, City of Sac	8/16/2021	4/8/2022	4/11/2022	6/17/2022	10/7/2022	4/7/2023
112 116	Merritt Island*, RD 150 W. Sacramento*, RD 900	1/3/2022	8/26/2022	8/29/2022	11/4/2022	2/24/2023	8/25/2023

*May not require a design deviation

Dates not finalized, subject to change

Tables 3 and 4 display design milestones at which technical reviews would be performed. As discussed in Section 7 of the body of the RP, SAR would be conducted for setback levees, but not for traditional quarry stone bank protection. Review by experts external to USACE likely can make the greatest contribution to future construction after designs have been drafted and received the benefit of DQC and ATR. Accordingly, for setback levees, the PDT will plan for SAR to occur after 60% designs have been developed and again at final design. During actual construction, the potential to conduct SAR is greatly influenced by the length of the construction period. The technical review schedules in the tables below assume that QS bank protection usually will be constructed in a single construction season lasting approximately 3 months. The brevity of the construction season requires SPK to respond rapidly to proposed design changes, affording little opportunity for review by experts outside of USACE during construction. By contrast, a setback levee is more likely to be constructed over multiple construction seasons, creating greater opportunity for SAR during construction (e.g. at or near the midpoint of construction). The tables below will be updated or replaced once specific dates for technical reviews are established.

Table 3: Review Schedule for Setback Levee Design

Level of Review	DQC		ATR		SAR*		BCOES	
Milestone	Review Start & End Dates		Review Start & End Dates		Review Start & End Dates		Review Start & End dates	
30%	TBD	TBD	TBD	TBD	N/A	N/A	N/A	N/A
60%	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD
90%	TBD	TBD	TBD	TBD	N/A	N/A	TBD	TBD
Final	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD
Design Change During Construction	TBD	TBD	TBD	TBD	N/A	N/A	N/A	N/A
Midpoint of Construction	N/A	N/A	N/A	N/A	TBD	TBD	N/A	N/A

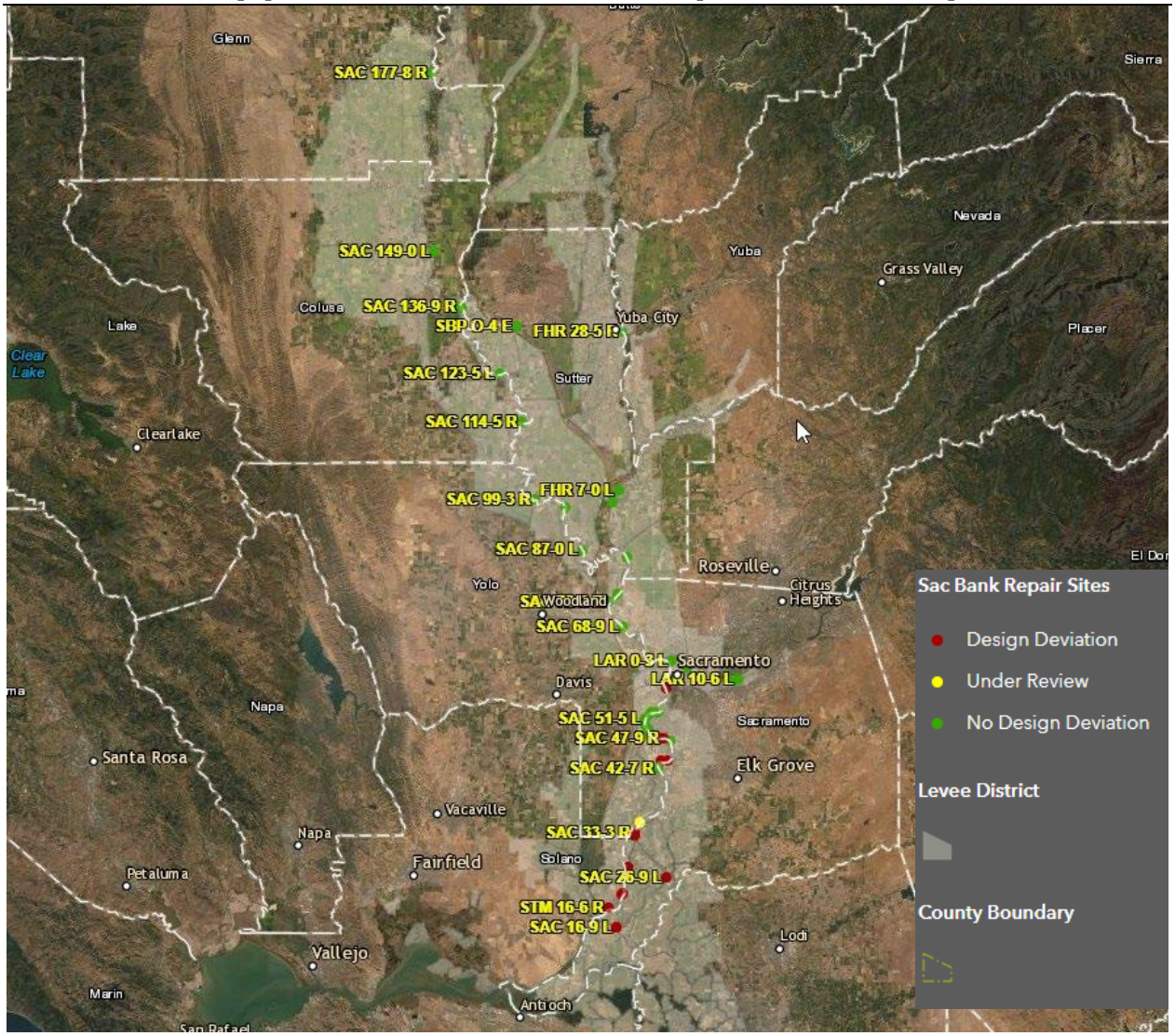
Key: TBD= review would be conducted for the milestone, dates to be determined.
N/A = not applicable; review would not be conducted for this milestone
* Whether and when to conduct SAR subject to re-determination by SPK Chief of Engineering.

Table 4: Review Schedule for QS Bank Protection Design

Level of Review	DQC		ATR		BCOES	
Milestone	Review Start & End		Review Start & End		Review Start & End	
30%	TBD	TBD	TBD	TBD	N/A	N/A
60%	TBD	TBD	TBD	TBD	TBD	TBD
90%	TBD	TBD	TBD	TBD	TBD	TBD
Final	TBD	TBD	TBD	TBD	TBD	TBD
Design Change During Construction	TBD	TBD	TBD	TBD	N/A	N/A

For a design with one or more deviations from minimum engineering standards, SQRA would be conducted between 30% and 60% designs. Levee safety reviews of the resulting DD/SQRA report would occur between 60% and 90% designs.

Appendix 3 SRBPP Repair Site Map



Appendix 4 Review Plan Revisions

Table 1: Review Plan Revisions

Revision Date	Description of Change	Page/Paragraph Number